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(54) **NEW COMPOUND AND ORGANIC LIGHT EMITTING DEVICE USING THE SAME(5)**

NEUE VERBINDUNG UND ORGANISCHE LICHTEMITTIERENDE VORRICHTUNG DAMIT (5)

NOUVEAU COMPOSE ET DISPOSITIF ELECTROLUMINESCENT ORGANIQUE UTILISANT UN TEL COMPOSE (5)

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- **TRITSCHLER ET AL. CHEMISCHE BERICHTE vol. 117, no. 8, 1984, pages 2703 - 2713, XP008095206**

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Description

Technical Field

[0001] The present invention relates to an organic light emitting device which comprises a fluorene derivative capable of significantly improving a lifespan, efficiency, and electrochemical and thermal stabilities thereof.

[0002] Background Art

[0003] An organic light emission phenomenon is an example of a conversion of current into visible rays through an internal process of a specific organic molecule. The organic light emission phenomenon is based on the following mechanism. When organic material layers are interposed between an anode and a cathode, if voltage is applied between the two electrodes, electrons and holes are injected from the cathode and the anode into the organic material layer. The electrons and the holes which are injected into the organic material layer are recombined to form an exciton, and the exciton is reduced to a bottom state to emit light. An organic light emitting device which is based on the above mechanism typically comprises a cathode, an anode, and organic material layer(s), for example, organic material layers including a hole injection layer, a hole transport layer, a light emitting layer, and an electron transport layer, interposed therebetween.

[0004] The materials used in the organic light emitting device are mostly pure organic materials or complexes of organic material and metal. The material used in the organic light emitting device may be classified as a hole injection material, a hole transport material, a light emitting material, an electron transport material, or an electron injection material, according to its use. In connection with this, an organic material having a p-type property, which is easily oxidized and is electrochemically stable when it is oxidized, is mostly used as the hole injection material or the hole transport material. Meanwhile, an organic material having an n-type property, which is easily reduced and is electrochemically stable when it is reduced, is used as the electron injection material or the electron transport material. As the light emitting layer material, an organic material having both p-type and n-type properties is preferable, which is stable when it is oxidized and when it is reduced. Also a material having high light emission efficiency for conversion of the exciton into light when the exciton is formed is preferable.

[0005] The document WO 2004/020371 discloses fluorene compounds wherein the two benzene rings are substituted with arylamine moities. These compounds are applied in the light-emitting layer or hole-transporting layer of organic light-emitting devices.

[0006] In addition, it is preferable that the material used in the organic light emitting device further have the following properties.

[0007] First, it is preferable that the material used in the organic light emitting device have excellent thermal stability. The reason is that joule heat is generated by movement of electric charges in the organic light emitting device. NPB, which has recently been used as the hole transport layer material, has a glass transition temperature of 100°C or lower, thus it is difficult to apply to an organic light emitting device requiring a high current.

[0008] Second, in order to produce an organic light emitting device that is capable of being actuated at low voltage and has high efficiency, holes and electrons which are injected into the organic light emitting device must be smoothly transported to a light emitting layer, and must not be released out of the light emitting layer. To achieve this, a material used in the organic light emitting device must have a proper band gap and a proper HOMO and LUMO energy levels. A LUMO energy level of PEDOT:PSS, which is currently used as a hole transport material of an organic light emitting device produced using a solution coating method, is lower than that of an organic material used as a light emitting layer material, thus it is difficult to produce an organic light emitting device having high efficiency and a long lifespan.

[0009] Moreover, the material used in the organic light emitting device must have excellent chemical stability, electric charge mobility, and interfacial characteristic with an electrode or an adjacent layer. That is to say, the material used in the organic light emitting device must be little deformed by moisture or oxygen. Furthermore, proper hole or electron mobility must be assured so as to balance densities of the holes and of the electrons in the light emitting layer of the organic light emitting device to maximize the formation of excitons. Additionally, it has to be able to have a good interface with an electrode including metal or metal oxides so as to assure stability of the device.

[0010] Accordingly, there is a need to develop an organic light emitting device including an organic material having the above-mentioned requirements in the art.

[0011] Disclosure of Invention Technical Problem

[0012] Therefore, the object of the present inventions is to provide an organic light emitting device which is capable of satisfying conditions required of a material usable for an organic light emitting device, for example, a proper energy level, electrochemical stability, and thermal stability, and which includes a fluorene derivative having a chemical structure capable of playing various roles required in the organic light emitting device, depending on a substituent group.

[0013] Technical Solution

[0014] The present invention provides an organic light emitting device according claim 1.

Brief Description of the Drawings

[0015] FIG. 1 illustrates an organic light emitting device comprising a substrate 1, an anode 2, a light emitting layer 3, and a cathode 4; and

[0016] FIG. 2 illustrates an organic light emitting device comprising a substrate 1, an anode 2, a hole injection layer 5, a hole transport layer 6, a light emitting layer 7, an electron transport layer 8, and a cathode 4.

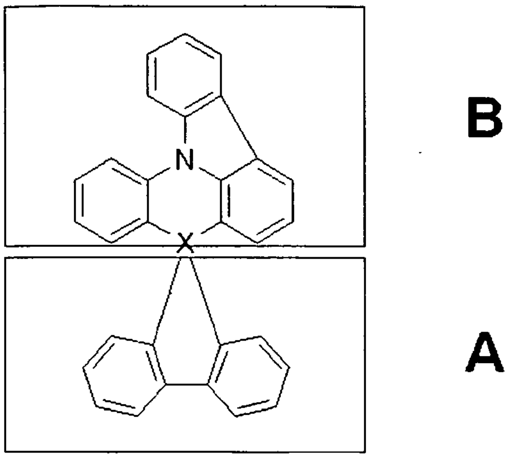
[0017] Best Mode for Carrying Out the Invention

[0018] Hereinafter, a detailed description will be given of the present invention.

[0019] In detail, the core structure in which a fluorene group is bonded to a combination of an acridine group and a carbazolyl group to form a spiro structure, thereby the compound as defined in claim 1 has characteristics suitable for application to an organic material layer used in an organic light emitting device. This will be described in detail, below.

[0020] The steric core structure of the compound as defined in claim 1, for convenience of explanation, can be divided into two portions, A and B, as shown in the following Formula.

[0021]



[0022] The compound as defined in claim 1 has the steric core structure in which a plane A meets with a plane B at right angles around X, and conjugation does not occur between the A and B portions around X. Furthermore, since one nitrogen atom is positioned among three aryl groups in the plane B, conjugation is limited in the plane B.

[0023] The conjugation length of the compound has a close relationship with an energy band gap. In detail, the energy band gap is reduced as the conjugation length of the compound increases. As described above, since a conjugation structure is limited in the core structure of the compound as defined in claim 1, the core structure has a large energy band gap.

[0024] With respect to the energy band gap and the energy level, for example, since the compound of Formula 2-2, in which arylamine is introduced into the hole transport material or the hole injection material of the structure as defined in claim 1, has HOMO of 5.31 cV, it has an energy level suitable for the hole injection layer or the hole transport layer. Meanwhile, the compound of Formula 2-1 has the band gap of 2.99 eV, which is still larger than that of NPB, typically used as the hole transport layer material, thus it has a LUMO value of about 2.32 eV, which is considered to be very high. If a compound having a high LUMO value is used as the hole transport layer, it increases the energy wall of LUMO of the material constituting the light emitting layer to prevent the movement of electrons from the light emitting layer to the hole transport layer. Accordingly, the above-mentioned compound improves the light emission efficiency of the organic light emitting device so that efficiency is higher than that of conventionally used NPB (HOMO 5.4 eV, LUMO 2.3 eV, and energy band gap 3.1 eV). In the present invention, the energy band gap is calculated by a typical method using a UV-VIS spectrum.

[0025] As well, the compound as defined in claim 1 has stable redox characteristics. Redox stability is estimated using a CV (cyclovoltammetry) method. For example, if oxidation voltage is repeatedly applied to the compound of Formula 2-1, oxidation repeatedly occurs at the same voltage and the current amount is the same. This means that the compound has excellent stability to oxidation.

[0026] Meanwhile, since the compound as defined in claim 1 has a high glass transition temperature (Tg), it has excellent thermal stability. For example, the glass transition temperature of the compound of Formula 2-1 is 150°C, which is still higher than that of conventionally used NPB (Tg: 96°C). Such increase in thermal stability is an important factor providing actuating stability to the device.

[0027] Furthermore, the compound as defined in claim 1 may be used to form the organic material layer using a vacuum deposition process or a solution coating process during the production of the organic light emitting device. In connection with this, illustrative, but non-limiting, examples of the solution coating process include a spin coating process, a dip coating process, an inkjet printing process, a screen printing process, a spray process, and a roll coating process.

[0028] Tertiary alcohol, which is produced by a reaction of a lithiated aryl and keto group, is heated in the presence of an acid catalyst to form a hexagonal cyclic structure while water is removed, thereby producing the compound having a spiro structure according to the present invention. The above-mentioned procedure for producing the compound is well known in the art, and those skilled in the art can change the production conditions during the production of the compound as defined in claim 1. The production will be described in detail in the preparation examples later.

[0029] The organic light emitting device of the present invention can be produced using known materials through a known process, modified only in that at least one layer of organic material layer(s) include the compound of the present invention, that is, the compound as defined in claim 1.

[0030] The organic material layer(s) of the organic light emitting device according to the present invention may have a single layer structure, or alternatively, a multilayered structure in which two or more organic material layers are layered. For example, the organic light emitting device of the present invention may comprise a hole injection layer, a hole transport layer, a light emitting layer, an electron transport layer, and an electron injection layer as the organic material layer(s). However, the structure of the organic light emitting device is not limited to this, but may comprise a smaller number of organic material layers.

[0031] Furthermore, the organic light emitting device of the present invention may be produced, for example, by sequentially layering a first electrode, organic material layer(s), and a second electrode on a substrate. In connection with this, a physical vapor deposition (PVD) method, such as a sputtering method or an e-beam evaporation method, may be used, but the method is not limited to these.

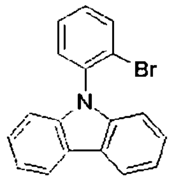
[0032] A method of producing the compound of Formula 1 and the production of the organic light emitting device using the same will be described in detail in the following preparation examples and examples. However, the following preparation examples and examples are set forth to illustrate, but are not to be construed to limit the present invention.

[0033] Mode for the Invention

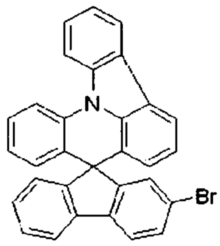
[0034] A better understanding of a method of producing an organic compound as defined in claim 1 and the production of an organic light emitting device using the same may be obtained in light of the following preparation examples and examples which are set forth to illustrate, but are not to be construed to limit the present invention.

[0035] In order to produce the compound as defined in claim 1, any one of the compounds of the following Formulae, a to c, may be used as a starting material.

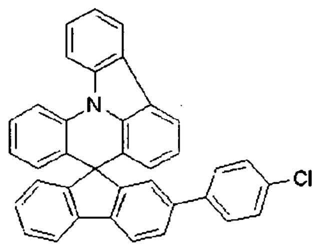
[0036]



[formula a]



[formula b]



[formula c]

[0037] PREPARATION EXAMPLE 1: Preparation of a starting material represented by Formula a

[0038] Carbazole (1.672 g, 10 mmol), 1-bromo-2-iodobenzene (1.5 ml, 12 mmol), potassium carbonate (K_2CO_3, 2.7646 g, 20 mmol), copper iodide (CuI, 95 mg, 0.5 mmol), and 25 ml of xylene were refluxed in a nitrogen atmosphere. After cooling to normal temperature, a product was extracted with ethyl acetate, water was removed with anhydrous magnesium sulfate ($MgSO_4$), and the solvent was removed at a reduced pressure. The resulting product was passed through a silica gel column using a hexane solvent to produce a compound, the solvent was removed at a reduced pressure, and vacuum drying was conducted to produce the resulting white solid compound (800 mg, 25 % yield). MS: $[M+H]^+$= 323.

[0039] PREPARATION EXAMPLE 2: Preparation of a starting material represented by Formula b

[0040] 4.19 g of starting material represented by Formula a (13 mmol) were dissolved in 50 ml of purified THF, and 4.8 ml of n-BuLi (2.5 M in hexane, 12 mmol) were slowly dropped thereon at -78°C. Stirring was conducted at the same temperature for 45 min, and 2.59 g of 2-bromo-9-fluorenone (10.0 mmol) were added thereto. After stirring at the same temperature for 1 hour, the temperature was raised to normal temperature, stirring was carried out for an additional 2 hours, and the reaction was completed in a NH_4Cl aqueous solution. An organic material was extracted with ethyl ether, water was removed therefrom, and an organic solvent was removed to produce yellow solid. The produced solid was dispersed in ethanol, stirred, filtered, and vacuum dried to obtain 4.5 g of intermediate material. The intermediate solid was dispersed in 40 ml of acetic acid, 12 drops of concentrated sulfuric acid were added thereto, and reflux was conducted for 3 hours. After cooling to normal temperature, the resulting solid was filtered, washed with ethanol, and vacuum dried to create 3.98 g of product (82.2 % yield). MS: $[M+H]^+$ = 484.

[0041] PREPARATION EXAMPLE 3: Preparation of a starting material represented by Formula c

[0042] The starting material represented by Formula c (5.0 g, 10.32 mmol) was completely dissolved in 40 ml of THF, 4-chloro-phenylboronic acid (2.42 g, 15.48 mmol), 2M potassium carbonate solution, tetrakis(triphenylphosphine)palladium(O) (0.31 mmol, 0.36 g), and 10 ml of ethanol were added thereto, and reflux was conducted for 24 hours. After the reaction was completed, cooling to normal temperature was conducted, and filtration was conducted. Washing was conducted with water and ethanol, several times. Recrystallization was conducted with ethanol, and vacuum drying was conducted to produce a compound (4.97 g, yield 93 %). MS: $[M+H]^+$= 515.

[0043] EXAMPLE 1: Preparation of the compound represented by Formula 2-2

[0044] Synthesis of arylamine (4-(N-phenyl-N-phenylamino)phenyl-1-naphthylamine) to produce the compound represented by Formula 2-2: 15.0 g of 4-bromophenyl-N-phenyl-N-phenylamine (46.3 mmol) and 7.29 g of 1-naphthylamine (50.9 mmol) were dissolved in 200 ml of toluene, 13.34 g of sodium-tert-butoxide (138.8 mmol), 0.53 g of bis(dibenzylidene acetone)palladium(0) (0.93 mmol), and 0.56 ml of 50 wt% tri-tert-butylphosphine toluene solution (1.39 mmol) were added thereto, and reflux was conducted in a nitrogen atmosphere for 2 hours. Distilled water was added to the reaction solution to complete the reaction, and the organic layer was extracted. A column separation process was conducted using a solvent of n-hexane and tetrahydrofuran at a ratio of 10:1, stirring was conducted using petroleum ether, and vacuum drying was conducted to produce an arylamine connection group (13 g, yield 73 %). MS: $[M+H]^+$= 386.

[0045] 2) 5.00 g of compound of Formula b (10.3 mmol) and 4.78 g of 4-(N-phenyl-N-phenylamino)phenyl-1-naphthylamine (12.4 mmol) were dissolved in 50 ml of toluene, 5.89 g of sodium-tert-butoxide (61.3 mmol), 0.12 g of bis (dibenzylidene acetone)dipalladium(0) (0.21 mmol), and 0.15 ml of 50 wt% tri-tert-butylphosphine toluene solution (0.31 mmol) were added thereto, and reflux was conducted in a nitrogen atmosphere for 2 hours. Distilled water was added to the reaction solution to complete the reaction, and the organic layer was extracted. A column separation process was conducted using a solvent of n-hexane and tetrahydrofuran at a ratio of 4:1, stirring was conducted using petroleum ether, and vacuum drying was conducted to produce the compound of Formula 2-2 (4.3 g, yield 53 %). MS: $[M+H]^+$= 789.

[0046] EXAMPLE 2: Preparation of the compound represented by Formula 2-256

[0047] 1) Synthesis of arylamine (4-(N,N-diphenylamino)-biphenyl-N-phenylamine) to produce the compound represented by Formula 2-256: 4.00 g of 4-chlorobiphenyl-N,N-diphenylamine (11.2 mmol) and 1.13 ml of aniline (12.4 mmol) were dissolved in 100 ml of toluene, 2.70 g of sodium-tert-butoxide (28.1 mmol), 0.13 g of bis(dibenzylidene acetone) palladium(0) (0.23 mmol), and 0.17 ml of 50 wt% tri-tert-butylphosphine toluene solution (0.34 mmol) were added thereto, and reflux was conducted in a nitrogen atmosphere for 5 hours. Distilled water was added to the reaction solution to complete the reaction, and the organic layer was extracted. After a column separation process was conducted using a solvent of n-hexane and tetrahydrofuran at a ratio of 10:1, stirring was conducted using petroleum ether, and vacuum drying was conducted to produce an arylamine connection group (3.8 g, yield 81 %). MS: $[M+H]^+$= 413.

[0048] 2) 3.62 g of compound of Formula b (7.47 mmol) and 3.4 g of 4-(N,N-diphenylamino)-biphenyl-N-phenylamine (8.2 mmol) were dissolved in 40 ml of toluene, 1.94 g of sodium-tert-butoxide (22.4 mmol), 0.09 g of bis(dibenzylidene acetone)palladium(0) (0.16 mmol), and 0.11 ml of 50 wt% tri-tert-butylphosphine toluene solution (0.22 mmol) were added thereto, and reflux was conducted in a nitrogen atmosphere for 2 hours. Distilled water was added to the reaction solution to complete the reaction, and the organic layer was extracted. After a column separation process was conducted using a solvent of n-hexane and tetrahydrofuran at a ratio of 8:1, stirring was conducted using petroleum ether, and vacuum drying was conducted to produce the compound of Formula 2-256 (3.5 g, yield 53 %). MS: $[M+H]^+$= 817.

[0049] EXAMPLE 3: Preparation of the compound represented by Formula 2-257

[0050] 1) Synthesis of arylamine (4-(N,N-diphenylamino)-biphenyl-N-naphthylamine) to produce the compound represented by Formula 2-257: 8.80 g of 4-chlorobiphenyl-N,N-diphenylamine (24.7 mmol) and 5.31 g of 1-naphthylamine (37.1 mmol) were dissolved in 200 ml of toluene, 5.94 g of sodium-tert-butoxide (61.8 mmol), 0.43 g of bis(dibenzylidene acetone)palladium(0) (0.74 mmol), and 0.61 ml of 50 wt% tri-tert-butylphosphine toluene solution (1.24 mmol) were added thereto, and reflux was conducted in a nitrogen atmosphere for 5 hours. Distilled water was added to the reaction solution to complete the reaction, and the organic layer was extracted. After a column separation process was conducted using a solvent of n-hexane and tetrahydrofuran at a ratio of 10:1, stirring was conducted using petroleum ether, and vacuum drying was conducted to produce an arylamine connection group (7.0 g, yield 61 %). MS: $[M+H]^+$= 413.

[0051] 2) 3.62 g of compound of Formula b (7.47 mmol) and 3.8 g of 4-(N,N-diphenylamino)-biphenyl-N-naphthylamine (8.2 mmol) were dissolved in 40 ml of toluene, 1.94 g of sodium-tert-butoxide (22.4 mmol), 0.09 g of bis(dibenzylidene acetone)palladium(0) (0.16 mmol), and 0.11 ml of 50 wt% tri-tert-butylphosphine toluene solution (0.22 mmol) were added thereto, and reflux was conducted in a nitrogen atmosphere for 2 hours. Distilled water was added to the reaction solution to complete the reaction, and the organic layer was extracted. After a column separation process was conducted using a solvent of n-hexane and tetrahydrofuran at a ratio of 8:1, stirring was conducted using petroleum ether, and vacuum drying was conducted to produce the compound of Formula 2-257 (3.5 g, yield 54 %). MS: $[M+H]^+$= 867.

[0052] EXAMPLE 4: Preparation of the compound represented by Formula 2-259

[0053] 1) Synthesis of arylamine (4-(N,N-diphenylamino)-biphenyl-N-biphenylamine) to produce the compound represented by Formula 2-259: 8.80 g of 4-chlorobiphenyl-N,N-diphenylamine (24.7 mmol) and 6.28 g of 4-aminobiphenyl (37.1 mmol) were dissolved in 200 ml of toluene, 5.94 g of sodium-tert-butoxide (61.8 mmol), 0.43 g of bis(dibenzylidene acetone)palladium(0) (0.74 mmol), and 0.61 ml of 50 wt% tri-tert-butylphosphine toluene solution (1.24 mmol) were added thereto, and reflux was conducted in a nitrogen atmosphere for 5 hours. Distilled water was added to the reaction solution to complete the reaction, and the organic layer was extracted. After a column separation process was conducted using a solvent of n-hexane and tetrahydrofuran at a ratio of 10:1, stirring was conducted using petroleum ether, and vacuum drying was conducted to produce an arylamine connection group (7.0 g, yield 58 %). MS: $[M+H]^+$= 489.

[0054] 2) 3.62 g of compound of Formula b (7.47 mmol) and 4.0 g of 4-(N,N-diphenylamino)-biphenyl-N-biphenylamine (8.2 mmol) were dissolved in 40 ml of toluene, 1.94 g of sodium-tert-butoxide (22.4 mmol), 0.09 g of bis(dibenzylidene acetone)palladium(0) (0.16 mmol), and 0.11 ml of 50 wt% tri-tert-butylphosphine toluene solution (0.22 mmol) were added thereto, and reflux was conducted in a nitrogen atmosphere for 2 hours. Distilled water was added to the reaction solution to complete the reaction, and the organic layer was extracted. After a column separation process was conducted using a solvent of n-hexane and tetrahydrofuran at a ratio of 8:1, stirring was conducted using petroleum ether, and vacuum drying was conducted to produce the compound of Formula 2-259 (3.5 g, yield 53 %). MS: $[M+H]^+$= 893.

[0055] EXAMPLE 5: Preparation of the compound represented by Formula 2-273

[0056] 1) Synthesis of arylamine

(4-(N-phenyl-N-naphthylamino)-biphenyl-N-phenylamine) to produce the compound represented by Formula 2-273: 4.08 g of 4-chlorobiphenyl-N-phenyl-N-naphthylamine (10.1 mmol) and 1.38 ml of aniline (15.1 mmol) were dissolved in 100 ml of toluene, 2.90 g of sodium-tert-butoxide (30.2 mmol), 0.17 g of bis(dibenzylidene acetone)palladium(0) (0.30 mmol), and 0.26 ml of 50 wt% tri-tert-butylphosphine toluene solution (0.53 mmol) were added thereto, and reflux was conducted in a nitrogen atmosphere for 7 hours. Distilled water was added to the reaction solution to complete the reaction, and the organic layer was extracted. After a column separation process was conducted using a solvent of n-hexane and tetrahydrofuran at a ratio of 10:1, stirring was conducted using petroleum ether, and vacuum drying was conducted to produce an arylamine connection group (3.8 g, yield 82 %). MS: $[M+H]^+$= 463.

[0057] 2) 3.13 g of compound of Formula b (6.47 mmol) and 3.3 g of 4-(N-phenyl-N-naphthylamino)-biphenyl-N-phenylamine (7.1 mmol) were dissolved in 40 ml of toluene, 1.94 g of sodium-tert-butoxide (22.4 mmol), 0.08 g of bis (dibenzylidene acetone)palladium(0) (0.14 mmol), and 0.11 ml of 50 wt% tri-tert-butylphosphine toluene solution (0.22 mmol) were added thereto, and reflux was conducted in a nitrogen atmosphere for 2 hours. Distilled water was added to the reaction solution to complete the reaction, and the organic layer was extracted. After a column separation process was conducted using a solvent of n-hexane and tetrahydrofuran at a ratio of 8:1, stirring was conducted using petroleum ether, and vacuum drying was conducted to produce the compound of Formula 2-273 (2.5 g, yield 45 %). MS: $[M+H]^+$= 867.

[0058] EXAMPLE 6: Preparation of the compound represented by Formula 2-274

[0059] 1) Synthesis of arylamine

(4-(N-phenyl-N-naphthylamino)-biphenyl-N-naphthylamine) to produce the compound represented by Formula 274: 4.08 g of 4-chlorobiphenyl-N-phenyl-N-naphthylamine (10.1 mmol) and 2.16 g of 1-naphthylamine (15.1 mmol) were dissolved in 100 ml of toluene. 2.90 g of sodium-tert-butoxide (30.2 mmol), 0.17 g of bis(dibenzylidene acetone)palladium(0) (0.30 mmol), and 0.26 ml of 50 wt% tri-tert-butylphosphine toluene solution (0.53 mmol) were added thereto, and reflux was conducted in a nitrogen atmosphere for 7 hours. Distilled water was added to the reaction solution to complete the reaction, and the organic layer was extracted. After a column separation process was conducted using a solvent of n-hexane and tetrahydrofuran at a ratio of 10:1 stirring was conducted using petroleum ether, and vacuum drying was conducted to produce an arylamine connection group (3.8 g, yield 74 %). MS: $[M+H]^+$= 513.

[0060] 2) 3.62 g of compound of Formula b (7.47 mmol) and 3.8 g of

4-(N-phenyl-N-naphthylamino)-biphenyl-N-naphthylamine (7.4 mmol) were dissolved in 40 ml of toluene, 1.94 g of sodium-tert-butoxide (22.4 mmol), 0.089 g of bis(dibenzylidene acetone)palladium(0) (0.16 mmol), and 0.11 ml of 50 wt% tri-tert-butylphosphine toluene solution (0.22 mmol) were added thereto, and reflux was conducted in a nitrogen atmosphere for 2 hours. Distilled water was added to the reaction solution to complete the reaction, and the organic layer was extracted. After a column separation process was conducted using a solvent of n-hexane and tetrahydrofuran at a ratio of 8:1, stirring was conducted using petroleum ether, and vacuum drying was conducted to produce the compound of Formula 2-274 (3.0 g, yield 44%). MS: $[M+H]^+$= 917.

[0061] EXAMPLE 7: Preparation of the compound represented by Formula 2-276

[0062] 1) Synthesis of arylamine

(4-(N-phenyl-N-naphthylamino)-biphenyl-N'-biphenylamine) to produce the compound represented by Formula 276: 4.08 g of 4-chlorobiphenyl-N-phenyl-N-naphthylamine (10.1 mmol) and 2.55 g of 4-aminobiphenyl (15.1 mmol) were dissolved in 100 ml of toluene, 2.90 g of sodium-tert-butoxide (30.2 mmol), 0.17 g of bis(dibenzylidene acetone)palladium (0) (0.30 mmol), and 0.26 ml of 50 wt% tri-tert-butylphosphine toluene solution (0.53 mmol) were added thereto, and reflux was conducted in a nitrogen atmosphere for 7 hours. Distilled water was added to the reaction solution to complete the reaction, and the organic layer was extracted. After a column separation process was conducted using a solvent of n-hexane and tetrahydrofuran at a ratio of 10:1, stirring was conducted using petroleum ether, and vacuum drying was conducted to produce an arylamine connection group (3.8 g, yield 70 %). MS: $[M+H]^+$= 539.

[0063] 2) 3.13 g of compound of Formula b (6.47 mmol) and 3.8 g of 4-(N-phenyl-N-naphthylamino)-biphenyl-N'-biphenylamine (7.1 mmol) were dissolved in 40 ml of toluene, 1.94 g of sodium-tert-butoxide (22.4 mmol), 0.081 g of bis(dibenzylidene acetone)palladium(0) (0.14 mmol), and 0.11 ml of 50 wt% tri-tert-butylphosphine toluene solution (0.22 mmol) were added thereto, and reflux was conducted in a nitrogen atmosphere for 2 hours. Distilled water was added to the reaction solution to complete the reaction, and the organic layer was extracted. After a column separation process was conducted using a solvent of n-hexane and tetrahydrofuran at a ratio of 8:1, stirring was conducted using petroleum ether, and vacuum drying was conducted to produce the compound of Formula 2-276 (2.5 g, yield 41 %). MS: $[M+H]^+$= 943.

[0064] EXAMPLE 8: Preparation of the compound represented by Formula 2-307

[0065] 1) Synthesis of arylamine

(4-(N-phenyl-N-biphenylamino)-biphenyl-N'-phenylamine) to produce the compound represented by Formula 307: 4.86 g of 4-chlorobiphenyl-N-phenyl-N-biphenylamine (11.2 mmol) and 1.13 ml of aniline (12.4 mmol) were dissolved in 100 ml of toluene, 2.70 g of sodium-tert-butoxide (28.1 mmol), 0.13 g of bis(dibenzylidene acetone)palladium(0) (0.23 mmol), and 0.17 ml of 50 wt% tri-tert-butylphosphine toluene solution (0.34 mmol) were added thereto, and reflux was conducted in a nitrogen atmosphere for 7 hours. Distilled water was added to the reaction solution to complete the reaction, and the organic layer was extracted. After a column separation process was conducted using a solvent of n-hexane and tetrahydrofuran at a ratio of 10:1, stirring was conducted using petroleum ether, and vacuum drying was conducted to produce an arylamine connection group (3.8 g, yield 69 %). MS: $[M+H]^+$= 489.

[0066] 2) 3.13 g of compound of Formula b (6.47 mmol) and 3.5 g of 4-(N-phenyl-N-biphenylamino)-biphenyl-N'-phenylamine (7.1 mmol) were dissolved in 40 ml of toluene, 1.94 g of sodium-tert-butoxide (22.4 mmol), 0.081 g of bis (dibenzylidene acetone)palladium(0) (0.14 mmol), and 0.11 ml of 50 wt% tri-tert-butylphosphine toluene solution (0.22 mmol) were added thereto, and reflux was conducted in a nitrogen atmosphere for 2 hours. Distilled water was added to the reaction solution to complete the reaction, and the organic layer was extracted. After a column separation process was conducted using a solvent of n-hexane and tetrahydrofuran at a ratio of 8:1, stirring was conducted using petroleum ether, and vacuum drying was conducted to produce the compound of Formula 2-307 (2.6 g, yield 45 %). MS: $[M+H]^+$= 893.

[0067] EXAMPLE 9: Preparation of the compound represented by Formula 2-308

[0068] 1) Synthesis of arylamine

(4-(N-phenyl-N-biphenylamino)-biphenyl-N'-naphthylamine) to produce the compound represented by Formula 308: 4.86 g of 4-chlorobiphenyl-N-phenyl-N-biphenylamine (11.2 mmol) and 1.78 ml of 1-naphthylamine (12.4 mmol) were dissolved in 100 ml of toluene, 2.70 g of sodium-tert-butoxide (28.1 mmol), 0.13 g of bis(dibenzylidene acetone)palladium (0) (0.23 mmol), and 0.17 ml of 50 wt% tri-tert-butylphosphine toluene solution (0.34 mmol) were added thereto, and reflux was conducted in a nitrogen atmosphere for 7 hours. Distilled water was added to the reaction solution to complete the reaction, and the organic layer was extracted. After a column separation process was conducted using a solvent of n-hexane and tetrahydrofuran at a ratio of 10:1, stirring was conducted using petroleum ether, and vacuum drying was conducted to produce an arylamine connection group (4.0 g, yield 69 %). MS: $[M+H]^+$= 539.

[0069] 2) 3.13 g of compound of Formula b (6.47 mmol) and 3.8 g of 4-(N-phenyl-N-biphenylamino)-biphenyl-N'-naphthylamine (7.1 mmol) were dissolved in 40 ml of toluene, 1.94 g of sodium-tert-butoxide (22.4 mmol), 0.081 g of bis(dibenzylidene acetone)palladium(0) (0.14 mmol), and 0.11 ml of 50 wt% tri-tert-butylphosphine toluene solution (0.22 mmol) were added thereto, and reflux was conducted in a nitrogen atmosphere for 2 hours. Distilled water was added to the reaction solution to complete the reaction, and the organic layer was extracted. After a column separation process was conducted using a solvent of n-hexane and tetrahydrofuran at a ratio of 8:1, stirring was conducted using petroleum ether, and vacuum drying was conducted to produce the compound of Formula 2-308 (3.1 g, yield 51 %). MS: $[M+H]^+$= 943.

[0070] EXAMPLE 10: Preparation of the compound represented by Formula 2-310

[0071] 1) Synthesis of arylamine

(4-(N-phenyl-N-biphenylamino)-biphenyl-N'-biphenylamine) to produce the compound represented by Formula 310: 4.86 g of 4-chlorobiphenyl-N-phenyl-N-biphenylamine (11.2 mmol) and 2.09 ml of 4-aminobiphenyl (12.4 mmol) were dissolved in 100 ml of toluene, 2.70 g of sodium-tert-butoxide (28.1 mmol), 0.13 g of bis(dibenzylidene acetone)palladium (0) (0.23 mmol), and 0.17 ml of 50 wt% tri-tert-butylphosphine toluene solution (0.34 mmol) were added thereto, and reflux was conducted in a nitrogen atmosphere for 5 hours. Distilled water was added to the reaction solution to complete the reaction, and the organic layer was extracted. After a column separation process was conducted using a solvent of n-hexane and tetrahydrofuran at a ratio of 10:1, stirring was conducted using petroleum ether, and vacuum drying was conducted to produce an arylamine connection group (3.6 g, yield 56 %). MS: $[M+H]^+$= 565.

