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(54) **Panel of glass including light emitting diodes and voltage regulation means**

(57) The invention relates to a panel of laminated glass, comprising a first sheet of glass, at least two conductive layers 1, at least one light emitting diode 2 and a power source, wherein the at least two conductive layers 1 are provided on one side of the first sheet of glass, the at least two conductive layers 1 are electrically separated from each other, the at least one light emitting diode 2 is electrically connected to one conductive layer

1 and to another conductive layer 1, and the power source is adapted for providing electrical power with at least one interruption to the at least one conductive layer 1. In this way, the invention allows for controlling the luminous intensity of the light emitting diode 2, by applying intermittent electrical power, thus allowing for a simple and inexpensive way to dim the luminous intensity of the light emitting diode 2.

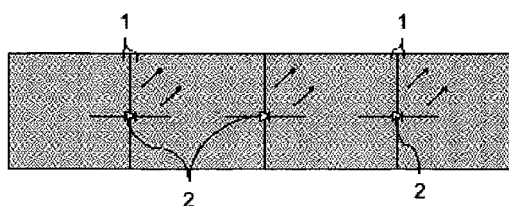


FIG. 1

Description

[0001] The present invention relates to a panel of laminated glass, comprising a first sheet of glass, at least two conductive layers, at least one electrical or electronic component and a power source, wherein the at least two conductive layers are provided on one side of the first sheet of glass, the at least two conductive layers are electrically separated from each other, and the at least one electrical or electronic component is electrically connected to one conductive layer and to another conductive layer as well as a method of operating and making the same.

[0002] Laminated glass is a type of safety glass that holds together when shattered. In the event of breaking, it is held in place by a plastics interlayer, typically of Polyvinylbutyral (PVB), sandwiched between its two or more sheets of glass. The plastics interlayer keeps the sheets of glass bonded even when broken, and its high strength prevents the sheets of glass from breaking-up into large sharp pieces.

[0003] Methods for manufacturing laminated glass are well-known in the window industry since decades. A so-called sandwich of the first sheet of glass, the plastics interlayer and the second sheet of glass is laminated in an automated laminating line by using the procedure of calendaring and autoclaving. Calendaring includes the pre-gluing of the sandwich under the action of a pressure imposed by two rolls applied on either side of the sheets of glass, optionally with action of heat. The final gluing of the sheets of glass by a vacuum/heating cycle, which combines pressure and temperatures, takes place during the step of autoclaving, which completely removes air between the plastics interlayer and the sheets of glass. The result is a clear glass laminate well known from car windscreens.

[0004] In the automotive, aviation and other industries, panels of laminated glass with integrated electrical or electronic components, such as light emitting diodes (LED) are known, e. g. for displaying information or for lighting purposes. For these application areas, the manufacturing of a panel of laminated glass with electrical or electronic components typically comprises the steps of depositing a conductive layer on the first sheet of glass, realization of electrical circuits in the conductive layer and depositing of electrical or electronic components on the conductive layer, connected to the electrical circuits. The plastics interlayer is then deposited on the conductive layer. The sandwich is obtained by the application of the second sheet of glass on the plastics interlayer, which is then laminated as outlined before.

[0005] The luminous intensity of a light emitting diode (or LED), is a function of the current flowing through the LED. Hence, systems for controlling the intensity of an LED known from the prior art use current-regulated power source. However, these current-regulated power source based systems for the control of the current of an LED in order to control the luminous intensity of the LED,

especially for an LED in a panel of laminated glass, are complex and costly.

[0006] Accordingly, it is the object of the invention to provide an alternative panel of glass, comprising a first sheet of glass, at least two conductive layers, at least one light emitting diode and a power source, wherein the at least two conductive layers are provided on one side of the first sheet of glass, the at least two conductive layers being electrically separated from each other, and the at least one light emitting diode being electrically connected to one conductive layer and to another conductive layer, as well as methods of operating and making the same.

[0007] An advantage of the present invention is the provision of a panel of glass with a light emitting diode, wherein the intensity of the light emitting diode can be controlled in a simple and inexpensive manner.

[0008] The above object is addressed by a panel of glass, comprising a first sheet of glass, at least two conductive layers, at least one light emitting diode and a power source, wherein the at least two conductive layers are provided on one side of the first sheet of glass, the at least two conductive layers are electrically separated from each other, the at least one light emitting diode is electrically connected to one conductive layer and to another conductive layer, and the power source is adapted for providing electrical power with intermittent operation to the at least one conductive layer to thereby control the power consumption of the at least one light emitting diode, wherein the power source is a voltage-regulated power source, and wherein the panel comprises current regulation means for the at least one light emitting diode, the current regulation means comprising the voltage-regulated power source and the internal resistance of the conductive layers.

