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(54) **DISPLAY DEVICE**

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(57) **ABSTRACT**

A display device which enables size reduction, particularly in the frame thereof, and allows a thinner liquid crystal panel and a larger screen is provided. Positioning of a liquid crystal panel is performed by contacting the outer periphery of a back side polarizing plate, which is affixed to a second transparent substrate configuring the main part of the liquid crystal panel, with the inside of a protruded fitting portion formed on the frame of a backlight assembly. Thereby, the display panel can be positioned securely without enlarging the outside dimension of the front chassis and the frame. This enables to realize a small-size display device, particularly, size reduction in the frame of the front chassis and reduction of the outside dimension.

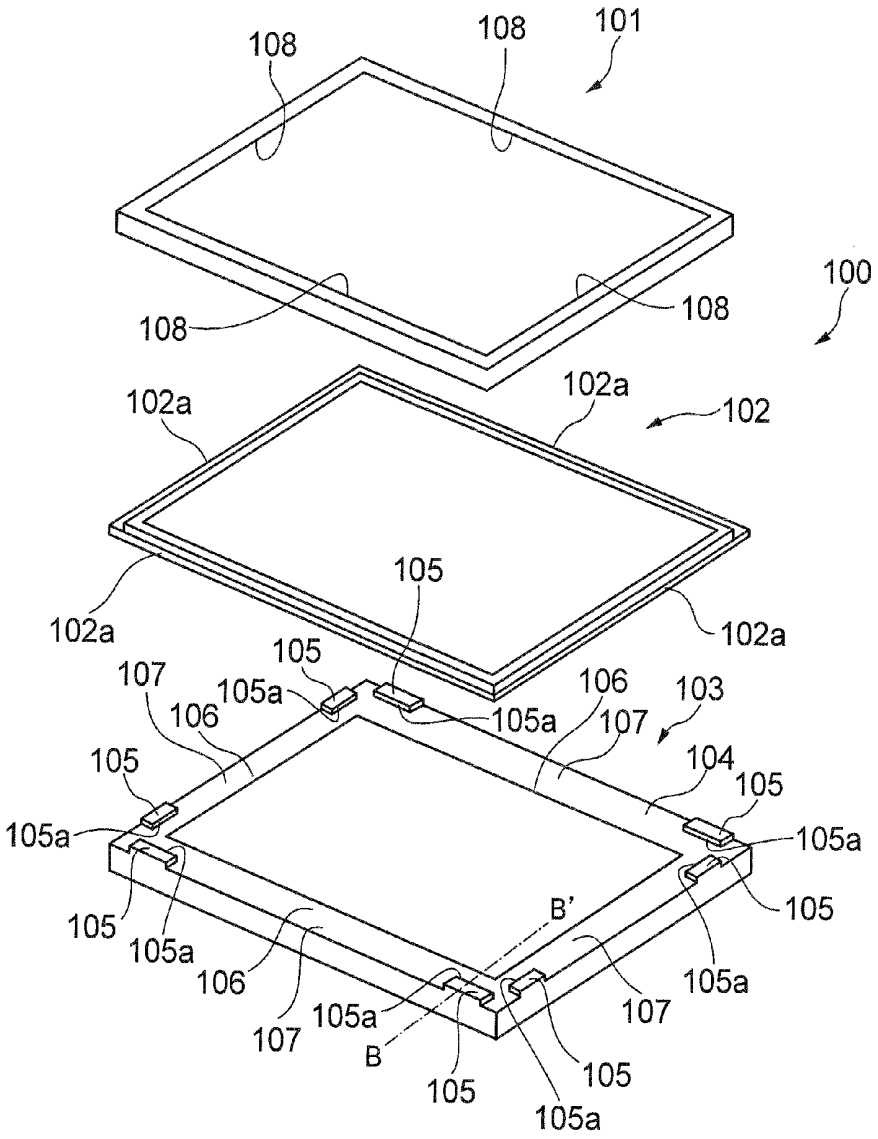
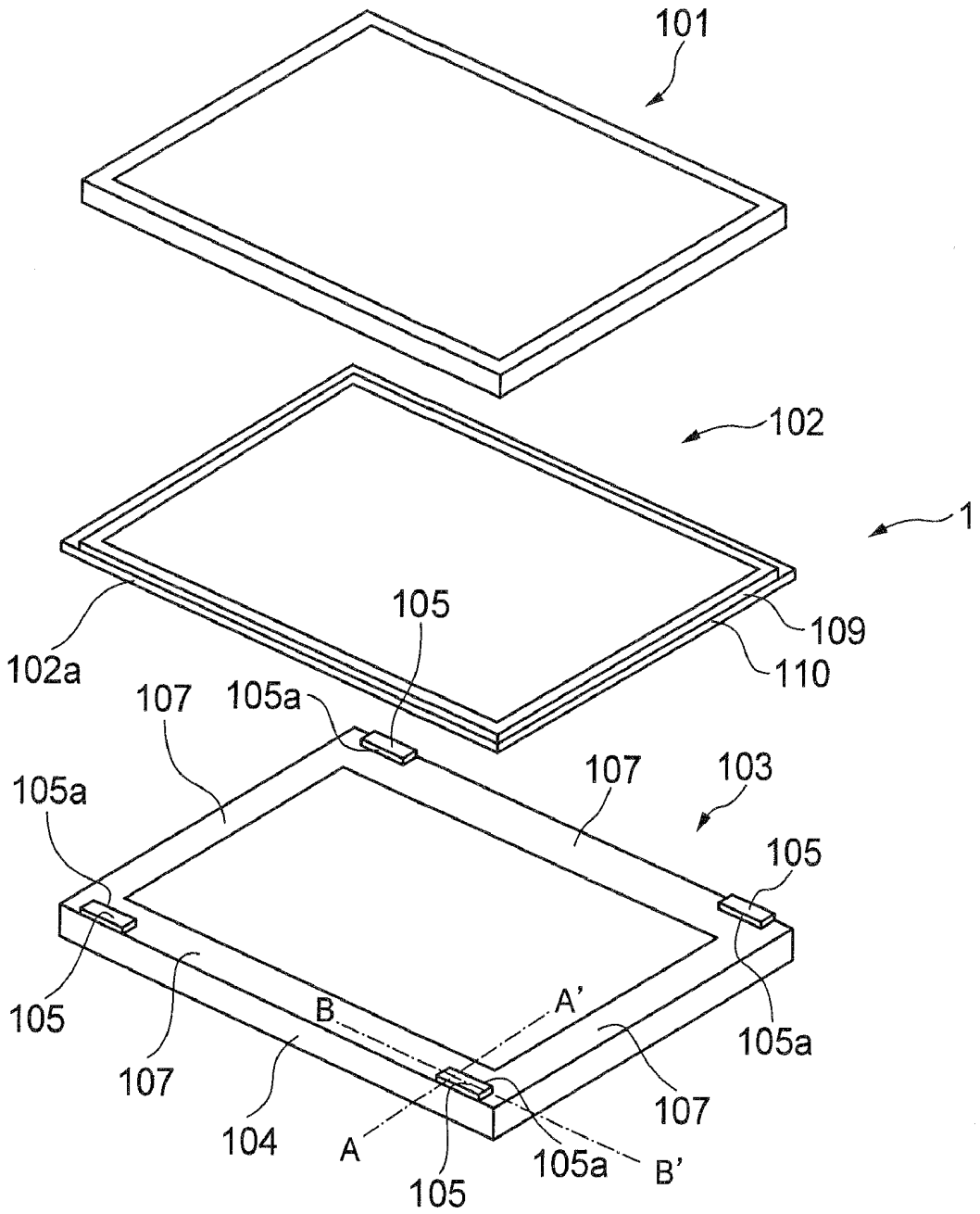


FIG. 1


101
102
1
102a
105
109
110
107
105a
107
103
105a
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107
B
A'
107
104
A
105a
B'
105