[0072] 2) 2.92 g of compound of Formula b (6.02 mmol) and 3.57 g of 4-(N-phenyl-N-biphenylamino)-biphenyl-N'-

biphenylamine (6.32 mmol) were dissolved in 40 ml of toluene, 1.94 g of sodium-tert-butoxide (22.4 mmol), 0.073 g of bis(dibenzylidene acetone)palladium(0) (0.13 mmol), and 0.10 ml of 50 wt% tri-tert-butylphosphine toluene solution (0.19 mmol) were added thereto, and reflux was conducted in a nitrogen atmosphere for 2 hours. Distilled water was added to the reaction solution to complete the reaction, and the organic layer was extracted. After a column separation process was conducted using a solvent of n-hexane and tetrahydrofuran at a ratio of 8:1, stirring was conducted using petroleum ether, and vacuum drying was conducted to produce the compound of Formula 2-310 (2.5 g, yield 43 %). MS: $[M+H]^+= 969$.

[0073] EXAMPLE 11: Preparation of the compound represented by Formula 3-2

[0074] 1) Synthesis of arylamine (4-(N-phenyl-N-phenylamino)phenyl-1-naphthylamine) to produce the compound represented by Formula 3-2: Synthesis was conducted through the same procedure as in synthesis of the arylamine connection group of Formula 2-2.

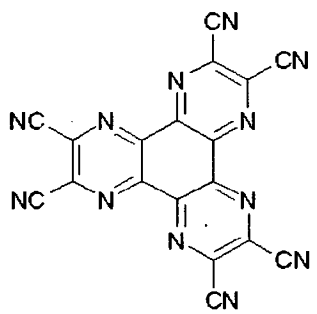
[0075] 2) 4.97 g of compound of Formula c (9.63 mmol) and 5.58 g of 4-(N-phenyl-N-phenylamino)phenyl-1-naphthylamine (12.4 mmol) were dissolved in 50 ml of toluene, 1.85 g of sodium-tert-butoxide (19.3 mmol), 0.11 g of bis (dibenzylidene acetone)palladium(0) (0.19 mmol), and 0.14 ml of 50 wt% tri-tert-butylphosphine toluene solution (0.29 mmol) were added thereto, and reflux was conducted in a nitrogen atmosphere for 2 hours. Distilled water was added to the reaction solution to complete the reaction, and the organic layer was extracted. A column separation process was conducted using a solvent of n-hexane and tetrahydrofuran at a ratio of 4:1, stirring was conducted using petroleum ether, and vacuum drying was conducted to produce the compound of Formula 3-2 (4.5 g, yield 54 %). MS: $[M+H]^+= 865$.

[0076] EXAMPLE 12: Production of an organic light emitting device

[0077] Hexanitrile hexaazatriphenylene (hereinafter, referred to as "HAT") of the following Formula was vacuum deposited to a thickness of 500 Å by heating on a transparent ITO electrode, which was prepared through the above procedure, so as to form an anode including an ITO conductive layer and an N-type organic material.

[0078]

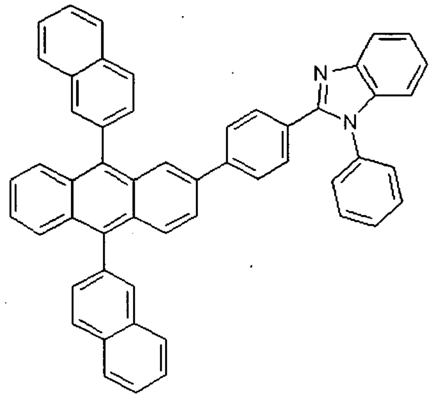
[HAT]



[0079] The compound of Formula 2-2 (400 Å) was vacuum deposited thereon to form a hole transport layer. Alq3 was vacuum deposited to a thickness of 300 Å on the hole transport layer to form a light emitting layer. An electron transport layer material of the following Formula was deposited to a thickness of 200 Å on the light emitting layer to form an electron transport layer.

[0080]

Electron transport layer material



[0081] Lithium fluoride (LiF) having a thickness of 12 Å and aluminum having a thickness of 2000 Å were sequentially deposited on the electron transport layer to form a cathode.

[0082] In the above procedure, the deposition speed of an organic material was maintained at 0.3 - 0.8 Å/sec. Furthermore, lithium fluoride and aluminum were deposited at speeds of 0.3 Å/sec and 1.5 - 2.5Å/sec, respectively, on the cathode. During the deposition, a vacuum was maintained at 1 - 3 X 10^{-7}.

[0083] The resulting device had an electric field of 7.44 V at a forward current density of 100 mA/cm^2, and a spectrum having a light efficiency of 1.69 1m/W. The operation and light emission of the device at the above-mentioned actuating voltage mean that the compound of Formula 2-2, which formed the layer between the hole injection layer and the light emitting layer, functions to transport holes.

[0084] EXAMPLE 13: Production of an organic light emitting device

[0085] HAT was deposited on an ITO substrate, which was prepared through the procedure of example 12, to a thickness of 80 Å to form a thin film. The thin film can improve the characteristics of an interface of the substrate and a hole injection layer. Subsequently, the compound of Formula 2-2 was deposited on the thin film to a thickness of 800 Å to form the hole injection layer.

[0086] NPB was deposited on the hole injection layer to a thickness of 300 Å so as to form a hole transport layer, and Alq3 was then deposited thereon to a thickness of 300 Å to form a light emitting layer. An electron transport layer and a cathode were formed on the light emitting layer through the same procedure as example 14.

[0087] In the present example, deposition speeds of an organic material and the cathode were the same as those of example 12.

[0088] The resulting device had an electric field of 9.36 V at a forward current density of 100 mA/cm^2, and a spectrum having a light efficiency of 2.38 lm/W. The operation and light emission of the device at the above-mentioned actuating voltage mean that the compound of Formula 2-2, which formed the layer between the thin film on the substrate and the hole transport layer, functions to inject holes.

[0089] EXAMPLE 14: Production of an organic light emitting device

[0090] The procedure of example 12 was repeated to produce a device except that the compound of Formula 2-256 was used as the hole transport layer instead of the compound of Formula 2-2.

[0091] The resulting device had an electric field of 8.05 V at a forward current density of 100 mA/cm^2, and a spectrum having a light efficiency of 2.01 lm/W.

[0092] EXAMPLE 15: Production of an organic light emitting device

[0093] The procedure of example 12 was repeated to produce a device except that the compound of Formula 2-257 was used as the hole transport layer instead of the compound of Formula 2-2.

[0094] The resulting device had an electric field of 8.08 V at a forward current density of 100 mA/cm^2, and a spectrum having a light efficiency of 2.37 lm/W.

[0095] EXAMPLE 16: Production of an organic light emitting device

[0096] The procedure of example 12 was repeated to produce a device except that the compound of Formula 2-259 was used as the hole transport layer instead of the compound of Formula 2-2.

[0097] The resulting device had an electric field of 8.00 V at a forward current density of 100 mA/cm^2, and a spectrum having a light efficiency of 2.23 lm/W.

[0098] EXAMPLE 17: Production of an organic light emitting device

[0099] The procedure of example 12 was repeated to produce a device except that the compound of Formula 2-273 was used as the hole transport layer instead of the compound of Formula 2-2.

[0100] The resulting device had an electric field of 8.02 V at a forward current density of 100 mA/cm^2, and a spectrum having a light efficiency of 2.16 lm/W.

[0101] EXAMPLE 18: Production of an organic light emitting device

[0102] The procedure of example 12 was repeated to produce a device except that the compound of Formula 2-274 was used as the hole transport layer instead of the compound of Formula 2-2.

[0103] The resulting device had an electric field of 4.43 V at a forward current density of 100 mA/cm^2, and a spectrum having a light efficiency of 2.24 lm/W.

[0104] EXAMPLE 19: Production of an organic light emitting device

[0105] The procedure of example 12 was repeated to produce a device except that the compound of Formula 2-276 was used as the hole transport layer instead of the compound of Formula 2-2.

[0106] The resulting device had an electric field of 8.13 V at a forward current density of 100 mA/cm^2, and a spectrum having a light efficiency of 2.32 1m/W.

[0107] EXAMPLE 20: Production of an organic light emitting device

[0108] The procedure of example 12 was repeated to produce a device except that the compound of Formula 2-307 was used as the hole transport layer instead of the compound of Formula 2-2.

[0109] The resulting device had an electric field of 8.05 V at a forward current density of 100 mA/cm^2, and a spectrum having a light efficiency of 2.03 lm/W.

[0110] EXAMPLE 21: Production of an organic light emitting device

[0111] The procedure, of example 12 was repeated to produce a device except that the compound of Formula 2-308 was used as the hole transport layer instead of the compound of Formula 2-2.

[0112] The resulting device had an electric field of 8.07 V at a forward current density of 100 mA/cm^2, and a spectrum having a light efficiency of 2.23 lm/W.

[0113] EXAMPLE 22: Production of an organic light emitting device

[0114] The procedure of example 12 was repeated to produce a device except that the compound of Formula 2-310 was used as the hole transport layer instead of the compound of Formula 2-2.

[0115] The resulting device had an electric field of 8.01 V at a forward current density of 100 mA/cm^2. and a spectrum having a light efficiency of 2.19 lm/W.

[0116] EXAMPLE 23: Production of an organic light emitting device

[0117] The procedure of example 12 was repeated to produce a device except that the compound of Formula 3-2 was used as the hole transport layer instead of the compound of Formula 2-2.

[0118] The resulting device had an electric field of 7.34 V at a forward current density of 100 mA/cm^2, and a spectrum having a light efficiency of 1.73 lm/W.

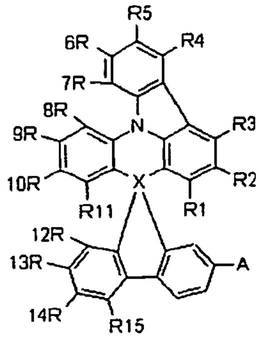
[0119] Industrial Applicability

[0120] The compound of the present invention can be used as an organic material layer material, particularly, hole injection and/or transport materials in an organic light emitting device, and when applied to an organic light emitting device it is possible to reduce the actuating voltage of the device, to improve the light efficiency thereof, and to improve the lifespan of the device through the thermal stability of the compound.

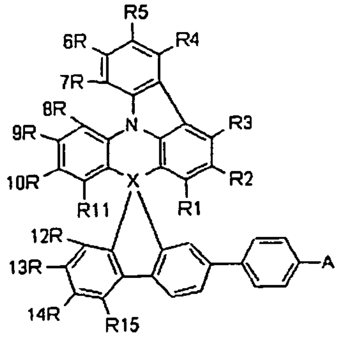
Claims

1. An organic light-emitting device comprising:

a first electrode;
organic material layers comprising a light-emitting layer and one of a hole-injection layer, a hole-transport layer and a layer which both injects and transports holes; and
a second electrode;
wherein the first electrode, the organic material layers and the second electrode form a layered structure; and the hole-injection layer, the hole-transport layer or the layer which both injects and transports holes comprises a compound represented by Formula 2 or Formula 3:

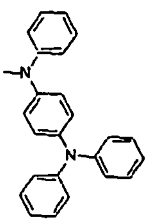


[Formula2]



[Formula3]

wherein:
X is C;
R1 to R15 are hydrogen; and
A is one of the following groups: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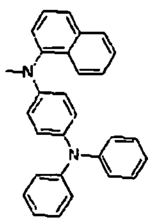
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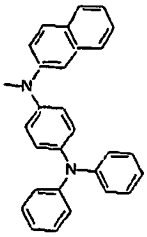
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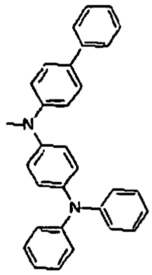
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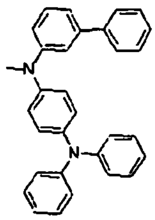
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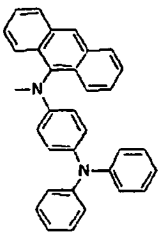
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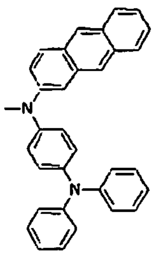
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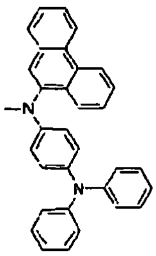
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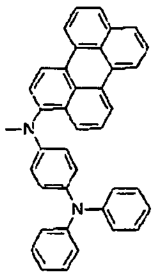
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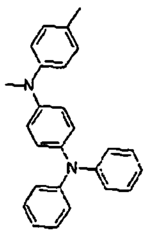
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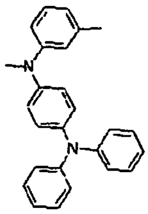
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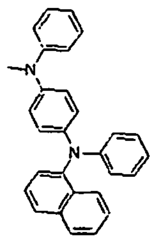
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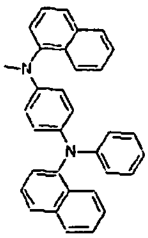
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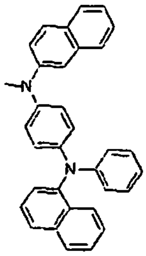
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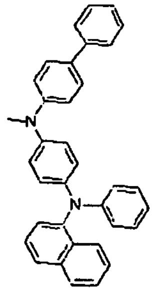
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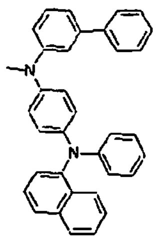
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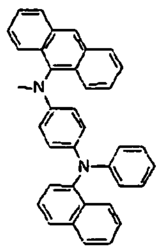
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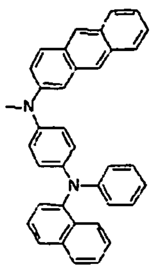
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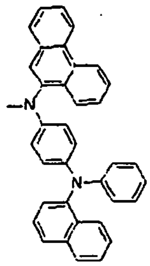
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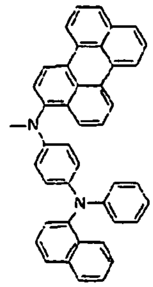
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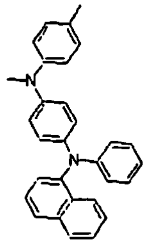
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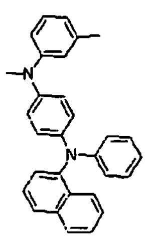
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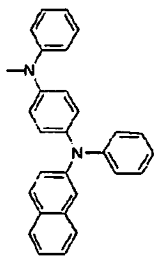
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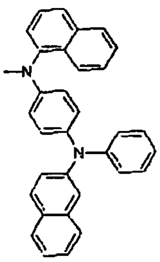
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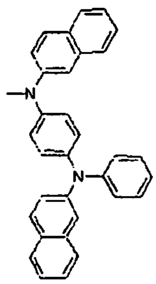
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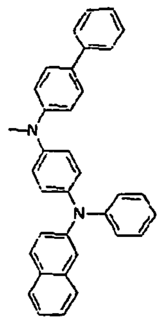
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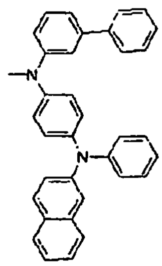
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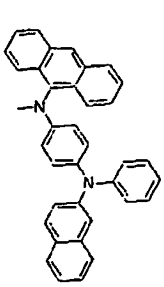
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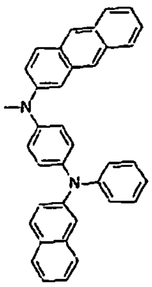
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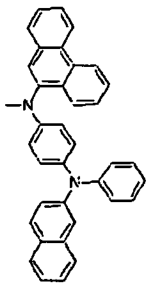
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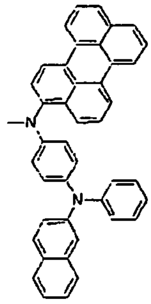
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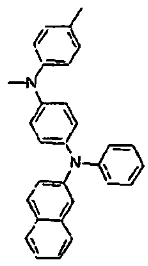
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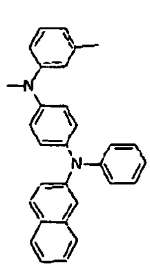
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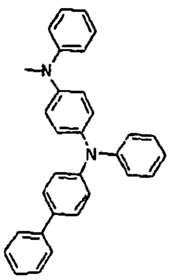
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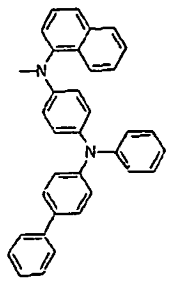
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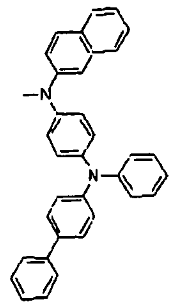
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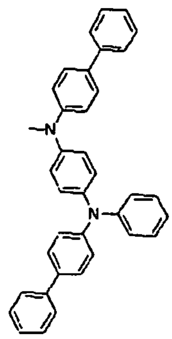
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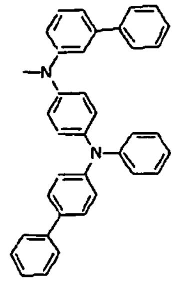
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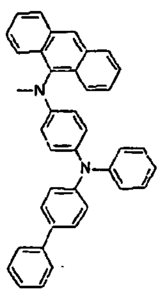
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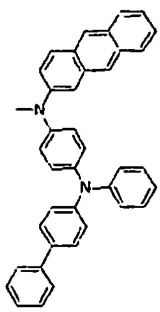
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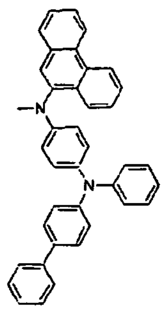
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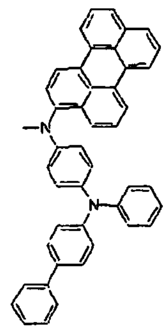
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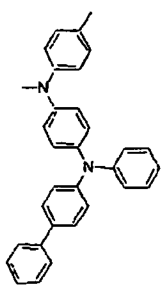
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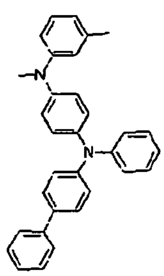
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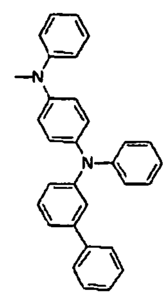
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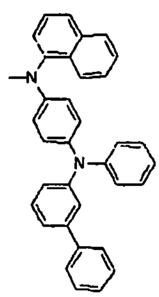
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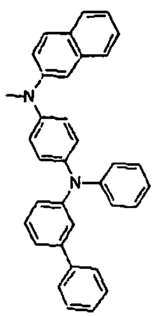
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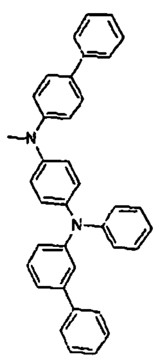
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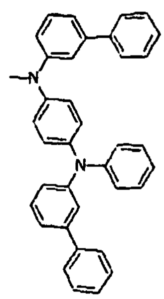
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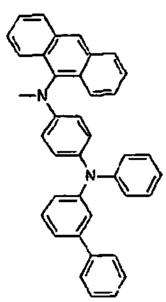
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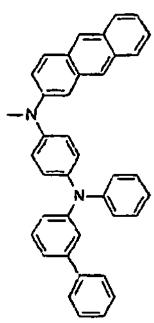
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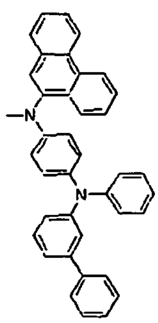
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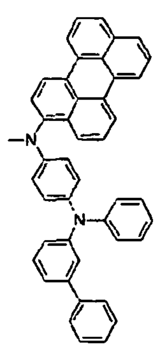
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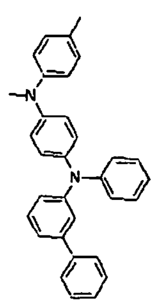
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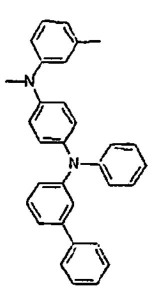
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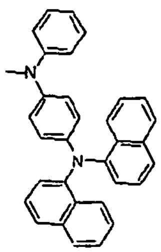
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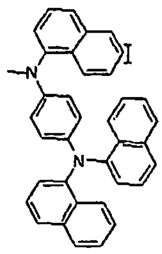
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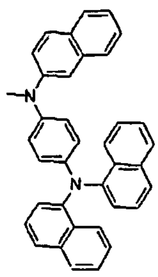
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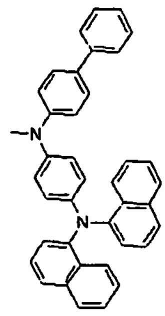
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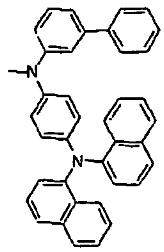
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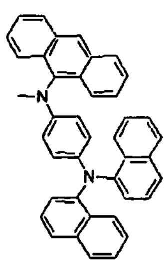
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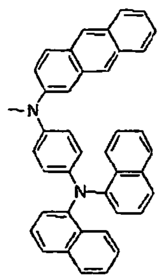
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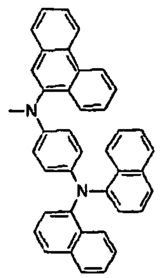
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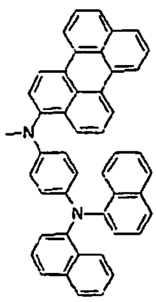
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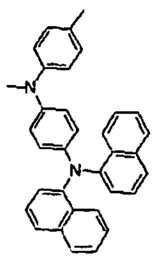
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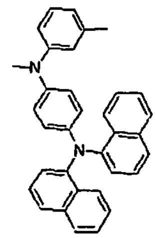
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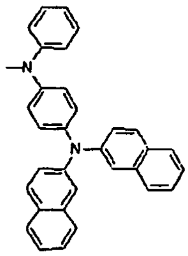
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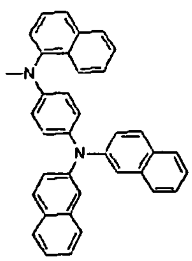
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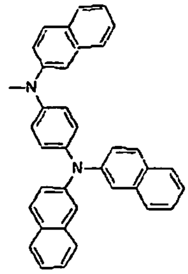
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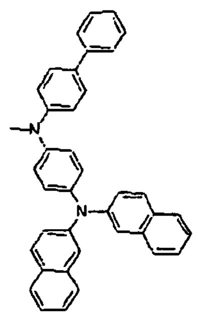
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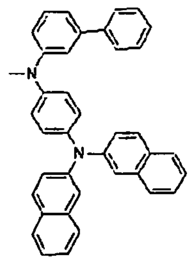
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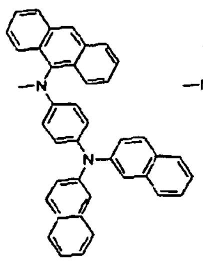
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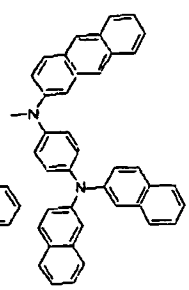
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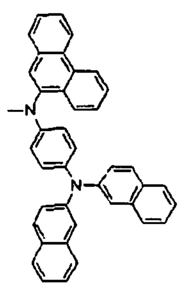
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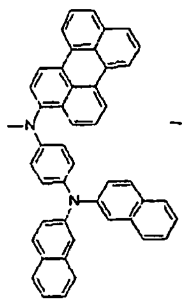
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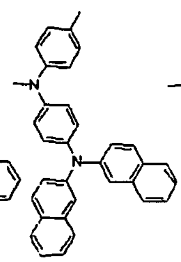
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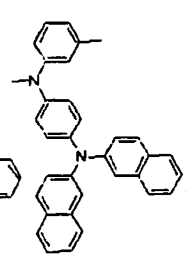
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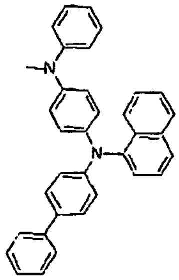
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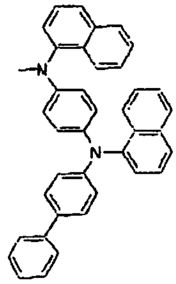
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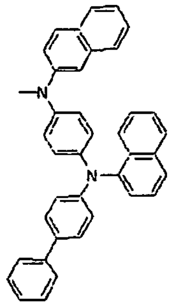
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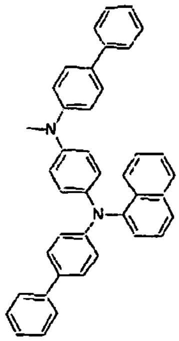
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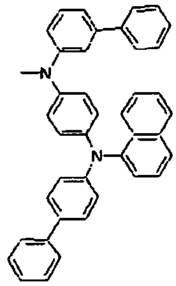
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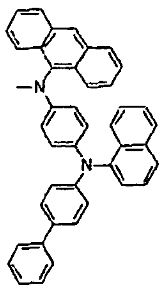
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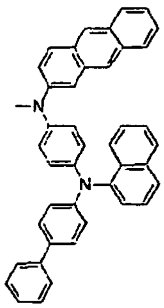
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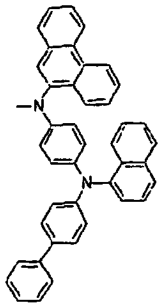
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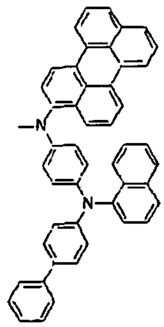
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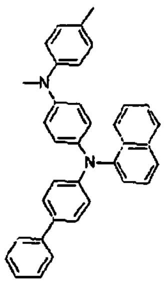
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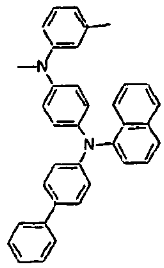
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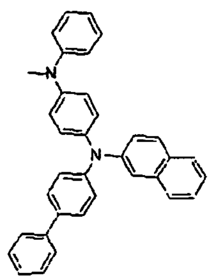
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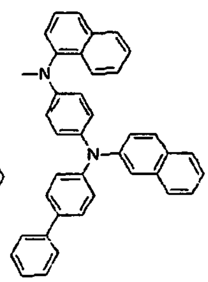
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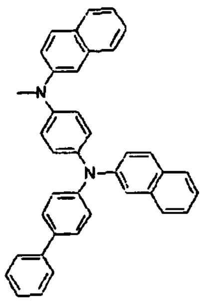
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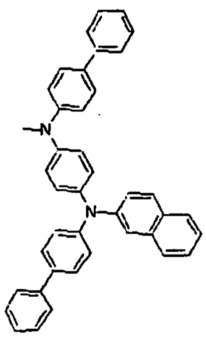
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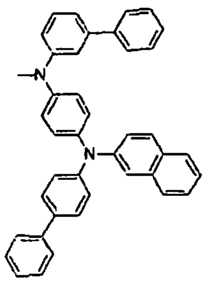
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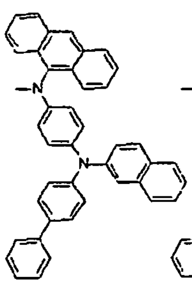
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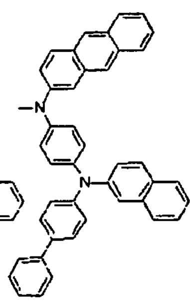
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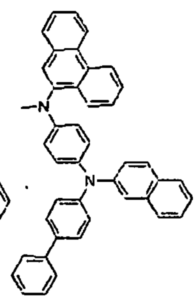
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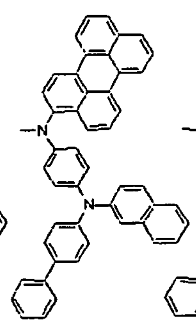
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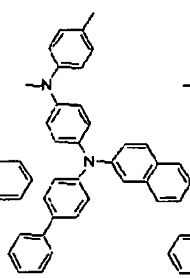
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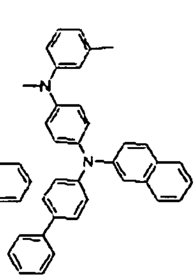
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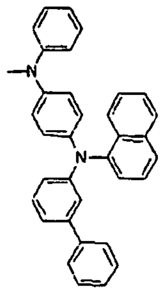
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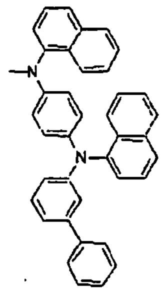
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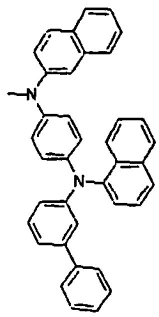
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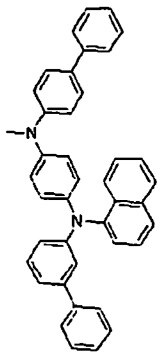
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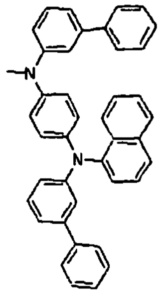
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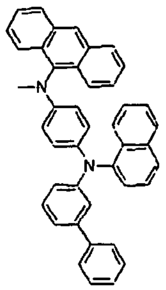
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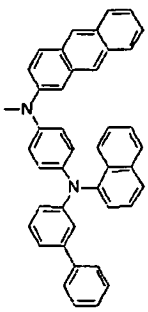
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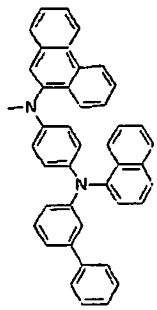
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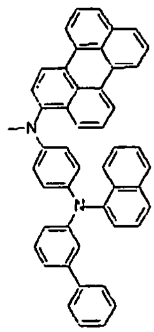
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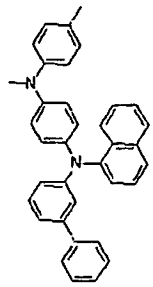
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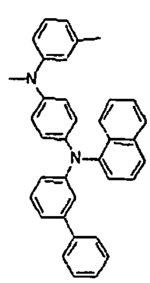
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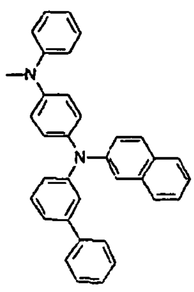
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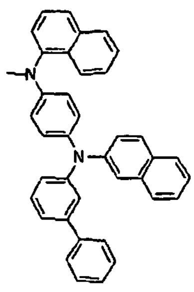
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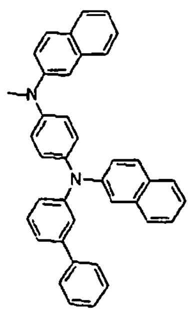
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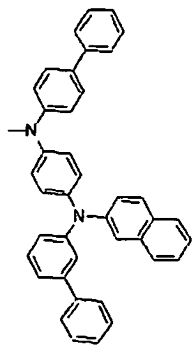
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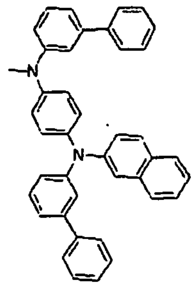
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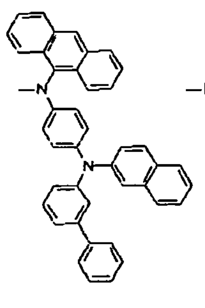
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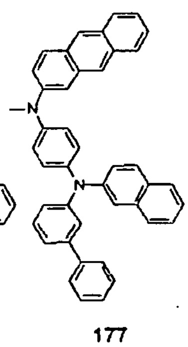
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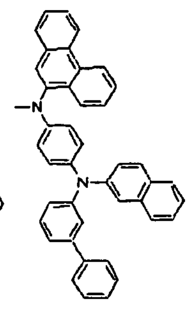
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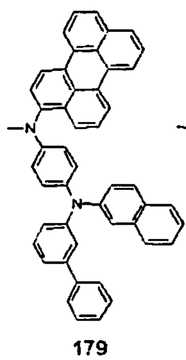
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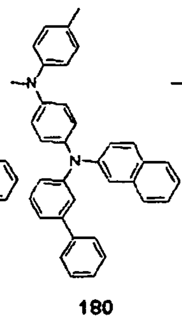
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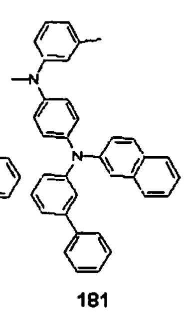
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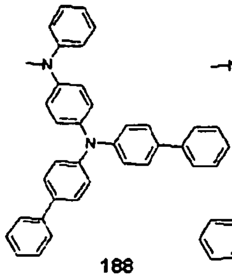
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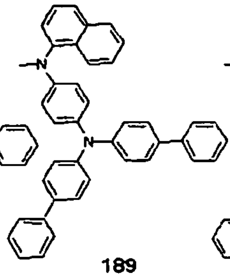
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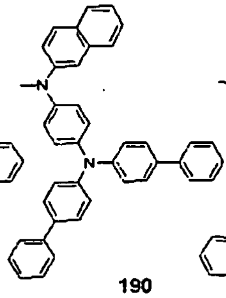
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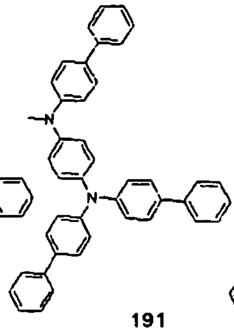
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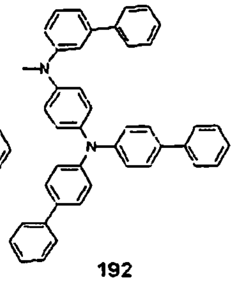
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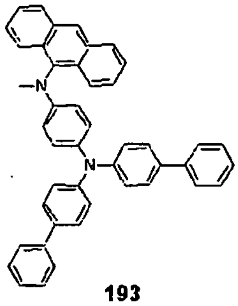
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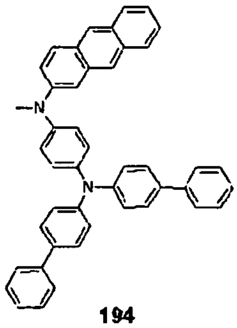
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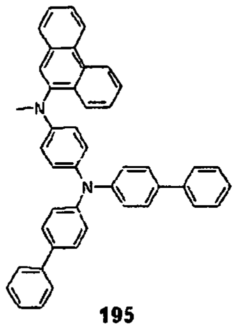
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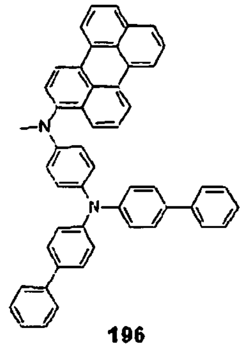
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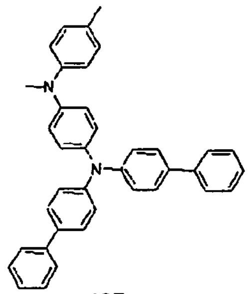
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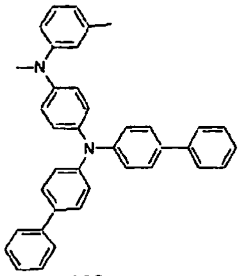
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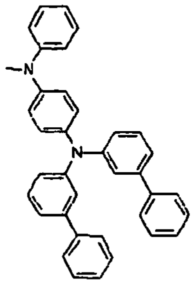