[0009] Accordingly, it is an essential idea of the invention to provide electrical power to the light emitting diode in an intermittent manner thanks to a voltage-regulated power source. In this way, for example, the luminous intensity of the light emitting diode can be controlled by applying intermittent electrical power, thus allowing for a simple and inexpensive way for dimming the luminous intensity of the light emitting diode.

[0010] According to another preferred embodiment of the invention, the electrical power is pulse modulated, e.g. pulse-width modulated. In this way, the invention allows for controlling the luminous intensity of the light emitting diode by applying pulse modulated, e.g. pulse-width modulated electrical power. It is preferred that the electrical power is pulse modulated, e.g. pulse-width modulated with a frequency not visible to the human eye, i.e. the intermittent application of the pulse modulated, e.g. pulse-width modulated electrical power to the electrical or electronic component is not visible to the human eye, thus creating the effect of "dimming" the light emitting diode for the human eye.

[0011] In this context, according to another preferred embodiment of the invention, the electrical power is pulse

modulated, e.g. pulse-width modulated with a frequency of ≥ 100 Hz, preferably with a frequency ≥ 400 Hz and more preferably with a frequency ≥ 800 Hz. It is to be noted, that according to the preferred embodiment of the invention the luminous intensity of the light emitting diode is a function of the frequency at which the electrical power is pulse-modulated, e.g. pulse-width modulated.

[0012] It is further preferred that a plurality of light emitting diodes are provided, wherein the plurality of light emitting diodes are electrically connected in parallel or/and in series by means of a plurality of conductive layers, wherein the light emitting diodes are preferably electrically connected to the conductive layers by means of gluing and/or soldering. Each of the plurality of light emitting diodes may be associated with passive devices such as resistors, capacitors and/or inductors or may include active devices such as transistors, light sources, switches, microprocessors of microcontrollers, chips, ASICs, FPGAs, etc.

[0013] According to another preferred embodiment of the invention, the resistance of the conductive layer is ≥ 3 ohm per square, preferably ≥ 5 ohm per square and more preferable ≥ 8 ohm per square. In this way, the invention allows for controlling the luminous intensity of the light emitting diodes using a voltage regulated power source, given that the conductive layer provides a resistance to the light emitting diodes connected in series with the conductive layer. As a matter of fact, in such a case due to the high resistance of the conductive layer, the voltage-regulated power source associated with the internal resistance of that conductive layer act as a current regulation means for the light emitting diodes. Therefore, the invention allows for dimming the luminous intensity of the light emitting diode by controlling the voltage of a power source, wherein the electrical power provided by the power source is preferably pulse-width modulated. This is advantageous over the prior art, as the invention allows for a simple and inexpensive way to control the luminous intensity of a light emitting diode, preferably of a panel of glass.

[0014] Generally, it is possible to supply electrical power to the panel of glass in different ways. However, according to another preferred embodiment of the invention, a busbar is provided, wherein the busbar is arranged on the conductive layer and the busbar is electrically connected to the conductive layer and to the power supply. It is further preferred that the busbar comprises an adhesive copper. The busbar can be electrically connected to the conductive layer and/or to the power supply by means of gluing and/or soldering. In this way, the busbar allows for a simple and convenient way to electrically connect the conductive layer and the power source.

[0015] A panel of glass according to further embodiment of the present invention can comprise a plurality of light emitting diodes, or a plurality of groups of light emitting diodes, and a controller to control the power supplied to a first light emitting diode, or a first group of light emitting diodes independently of power supplied to a second

light emitting diode, or a second group of light emitting diodes.

[0016] Preferably the panel of glass is a panel of laminated glass further comprising a second sheet of glass and a plastics interlayer, wherein the first sheet of glass and the second sheet of glass are laminated together via the plastics interlayer and the at least two conductive layers are provided between the plastics interlayer and the first sheet of glass.

[0017] The object of the invention is further addressed by a method for operating a panel of glass, the panel of glass comprising a first sheet of glass, at least two conductive layers and at least one light emitting diode, wherein the at least two conductive layers are provided on one side of the first sheet of glass, the at least two conductive layers are electrically separated from each other, and the at least one electrical light emitting diode is connected to one conductive layer and to another conductive layer, the method comprising the steps of applying electrical power to the at least two conductive layers with intermittent operation, to thereby control the power consumption of the at least one light emitting diode, wherein the power source is a voltage-regulated power source, and wherein the voltage-regulated power source and the internal resistance of the conductive layers forms at least a part of a current regulation means for the at least one light emitting diode.

[0018] The method for operating the panel of glass according to the invention is advantageous, since it, for example, allows for controlling the luminous intensity of the light emitting diode by interrupting the electrical power, i.e. by applying electrical power in an intermittent way, thus allowing for dimming the light emitting diode. Each of the light emitting diodes may be associated with passive devices such as resistors, capacitors and/or inductors or may include active devices such as transistors, light sources, switches, microprocessors of microcontrollers, chips, ASICs, FPGAs, etc.