FIG. 2

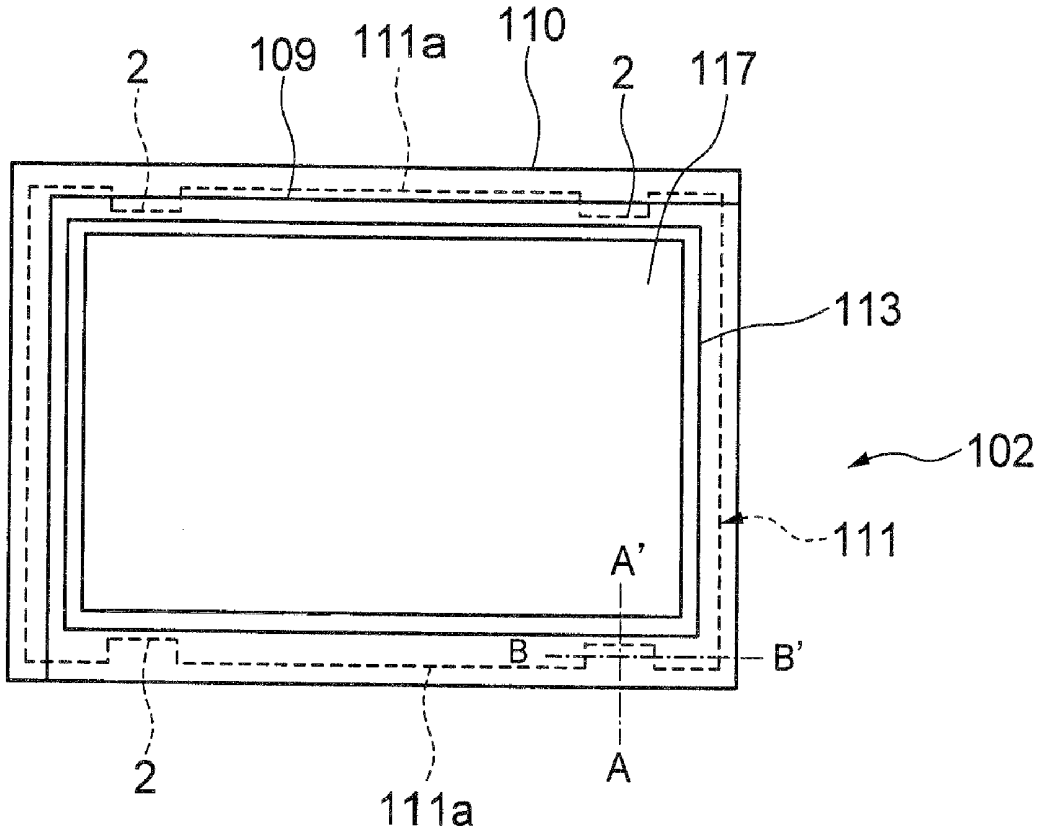


FIG. 3A

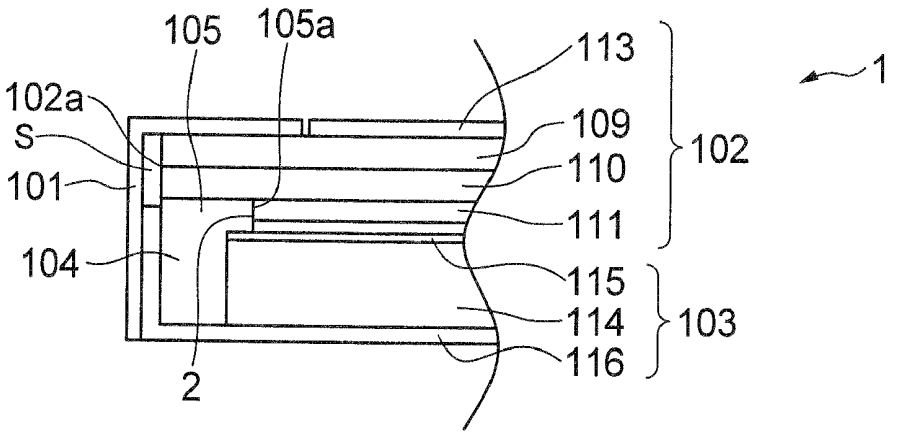


FIG. 3B

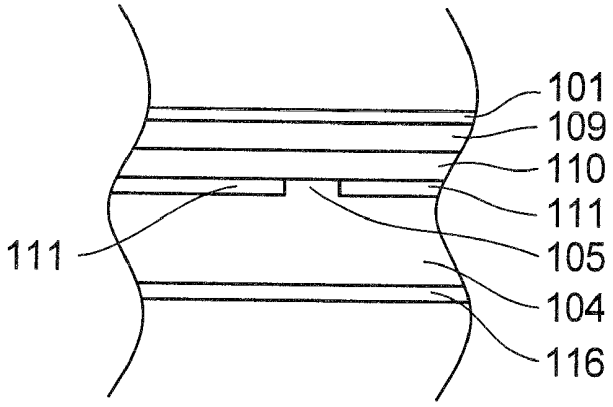


FIG. 3C

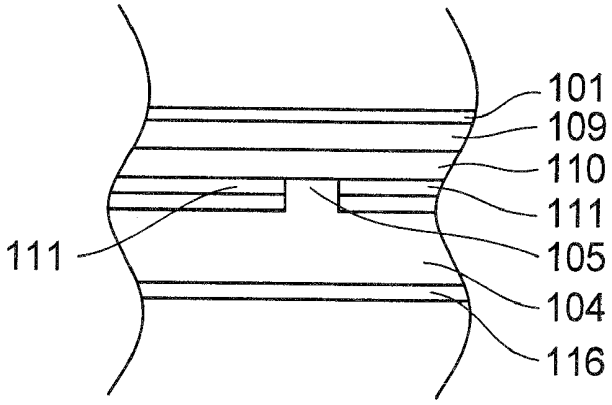


FIG. 4

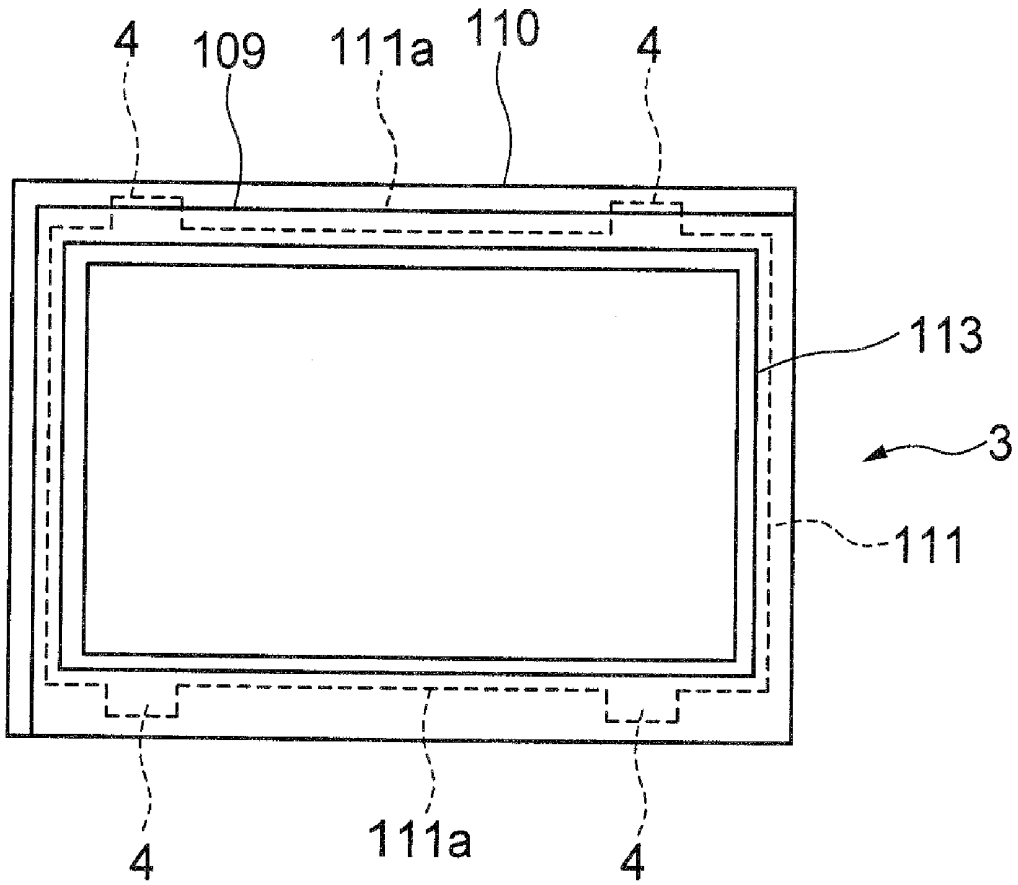


FIG. 5

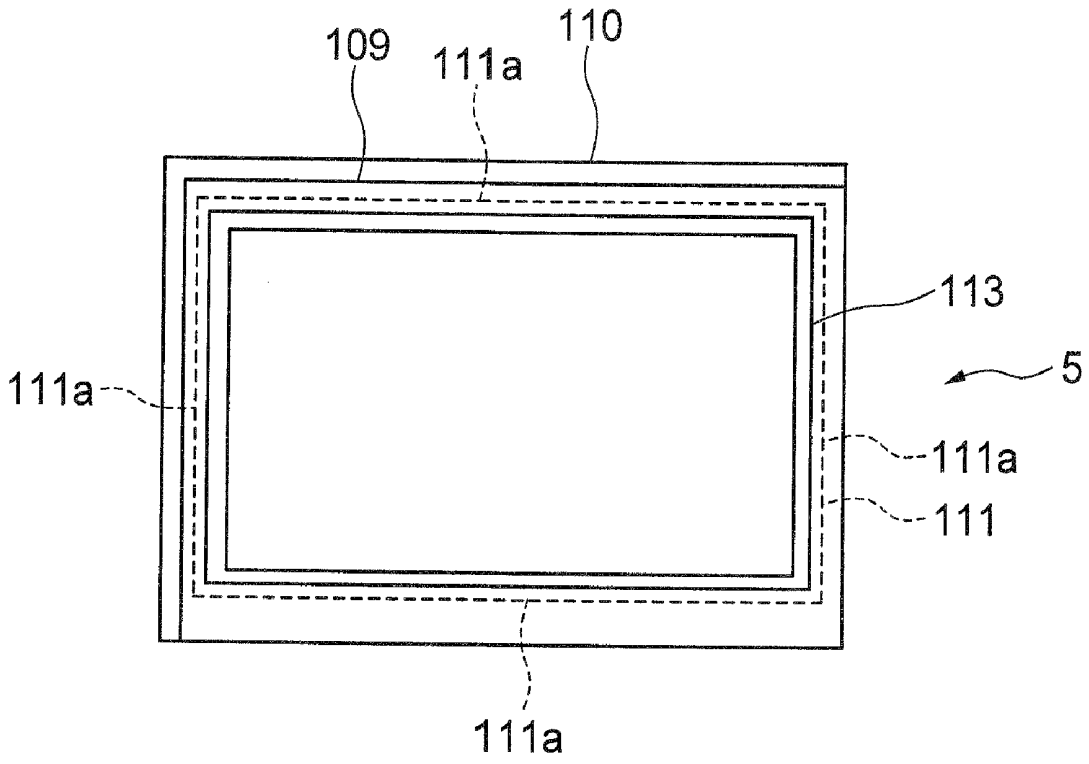


FIG. 6A

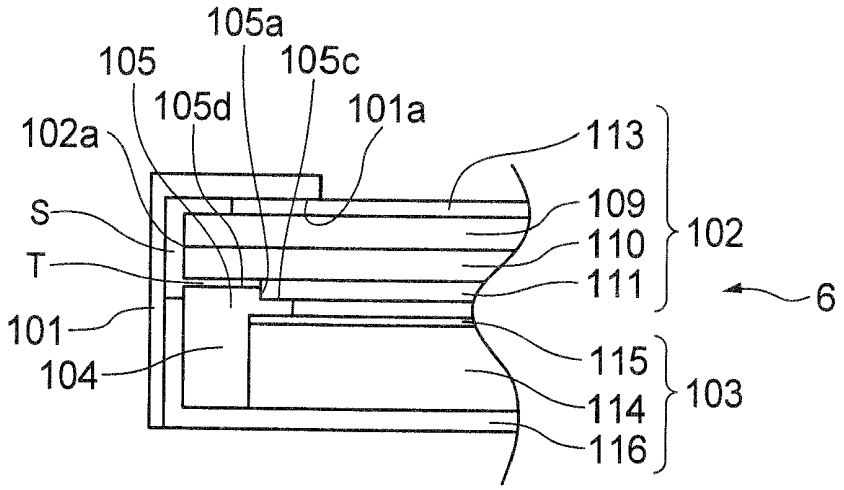


FIG. 6B

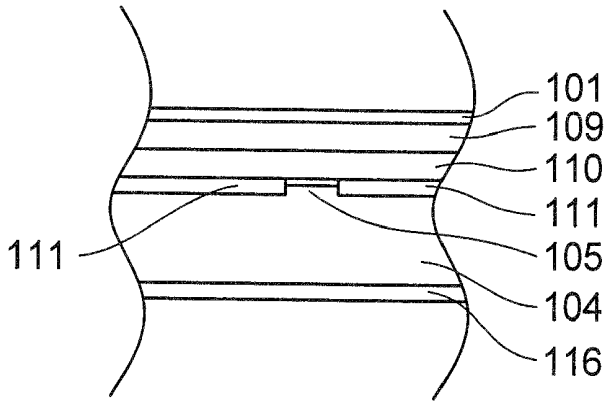


FIG. 6C

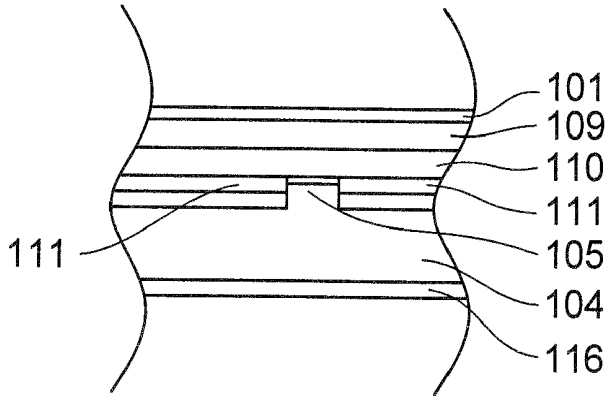
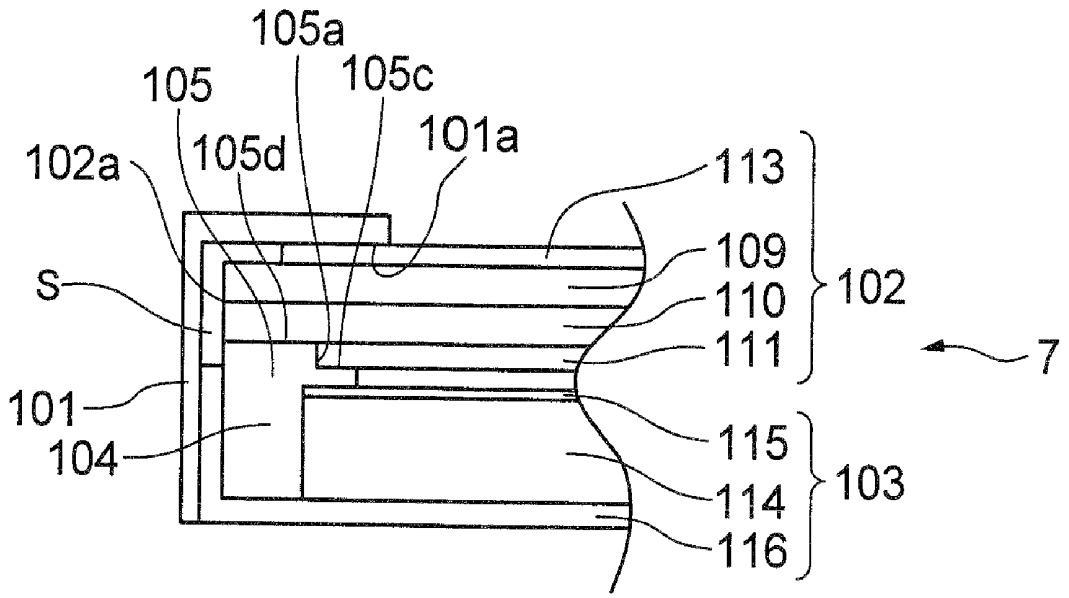


FIG. 7


105a
105
105c