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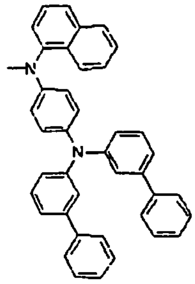

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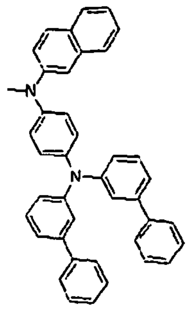

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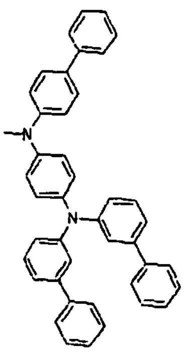

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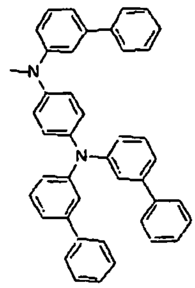

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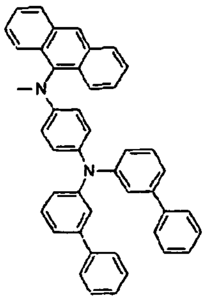

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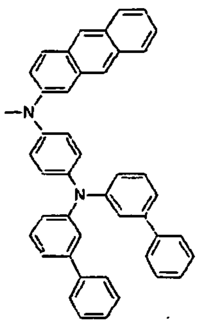

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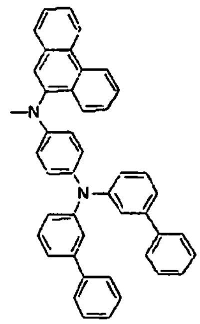

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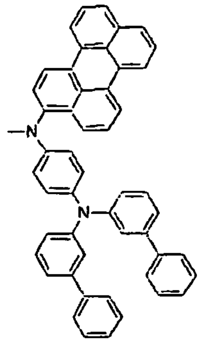

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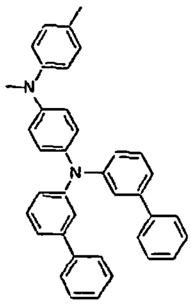

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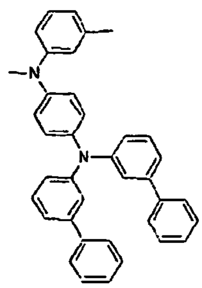

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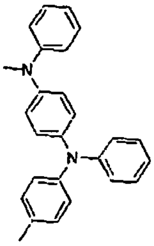
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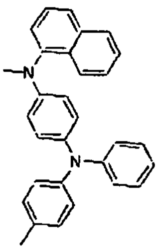
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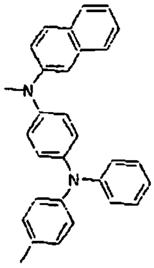
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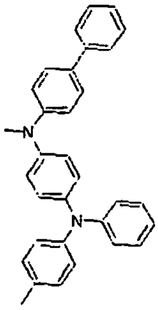
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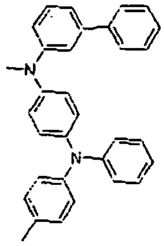
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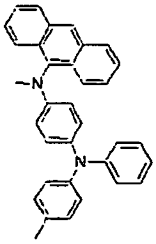
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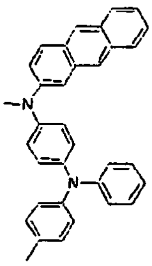
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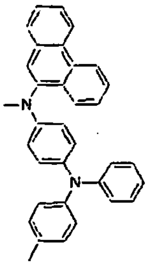
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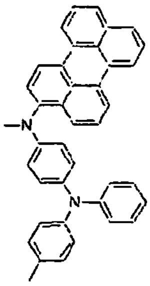
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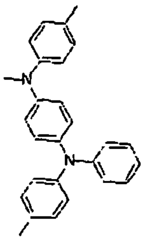
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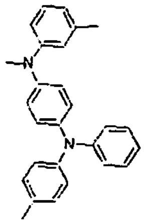
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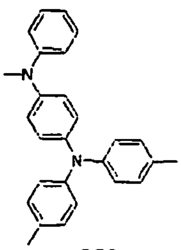
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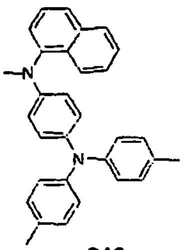
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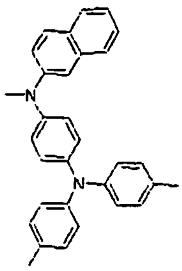
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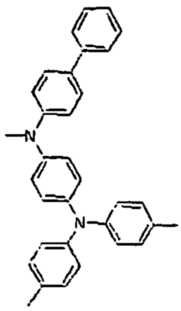
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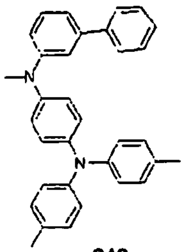
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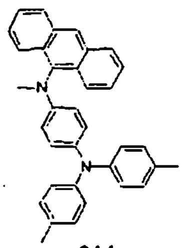
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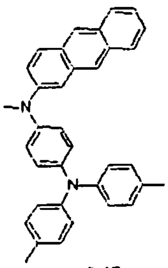
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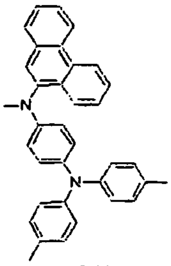
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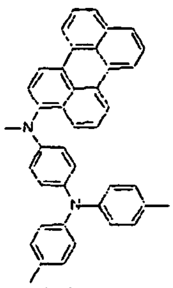
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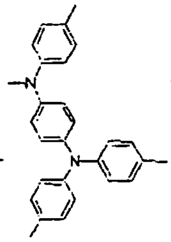
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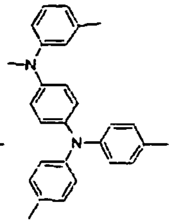
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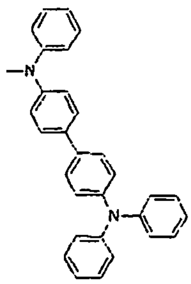
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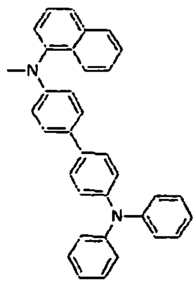
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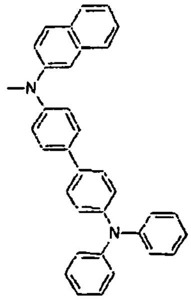
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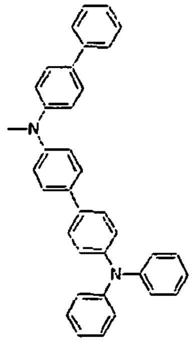
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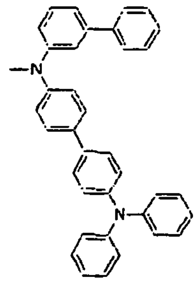
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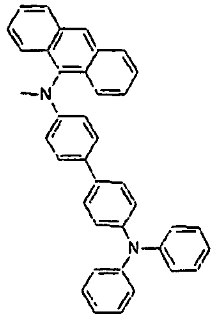
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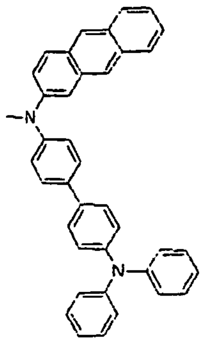
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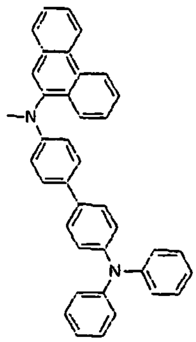
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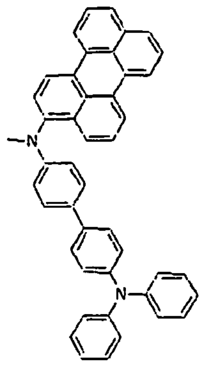
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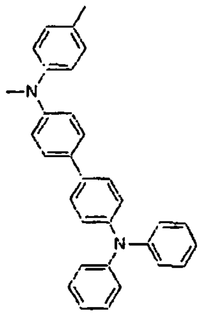
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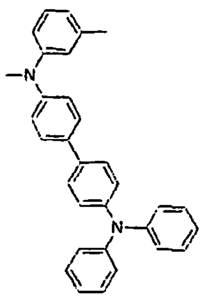
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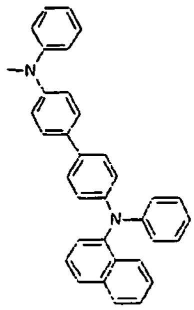

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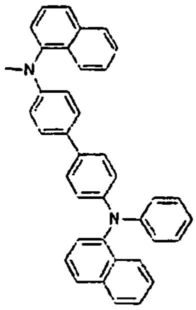

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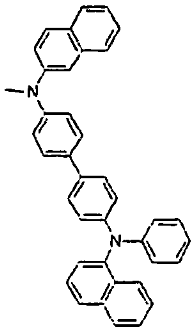

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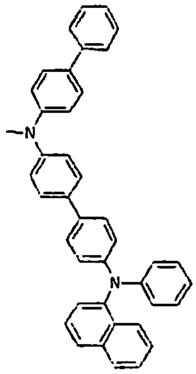

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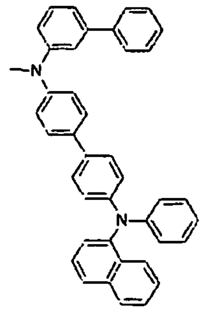

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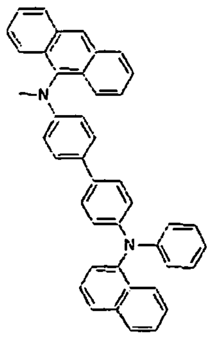

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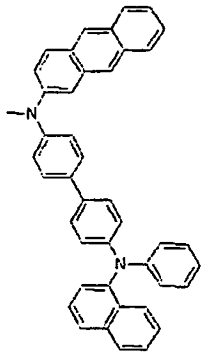

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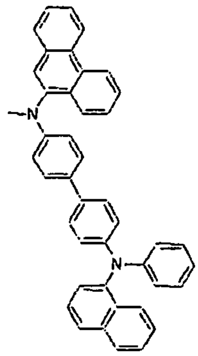

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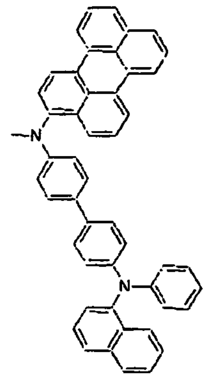

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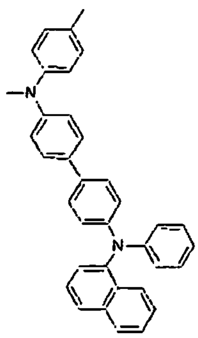

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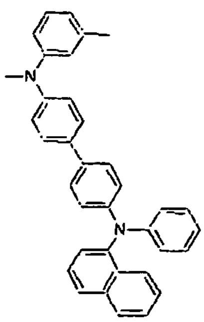

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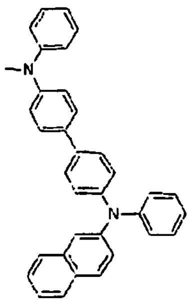

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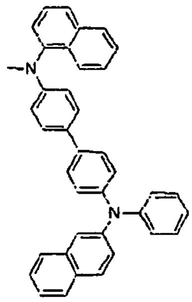

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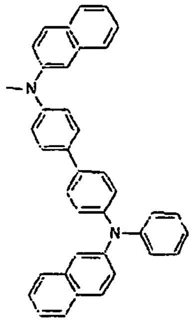

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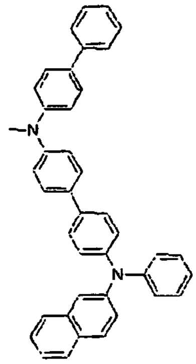

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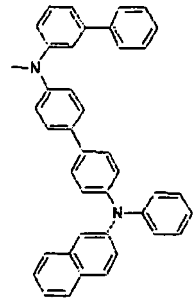

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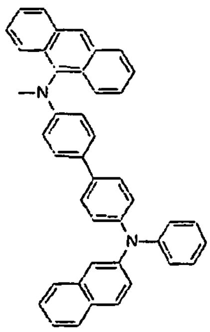

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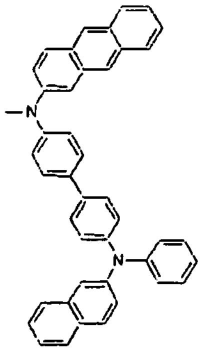

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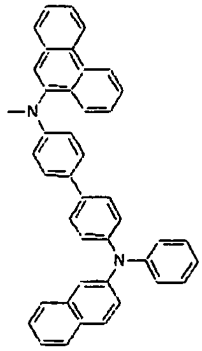

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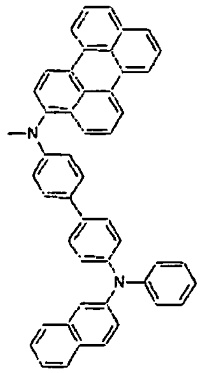

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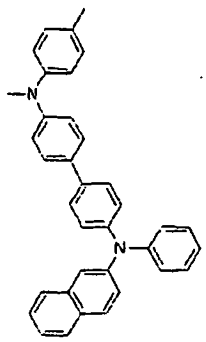

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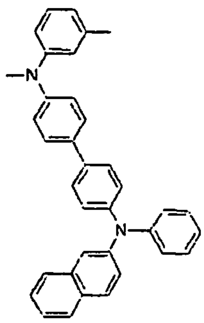

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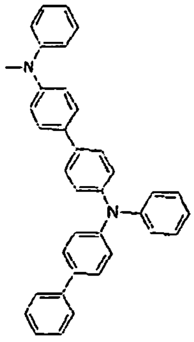

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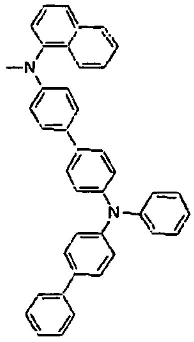

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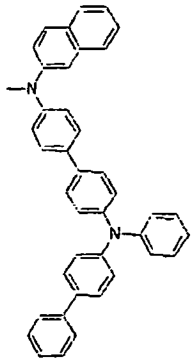

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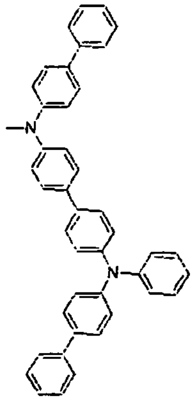

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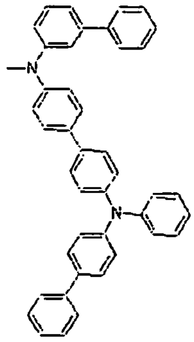

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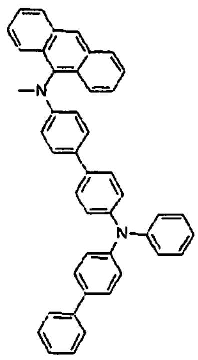

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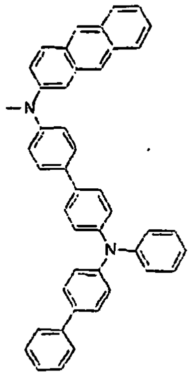

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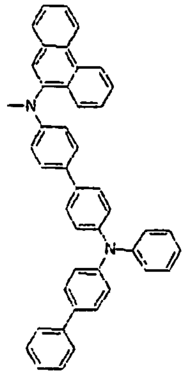

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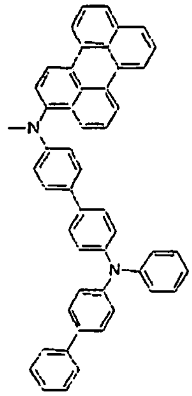

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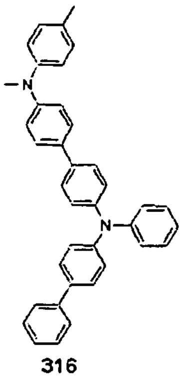

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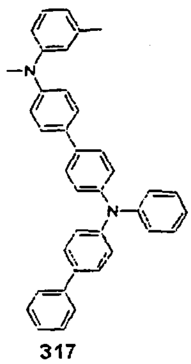

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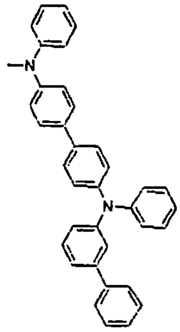
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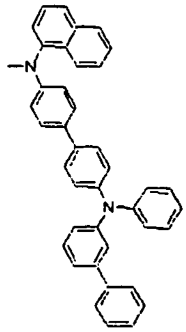
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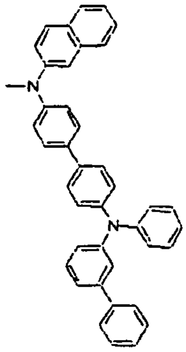
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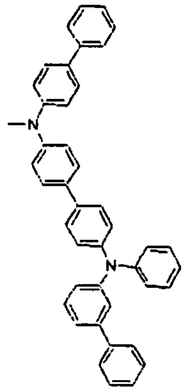
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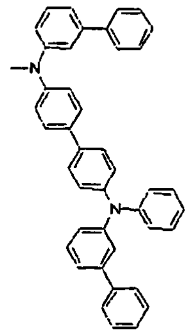
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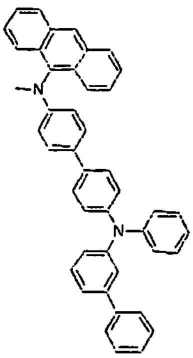
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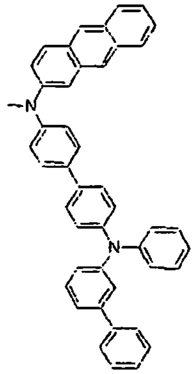
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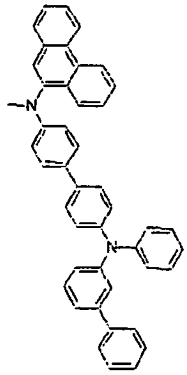
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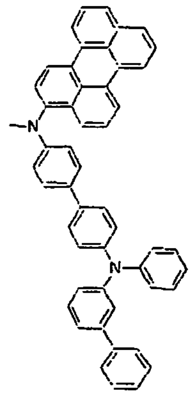
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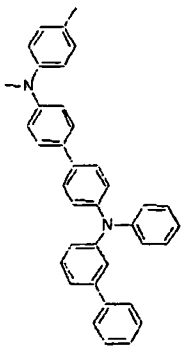
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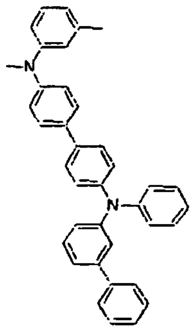
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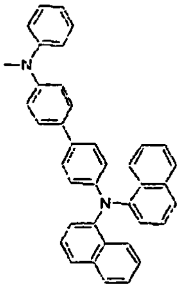
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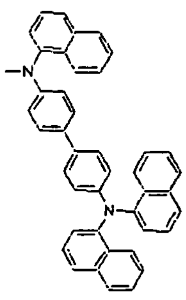
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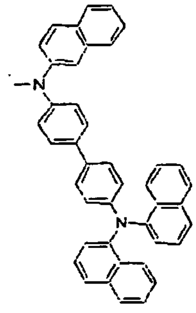
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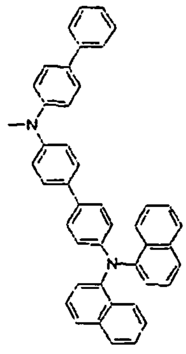
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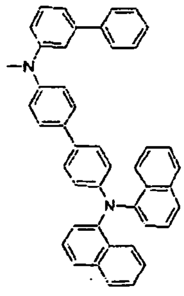
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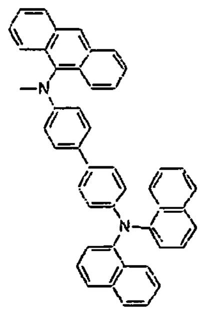
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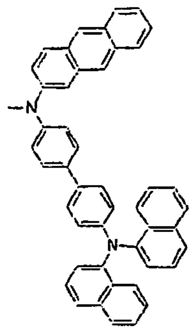
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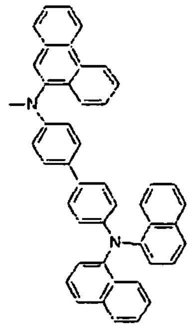
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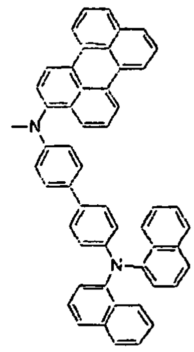
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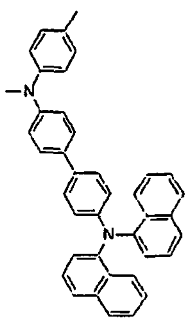
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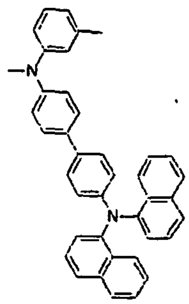
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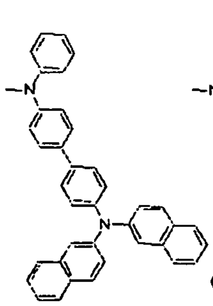
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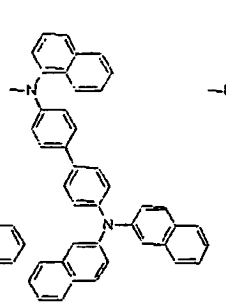
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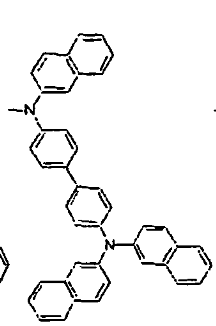
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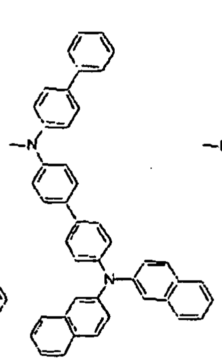
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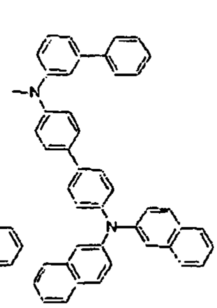
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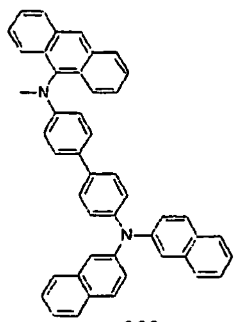

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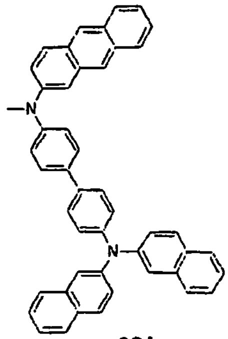

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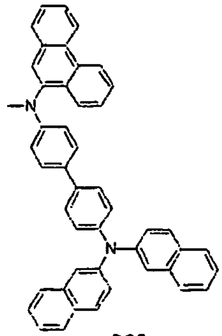

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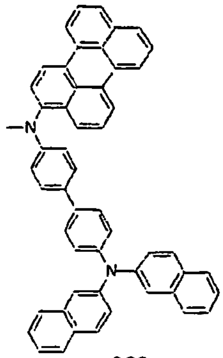

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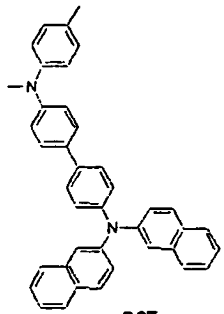

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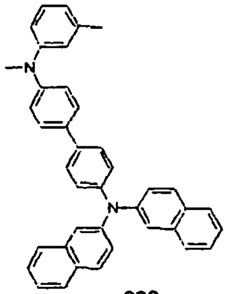

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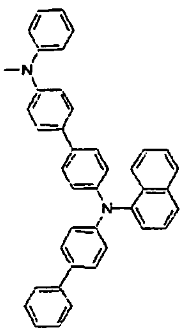

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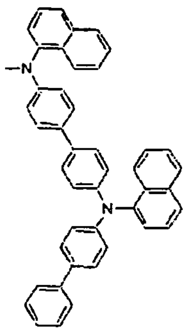

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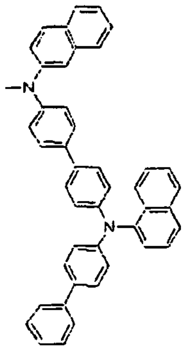

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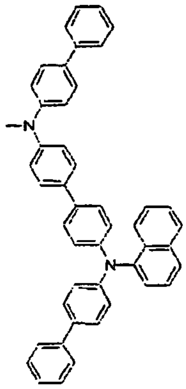

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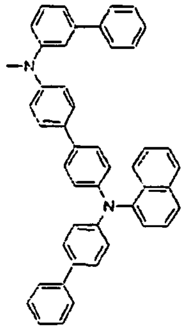

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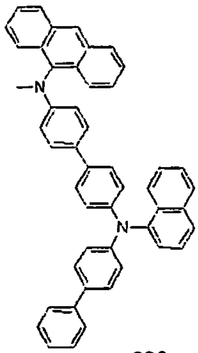

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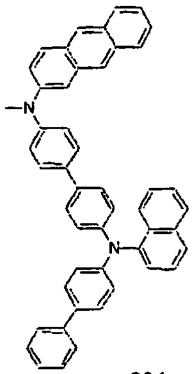

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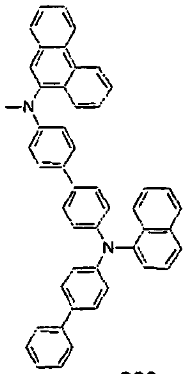

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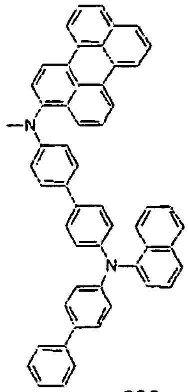

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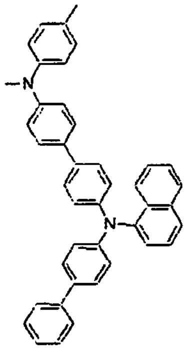

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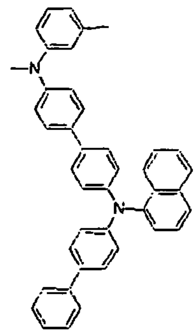

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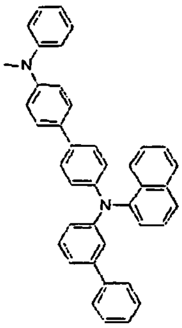

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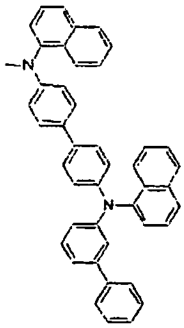

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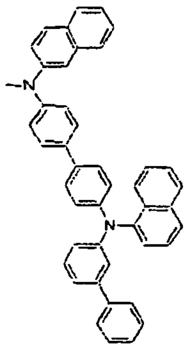

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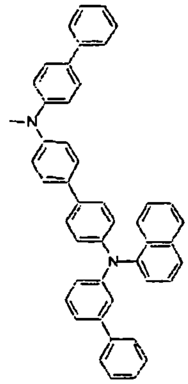

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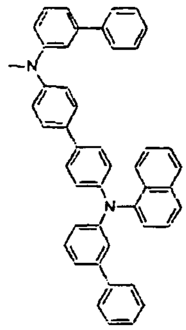

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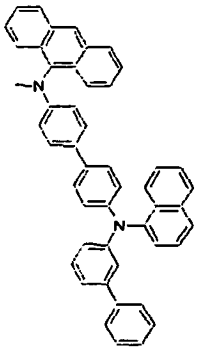

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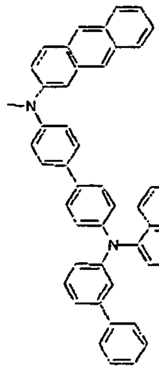

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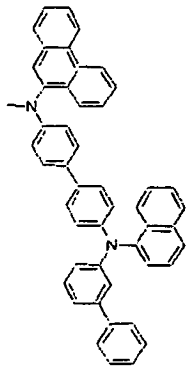

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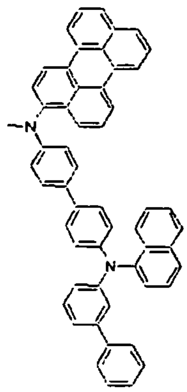

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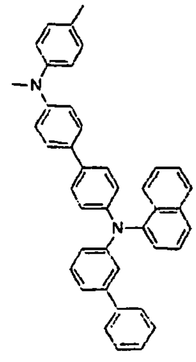

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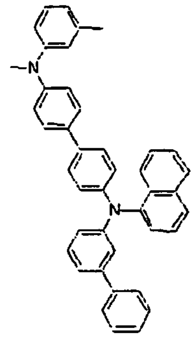

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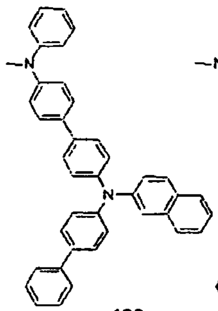

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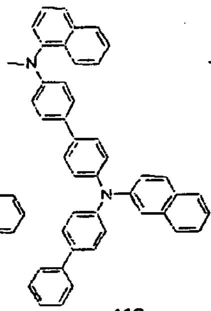

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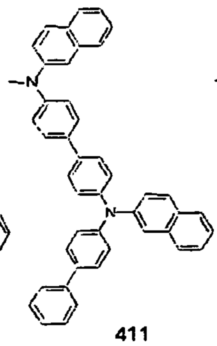

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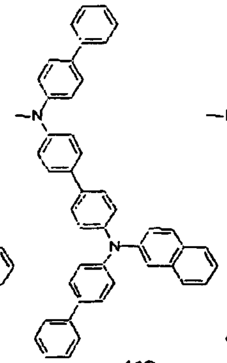

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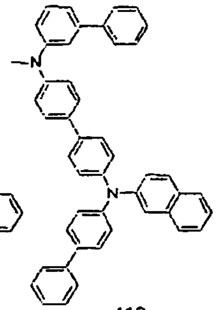

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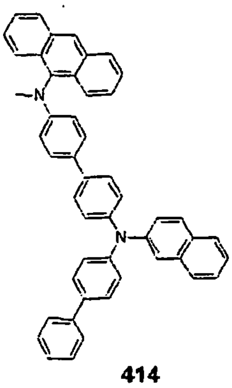

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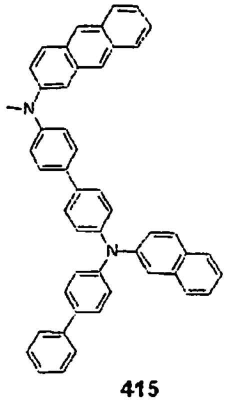