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102a
105d
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S
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111
7
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103
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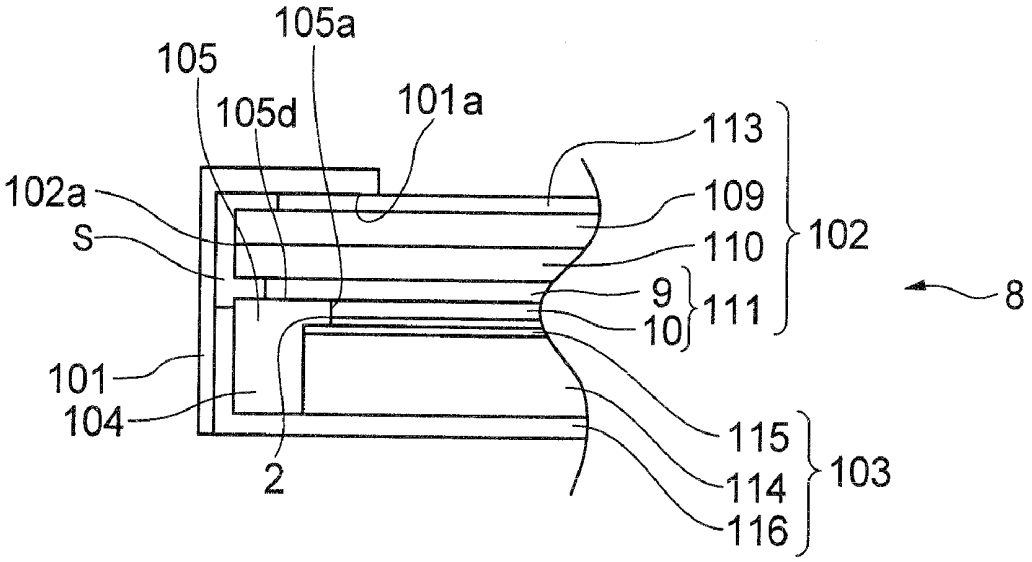
116

FIG. 8


105a
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105d
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FIG. 9

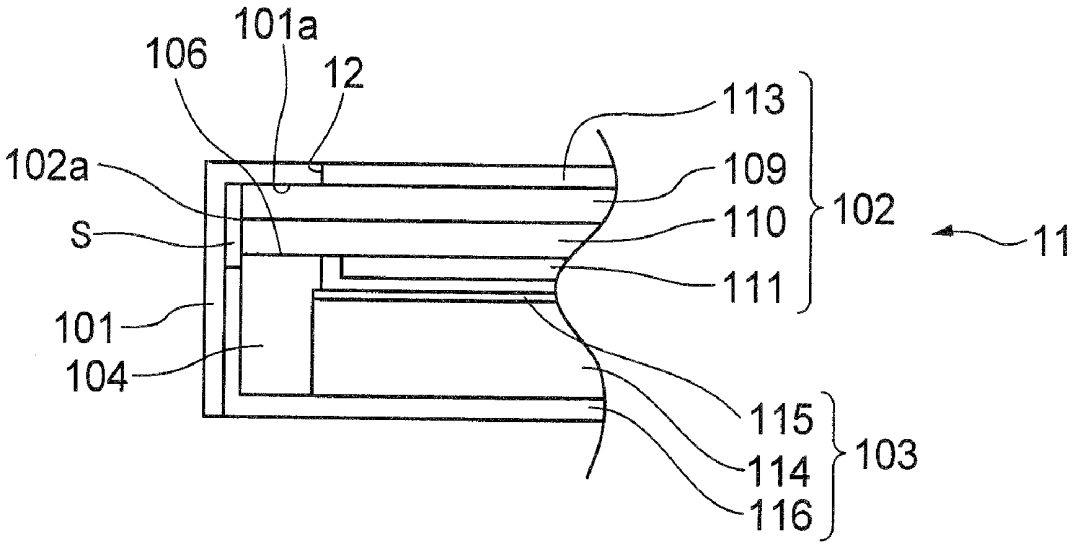
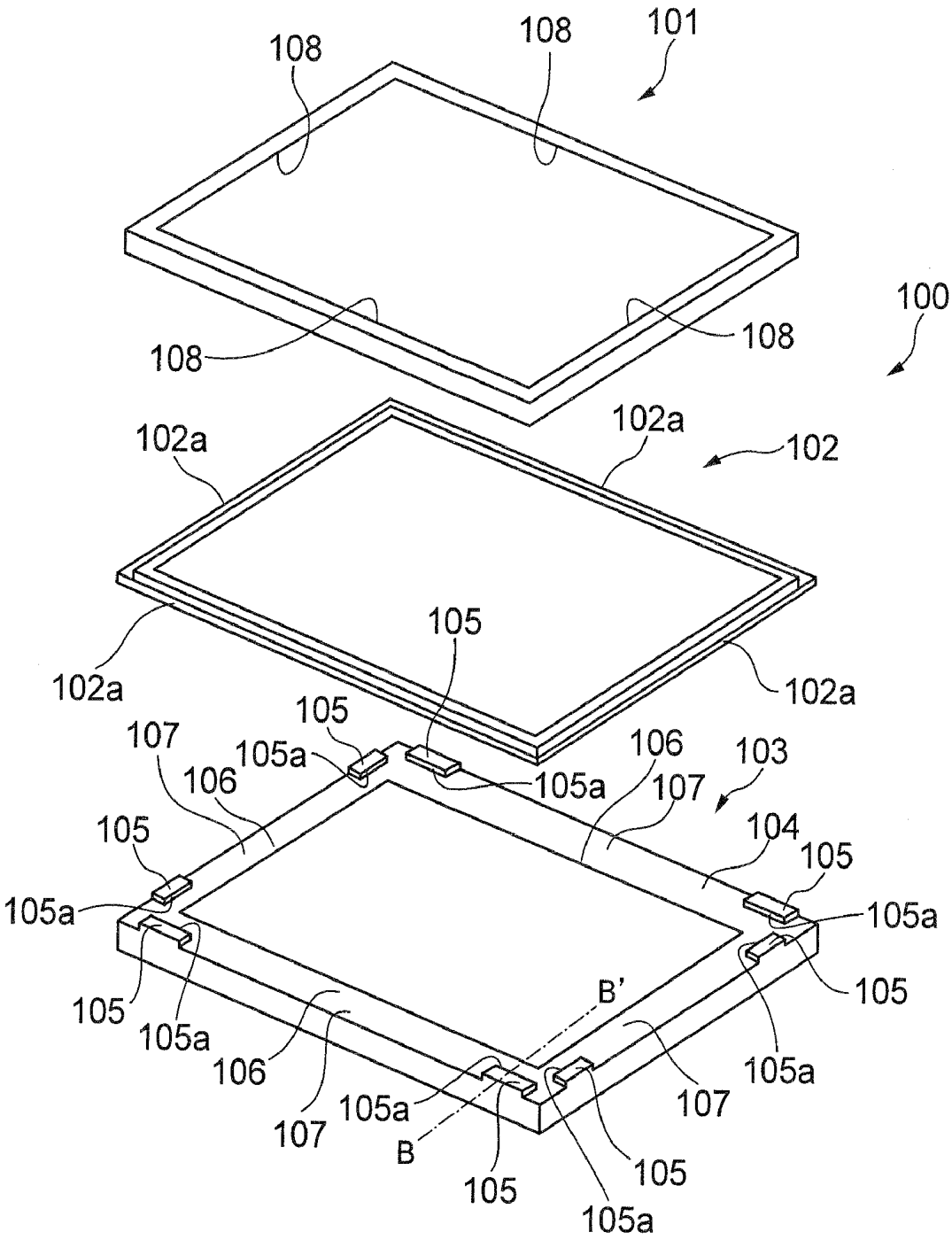


FIG.10


101
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104
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105a
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105
105a
105a
B'
B
105
105
105a
107
107
106

FIG.11

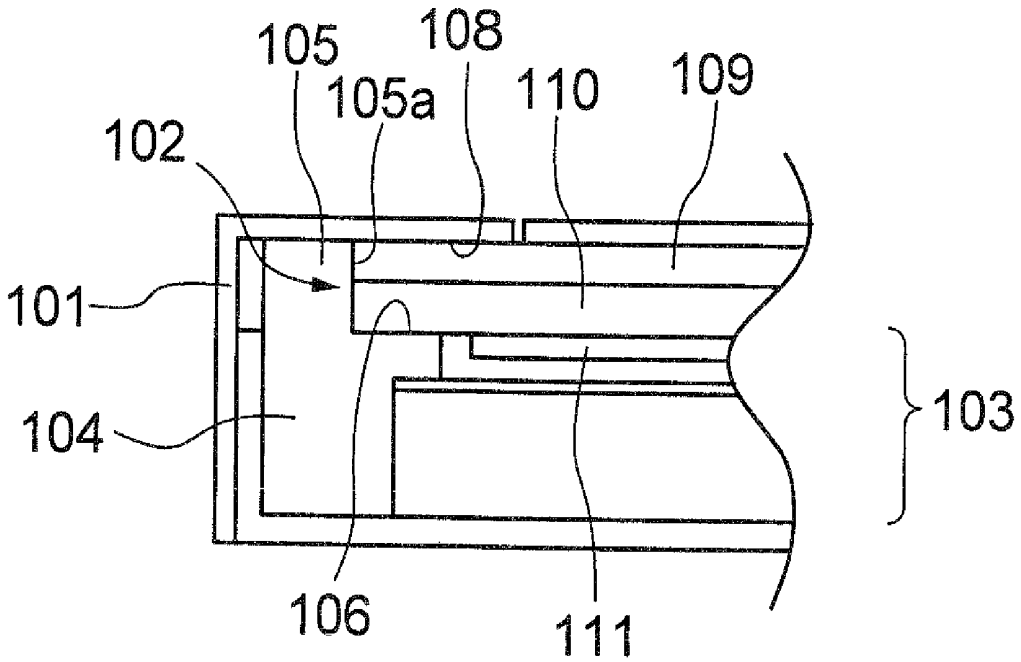


FIG.12

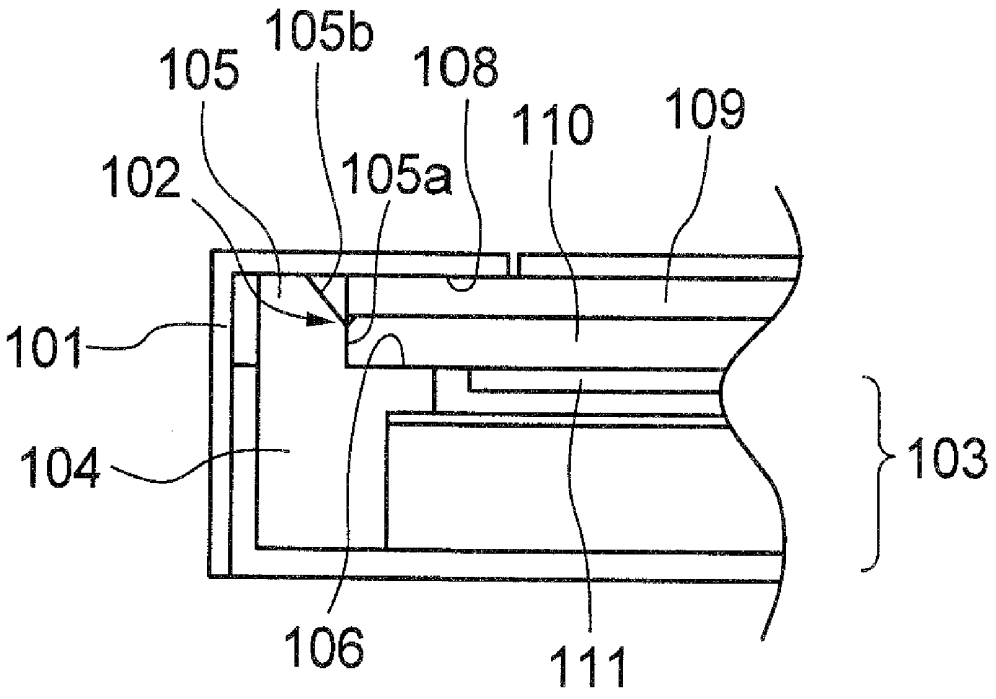
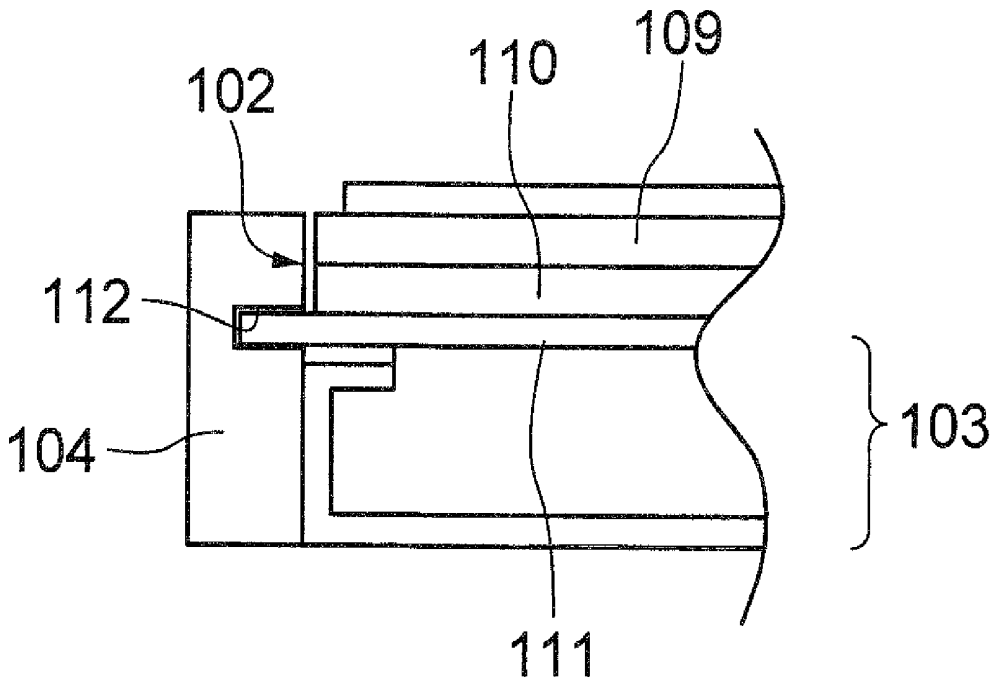


FIG.13



DISPLAY DEVICE

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is based upon and claims the benefit of priority from Japanese patent application No. 2007-199075, filed on Jul. 31, 2007, the disclosure of which is incorporated herein in its entirety by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to an improvement of a display device configured such that a display panel is interposed and fixed between rectangle frame members configuring the casing.

[0004] 2. Related Art

[0005] As a display device configured such that a display panel is interposed and fixed between rectangle frame members configuring the casing, a flat-panel type display device as disclosed in Japanese Patent Laid-Open Publication No. 2001-33901 (Patent Document 1) and a liquid crystal display device as disclosed in Japanese Patent Laid-Open Publication No. 2005-242047 (Patent Document 2) have been known.