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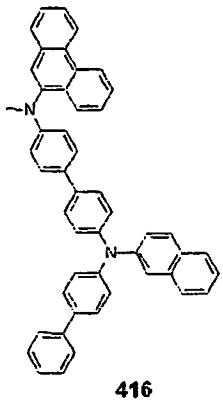

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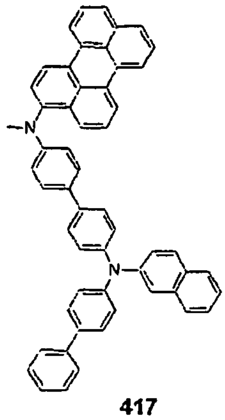

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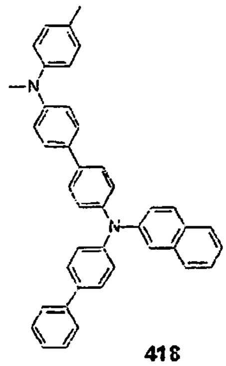

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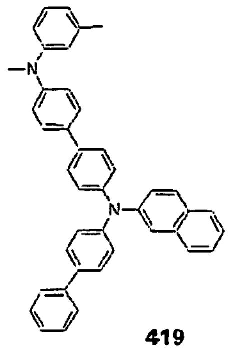

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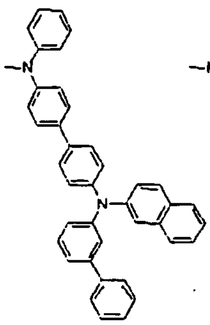

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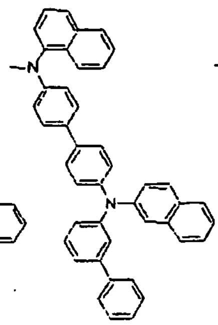

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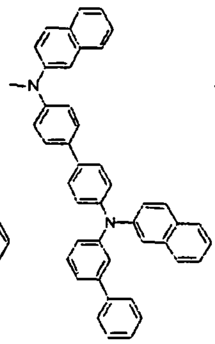

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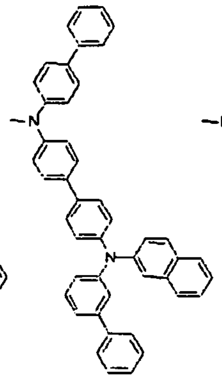

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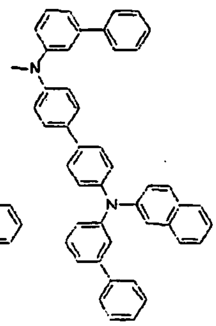

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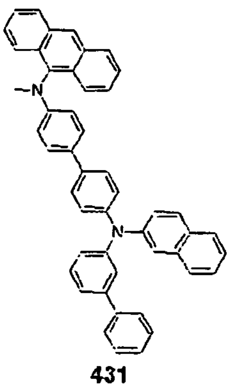

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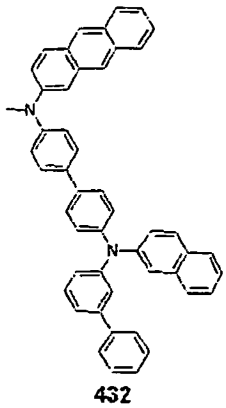

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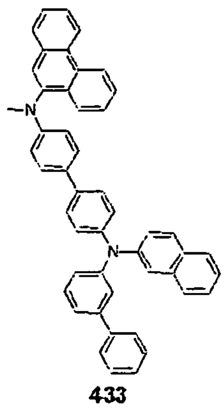

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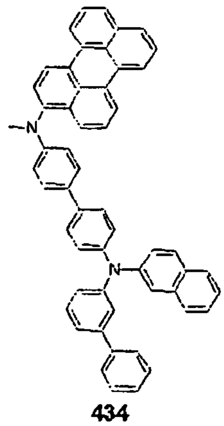

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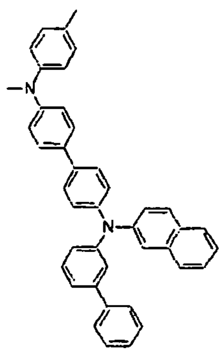

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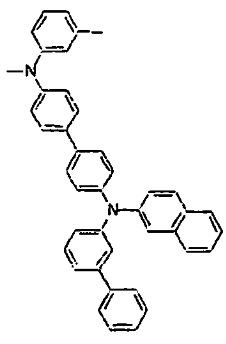

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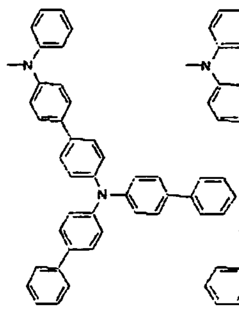
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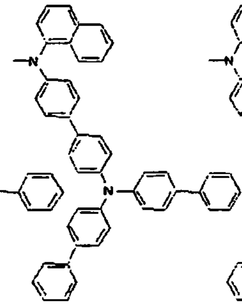
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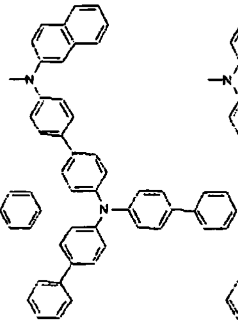
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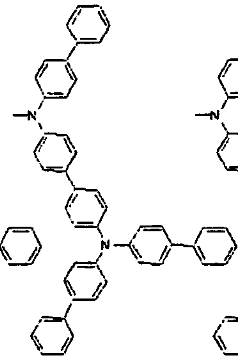
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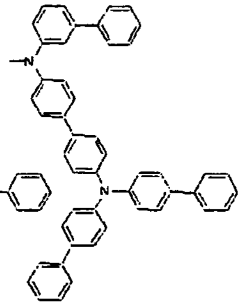
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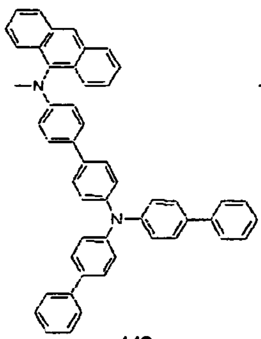
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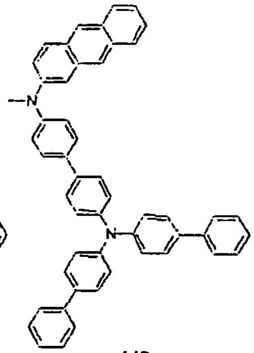
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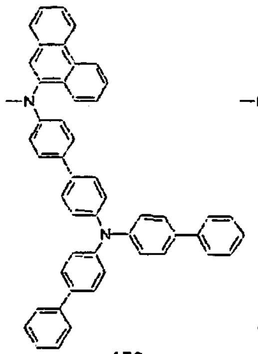
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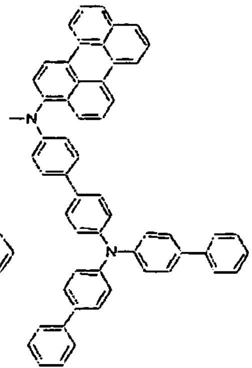
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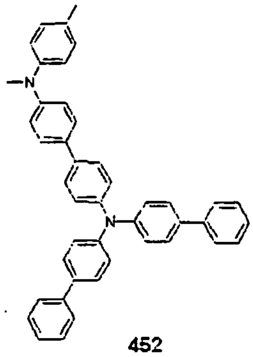
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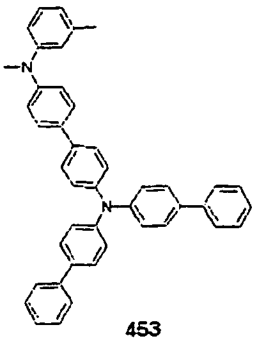
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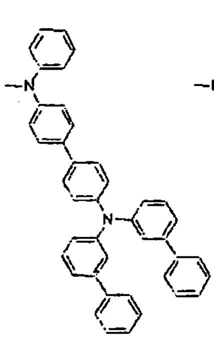
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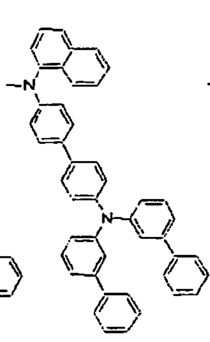
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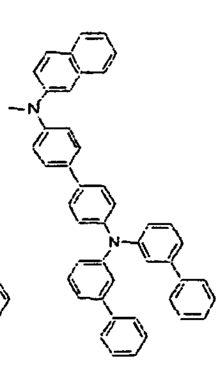
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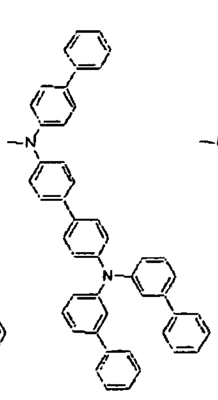
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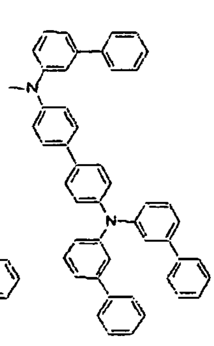
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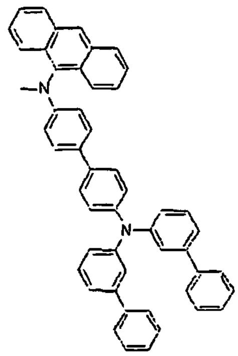

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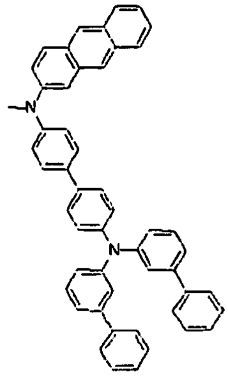

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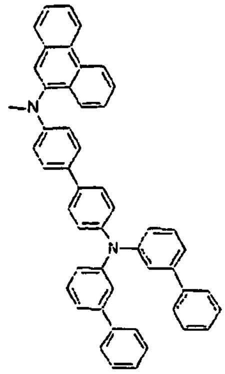

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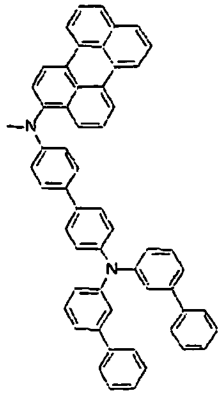

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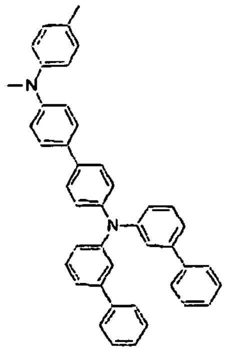

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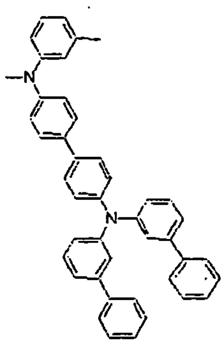
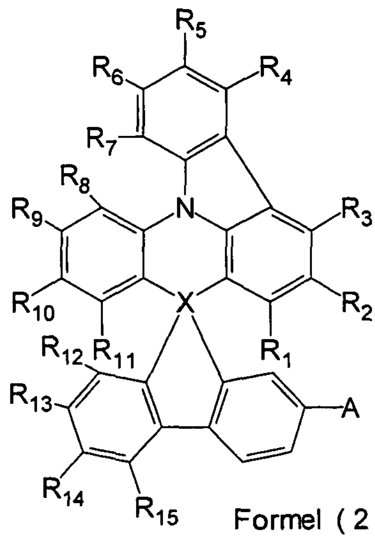


470

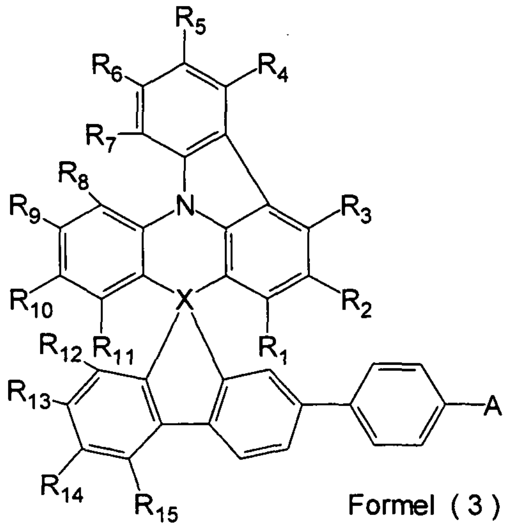
Patentansprüche

1. Organische, lichtemittierende Vorrichtung, umfassend:

eine erste Elektrode;
Schichten aus organischem Material, umfassend eine lichtemittierende Schicht und eine aus einer Lochinjektionsschicht, einer Lochtransportschicht und einer Schicht, die Löcher sowohl injiziert als auch transportiert; und eine zweite Elektrode;
wobei die erste Elektrode, die Schichten aus organischem Material und die zweite Elektrode eine Schichtstruktur bilden; und
die Lochinjektionsschicht, die Lochtransportschicht oder die Schicht, die Löcher sowohl injiziert als auch transportiert, eine Verbindung der Formel (2) oder (3) umfassen:

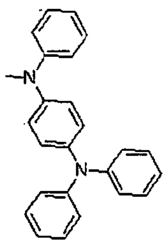


Formel (2)



Formel (3)

worin:
X C ist;
R_1 bis R_{15} Wasserstoff sind; und
A eine der folgenden Gruppen ist:



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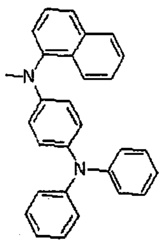

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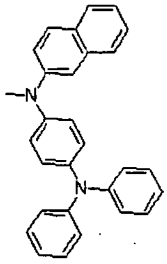

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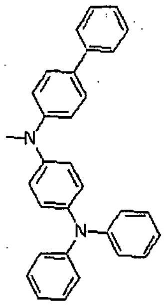

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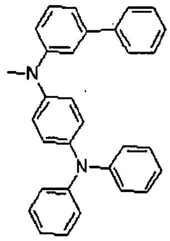

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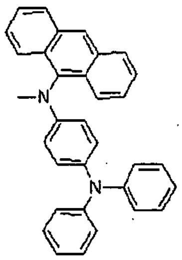

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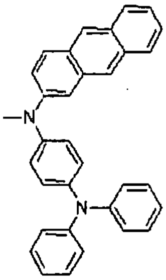

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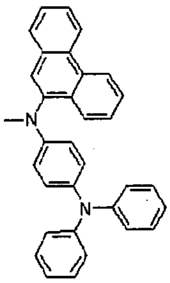

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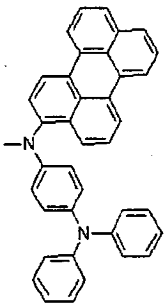

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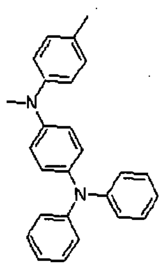

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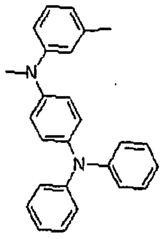

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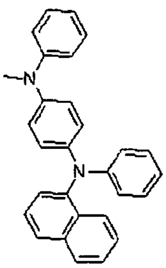

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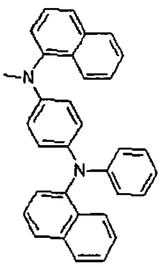

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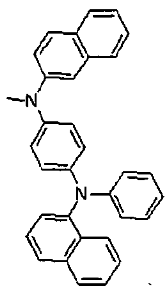

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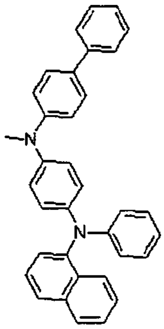

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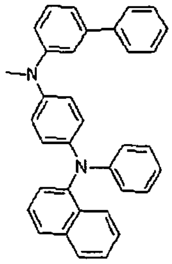

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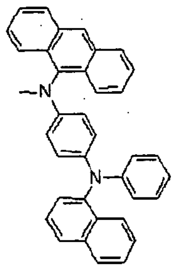
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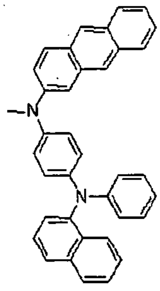
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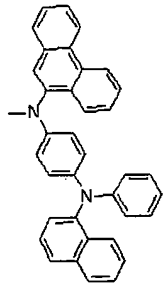
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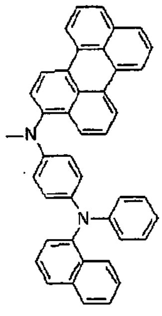
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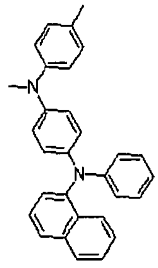
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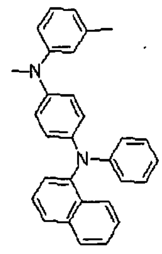
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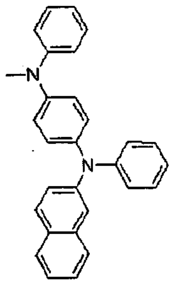
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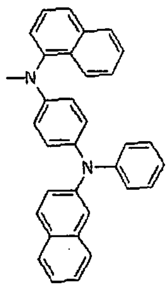
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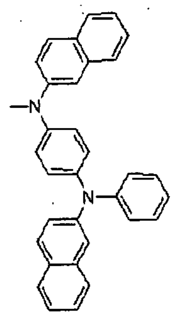
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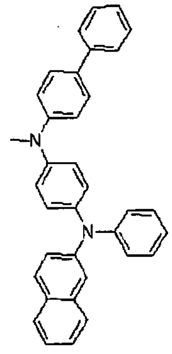
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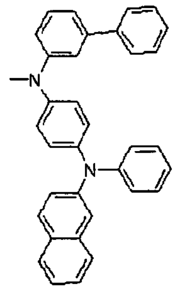
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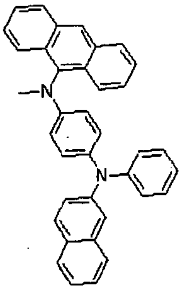
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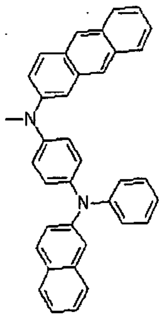
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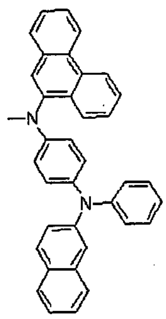
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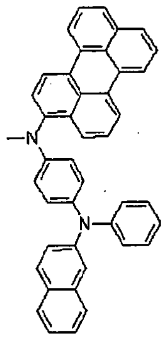
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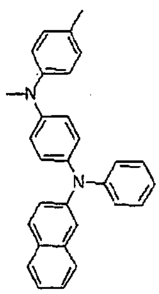
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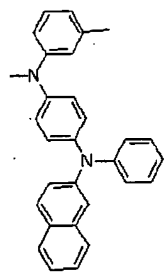
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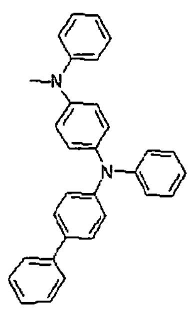
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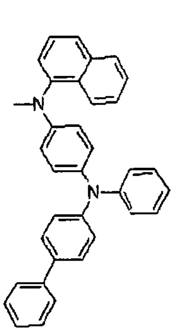
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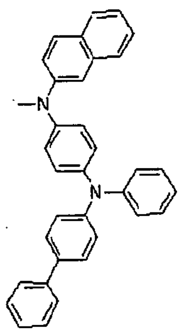
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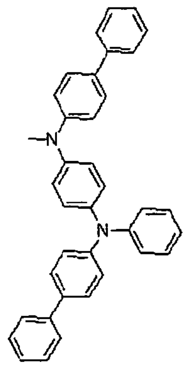
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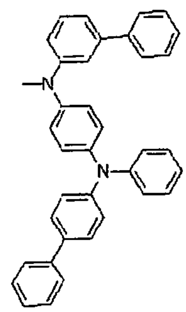
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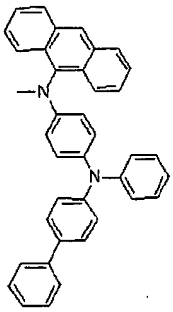
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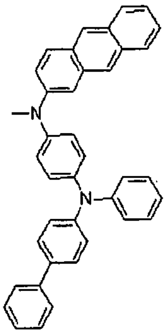
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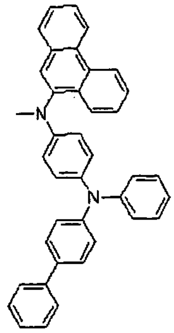
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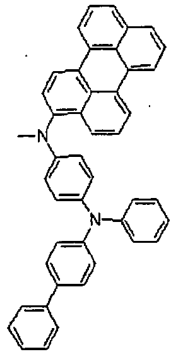
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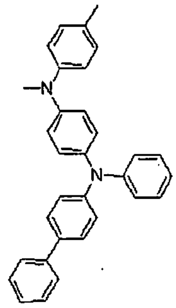
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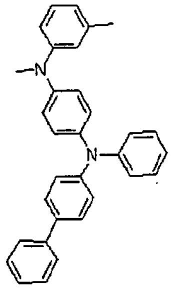
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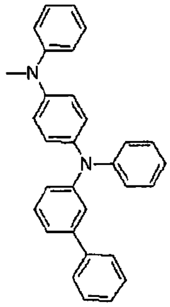
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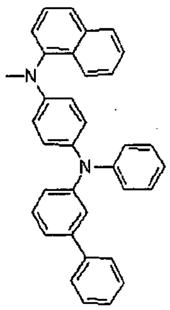
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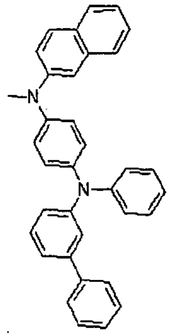
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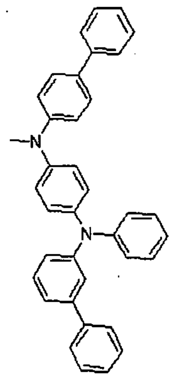
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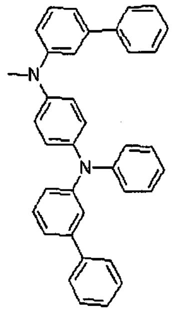
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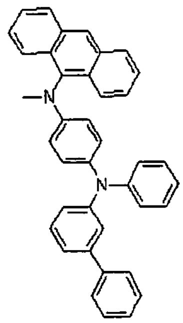
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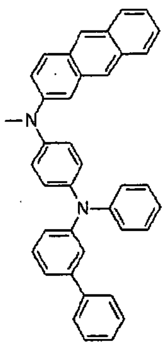
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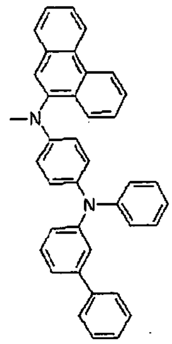
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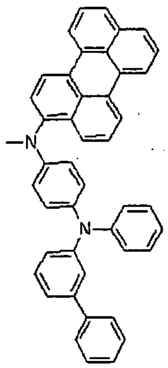
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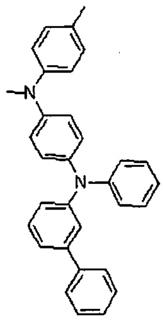
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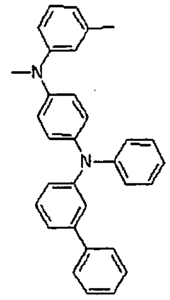
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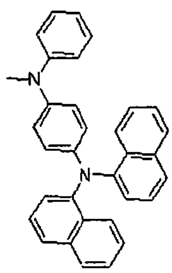
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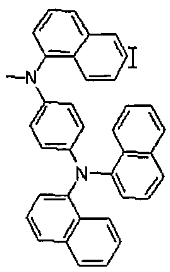
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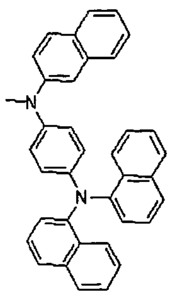
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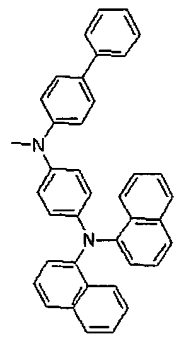
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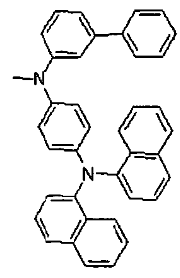
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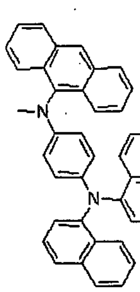
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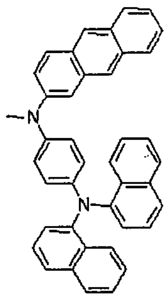
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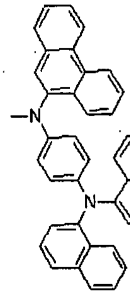
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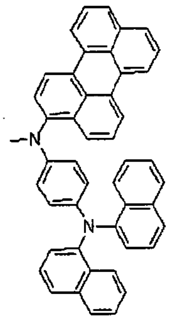
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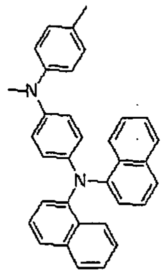
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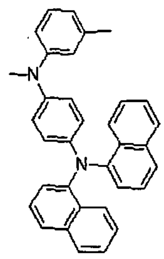
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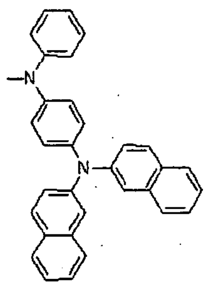
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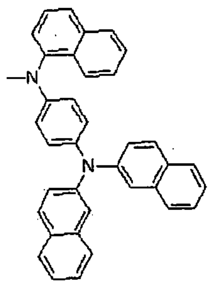
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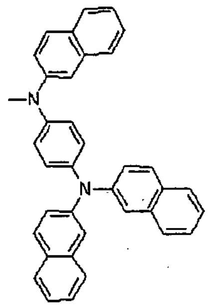
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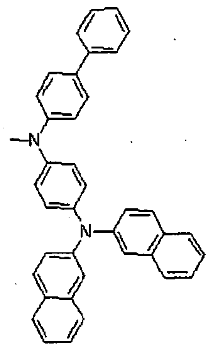
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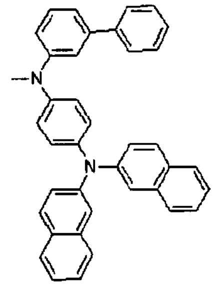
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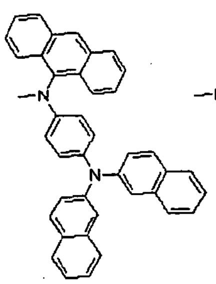
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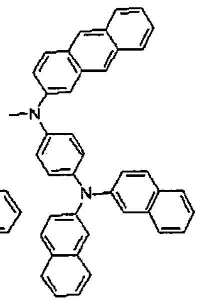
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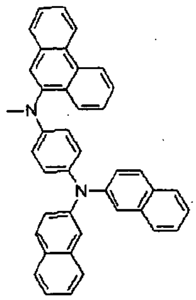
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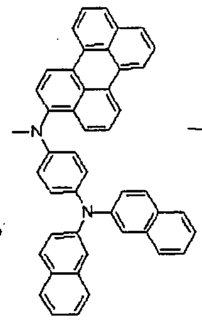
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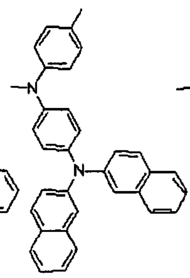
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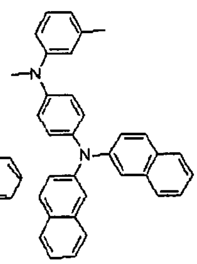
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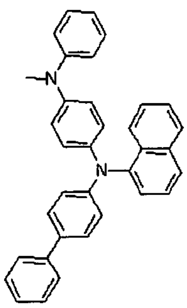
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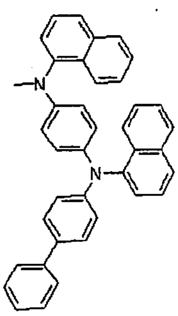
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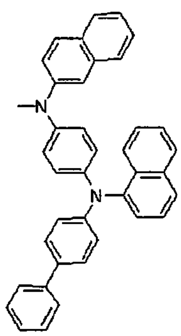
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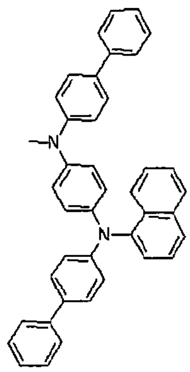
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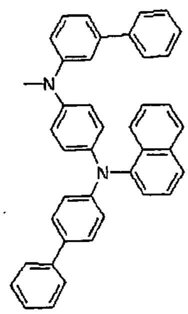
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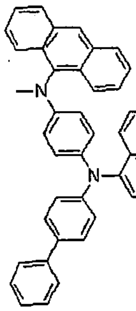
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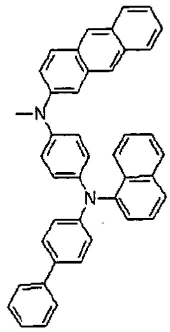
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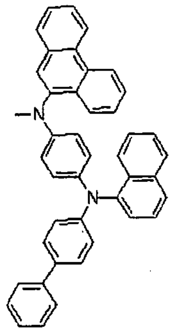
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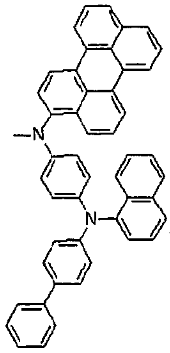
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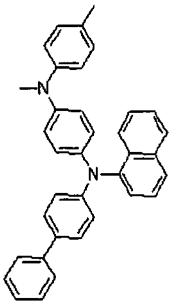
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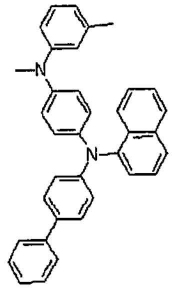
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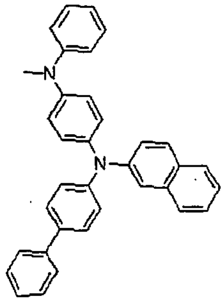
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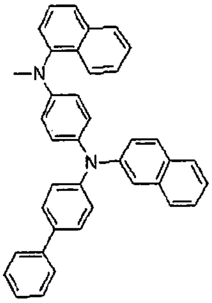
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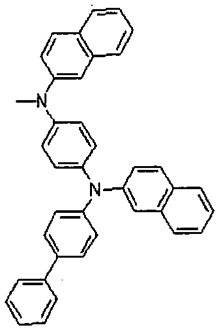
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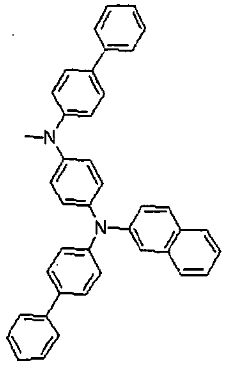
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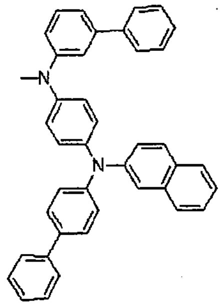
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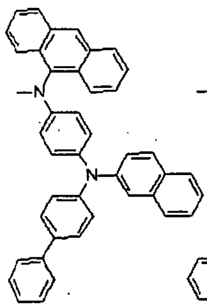
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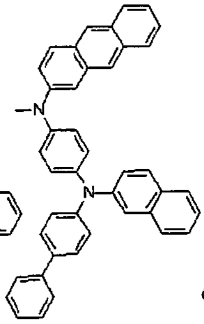
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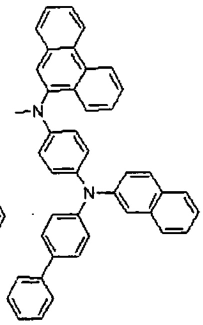
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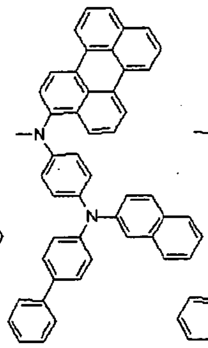
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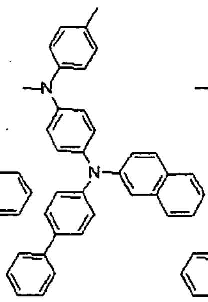
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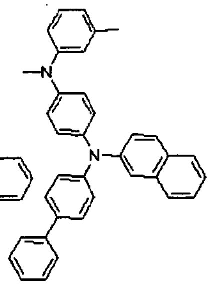
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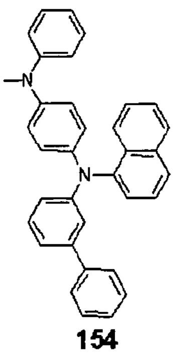
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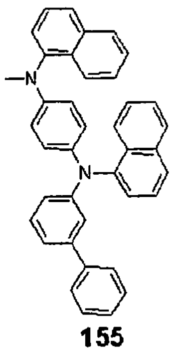
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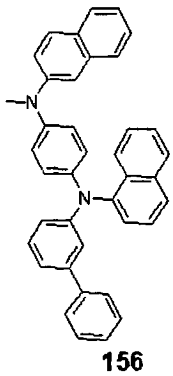
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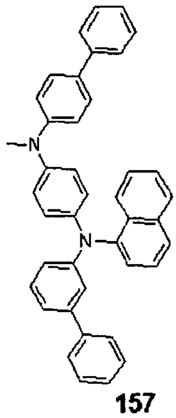
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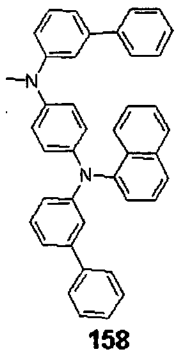
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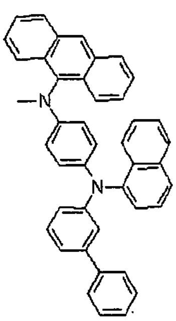
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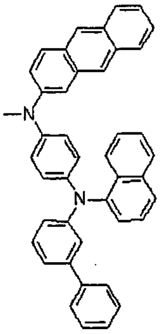
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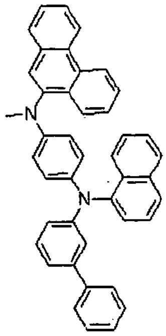
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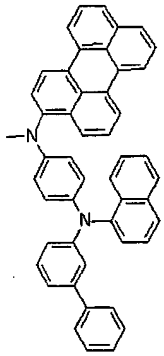
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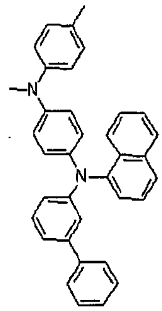
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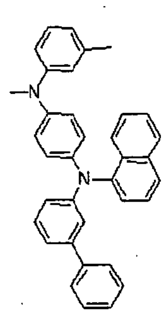
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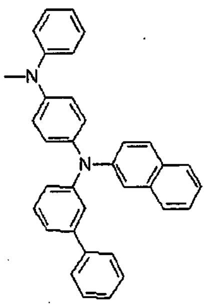
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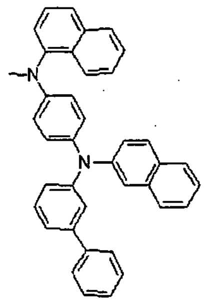
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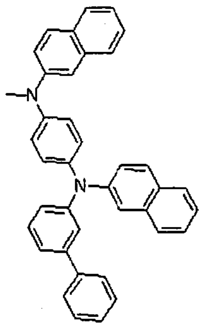
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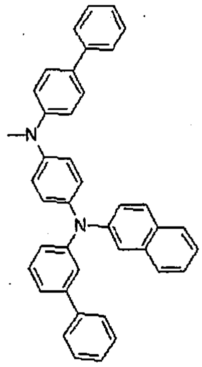
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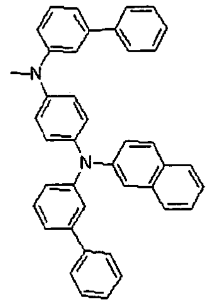
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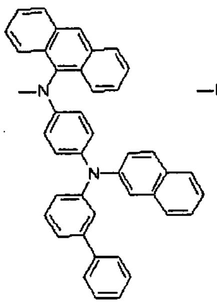
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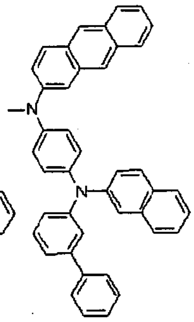
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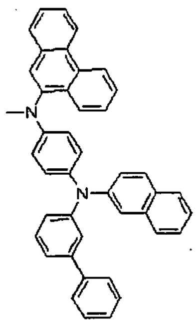
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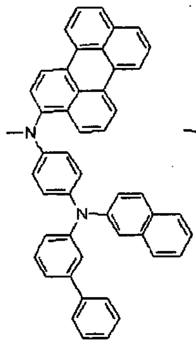
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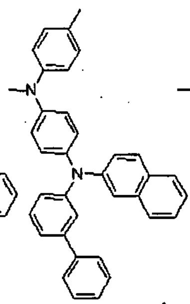
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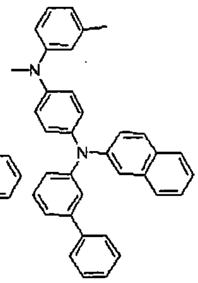
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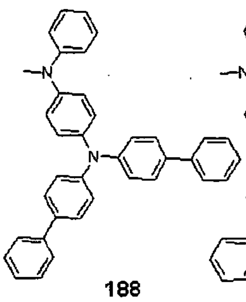
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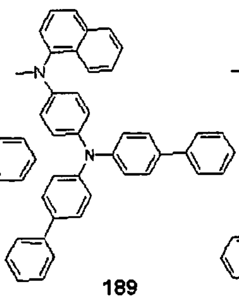
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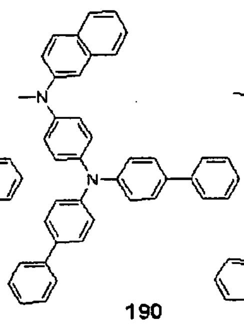
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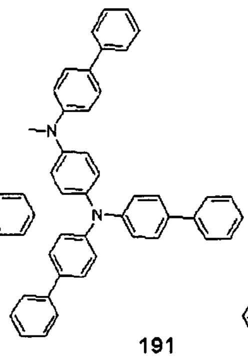
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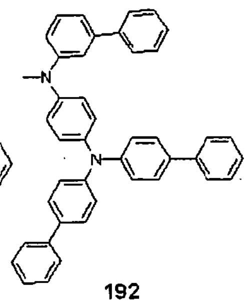
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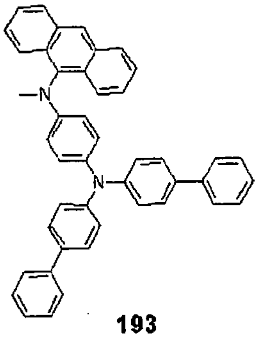
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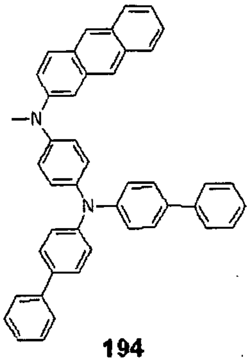
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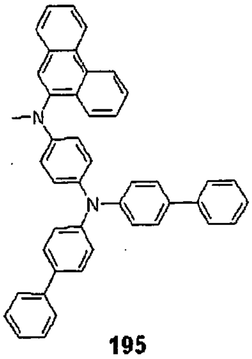
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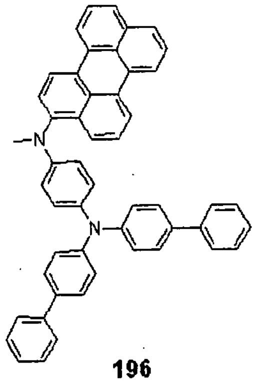
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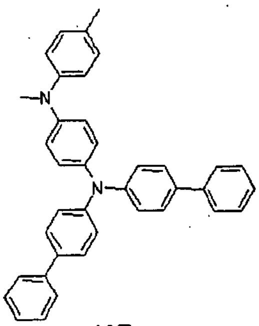
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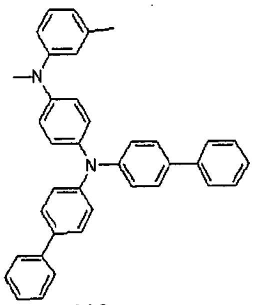
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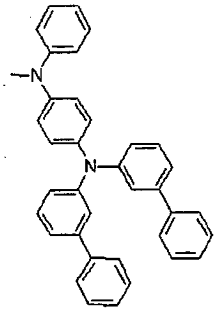
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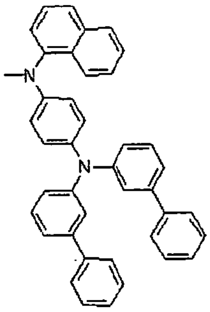
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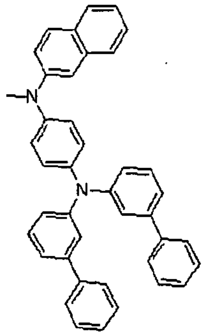
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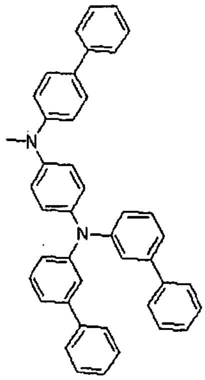
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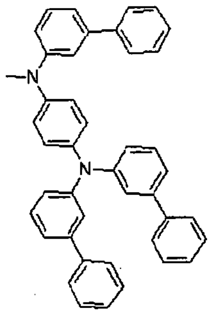
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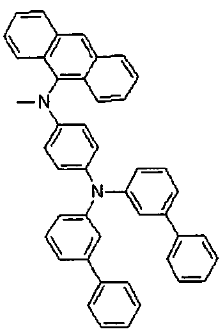
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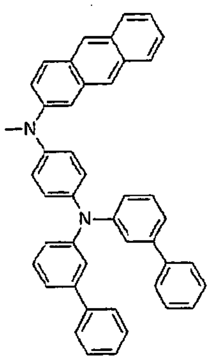
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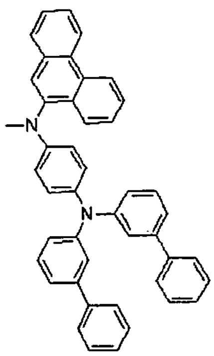
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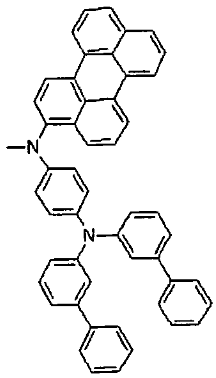
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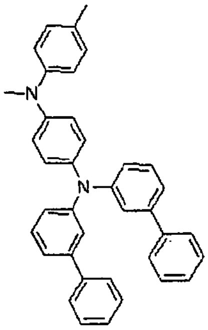