[0006] FIG. **10** shows an exploded perspective view of a display device disclosed in Patent Document 1, and FIG. **11** shows a cross-sectional view taken along the line B-B' in FIG. **10**.

[0007] As shown in FIG. **10**, a liquid crystal display device **100** mainly includes a front chassis **101**, a liquid crystal panel **102**, and a backlight assembly **103**, and is configured such that the liquid crystal panel **102** is interposed and fixed between the two rectangle frame members configuring the casing, that is, the frame **104** of the backlight assembly **103** and the front chassis **101**.

[0008] More specifically, the liquid crystal display device **100** is configured such that rectangle protruded fitting portions **105** are formed on the surface **107** facing the front chassis **101** of the frame **104** as shown in FIG. **10**, and in a state that the liquid crystal panel **102** is positioned so as not to be movable with respect to the frame **104** bringing the outer periphery **102***a* of the liquid crystal panel **102** into contact with the insides **105***a* of the protruded fitting portions **105**, the liquid crystal panel **102** is interposed and fixed between the surface **106** facing the front chassis **101** of the frame **104**, in which no protruded fitting portion **105** is formed, and the surface **108** facing the frame **104** of the front chassis **101** as shown in FIG. **11**.

[0009] As shown in FIG. **11**, the main part of the liquid crystal panel **102** is configured of a first transparent substrate **109** and a second transparent substrate **110**. Although the liquid crystal panel **102** is positioned by contacting the outer periphery **102***a* of the liquid crystal panel **102** to the protruded fitting portions **105** of the frame **104** as described above, as the liquid crystal panel **102** is formed such that the first transparent substrate **109** and the second transparent substrate **110** are integrally joined, if a difference is caused between the dimensions of the first transparent substrate **109** and the second transparent substrate **110**, a bump may be generated on the outer periphery **102***a* of the liquid crystal panel **102** due to the non-uniformity of the dimensions when they are cut out. Further, a burr generated in the cutting step may remain as an acute protrusion on the cut part of the first transparent substrate **109** or the second transparent substrate **110**, that is, on the outer periphery **102***a* of the liquid crystal panel **102**.

[0010] If the bump contacts the inside **105***a* of the protruded fitting portion **105**, the outer periphery **102***a* of the first transparent substrate **109** or the second transparent substrate **110** is grinded so that minute foreign materials are generated and are scattered inside the liquid crystal display device **100**. Further, an acute burr formed on the outer periphery **102***a* of the first transparent substrate **109** or the second transparent substrate **100** may grind the inside **105***a* of the protruded fitting portion **105** so that minute foreign materials are generated.

[0011] Although such foreign materials are minute, once they slip into between the backlight assembly **103** and the liquid crystal panel **102**, shades like black spots appear in the liquid crystal panel **102** when the liquid crystal panel **102** is illuminated from the rear side by operating the backlight assembly **103**, causing a problem that the display quality of the liquid crystal panel **102** is deteriorated significantly In order to address such a problem, the invention of Patent Document 1 is configured, as shown in the cross-sectional view of FIG. **12**, such that an escape slope **105***b* is formed inside the protruded fitting portion **105** so that a lower part of the protruded fitting portion **105** supports a position lower than the joined surfaces of the first transparent panel **109** and the second transparent panel **110**, so as to prevent a bump or a burr on the outer peripheral part **102***a* of the liquid crystal panel **102** from contacting the inside **105***a* of the protruded fitting portion **105** to thereby avoid generation of foreign materials.

[0012] With this configuration, however, positioning of the liquid crystal panel **102** is still performed by using the outer periphery of the second transparent substrate **110** and the protruded fitting portion **105** on the frame **104**, so that the outside dimension of the frame **104** is necessarily larger than the maximum outside dimension of the liquid crystal panel **102**, which makes size reduction of the display device difficult.

[0013] Further, the first transparent substrate **109** and the second transparent substrate **110** is often made of a glass material, and as the weight and thickness has been increasingly reduced in recent years, there is a case that the thickness of the second transparent substrate **110** is 0.5 mm or smaller, so the outer periphery of the second transparent substrate **110** is extremely fragile. As such, there is a concern that a breakage or a crack may easily be caused from the outer peripheral part of the second transparent substrate **110** when vibration or impact is applied to the display device, which leads to defective display. This is an obstacle to make the liquid crystal panel **102** thinner.

[0014] Further, as positioning is performed by using the outer peripheries of the first transparent substrate **109** and the second transparent substrate **110** configuring the main part of the liquid crystal panel **102**, there remains concerns in resistance to vibration and resistance to impact of the liquid crystal display device **100**. Thereby, it is difficult to commonly use members in various products in which thickness of the first transparent substrate **109** and the second transparent substrate **110** differs.

[0015] On the other hand, a display device of Patent Document 2 is configured, as shown in FIG. **13**, such that a back side polarizing plate **111** which is a kind of an optical film to be affixed to the back side of a second transparent substrate **110** is made to be protruded outward from the second transparent substrate **110**, and positioning of the liquid crystal

panel **102** is performed by putting the protruded portion of the back side polarizing plate **111** into the positioning groove **112** provided in the frame **104** of the backlight assembly **103**.

[0016] With this configuration, however, positioning of the liquid crystal panel **102** is required to be performed by inserting an end part of the back side polarizing plate **111** which is larger than the second transparent substrate **110** into the inner peripheral side of the frame **104**. As such, even in this case, the outside dimension of the frame **104** becomes larger than the maximum outside dimension of the liquid crystal panel **102**, which makes size reduction of the display device difficult.

[0017] Further, although display devices are often used such that the screens are vertically set up, the mechanical strength of the protrusion of the back side polarizing plate **111** is weak, so even if the back side polarizing plate **111** is protruded from a longer edge side or a shorter edge side of the liquid crystal panel **102**, the liquid crystal panel **102** cannot be positioned sufficiently stably if the liquid crystal panel **102** becomes larger and the weight thereof increases. As a result, such art only addresses small-type display devices and is difficult to be applied to large-type liquid crystal display devices Additionally, as the size of the back side polarizing plate **111** becomes larger exceeding the required screen size, a problem that the weight of the liquid crystal panel **102** increases beyond necessity is also involved.

SUMMARY OF THE INVENTION

[0018] It is an exemplary object of the invention to provide a display device, capable of improving aforementioned shortcomings, enabling size deduction, in particular, enabling to reduce the size of the frame portion around the display panel, and easily allowing a liquid crystal panel to be thinner and have a larger screen.

[0019] A display device according to an exemplary aspect of the invention is configured such that a display panel formed by affixing an optical film on at least a surface of a transparent substrate configuring the main part of the display panel is inserted and fixed between a first rectangle frame member and a second rectangle frame member configuring a part of the casing.

[0020] In order to achieve the exemplary object, the display device is particularly configured such that the outside dimension of the optical film is formed to be smaller than the outside dimension of the transparent substrate, the outer periphery of the optical film is brought into contact with at least the inside of a protruded fitting portion formed on a surface, facing a second rectangle frame member, of the first rectangle frame member so that the transparent substrate is positioned with respect to at least the first rectangle frame member, and a space surrounding the outer periphery of the transparent substrate is formed around the outer periphery.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] FIG. **1** is an exploded perspective view showing the schematic configuration of a display device according to a first exemplary embodiment of the invention;

[0022] FIG. **2** is a plan view showing the display device of the first exemplary embodiment;

[0023] FIG. **3**A is a cross-sectional view taken along the line A-A' in FIGS. **1** and **2**, FIG. **3**B is a cross-sectional view taken along the line B-B' in FIGS. **1** and **2**, and FIG. **3**C is a cross-sectional view showing a variation of FIGS. **3**A and **3**B;

[0024] FIG. **4** is a plan view showing the schematic configuration of a liquid crystal panel of a display device according to a second exemplary embodiment;

[0025] FIG. **5** is a plan view showing the schematic configuration of a liquid crystal panel of a display device according to a third exemplary embodiment;

[0026] FIG. **6**A is a cross-sectional view taken along the line A-A' in FIG. **1**, FIG. **6**B is a cross-sectional view taken along the line B-B' in FIG. **1**, and FIG. **6**C is a cross-sectional view showing a variation of FIGS. **6**A and **6**B, indicating the schematic configuration of a display device according to a fourth exemplary embodiment;

[0027] FIG. **7** is a cross-sectional view showing the schematic configuration of a display device according to a fifth exemplary embodiment;

[0028] FIG. **8** is a cross-sectional view showing the schematic configuration of a display device according to a sixth exemplary embodiment;

[0029] FIG. **9** is a cross-sectional view showing the schematic configuration of a display device according to a seventh exemplary embodiment;

[0030] FIG. **10** is an exploded perspective view showing an example of a generally-used display device;

[0031] FIG. **11** is a cross-sectional view taken along the line B-B' in FIG. **10**;

[0032] FIG. **12** is a cross-sectional view taken along the line B-B' in FIG. **1**, showing the measures to prevent generation of scrapes of a transparent substrate or a protruded fitting portion in the generally-used display device; and

[0033] FIG. **13** is a cross-sectional view taken along the B-B' in FIG. **10**, showing another measures provided to a generally-used display device.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0034] Next, specific configurations of display devices, to which the present invention is applied, will be described by way of exemplary embodiments. Although a liquid crystal panel is used as a display panel herein, the scope of application of the present invention is riot limited to it.

First Exemplary Embodiment

[0035] FIG. **1** is an exploded perspective view showing the schematic configuration of a display device **1** according to a first exemplary embodiment of the invention, FIG. **2** is a plan view showing the display device **1** of the first exemplary embodiment, FIG. **3**A is a cross-sectional view taken along the line A-A' in FIGS. **1** and **2**, and FIG. **3**B is a cross-sectional view taken along the line B-B' in FIGS. **1** and **2**. Note that hatchings in the respective cross-sectional views are omitted in order to show lead lines indicating the details.

[0036] As shown in FIG. **1**, the display device **1** is configured such that a liquid crystal panel **102** is interposed and fixed between a front chassis **101** and a frame **104** of a backlight assembly **103**. Each of the front chassis **101** and the frame **104** is a rectangle frame member configuring the casing.

[0037] The backlight assembly **103** includes a light guide plate **114**, an optical sheet which performs light diffusion and the like, a lamp not shown, the frame **104**, and a rear chassis **116**. As the general structure of the backlight assembly **103** is well known, its detailed explanation is not given herein.

[0038] As shown in FIGS. **3**A and **3**B, the liquid crystal panel **102** is formed such that a TFT substrate on which a thin film transistor is formed, that is, a second transparent substrate **110** configuring a part of the main part of the liquid crystal panel **102**, and a CF substrate on which a colored layer of RGB is disposed, that is, a first transparent substrate **109** configuring another part of the main part of the liquid crystal panel **102**, are affixed to each other, and liquid crystal is injected between them. Further, a back side polarizing plate Ill which is a kind of an optical film is affixed to the back side of the second transparent substrate **110**, and a front side polarizing plate **113** is affixed to the front side of the first transparent substrate **109**, and then a flexible substrate such as a COF (Chip On Film) or a TCP (Tape Carrier Package), not shown, is connected to a terminal of the second transparent substrate **110**. As shown in FIG. **2**, the substantial display area of the liquid crystal panel **102** is an area inside the front side deflecting pate **113** and the back side polarizing plate **111**, that is, a part indicated by a reference numeral **117** in FIG. **2**.

[0039] As the front side polarizing plate **113** and the back side polarizing plate **111** become to have multifunctions in recent years, one formed by affixing a plurality of optical films having functions of improving brightness, improving visual angle, phase difference, and reflection prevention, in addition to a polarizing functional film, is used and has a thickness of about 0.1 to 0.5 mm in total. These functional films are comprehensively referred to as a polarizing plate herein.

[0040] As shown in FIG. **1**, on the surface **107** facing the front chassis **101** of the frame **104** which is a first rectangle frame member, substantially rectangle protruded fitting portions **105** are disposed at four locations in total, on the both ends of the long edges of the both sides of the frame **104**.

[0041] Further, as shown in FIG. **2**, the back side polarizing plate **111** affixed to the back side of the liquid crystal panel **102**, that is, to the back side of the second transparent plate **110**, is formed to be smaller in vertical and horizontal outside dimensions than the second transparent substrate **110**, and on the back side polarizing plate **111**, positioning concavities **2**, having the same shape as that of the protruded fitting portions **105**, are formed at four locations of the outer periphery **111***a* corresponding to the protruded fitting portions **105** on the frame **104**.

[0042] The liquid crystal panel **102** with the back side polarizing plate **111** affixed to the back side thereof is disposed on the frame **104** by contacting the four positioning concavities **2** of the back side polarizing plate **111** to the insides **105***a* of four protruded fitting portions **105** on the frame **104** internally fitted in the rear chassis **116**. It is also acceptable to extend the protruded amount of the protruded fitting portions **105** so as not to contact the back side polarizing plate **111** to the frame **104** in portions other than the protruded fitting portions, as shown in FIG. **3**C.

[0043] Then, the front chassis **101** is put on the rear chassis **116** of the backlight assembly **103**, and by joining the front chassis **101** and the rear chassis **116**, the first transparent substrate **109** and the second transparent substrate **110** are interposed between the surfaces, facing the front chassis **101**, of the four protruded fitting portions **105** on the frame **104** and the surface, facing the frame **104**, of the front chassis **101**, whereby the liquid crystal panel **102** is securely fixed with respect to the frame **104** and the front chassis **101**.

[0044] In the present exemplary embodiment, as positioning of the liquid crystal panel **102** is performed by contacting the positioning concavities **2** formed on the outer periphery of the back side polarizing plate **111** affixed to the back side of the second transparent substrate **110** with the four protruded fitting portions **105** on the frame **104**, there is no need to press the outer periphery **102***a* of the liquid crystal panel **102** against another member for positioning. As such, a space S, surrounding the outer peripheries **102***a* of the first transparent substrate **109** and the second transparent substrate **110**, can be formed as shown in FIG. **3**, for example.

[0045] Accordingly, there is no need to take into account concerns that a bump formed when the first transparent substrate **109** or the second transparent substrate **110** are cut out is grind against another member in a state of interfering with it so that minute foreign materials are generated from the outer peripheries **102***a* of the first transparent substrate **109** and the second transparent substrate **110** when they are scraped, or a burr generated when the first transparent substrate **109** or the second transparent substrate **110** are cut out is grind against another member in a state of interfering with it so that minute foreign materials are generated from another member being scraped. As such, a shortcoming that shades like black spots appear on the liquid crystal panel **102** when the liquid crystal panel **102** is illuminated from the rear side by activating the backlight assembly **1**.**03**, which deteriorates the display quality of the liquid crystal panel, can be overcome.

[0046] Further, as the liquid crystal panel **102** is positioned by contacting the positioning concavities **2** formed on the outer periphery **111***a* of the back side polarizing plate **111** having a relative small area affixed to the back side of the second transparent substrate **110**, of the first transparent substrate **109** and the second transparent substrate **110** configuring the main part of the liquid crystal panel **102**, with the inner portions **105***a* of the protruded fitting portions **105** on the frame **104**, the liquid crystal panel **102** can be positioned securely without a large frame **104** of the backlight assembly **103**. This is different from one in which positioning is performed using the outer peripheries of the first transparent substrate **109** and the second transparent substrate **110**. Thereby, size reduction of the display device **1**, in particular, size reduction of the frame part of the front chassis **101** and reduction of the external size can be easily realized.

[0047] Further, the positioning concavities **2** formed on the outer periphery **111***a* of the back side polarizing plate **111** are merely used for positioning. As the display device **1** has a configuration such that the liquid crystal panel **102** is fixed by inserting the first transparent substrate **109** and the second transparent substrate **110** which are main parts of the liquid crystal panel **102** between the two rectangle frame members configuring the casing, that is, the frame **104** of the backlight assembly **103** and the opposed surface of the front chassis **101**, vibration and impact applied to the display device **1** can be addressed sufficiently.

[0048] Additionally, as the space S surrounding the outer peripheries of the first transparent substrate **109** and the second transparent substrate **110** is formed so that the outer periphery does not contact other members, even if vibration or impact is applied to the display device **1**, ends of the first transparent substrate **109** and the second transparent substrate **110** will never contact other members to cause breakage or cracks Consequently, defects in display due to breakage or cracks of the first and second transparent substrates **109** and **110** can be prevented.

[0049] As a glass member used for the first and second transparent substrates **109** and **110** is made to be light and thin so that no breakage or crack is caused in the first and second transparent substrates **109** and **110** even though the outer peripheries of the first and second transparent substrates **109** and **110** are fragile, the liquid crystal panel **102** and the display device **1** can be thinner, larger, and lighter easily, and particularly, can be applied to a large-scale display device.

[0050] Further, as positioning of the liquid crystal panel **102** is performed using the back side polarizing plate **111** which is an optical file affixed to the second transparent substrate **110**, irrespective of the first and second transparent substrates **109** and **110**, and fixing of the liquid crystal panel **102** is performed by inserting the liquid crystal panel **102** between the frame **104** of the backlight assembly **103** and the opposed surface of the front chassis **101**, there is no need to modify the backlight assembly **103** even if the thickness of the first and second transparent substrates **109** and **110** configuring the main part of the liquid crystal panel **102** is changed. It is only necessary to adjust the distance between the frame **104** of the backlight assembly **103** and the opposed surface of the front chassis **101**. As such, it is possible to commonly use main members for various products in which the first and second transparent substrates **109** and **110** have different thicknesses.

[0051] Although the protruded fitting portions **105** and the positioning concavities **2** used for positioning are provided at four locations on the both ends of the both long edges of the display device **1** in FIGS. **1** and **2**, they may be provided at four locations on the short edges. Although positioning is also possible by providing the protruded fitting portions **105** and the positioning concavities **2** on at least any two edges at one location each, they may be provided on three or four edges depending on the screen size and the like. Moreover, the number and the size thereof may be set arbitrarily.

[0052] As an exemplary advantage according to the invention, since the display device of the invention is configured such that the display panel is positioned by contacting the outer periphery of the optical film affixed to the transparent substrate configuring the main part of the display panel, in particular, the outer periphery of the optical film in which the outside dimension thereof is smaller than the main part of the display panel, with the inside of a protruded fitting portion formed on a rectangle frame member configuring a part of the casing, the display panel can be positioned securely without enlarging the rectangle frame member configuring the casing of the display device, including the frame of the front chassis and the backlight assembly. This enables to realize size reduction of the display device, in particular, size reduction of the frame around the display panel and the outside dimension.

[0053] Further, as another exemplary advantage according to the invention, since the display device is configured such that the front and back of the display panel is interposed and fixed between two rectangle frame members configuring a part of the casing, that is, between the frame of the backlight assembly and the opposed surface in the front chassis, vibration and impact to be applied to the display device can be addressed sufficiently

[0054] Moreover, as still another exemplary advantage according to the invention, since a space is formed to surround the outer periphery of the transparent substrate configuring the main part of the display panel so as to prevent the outer periphery of the transparent substrate from contacting other members, even if vibration and impact are applied to the display device, it is possible to prevent defectives which may be caused by a breakage or a crack in the transparent substrate.

[0055] As described above, as a glass member used as the transparent substrate becomes light and thin so that defective in display due to a breakage and a crack in the transparent substrate will not be caused even if the outer periphery of the transparent substrate is fragile, the present invention is advantageous in making a display panel and a display device thinner, larger, or lighter. Further, the present invention is also applicable to a large-scale display device.

[0056] Further, positioning of the display panel is performed by using an optical film affixed to the transparent substrate irrespective of the transparent substrate itself, and fixing of the display panel is performed by inserting the display panel between rectangle frame members configuring the casing of the display device, that is, between the frame of the backlight assembly and the opposed surface in the front chassis, for example. As such, even in the case that the thickness of the transparent substrate is changed, it is only necessary to adjust the distance between the frame of the backlight assembly and the opposed surface in the front chassis, without modifying the backlight assembly and the like. Therefore, main members can be commonly used in various products in which the thickness of transparent substrate differs.