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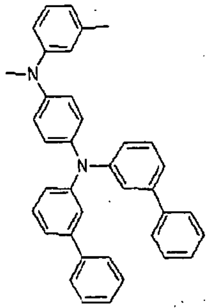

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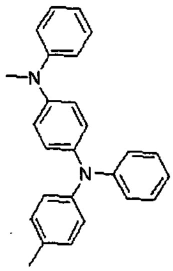

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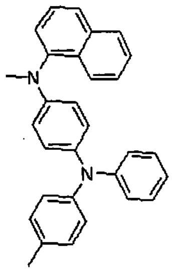

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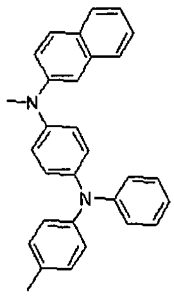

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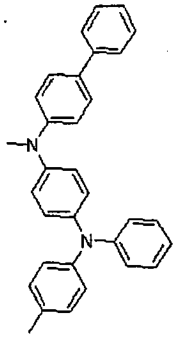

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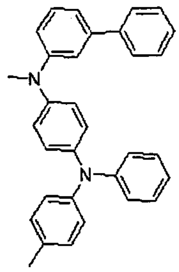

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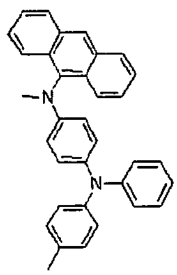

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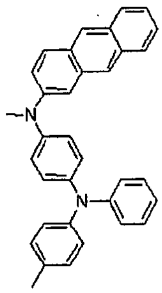

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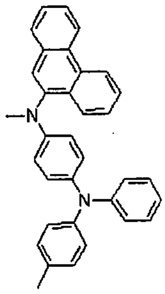

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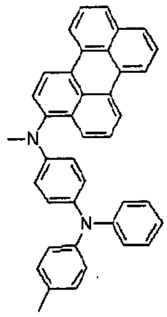

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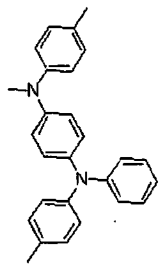

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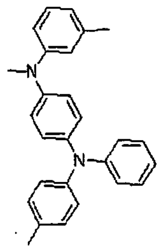

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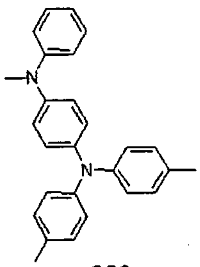

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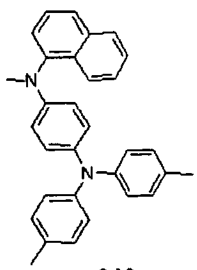

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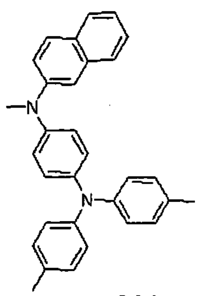

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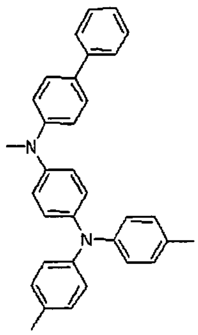

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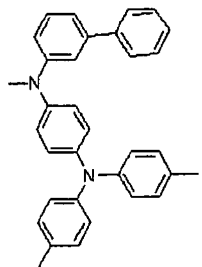

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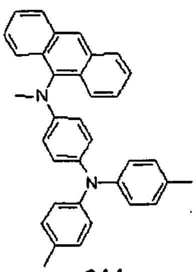
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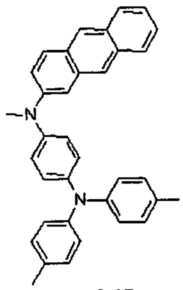
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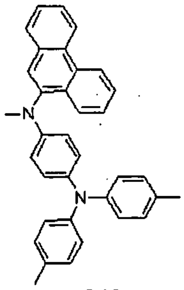
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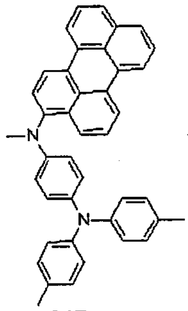
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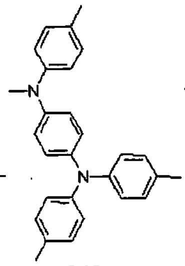
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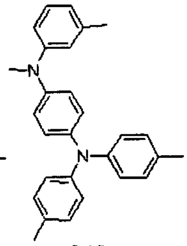
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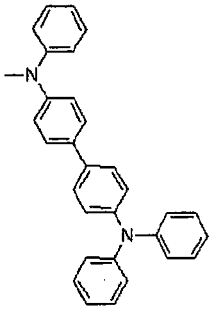
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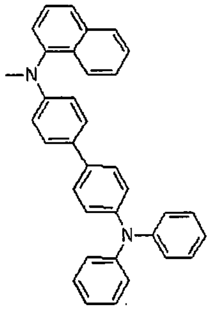
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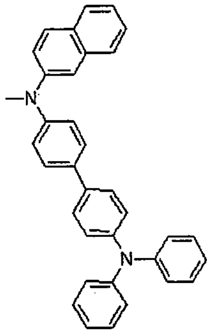
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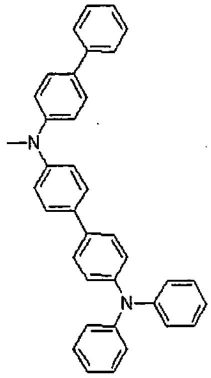
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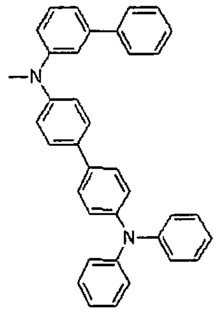
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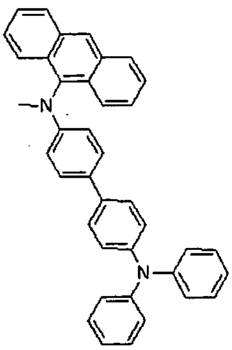
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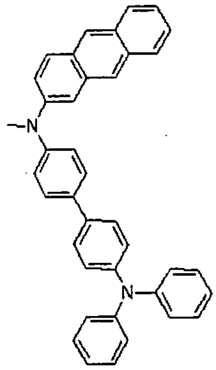
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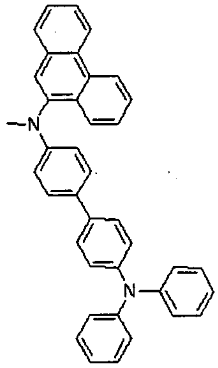
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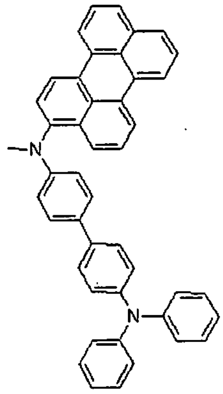
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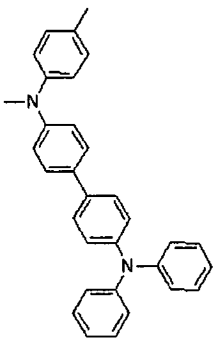
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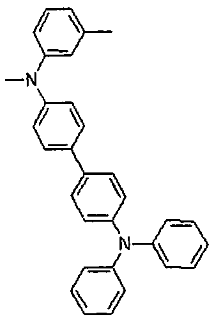
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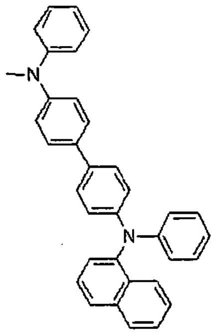
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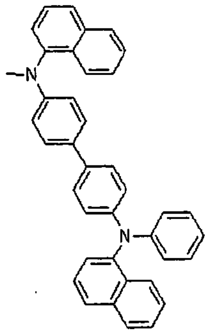
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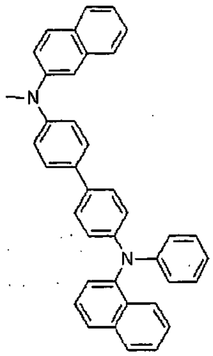
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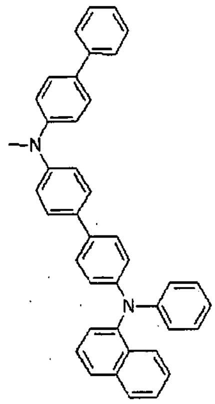
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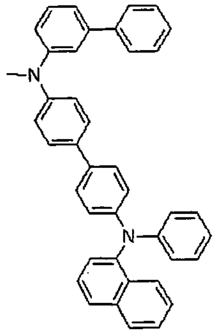
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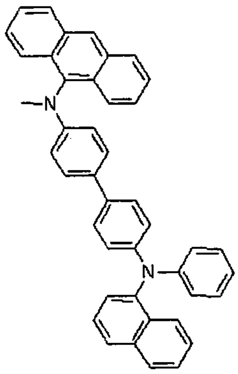
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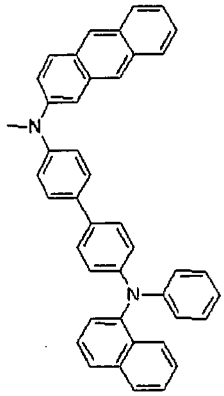
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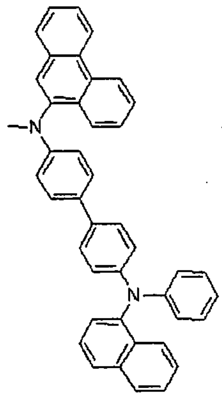
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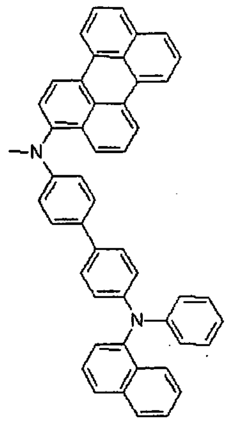
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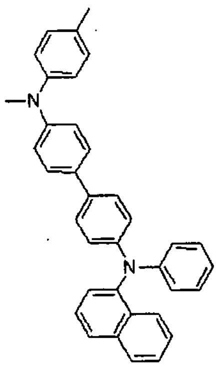
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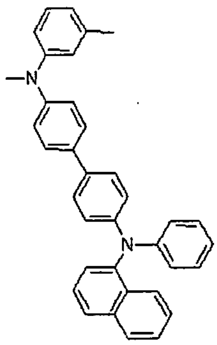
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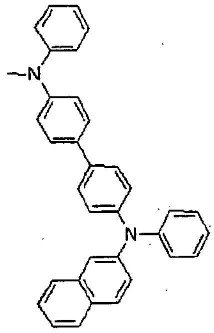
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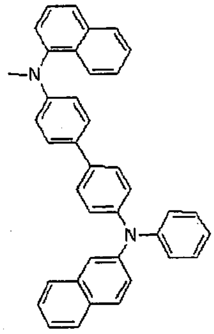
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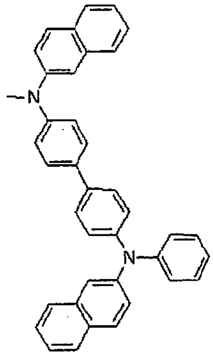
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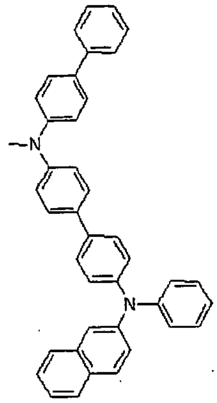
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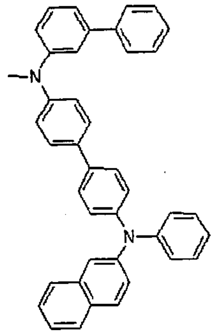
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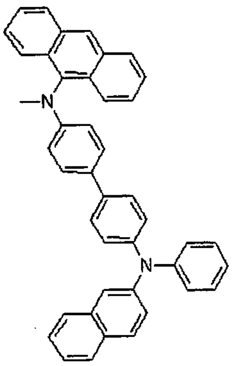
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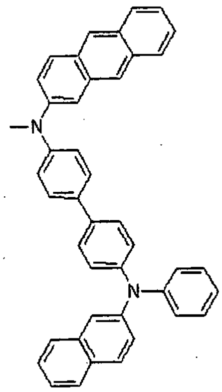
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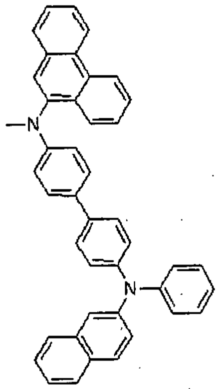
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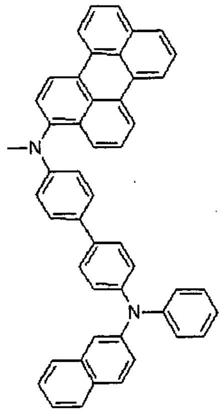
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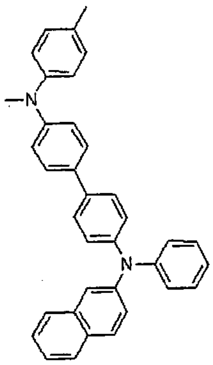
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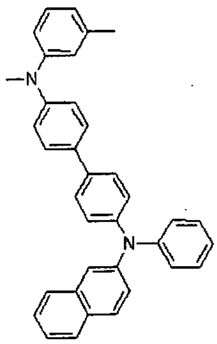
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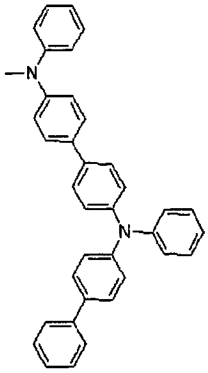

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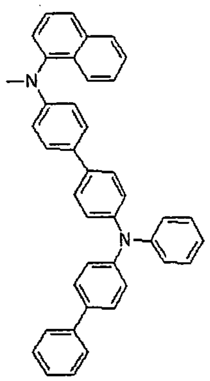

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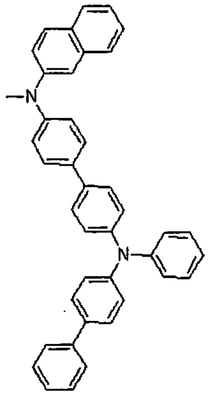

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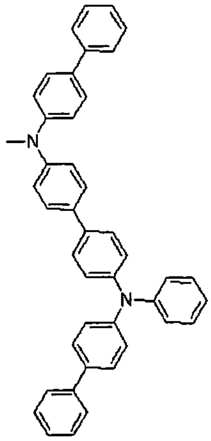

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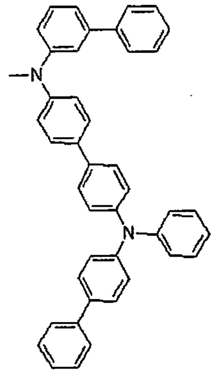

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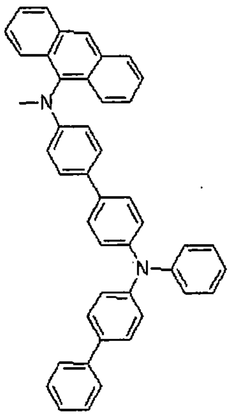

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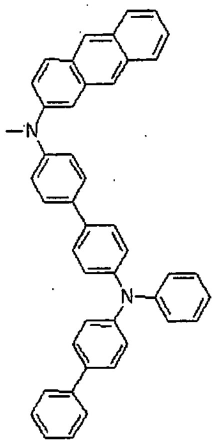

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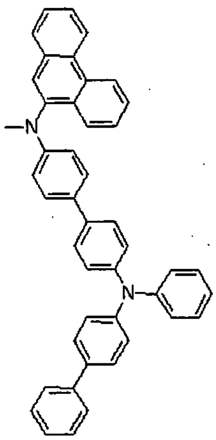

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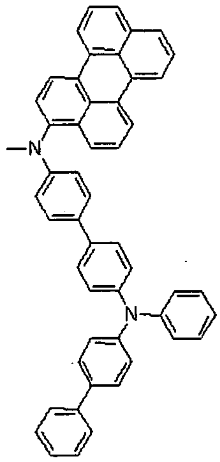

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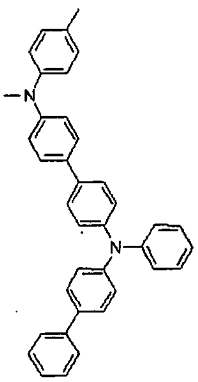

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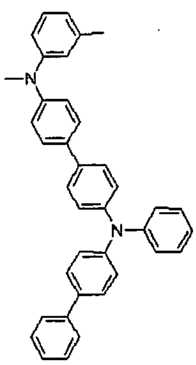

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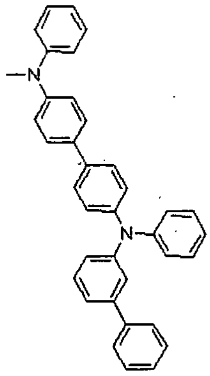

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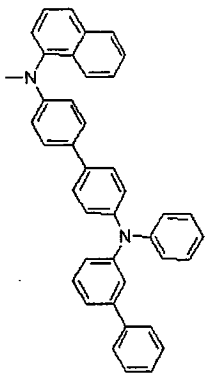

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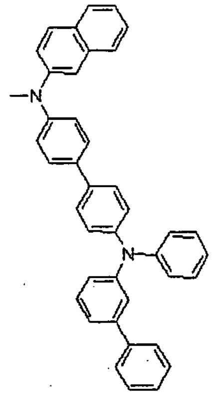

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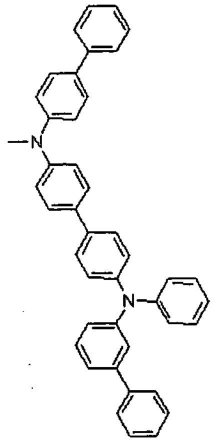

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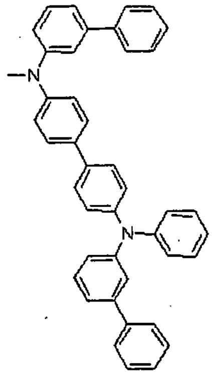

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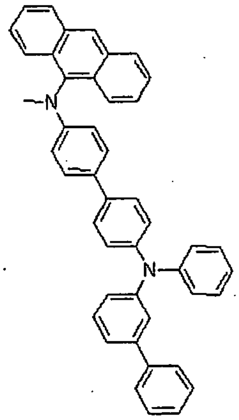

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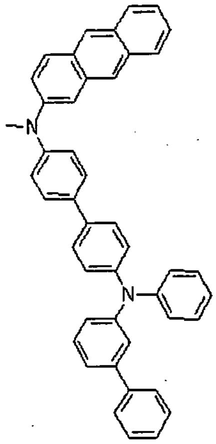

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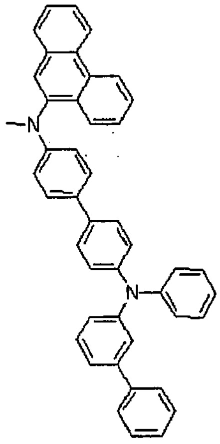

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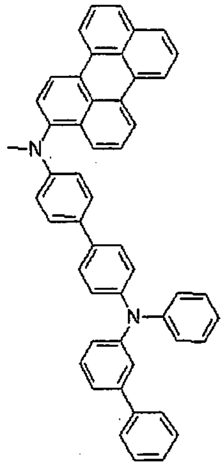

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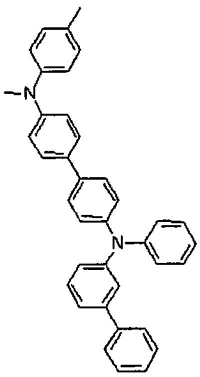

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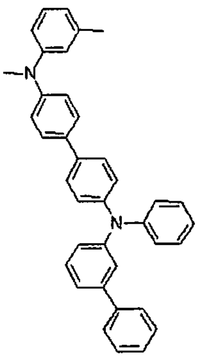