Second Exemplary Embodiment

[0057] The plan view of FIG. **4** shows the schematic configuration of a liquid crystal panel **3** according to a second exemplary embodiment. The difference between the present exemplary embodiment and the one described with reference to FIGS. **1** to **3** is that positioning protrusions **4** are formed at four locations on the outer periphery **111***a* of the back side polarizing plate **111** affixed to the back surface of the second transparent plate **110**, and the positioning protrusions **4** are brought into contact with the inside of the frame **104**. Other configurations are the same as those of the exemplary embodiment described in FIG. **1**.

[0058] In this case, the same effect as that of the first exemplary embodiment can be achieved with the positioning protrusions **4** formed not to protrude from the second transparent substrate **110**.

Third Exemplary Embodiment

[0059] The plan view of FIG. **5** shows the schematic configuration of a liquid crystal panel **5** according to a third exemplary embodiment. The difference between the exemplary embodiment and the first and second exemplary embodiments is that no specific portion such as positioning concavities **2** and positioning protrusions **4** is provided on the outer periphery **111***a* of the back side polarizing plate **111**, and the outer periphery **111***a* itself of the back side polarizing plate **111** is brought into contact with the inside of the protruded fitting part (not shown) in a rectangle circumferential wall shape formed around the frame **104** so as to surround the liquid crystal panel **102** in the surface facing the front chassis **101** in the frame **104**.

[0060] In this case, the same effects as those of the first and second exemplary embodiments can be achieved by incorpo-

rating the liquid crystal panel **5** shown in FIG. **5** as it is into the protruded fitting part in a circumferential wall shape of the frame **104**.

Fourth Exemplary Embodiment

[0061] The cross-sectional views of FIGS. **6**A and **6**B show the schematic configuration of a display device **6** according to a fourth exemplary embodiment. FIG. **6**A is a cross-sectional view taken along the line A-A' in FIG. **1**, and FIG. **6**B is a cross-sectional view taken along the line B-B'.

[0062] Positioning of the liquid crystal panel **102** is performed by contacting the back side polarizing plate **111** with the insides **105***a* of the protruded fitting portions **105** of the frame **104**, as the case of the first exemplary embodiment shown in FIG. **3**. However, in order to prevent the frame **104** from contacting the back side of the second transparent substrate **110**, the back surface of the back side polarizing plate **111** which is an optical film is protected overlapping by the supporting surface **105***c* formed of the surface facing the front chassis **101** in the frame **104** excluding the protruded fitting portions **105** so as to keep the surfaces **105***d* facing the front chassis **101** in the protruded fitting portions **105** distant from the back surface of the second transparent substrate **110**. This is the difference from the previous exemplary embodiments. It is also acceptable to keep the back side polarizing plate **111** distant from the frame **104** in parts other than the protruded fitting portions by increasing the protruded amount of the protruded fitting portions **105**, as shown in FIG. **6**C.

[0063] Further, in the exemplary embodiment, the front side polarizing plate **113** affixed to the first transparent substrate **109** is extended, and the liquid crystal panel **102** is fixed such that the front and back optical films of the liquid crystal panel **102**, that is, the back side polarizing plate **111** and the front side polarizing plate **113**, are interposed between the supporting surface **101***a* formed of the surface facing the frame **104** in the front chassis **101** and the supporting surface **105***c* of the frame **104**.

[0064] With this configuration, in addition to the space S surrounding the outer peripheries **102***a* of the first and second transparent substrates **109** and **110**, another space T is also formed between the back side of the end of the second transparent substrate **110** and the protruded fitting portion **105** of the frame **104**. As such, not only the outer peripheries **102***a* of the first and second transparent substrates **109** and **110** but also the back side of the end of the second transparent substrate **110** can be prevented from contacting other members.

[0065] Thereby, not only the ends of the first and second transparent substrates **109** and **110** but also the surrounding portions also have no direct contacts, and only the polarizing plates having cushioning characteristics contact the frame **104** and the front chassis **101**. Consequently, the display device **6** having higher resistance to vibration and impact can be achieved.

Fifth Exemplary Embodiment

[0066] The cross-sectional view of FIG. **7** shows the schematic configuration of a display device **7** according to a fifth exemplary embodiment. This cross-sectional view is taken along the line A-A' in FIG. **1**.

[0067] Although, in the fourth exemplary embodiment, the liquid crystal panel **102** is fixed by inserting the back side polarizing plate **111** and the front side polarizing plate **113** of the liquid crystal panel **102** between the supporting surface **105***c* of the frame **104** and the supporting surface **101***a* of the front chassis **101**, in the exemplary embodiment, the liquid crystal panel **102** is fixed by inserting the second transparent substrate **110** and the front side polarizing plate **113** between the supporting surface **105***d* formed by the surface facing the front chassis **101** in the protruded fitting portions **105** of the frame **104** and the supporting surface **101***a* of the front chassis **101**.

[0068] In other words, the liquid crystal panel **102** is interposed and fixed between the frame **104** and the front chassis **101** in a state that the back side of the second transparent substrate **110** is supported by the supporting surface **105***d* which is the surfaces facing the front chassis **101** (second frame member) in the protruded fitting portions **105** provided on the frame **104** (first rectangle frame member), and the back surface of the back side polarizing plate **111** is supported by the surface facing the front chassis **101** which is a part of the frame **104** without any protruded fitting portion **105**, that is, the supporting surface **105***c*, in this configuration.

[0069] With this configuration, although the space T between the back surface side of the end part of the second transparent substrate **110** and the protruded fitting portion **105** of the frame **104** is lost, as the supporting area increases as a whole, it is possible to reduce the weight applied to the supporting surface in unit area, and also to fix the liquid crystal panel **102** firmly.

[0070] Alternatively, it is also acceptable that the back surface of the second transparent substrate **110** is supported by the supporting surface **105***d* which is surfaces facing the front chassis **101** (second rectangle frame member) in the protruded fitting portions **105** whereas the surface facing the front chassis **101** in the frame **104** (first rectangle frame member) excluding the protruded fitting portions **105**, that is, the part corresponding to the supporting surface **105***c* in FIG. **7**, are made distant from the back surface of the back side polarizing plate **111** which is an optical film, and the liquid crystal panel **102** is inserted between the supporting surface **105***d* of the frame **104** side and the supporting surface **101***a* of the front chassis **101** side, that is, a configuration in which spacing is formed between the supporting surface **105***c* and the back side polarizing plate **111** in FIG. **7**.

Sixth Exemplary Embodiment

[0071] The cross-sectional view of FIG. **8** shows the schematic configuration of a display device **8** according to a sixth exemplary embodiment. This cross-sectional view is taken along the line A-A' in FIG. **1**.

[0072] As described above, a polarizing plate becomes to have multiple functions and optical films configuring the plate have a laminated structure. If any one of functions including a function of improving brightness, improving visual angle, phase difference, and preventing reflection, in addition to a polarizing function, is given to the back side polarizing plate **111**, the back side polarizing plate **111** has a laminated structure in which the first and second back side optical films **9** and **10** are laminated. When the number of functions combined increases, the number of laminated layers of the optical films also increases.

[0073] In the exemplary embodiment, the positioning concavities **2** as shown in FIG. **2** are provided only to a second back side optical film **10**, which is farther to the second transparent substrate **110**, of the first and second back side optical films **9** and **10** configuring the back side polarizing plate **111**.

[0074] More specifically, in the back side polarizing plate **111**, a part overlapping the supporting surface **105***d* which is the surface facing the front chassis **101** (second rectangle frame member) in the protruded fitting portions **105** is configured of an optical film, that is, the first back side optical film **9**, and a part not overlapping the supporting surface **105***d* is configured of two optical films, that is, the first and second back side optical films **9** and **10**. The number of optical films of the part not overlapping the supporting surface **105***d* which is the surface facing the front chassis **101** in the protruded fitting portion **105** is greater by one than the number of optical film of the part overlapping the supporting surfaces **105***d*, and the back side polarizing plate **111** not overlapping the supporting surface **105***d* is thicker than the back side polarizing plate **111** of the part overlapping the supporting surface **105***d*.

[0075] Although it is not necessarily easy to make the part overlapping the supporting surfaces **105***d* thin by processing the back side polarizing plate **111** made of a signal material, the part of the back side polarizing plate **111** overlapping the supporting surface **105***d* can easily be made thinner by providing positioning concavities **2** to the second back side optical film **10**, which is to be affixed to the outside, of the first and second back side optical films **9** and **10** configuring the back side polarizing plate **111** and affixing them to each other, as described above.

[0076] Then, the liquid crystal panel **102** is positioned by contacting the valley portions of the positioning concavities **2**, which are parts of the outer periphery of the second back side optical film **10** having a larger number of layers and a greater thickness, with the insides **105***a* of the protruded fitting portions **105** of the frame **104**, and the liquid crystal panel **102** is fixed such that the first back side optical film **9** and the front side polarizing plate **113** of the liquid crystal panel **102** are interposed between the supporting surfaces **105***d* formed on top of the protruded fitting portions **105** of the frame **104** and the supporting surface **101***a* of the front chassis **101**.

[0077] With this configuration, the same actions and effects as those of the aforementioned exemplary embodiments can be achieved. Further, as the second transparent substrate **110** is protected by the first back side optical film **9** having cushioning property, the exemplary embodiment particularly exceeds the aforementioned exemplary embodiments in the property of resistance to vibration and impact.

[0078] Note that the first transparent substrate **109** may be supported by the supporting surface **101***a* of the front chassis **101** as the case of the exemplary embodiment shown in FIG. **3**, instead of supporting the front side polarizing plate **113** by the supporting surface **101***a* of the front chassis **101**, in FIGS. **6**A to **8**.