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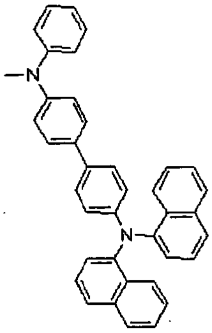
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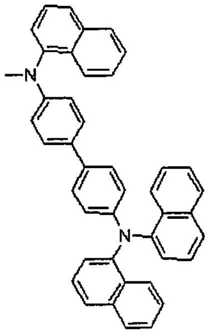
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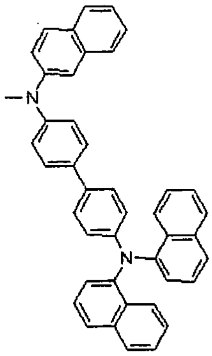
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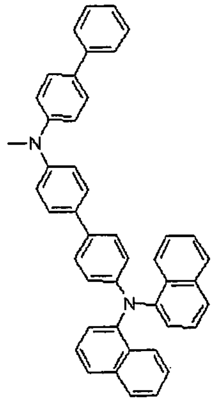
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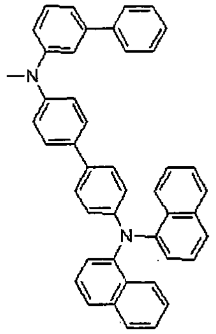
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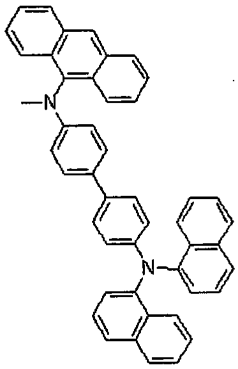
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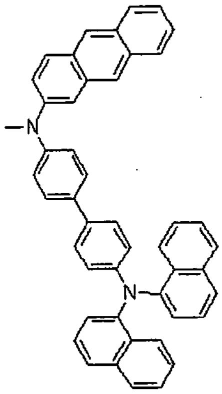
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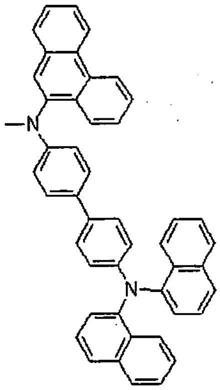
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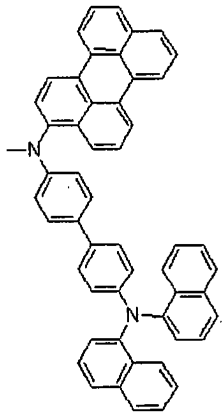
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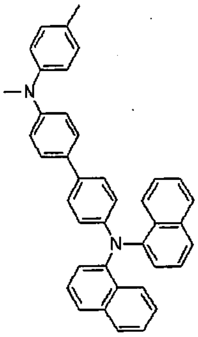
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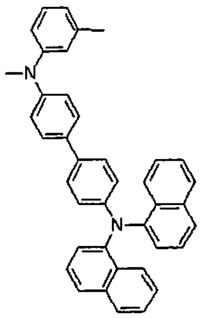
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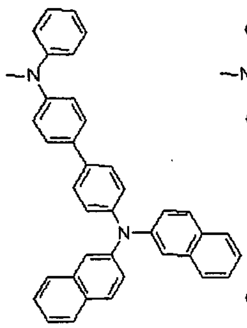
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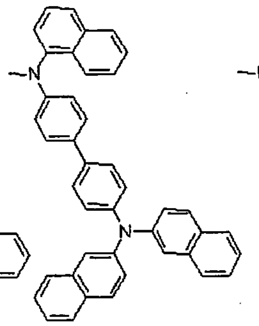
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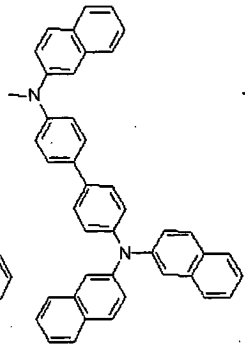
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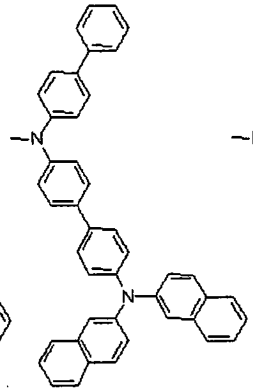
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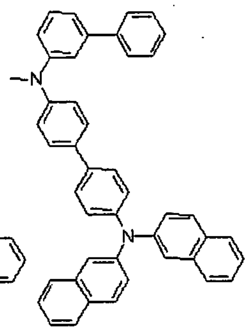
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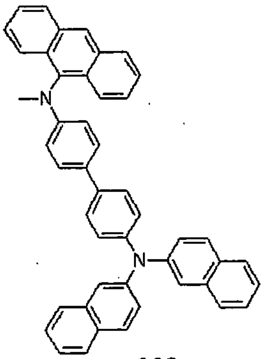
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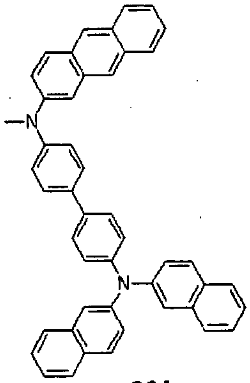
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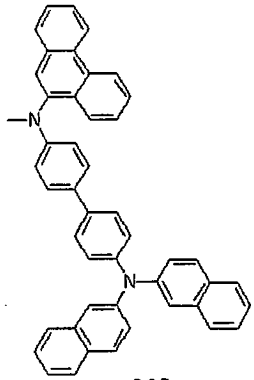
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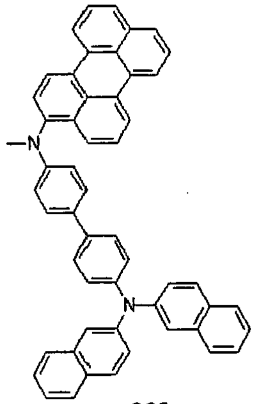
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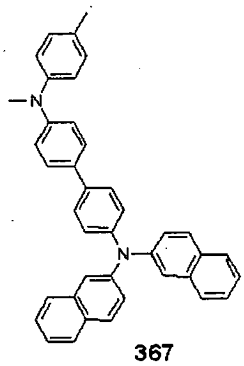
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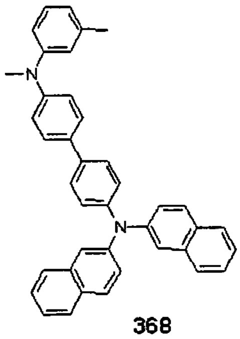
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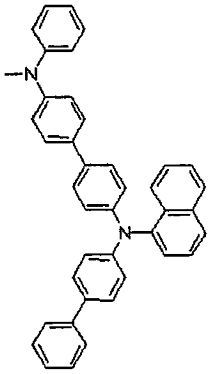

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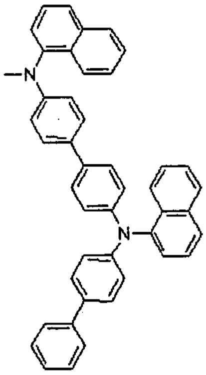

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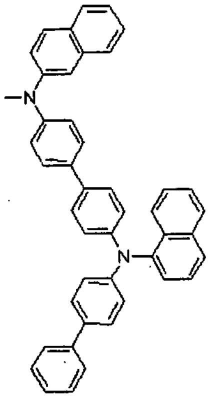

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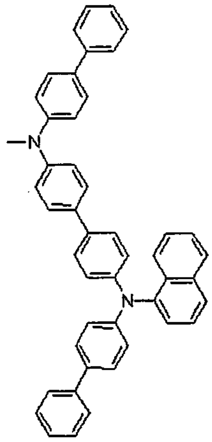

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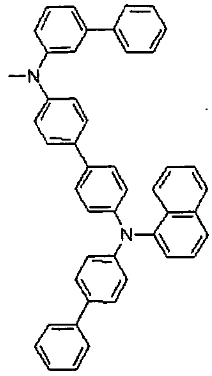

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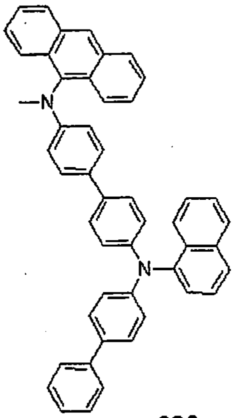

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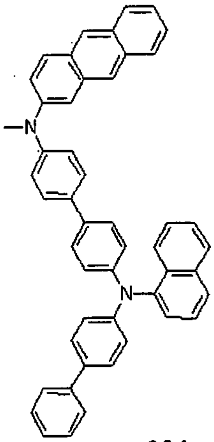

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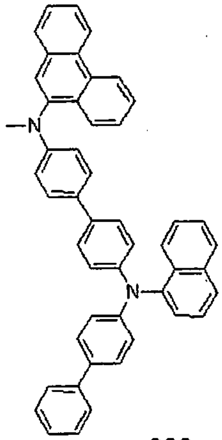

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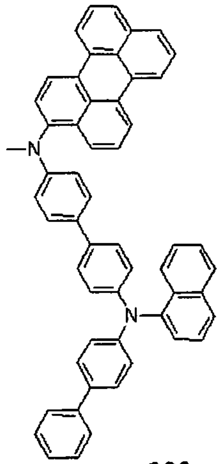

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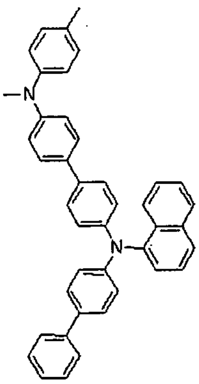

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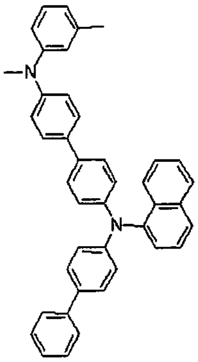

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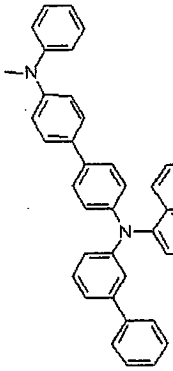
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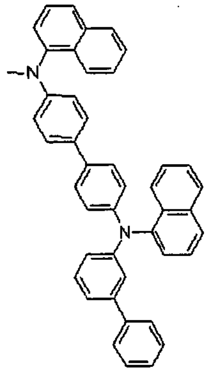
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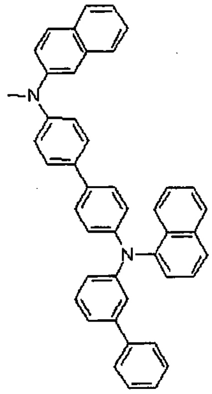
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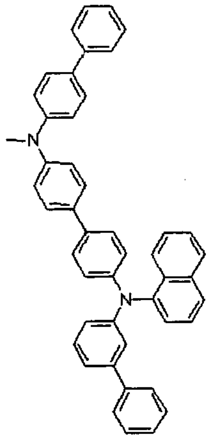
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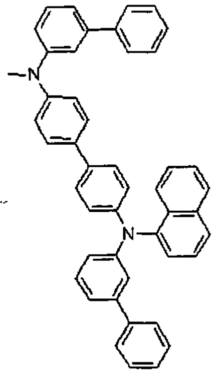
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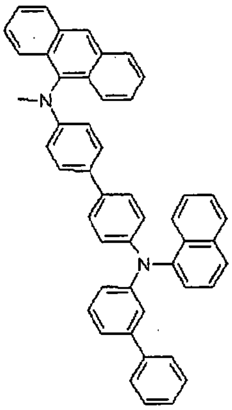
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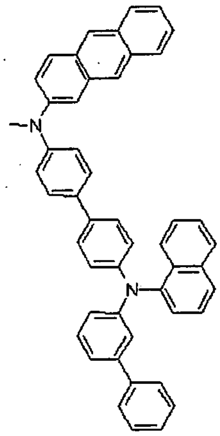
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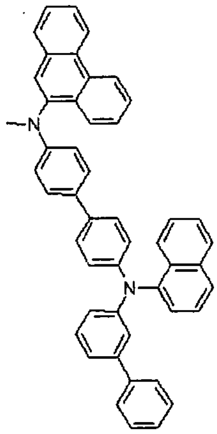
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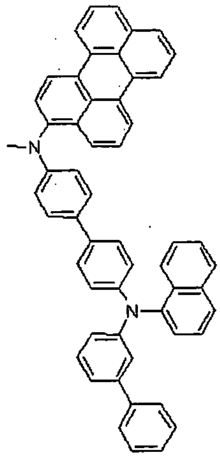
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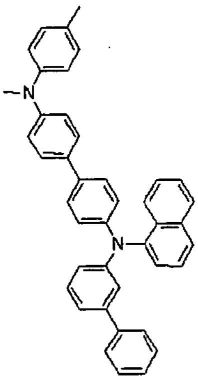
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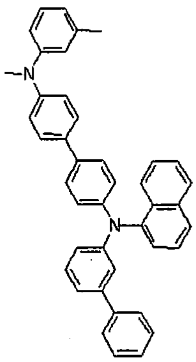
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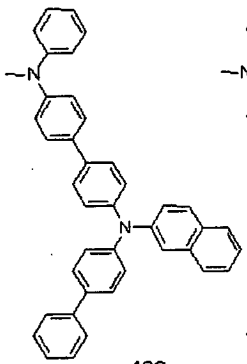
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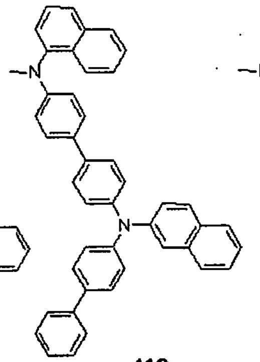
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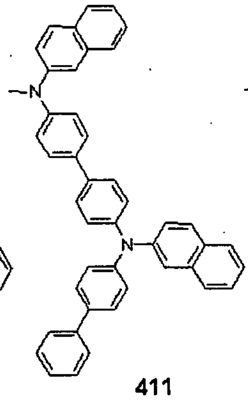
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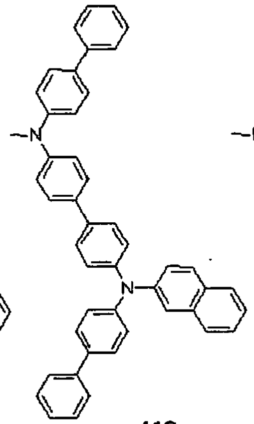
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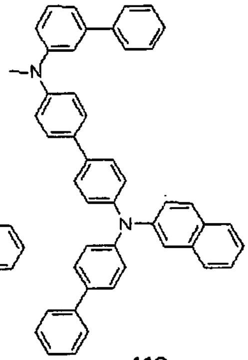
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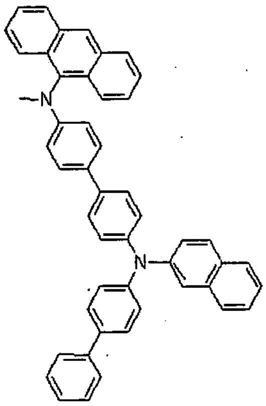
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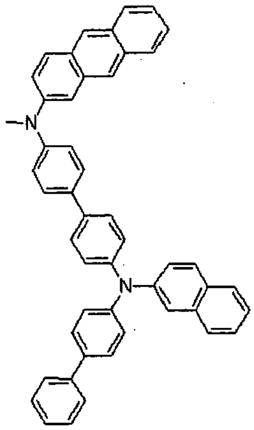
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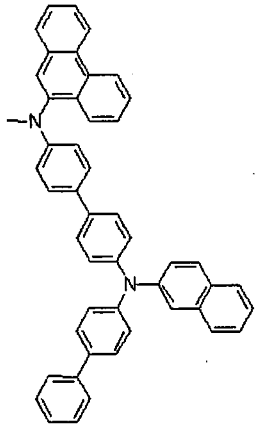
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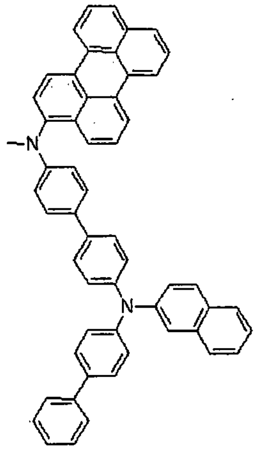
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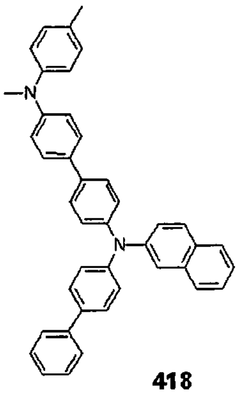
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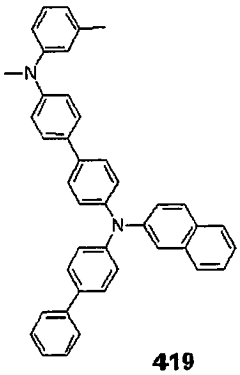
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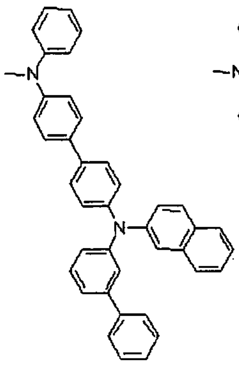
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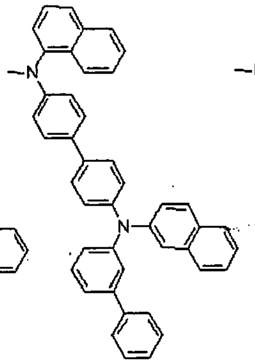
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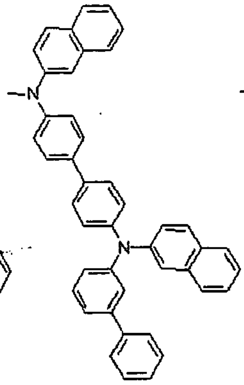
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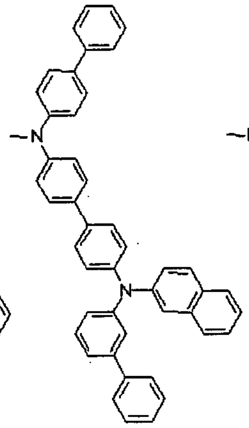
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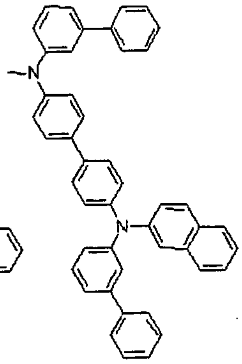
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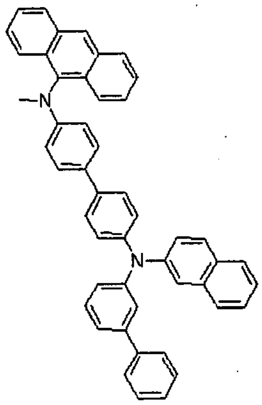
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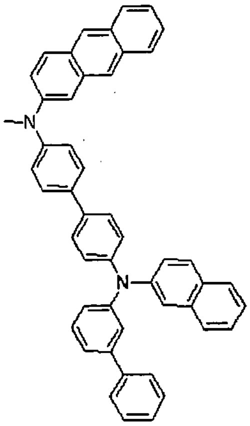
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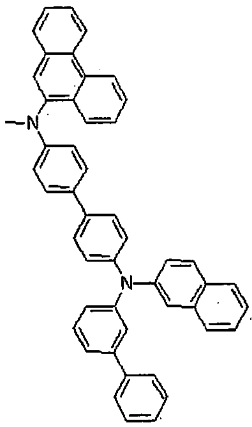
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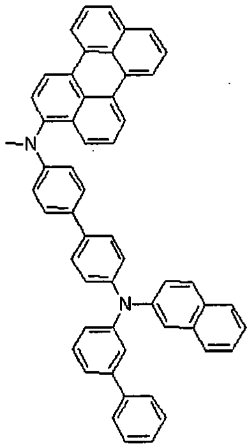
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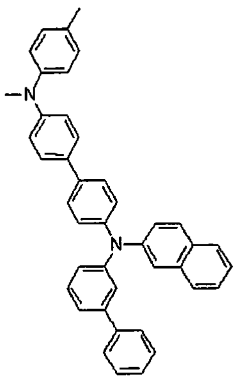
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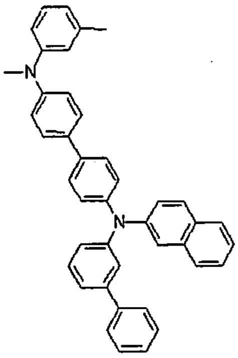
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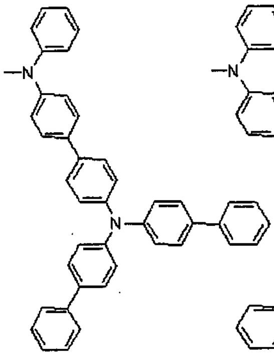

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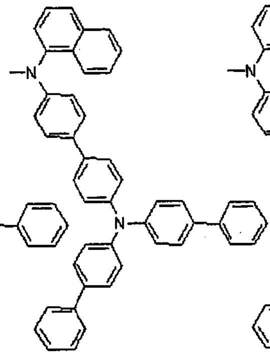

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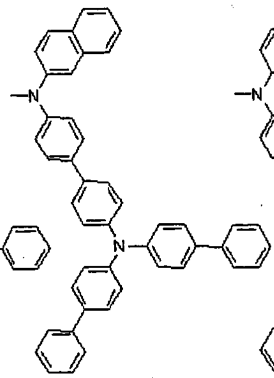

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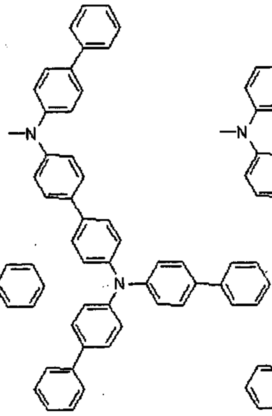

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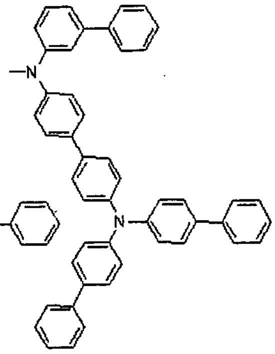

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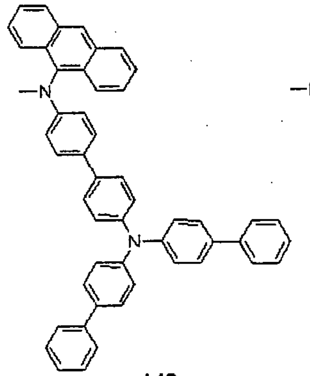

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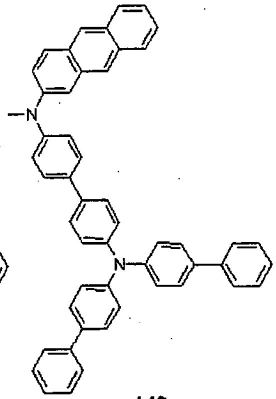

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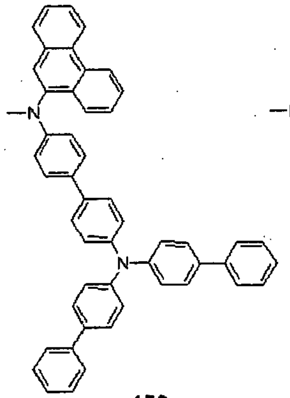

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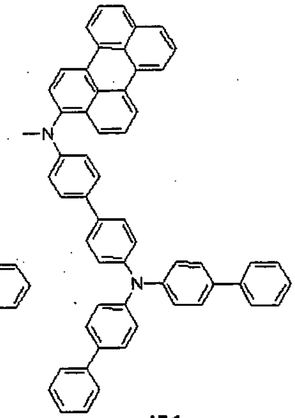

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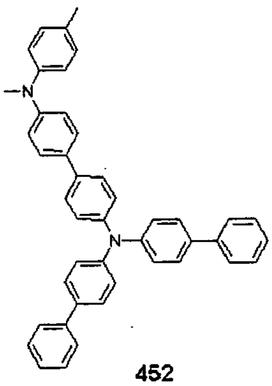

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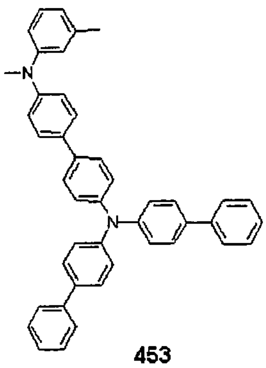

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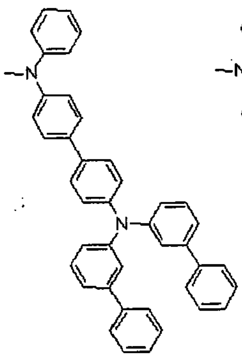
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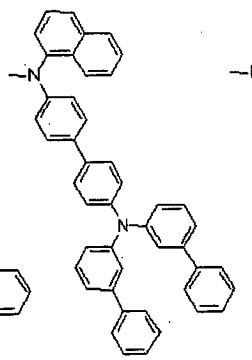
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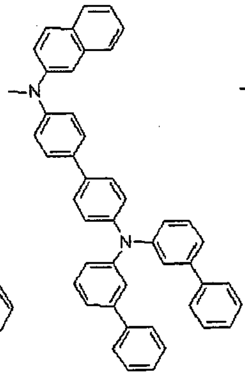
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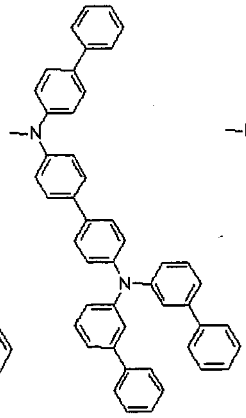
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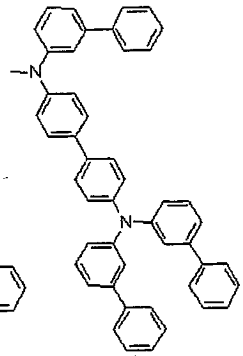
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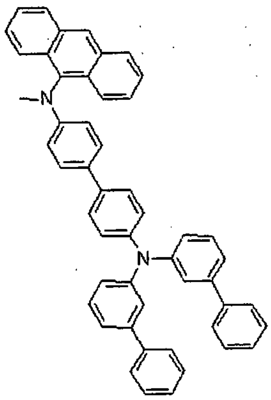
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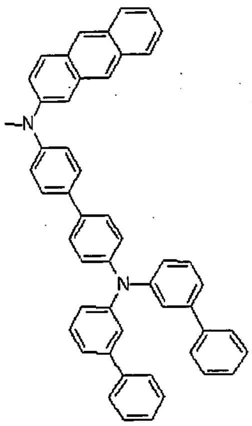
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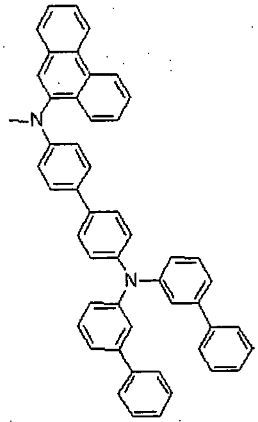
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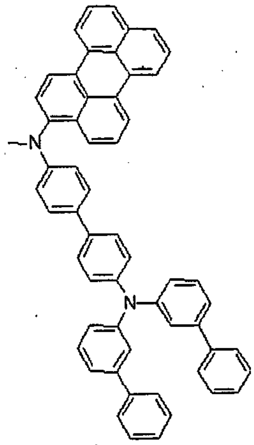
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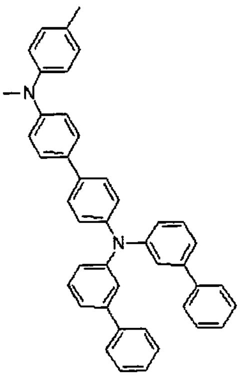
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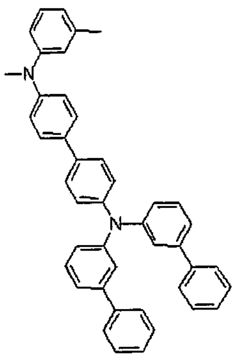
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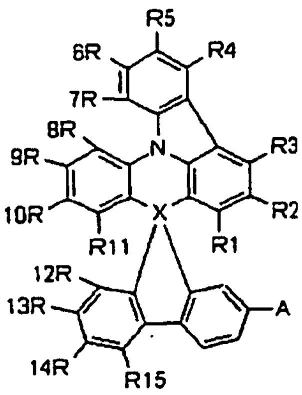
Revendications

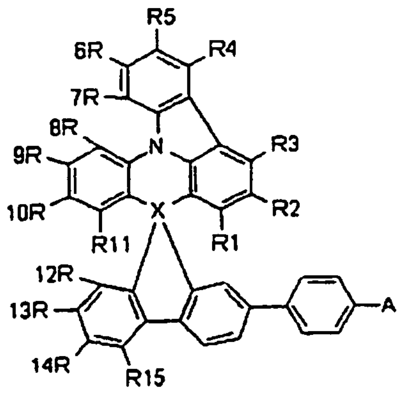
1. Dispositif électroluminescent organique comprenant :

une première électrode ;

des couches de matériaux organiques comprenant une couche électroluminescente et l'une parmi une couche d'injection de trous, une couche de transport de trous et une couche qui à la fois injecte et transporte des trous ; et une seconde électrode ;
dans lequel la première électrode, les couches de matériaux organiques et la seconde électrode forment une structure en couches ; et
la couche d'injection de trous, la couche de transport de trous ou la couche qui à la fois injecte et transporte des trous comprend un composé représenté par la Formule 2 ou la Formule 3 :

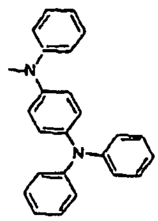


[Formule 2]



[Formule 3]

formules dans lesquelles :
X est C ;
R1 à R15 sont de l'hydrogène ; et
A est l'un des groupes suivants :



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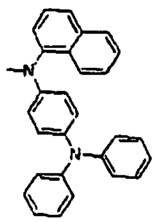

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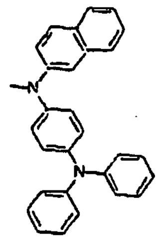

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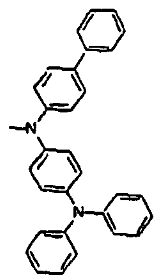

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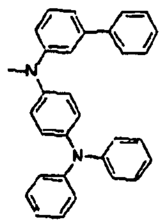

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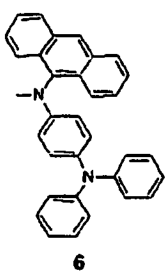

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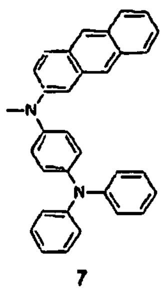

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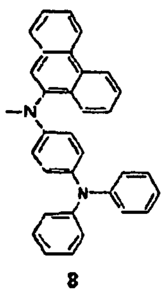

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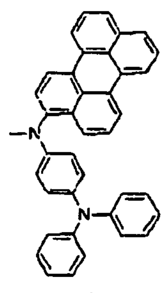

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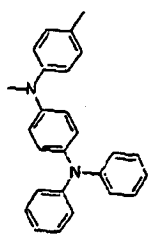

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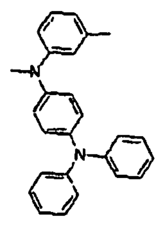

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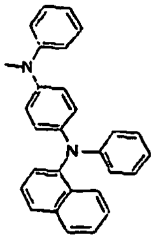
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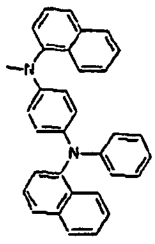
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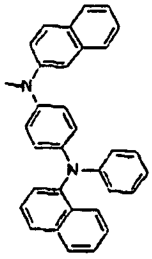
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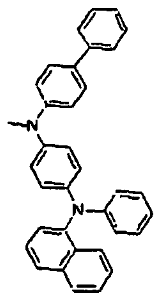
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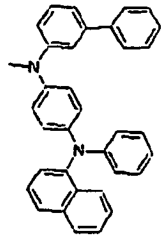
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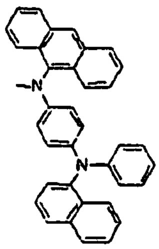
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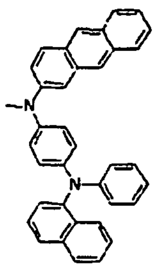
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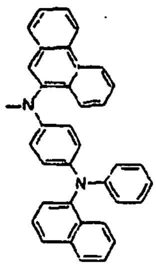
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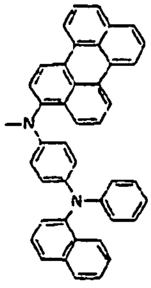
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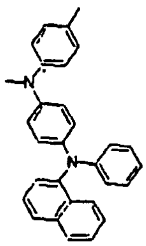
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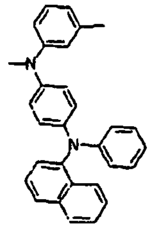
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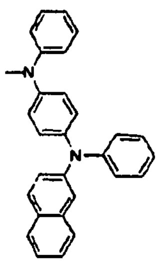
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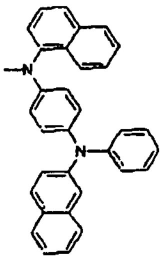
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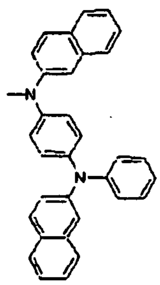
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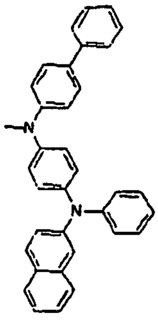
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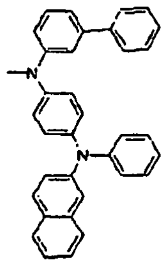
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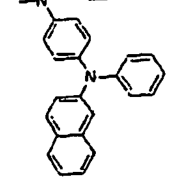
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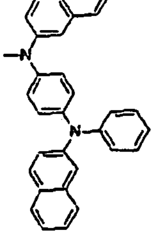
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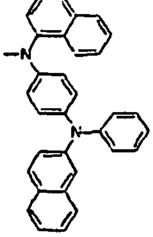
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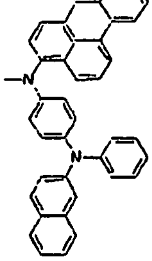
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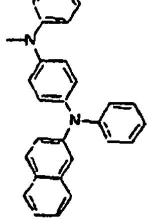
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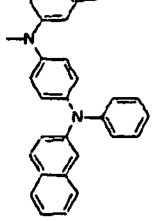
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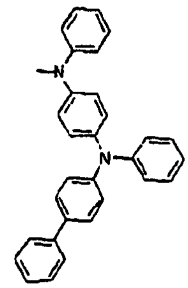
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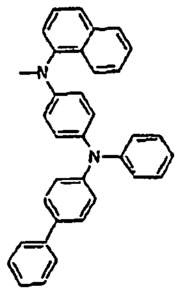
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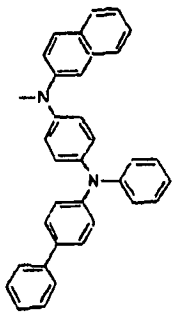
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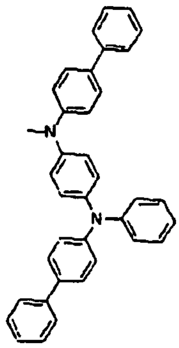
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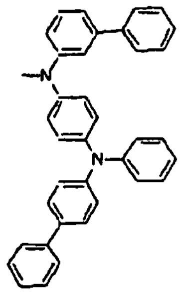
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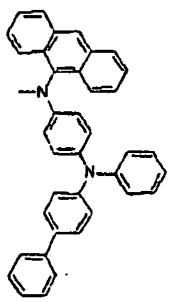
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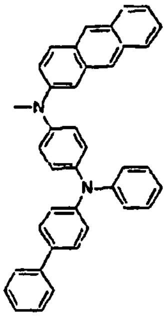
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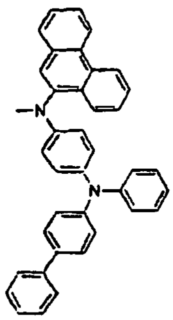
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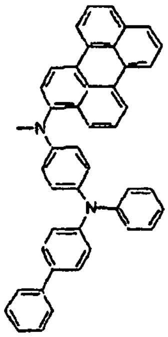
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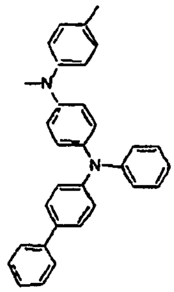
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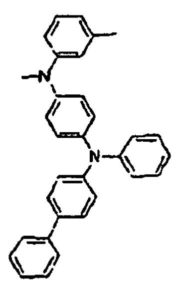
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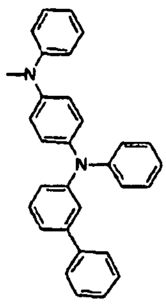
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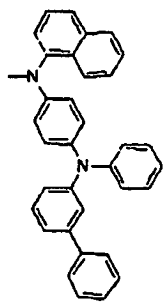
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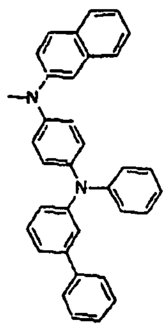
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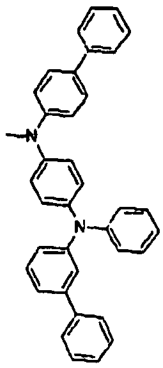
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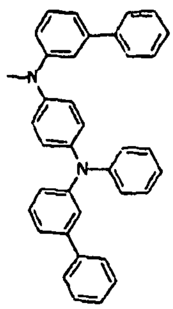
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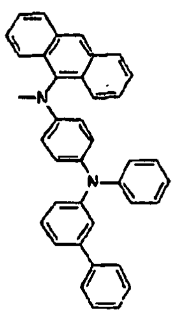
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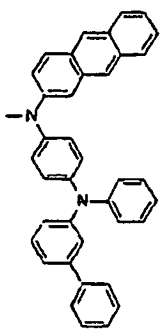
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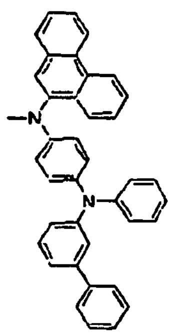
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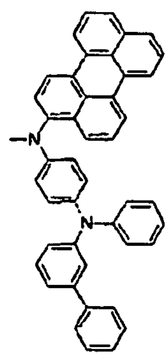
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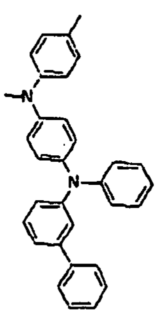
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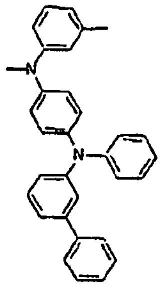
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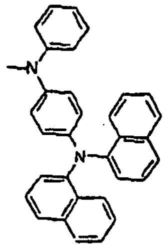
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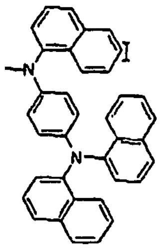
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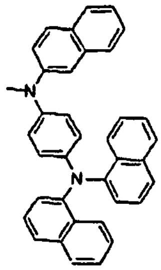
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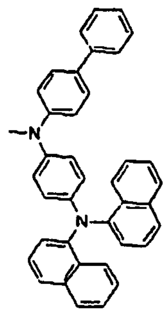
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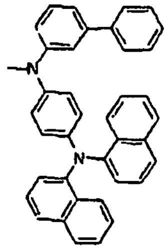
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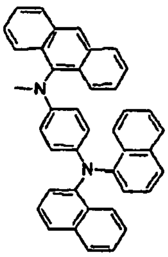
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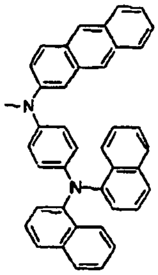
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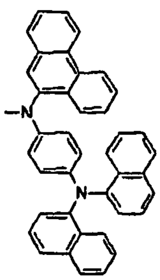
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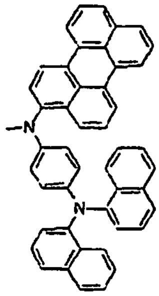
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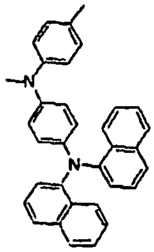
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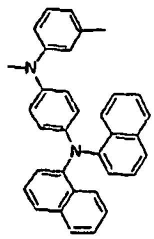
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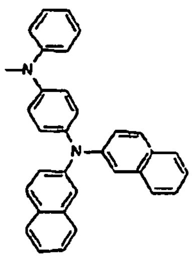
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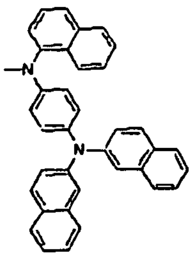
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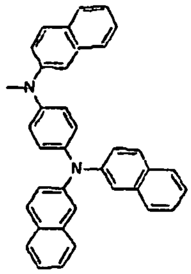
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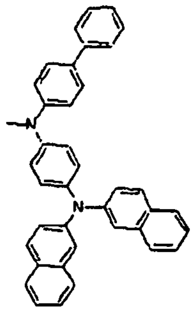
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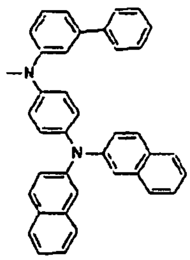
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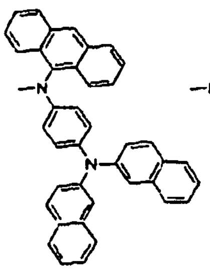
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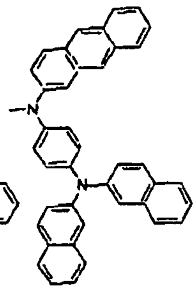
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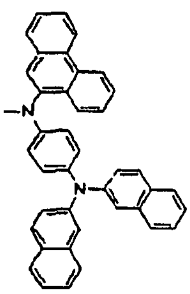
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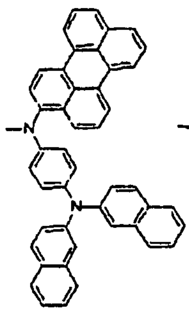
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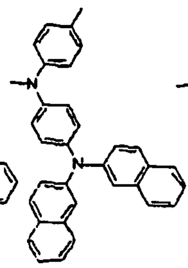
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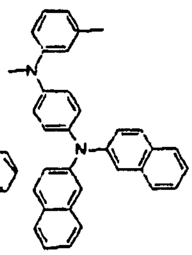
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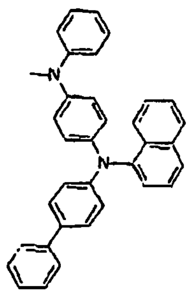
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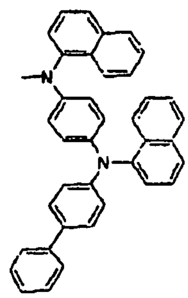
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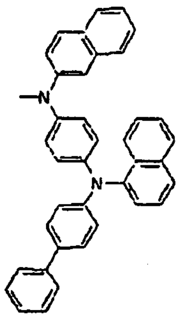
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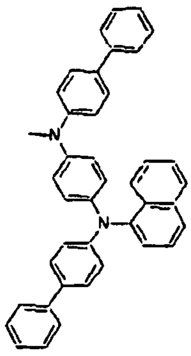
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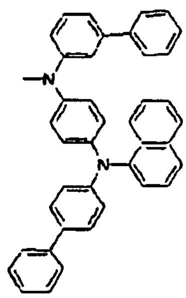
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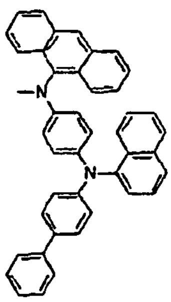
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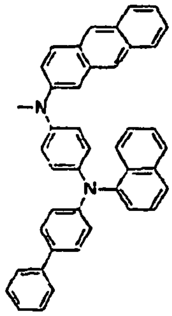
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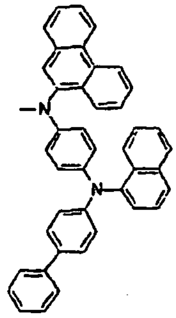
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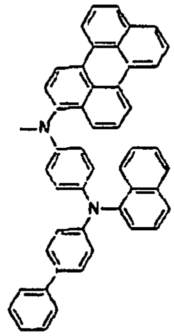
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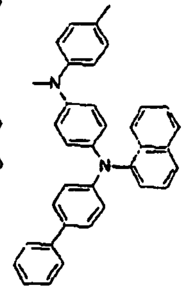
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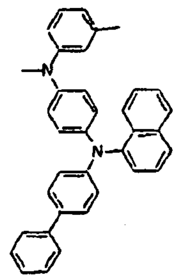
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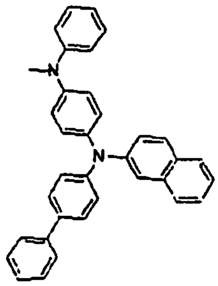
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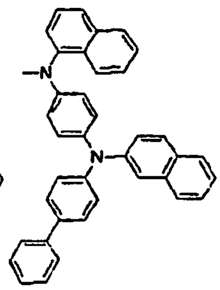
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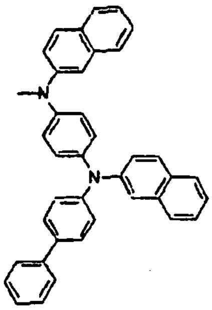
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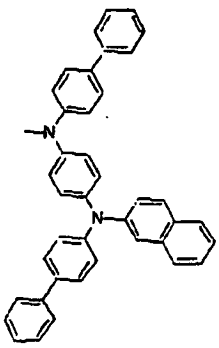
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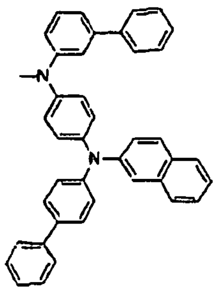
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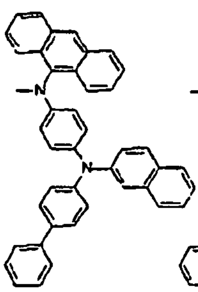
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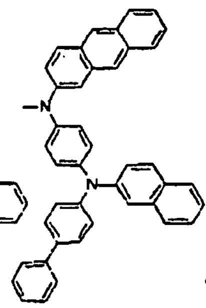
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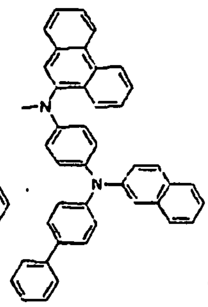
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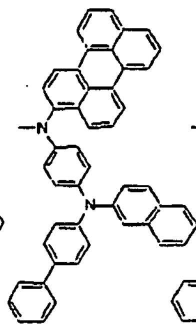
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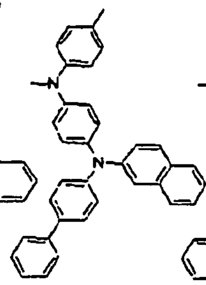
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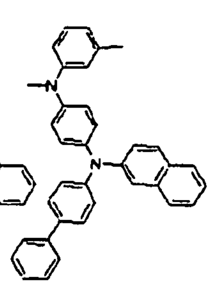
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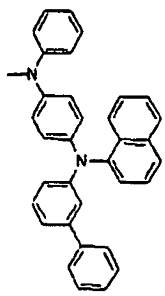
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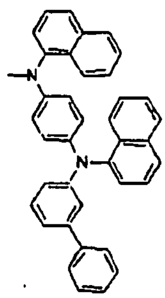
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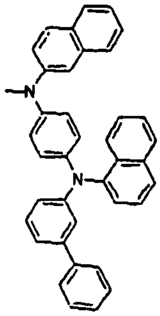
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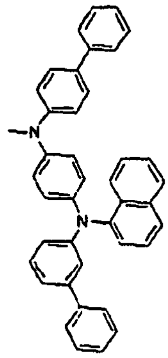
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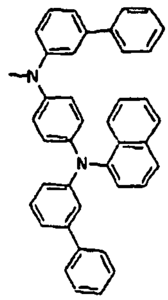
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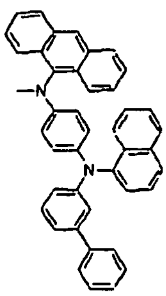
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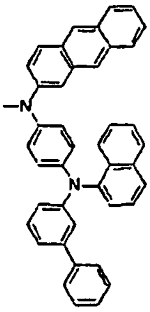
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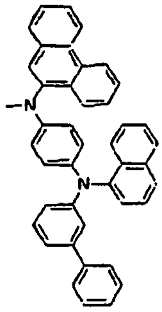
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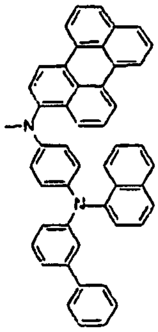
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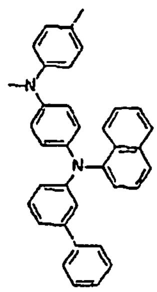
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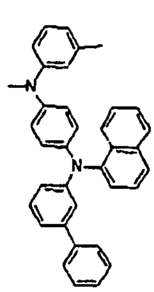
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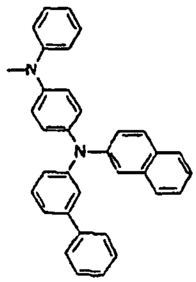
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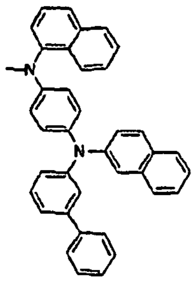
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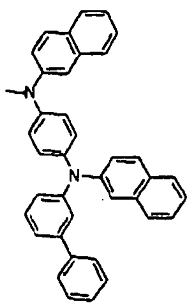
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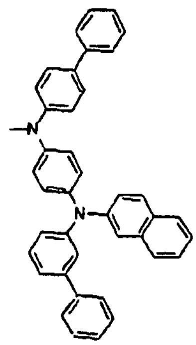
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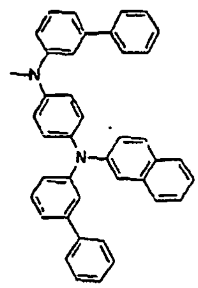
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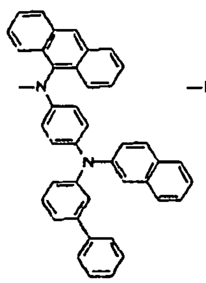
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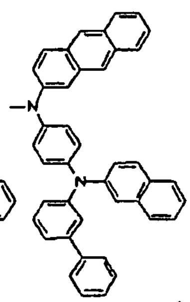
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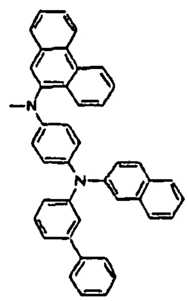
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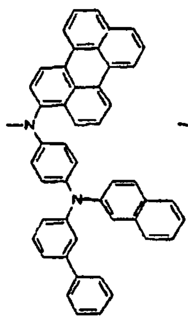
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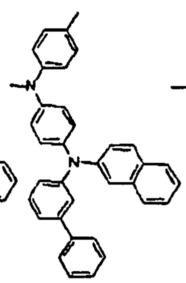
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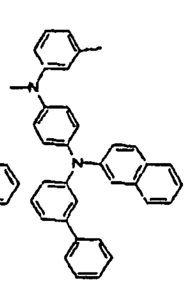
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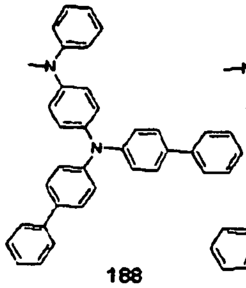
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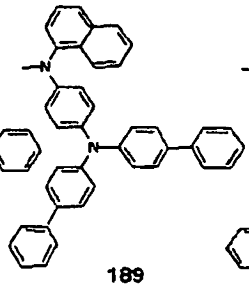
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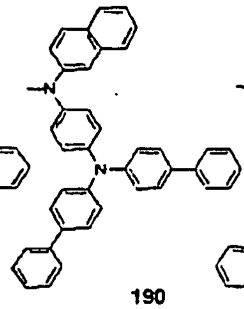
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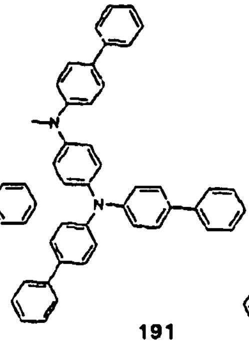
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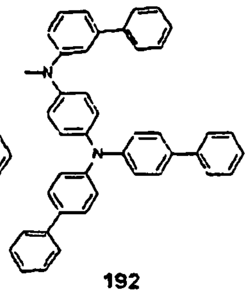
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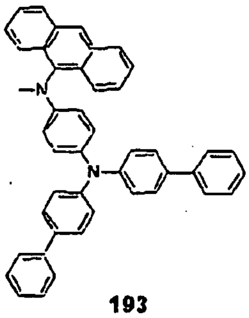
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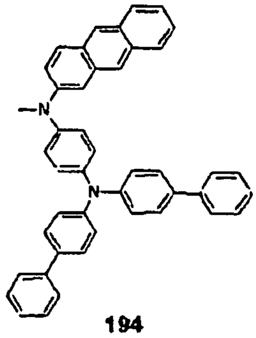
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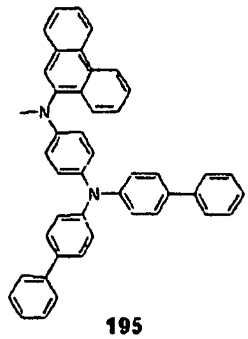
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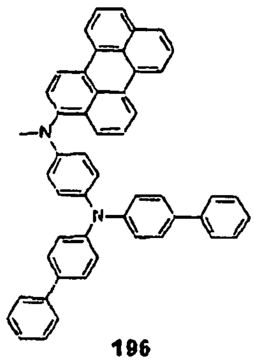
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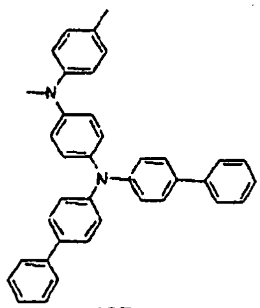
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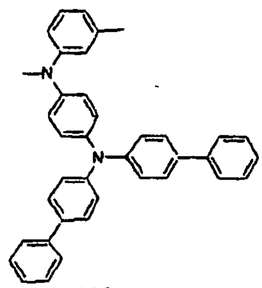
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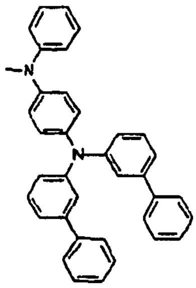

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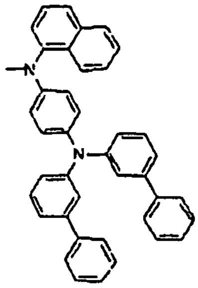

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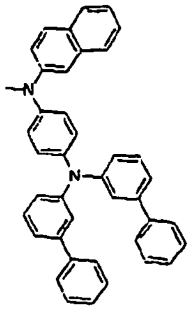

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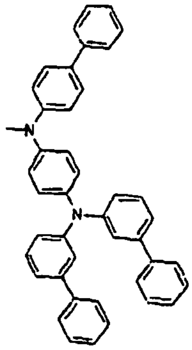

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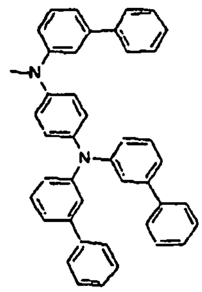

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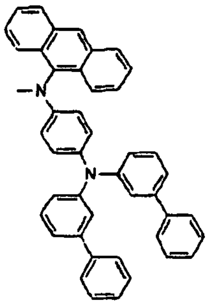

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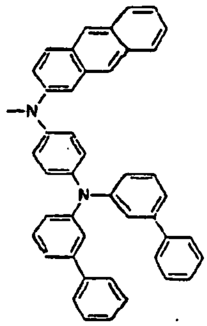

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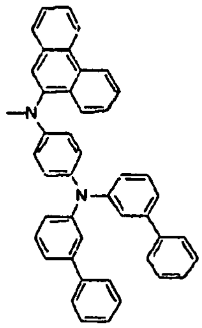

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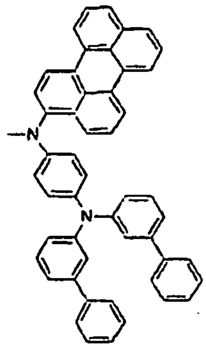

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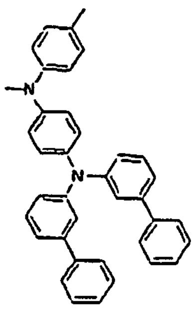

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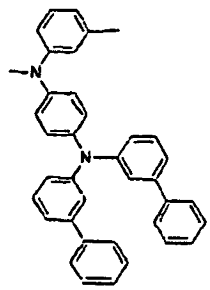

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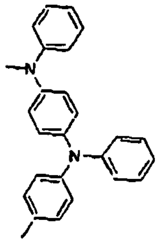
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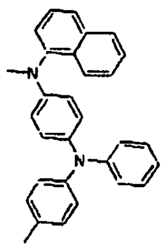
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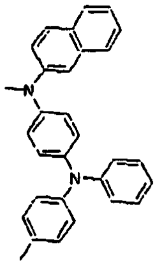
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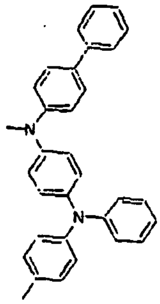
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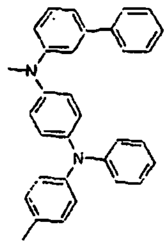
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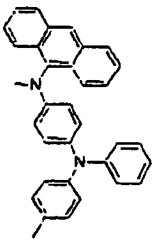
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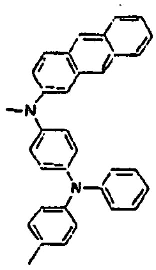
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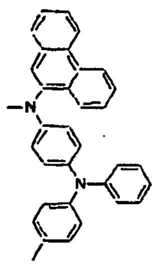
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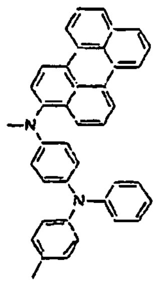
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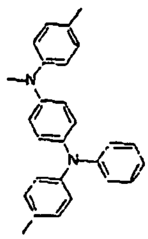
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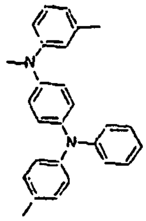
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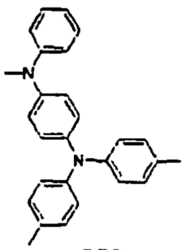
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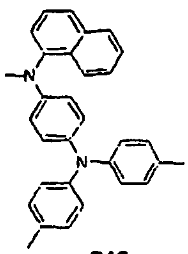
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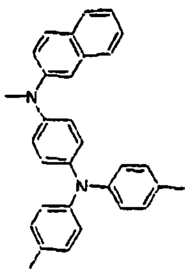
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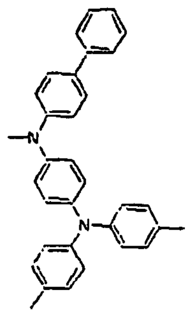
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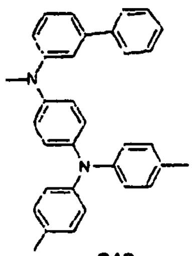
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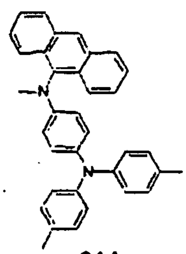
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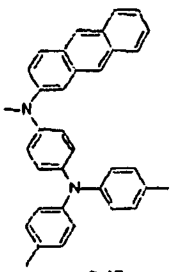
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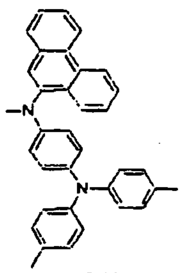
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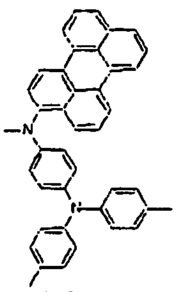
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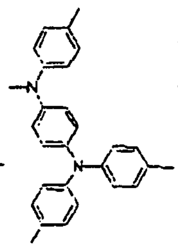
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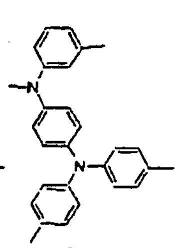
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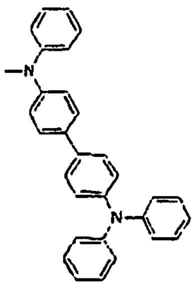
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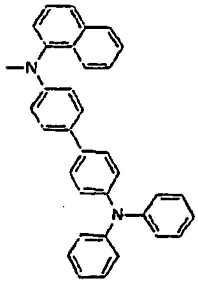
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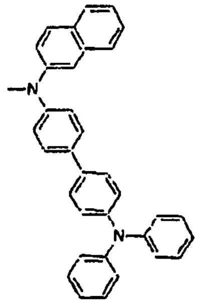
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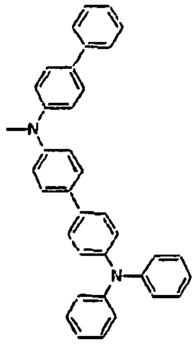
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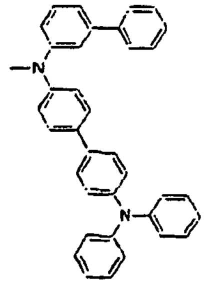
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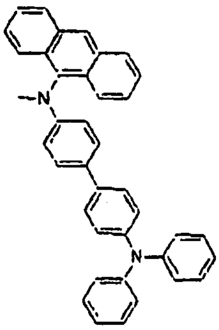
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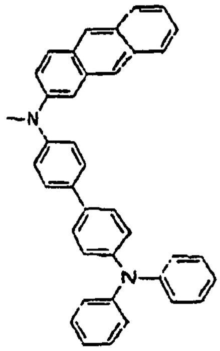
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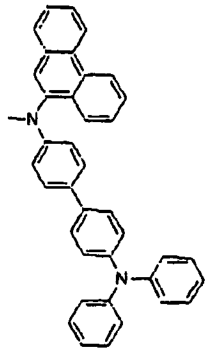
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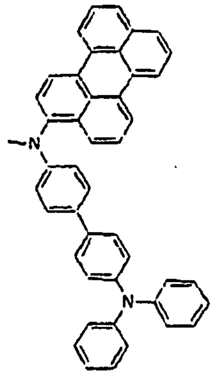
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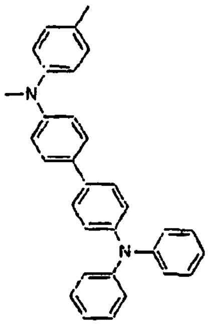
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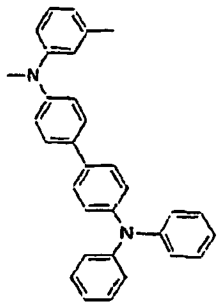
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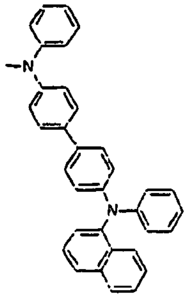
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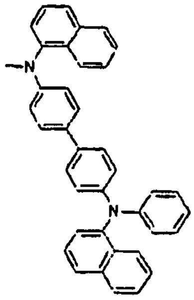
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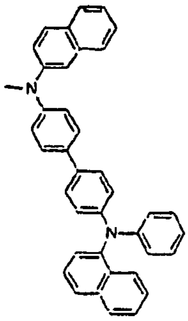
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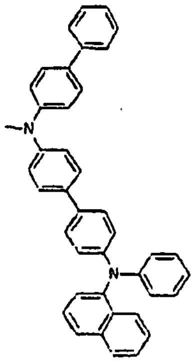
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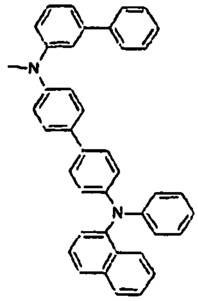
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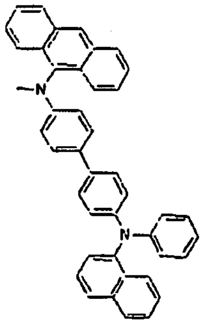
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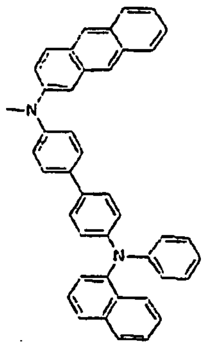
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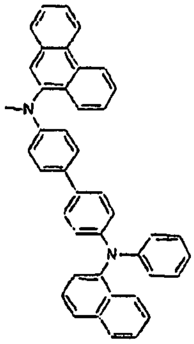
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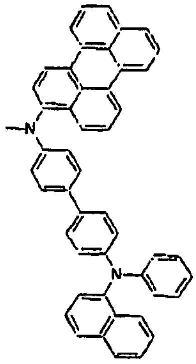
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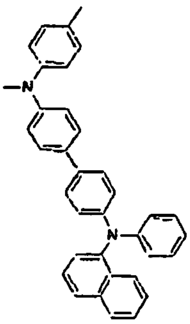
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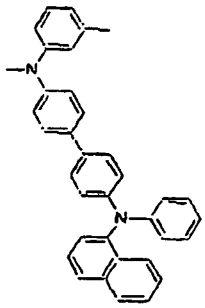
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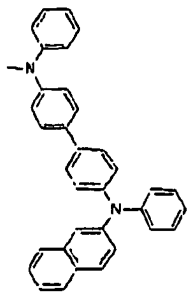
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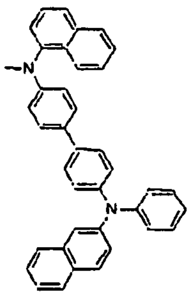
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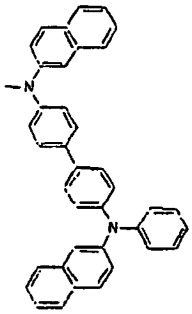
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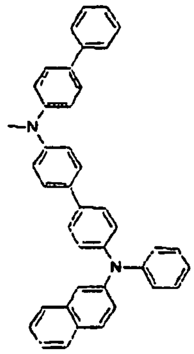
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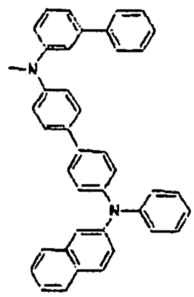
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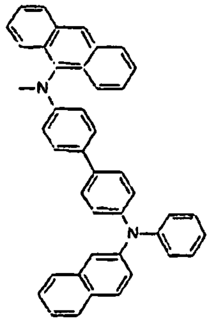
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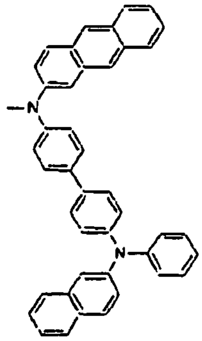
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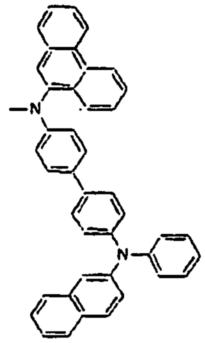
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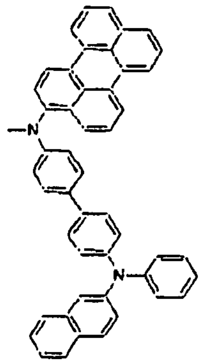
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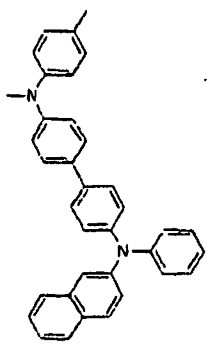
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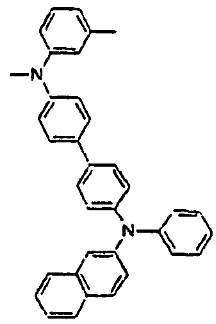
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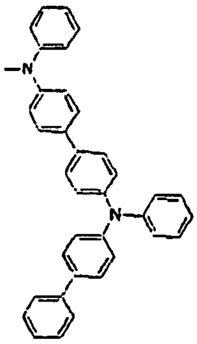

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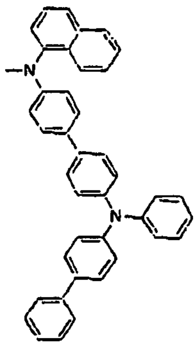