Seventh Exemplary Embodiment

[0079] The cross-sectional view of FIG. **9** shows the schematic configuration of a display device **11** according to a seventh exemplary embodiment. This cross-sectional view is corresponding to the cross-sectional view taken along the line A-A' in FIG. **1**.

[0080] Although the first to sixth exemplary embodiments have the configuration in which the protruded fitting portions **105** are provided on the frame **104** side of the backlight assembly **103** to position the liquid crystal panel **102**, the seventh exemplary embodiment adopts a configuration in which the liquid crystal panel **102** is positioned by using protruded fitting portions **12** provided on the front chassis **101** side. This is the difference from the above-described exemplary embodiments.

[0081] As shown in FIG. **9**, the inner periphery of the frame part of the front chassis **101**, which is a first rectangle frame member, is used as a protruded fitting portion **12** which is in a circumferential wall shape around the front chassis **101** in the seventh exemplary embodiment. The outer periphery of the front side polarizing plate **113** having a small outside dimension, affixed to the front side of the liquid crystal panel **102**, that is, the front side of the first transparent substrate **109**, is brought into contact with the inside of the protruded fitting portion **12** to thereby position the liquid crystal panel **102** with respect to the front chassis **101**. Further, in a state that the front surface of the first transparent substrate **109** is supported by the supporting surface **101***a* formed on the surface facing the frame **104** (second rectangle frame member) in the front chassis **101**, and the back surface of the second transparent substrate **110** is supported by the surface **106** facing the front chassis **101** in the frame **104**, the liquid crystal panel **102** is interposed and fixed between the front chassis **101** and the frame **104**.

[0082] Even in this case, the end parts of the first and second transparent substrates **109** and **110** do not contact other members in the whole periphery, so that the same actions and effects as those of the previous exemplary embodiments can be achieved.

[0083] Although the liquid crystal panel **102** is supported by the supporting surface **101***a* of the front chassis **101** and the opposed surface **106** in the frame **104**, the back surface of the second transparent substrate **110** may be supported directly by the opposed surface **106**, or the back side polarizing plate **111** may be extended to the top surface of the opposed surface **106** so that the back surface of the second transparent substrate **110** is supported by the opposed surface **106** via the back side polarizing plate **111**.

[0084] In this exemplary embodiment, as the liquid crystal panel **102** is positioned by using the front chassis **101** which is a first rectangle frame member and the front side polarizing plate **113** affixed to the first transparent substrate **109**, the frame **104** which is a second rectangle frame member merely supports the liquid crystal panel **102** and is not involved in positioning of the liquid crystal panel **102**.

[0085] The seventh exemplary embodiment can be realized in combination with the first to sixth exemplary embodiments appropriately. Thus, it is also possible to form protruded fitting portions on both the first rectangle frame member and the second rectangle frame member, that is, the front chassis **101** and the frame **104**, to thereby position the outer periphery of the front side polarizing plate **113** with the protruded fitting portions on the front chassis **101** side (configuration of the seventh exemplary embodiment), and also to position the outer periphery of the back side polarizing plate **111** with the protruded fitting portions on the frame **104** side (configuration of the first to sixth exemplary embodiments).

[0086] As described above, in the first to sixth exemplary embodiments described above, the outside dimension of the back side polarizing plate **111** for positioning the liquid crystal panel **102** is made smaller than the outside dimension of the second transparent substrate **110**, and the outer periphery of the back side polarizing plate **111** is brought into contact with the protruded fitting portions **105** on the frame **104** which is the first rectangle frame member configuring a part of the casing, to thereby position the liquid crystal panel **102**.

Thereby, the space S surrounding the outer peripheries of the first and second transparent substrates **109** and **110** is formed so that the end parts of the liquid crystal panel **102** do not contact other members such as the front chassis **101** and the backlight assembly **103**.

[0087] Meanwhile, in the seventh exemplary embodiment, the outside dimension of the front side polarizing plate **113** for positioning the liquid crystal panel **102** is made smaller than the outside dimension of the first transparent substrate **109**, and the outer periphery of the front side polarizing plate **113** is brought into contact with the protruded fitting portion **12** formed by the inner periphery of the frame part of the front chassis **101** which is the first rectangle frame member configuring a part of the casing to thereby position the liquid crystal panel **102**. Thereby, the space S surrounding the outer peripheries of the first and second transparent substrates **109** and **110** is formed so that the end parts of the liquid crystal panel **102** do not contact other members such as the front chassis **101** and the backlight assembly **103**.

[0088] Accordingly, every configuration of the first to seventh exemplary embodiments is common in that the outside dimension of the polarizing plate as an optical film affixed to the surface of the side near the first rectangle frame member on which protruded fitting portions are formed, of the front and back of the liquid crystal panel **102**, is smaller than the outside dimension of the transparent substrate configuring the main part of the liquid crystal panel **102**, and at least a part of the outer periphery of the polarizing plate as an optical film is brought into contact with the inside of the protruded fitting portion formed on the first rectangle frame member to thereby position the liquid crystal panel **102** with reference to the first rectangle frame, whereby a space is formed around the outer periphery of the transparent substrate configuring the main part of the liquid crystal panel **102**, and the liquid crystal panel **102** is interposed and fixed between the first rectangle frame member and the second frame member.

[0089] Therefore, for the second transparent substrate **110** which is a TFT substrate and the first transparent substrate **109** which is a CF substrate, there is no limitation for measures to be taken. Further, regarding the CF substrate, a structure in which no colored layer is arranged in the display area or an RGBW structure in which colored layers of RGB are arranged in the display area together with an area having no colored layer can be adopted. Further, any liquid crystal displaying systems including the TN (Twisted Nematic) system, the IPS (In-Plane Switching) system, the FFS (Fringe-Field Switching) system, and the VA (Vertical Alignment) system may be adopted, and any types of liquid crystal display devices including PDP (Plasma Display Panel) and EL (Electroluminescence Display) can be adopted.

[0090] While the invention has been particularly shown and described with reference to exemplary embodiments thereof, the invention is not limited to these embodiments. It will be understood by those of ordinary skill in the art that various changes in form and details may be made therein without departing from the spirit and scope of the present invention as defined by the claims.

What is claimed is:

1. A display device, comprising:

a display panel formed by affixing an optical film on at least one surface of a transparent substrate configuring a main part of the display panel; and

a first rectangle frame member and a second rectangle frame member configuring a part of a casing, between which the display panel is interposed and fixed, wherein

an outside dimension of the optical film is formed to be smaller than an outside dimension of the transparent substrate,

an outer periphery of the optical film is brought into contact with at least an inside of a protruded fitting portion formed on a surface, facing a second rectangle frame member, of the first rectangle frame member so that the transparent substrate is positioned with respect to at least the first rectangle frame member, and

a space surrounding an outer periphery of the transparent substrate is formed around the outer periphery of the transparent substrate.

2. The display device, according to claim **1**, wherein the first rectangle frame member is configured of a frame of a backlight assembly, and the second rectangle frame member is configured of a front chassis.

3. The display device, according to claim **1**, wherein the first rectangle frame member is configured of a front chassis, and the second rectangle frame member is configured of a frame of a backlight assembly.

4. The display device, according to claim **1**, wherein a positioning concavity is formed in the outer periphery of the optical film which contacts the inside of the protruded fitting portion.

5. The display device, according to claim **1**, wherein a positioning protrusion is formed on the outer periphery of the optical film which contacts the inside of the protruded fitting portion.

6. The display device, according to claim **1**, wherein the protruded fitting portion is formed around the first rectangle frame member so as to surround the display panel.

7. The display device, according to claim **1**, wherein a surface of the transparent substrate is supported by a surface, facing the second rectangle frame member, of the protruded fitting portion, and a surface of the optical film is supported by a surface, facing the second rectangle frame member, of the first rectangle frame member in which the protruded fitting portion is not formed.

8. The display device, according to claim **1**, wherein a surface of the transparent substrate is supported by a surface facing the second rectangle frame member of the protruded fitting portion, and a surface facing the second rectangle frame member, except for the protruded fitting portion, of the first rectangle frame member is distant from a surface of the optical film.

9. The display device, according to claim **1**, wherein a surface of the optical film is supported by a surface facing the second rectangle frame member of the first rectangle frame member except for the protruded fitting portion, and a surface facing the second rectangle frame member of the protruded fitting portion is distant from a surface of the transparent substrate.

10. The display device, according to claim **1**, wherein the optical film includes a part overlapping a surface facing the second rectangle frame member of the protruded fitting portion and a part not overlapping the surface facing the second rectangle frame member,

the part not overlapping the surface facing the second rectangle frame member is formed to be thicker than the part overlapping the surface facing the second rectangle frame member, and

an outer periphery of the optical film in the thick part contacts the inside of the protruded fitting portion.

11. The display device, according to claim **1**, wherein the optical film is made of a plurality of films affixed to each other.

12. The display device, according to claim **10**, wherein the optical film is made of a plurality of films affixed to each other, and includes the part overlapping the surface facing the second rectangle frame member of the protruded fitting portion and the part not overlapping the surface facing the second rectangle frame member,

a number of films of the part not overlapping the surface facing the second rectangle frame member is larger than a number of films of the part overlapping the surface facing the second rectangle frame member, and

the outer periphery of the optical film in the part having a larger number of films contacts the inside of the protruded fitting portion.

13. The display device, according to claim **1**, wherein the display panel is a liquid crystal panel.

* * * * *

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申请(专利权)人(译)	NEC液晶技术有限公司.		
当前申请(专利权)人(译)	NEC液晶技术有限公司.		
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摘要(译)

一种显示装置，其能够减小尺寸，特别是在其框架中，并且允许更薄的液晶面板和更大的屏幕。液晶面板的定位通过使固定在构成液晶面板的主要部分的第二透明基板上的背面侧偏光板的外周与形成在框架上的突出的嵌合部的内部接触来进行。背光组件的一部分。因此，可以可靠地定位显示面板而不会增大前机壳和框架的外部尺寸。这使得能够实现小尺寸显示装置，特别是前底盘框架的尺寸减小和外部尺寸的减小。