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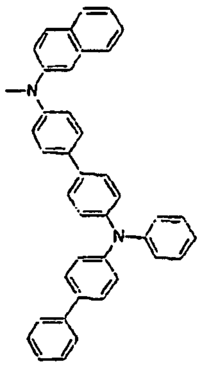

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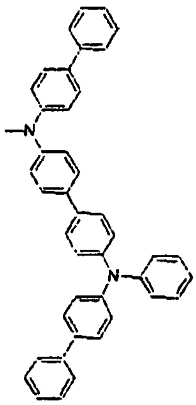

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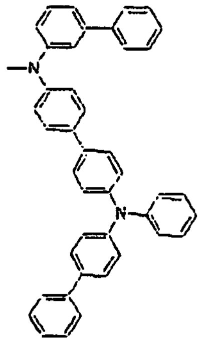

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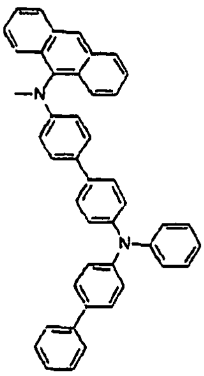

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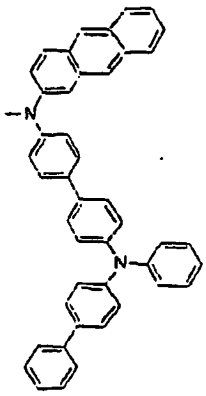

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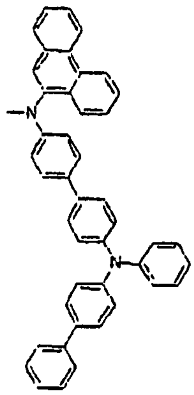

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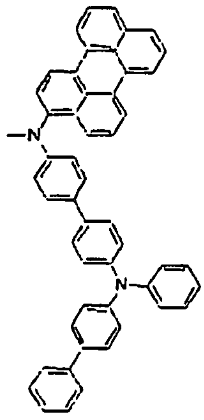

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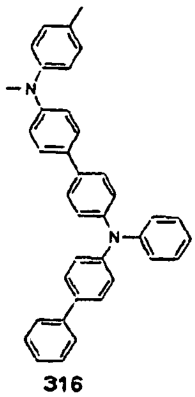

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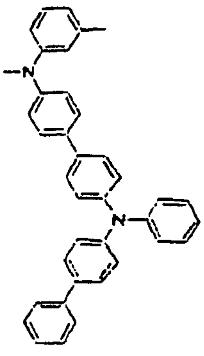

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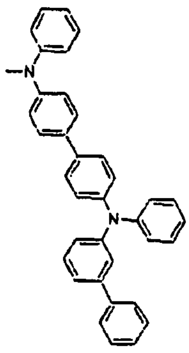

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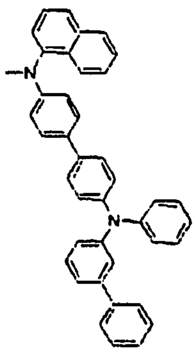

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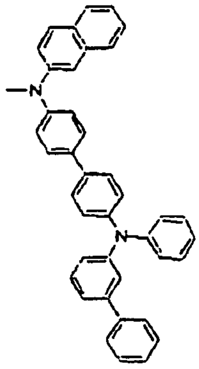

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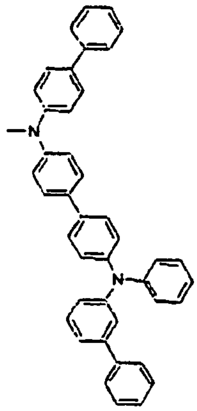

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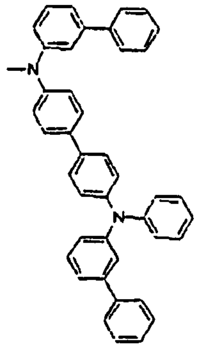

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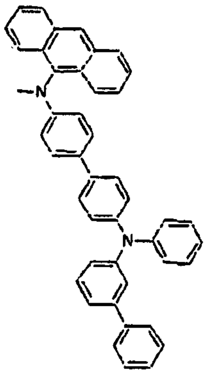

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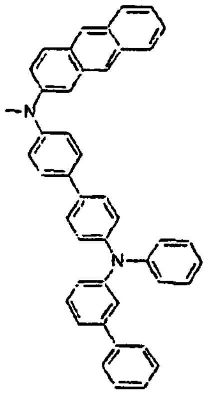

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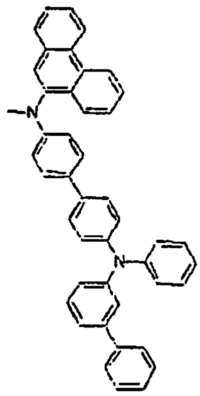

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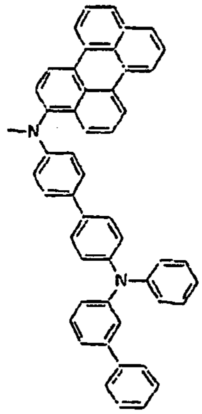

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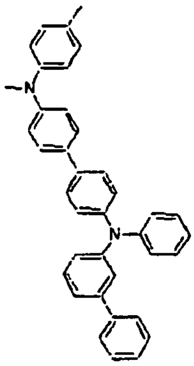

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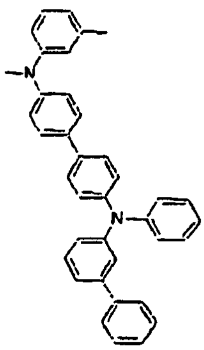

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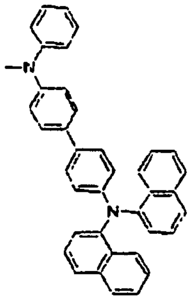
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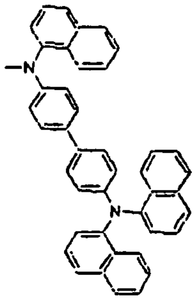
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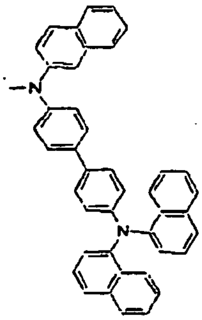
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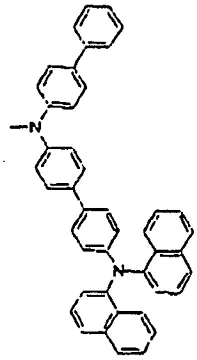
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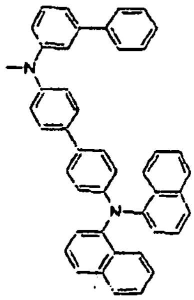
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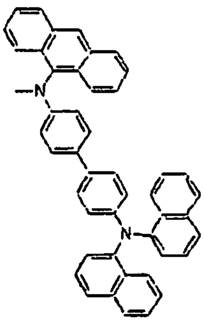
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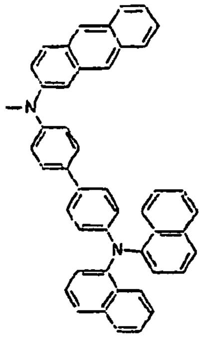
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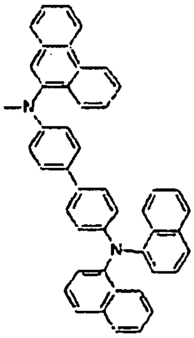
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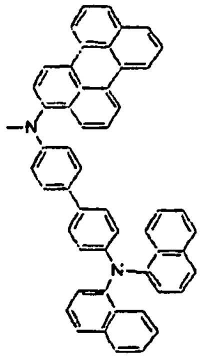
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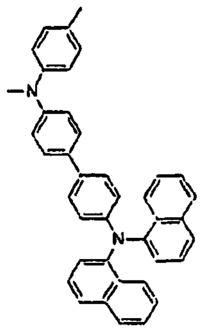
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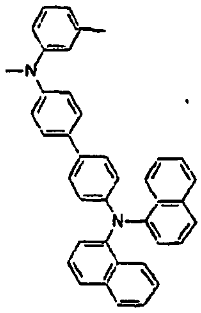
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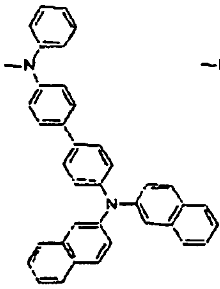
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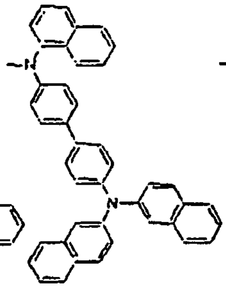
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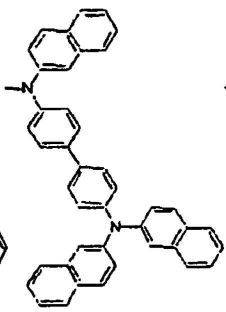
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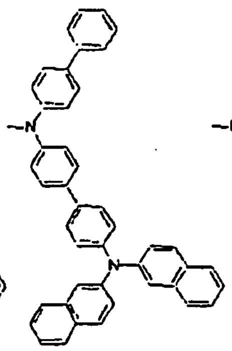
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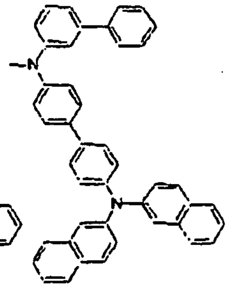
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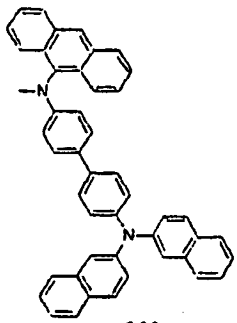
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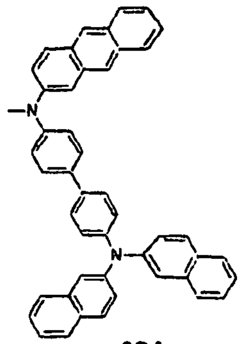
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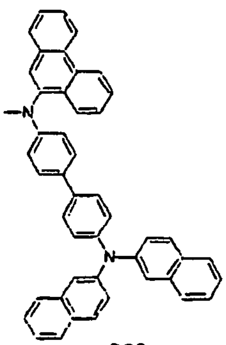
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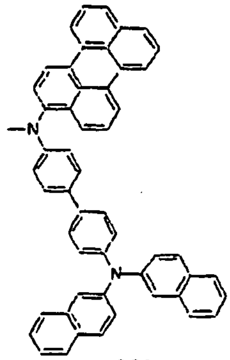
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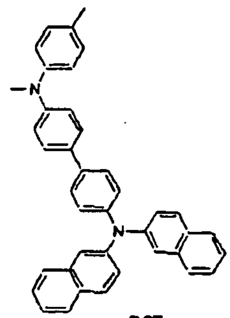
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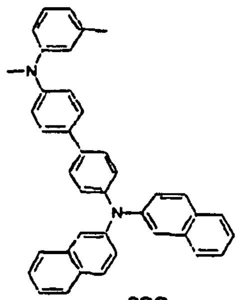
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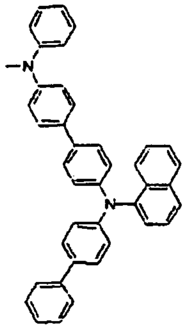
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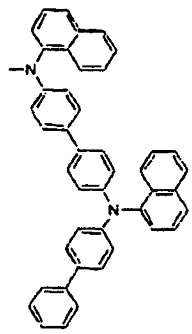
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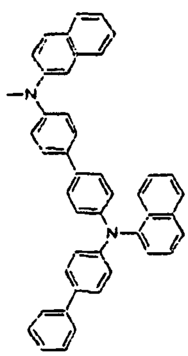
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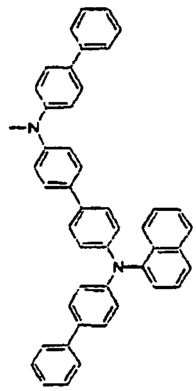
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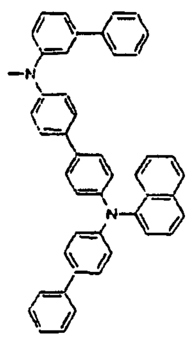
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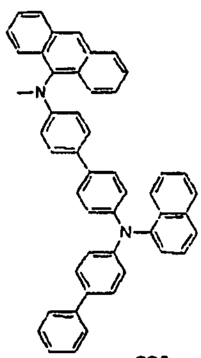
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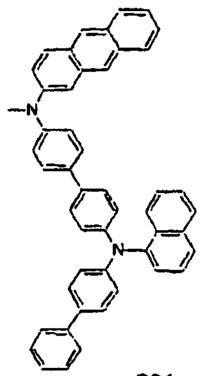
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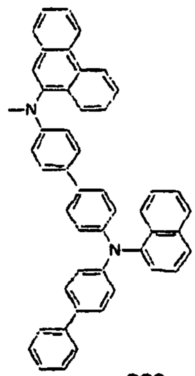
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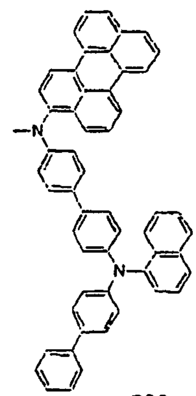
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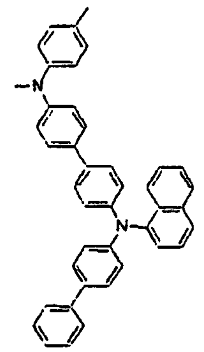

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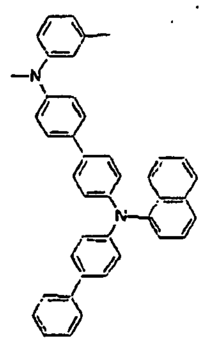

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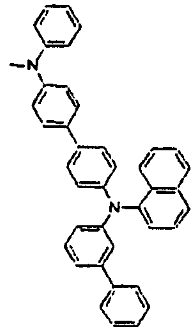

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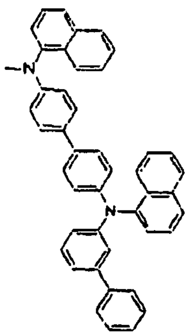

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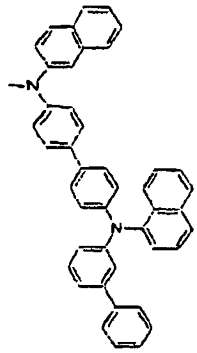

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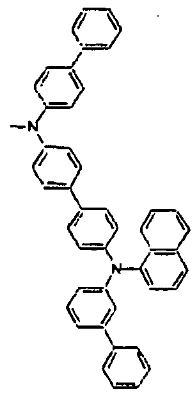

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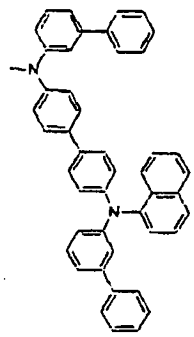

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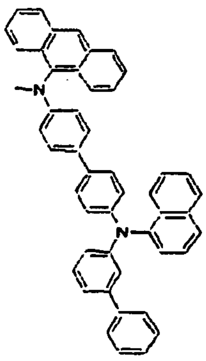

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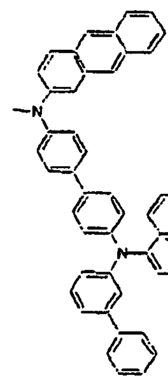

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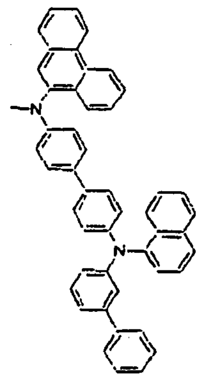

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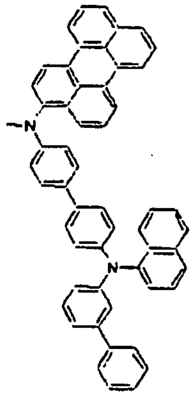

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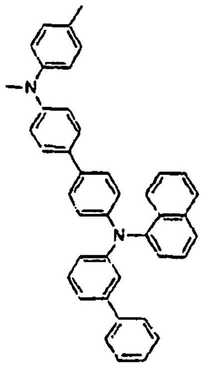

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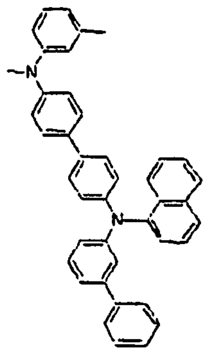

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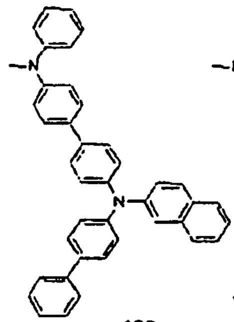

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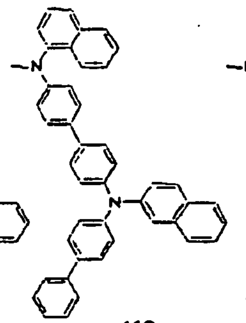

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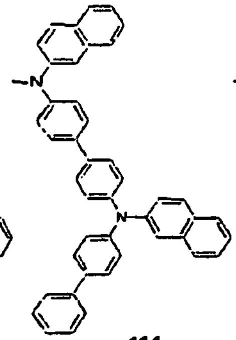

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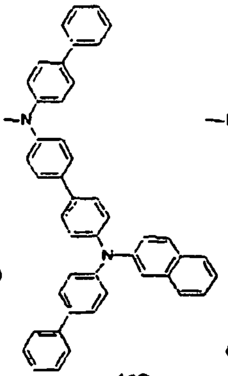

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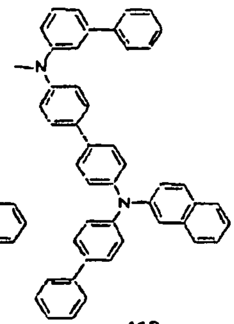

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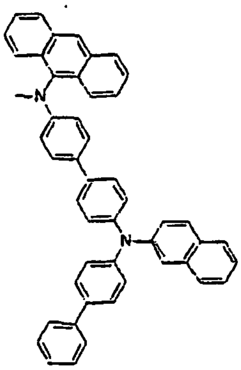

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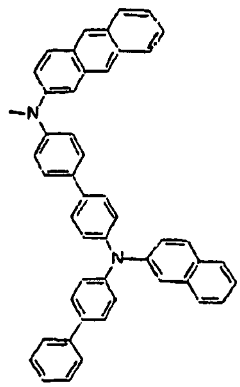

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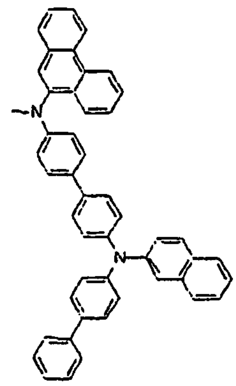

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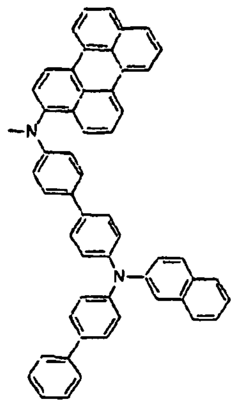

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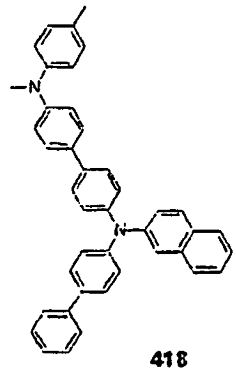
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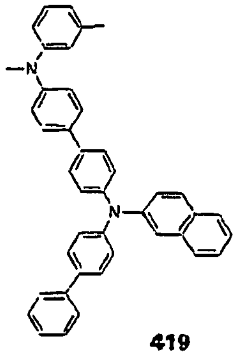
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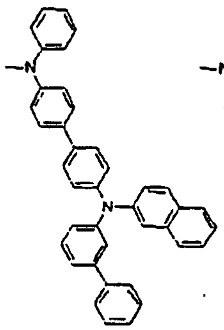
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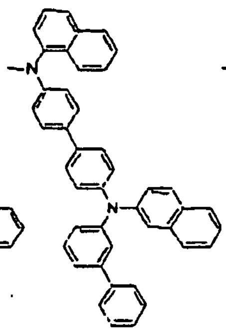
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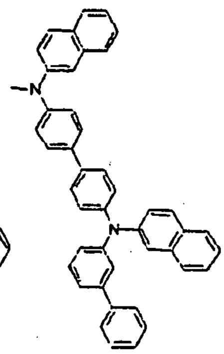
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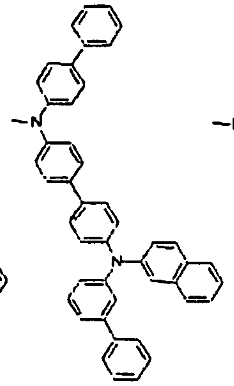
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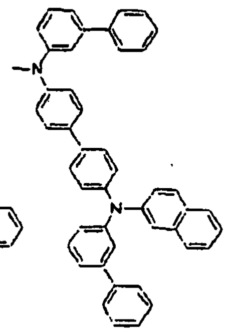
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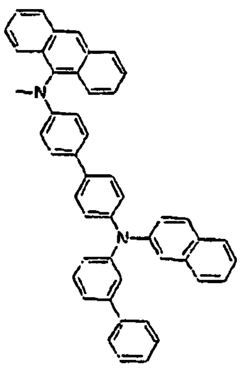
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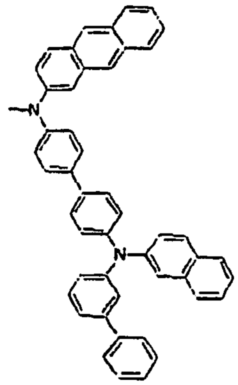
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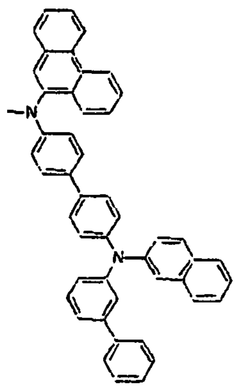
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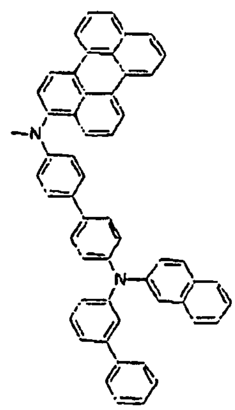
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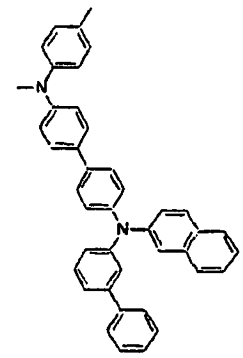
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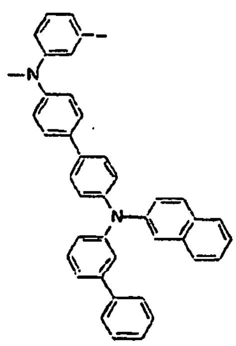
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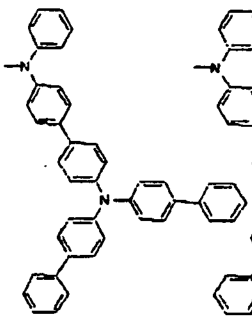

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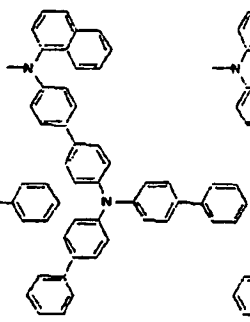

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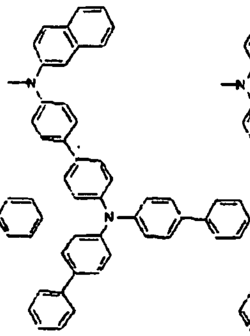

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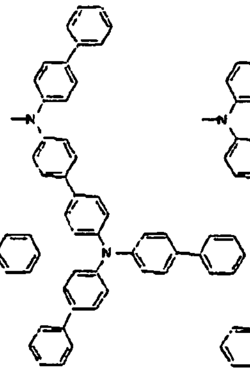

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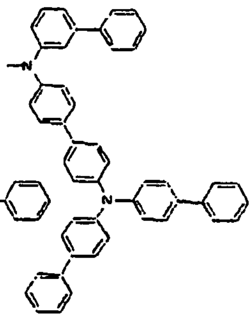

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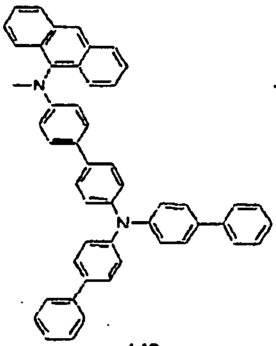

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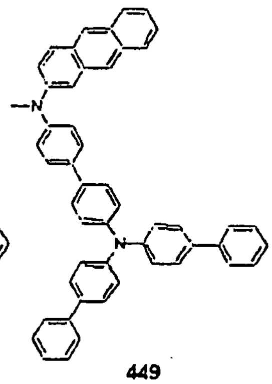

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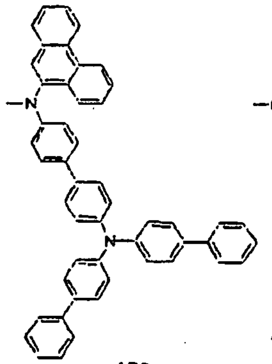

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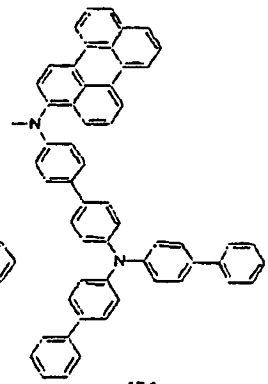

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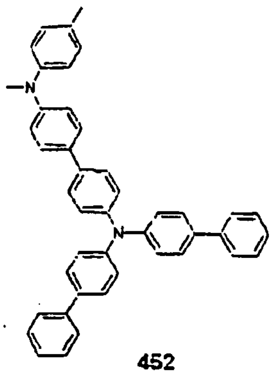

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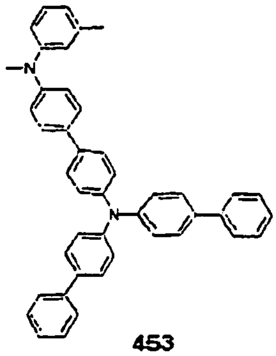

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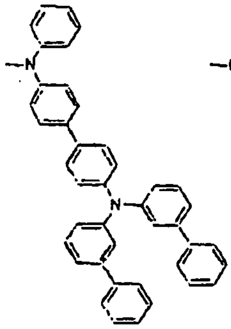

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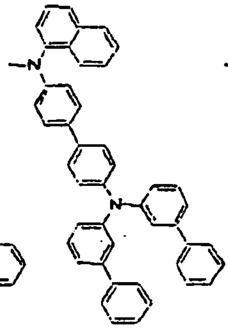

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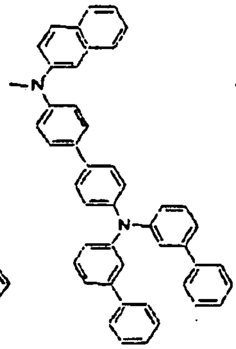

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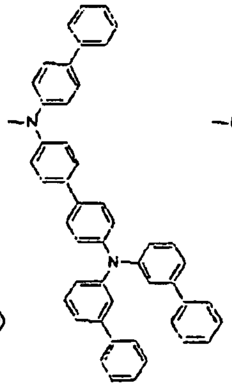

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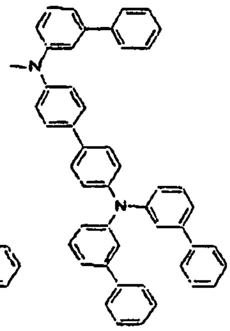

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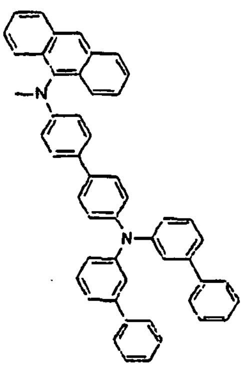

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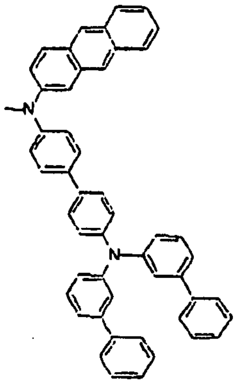

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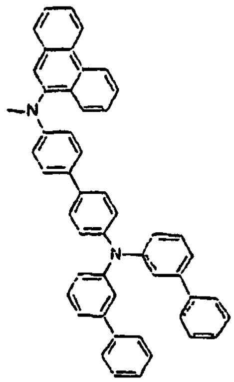

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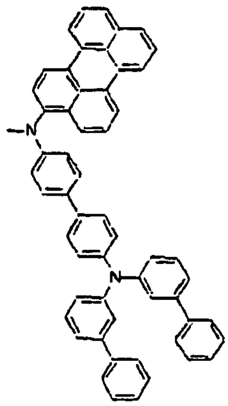

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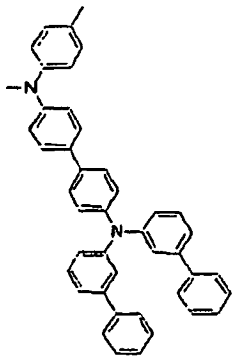

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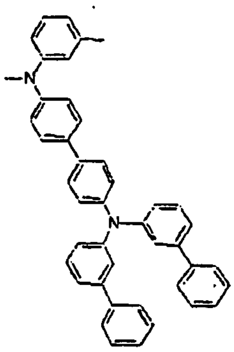
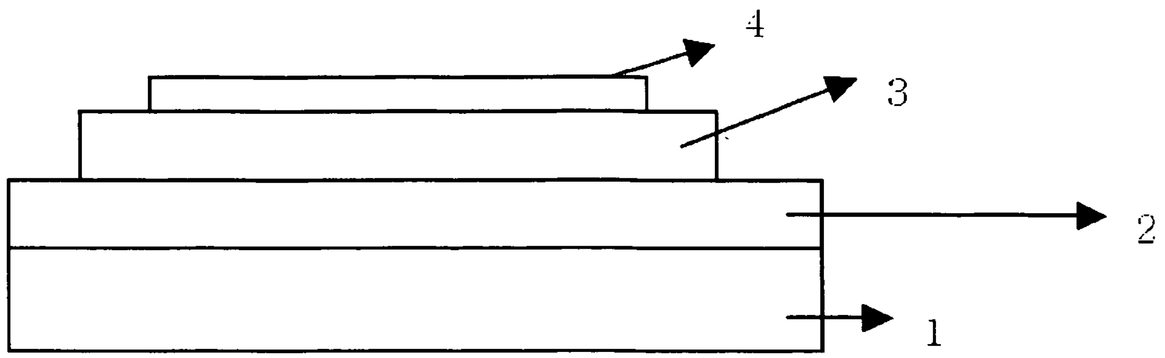
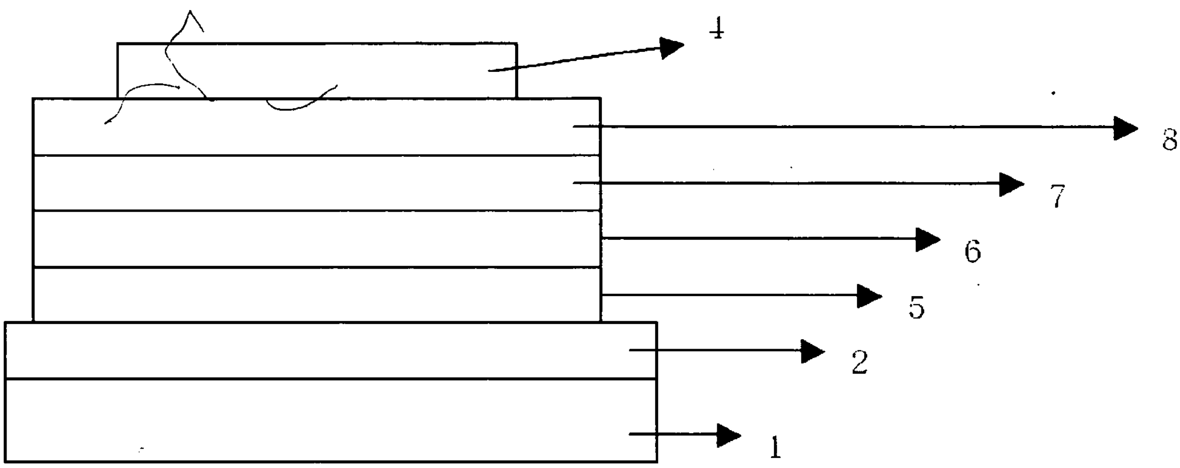


470

[Fig. 1]



[Fig. 2]



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2004020371 A **[0005]**

专利名称(译)	新型化合物及使用其的有机发光装置（5）		
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外部链接	Espacenet		

摘要(译)

公开了一种有机发光器件。 有机发光器件包括第一电极，包括发光层的有机材料层和第二电极。 第一电极，有机材料层和第二电极形成层状结构，并且有机材料层的至少一层包括其中热固性或光致的式1的化合物或式1的化合物 -介绍了可交联的官能团。