[0019] According to another preferred embodiment of the invention, the step interrupting the electrical power comprises pulse modulation such as pulse-width modulating. It is preferred that the electrical power is pulse modulated, e.g. pulse-width modulated at a frequency not visible to the human eye. It is further preferred that the electrical power is pulse modulated, e.g. pulse-width modulated with a frequency of ≥ 100 Hz, preferably with a frequency of greater of ≥ 400 Hz and more preferably with a frequency of ≥ 800 Hz.

[0020] According to another preferred embodiment of the invention, the resistance of the conductive layer is ≥ 3 ohm per square, preferably ≥ 5 ohm per square and more preferably ≥ 8 ohm per square. In this way, the luminous intensity of the light emitting diode can be controlled by electrical power that is voltage regulated, wherein the electrical power preferably comprises pulse-width modulating. As a matter of fact, in such a case due to the high resistance of the conductive layer, the voltage-regulated power source associated with the internal re-

sistance of that conductive layer act as a current regulation means for the diodes. Therefore, the invention allows for a simple and inexpensive way to regulate the luminous intensity and/or for dimming the luminous intensity of at least one light emitting diode in a panel of glass.

[0021] According to another preferred embodiment of the invention, a plurality of conductive layers and a plurality of light emitting diodes are provided, wherein the plurality of light emitting diodes are electrically connected in series and/or in parallel via the plurality of conductive layers. It is preferred that the light emitting diode(s) is (are) electrically connected to the conductive layer by means of soldering and/or gluing.

[0022] According to another preferred embodiment of the invention, the panel of glass is a panel of laminated glass further comprising a second sheet of glass and a plastics interlayer, wherein the first sheet of glass and a second sheet of glass are laminated together via the plastics interlayer and the at least two conductive layers are provided between the plastics interlayer and the first sheet of glass. In this way, the panel of laminated glass according to the invention can be manufactured at low cost and in a simple way with manufacturing methods known from the prior art.

[0023] The method may be used with a glass panel comprising a plurality of light emitting diodes, or a plurality of groups of light emitting diodes, and the method comprises supplying power to a first light emitting diode, or a first group of light emitting diodes independently of a second light emitting diode, or a second group of light emitting diodes.

[0024] These and other aspects of the invention will be apparent from and elucidated with reference to the embodiments described hereinafter.

Fig. 1 schematically shows a top view of a part of a panel of laminated glass according to a preferred embodiment of the invention,

Fig. 2 shows an equivalent circuit diagram of the panel of laminated glass according to the preferred embodiment of the invention,

Fig. 3 schematically shows a top view of a part of a panel of laminated glass according to another preferred embodiment of the invention.

Fig. 4 schematically shows a top view of a part of a panel of laminated glass according to another preferred embodiment of the invention based on the embodiment of Fig. 3.

[0025] The drawings described are only schematic and are non-limiting. In the drawings, the size of some of the elements may be exaggerated and not drawn on scale for illustrative purposes. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measured

cannot be used to advantage. Any reference signs in the claims should not be construed as limiting the scope.

[0026] Where the term "comprising" is used in the present description and claims, it does not exclude other elements or steps. Where an indefinite or definite article is used when referring to a singular noun e.g. "a" or "an", "the", this includes a plural of that noun unless something else is specifically stated.

[0027] Furthermore, the terms first, second and the like in the description and in the claims, are used for distinguishing between similar elements and not necessarily for describing a sequence, either temporally, spatially, in ranking or in any other manner. It is to be understood that the terms so used are interchangeable under appropriate circumstances and that the embodiments of the invention described herein are capable of operation in other sequences than described or illustrated herein.

[0028] Reference throughout this specification to "one embodiment" or "an embodiment" means that a particular feature, structure or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, appearances of the phrases "in one embodiment" or "in an embodiment" in various places throughout this specification are not necessarily all referring to the same embodiment, but may. Furthermore, the particular features, structures or characteristics may be combined in any suitable manner, as would be apparent to one of ordinary skill in the art from this disclosure, in one or more embodiments.

[0029] Similarly it should be appreciated that in the description of exemplary embodiments of the invention, various features of the invention are sometimes grouped together in a single embodiment, figure, or description thereof for the purpose of streamlining the disclosure and aiding in the understanding of one or more of the various inventive aspects. This method of disclosure, however, is not to be interpreted as reflecting an intention that the claimed invention requires more features than are expressly recited in each claim. Rather, as the following claims reflect, inventive aspects lie in less than all features of a single foregoing disclosed embodiment. Thus, the claims following the detailed description are hereby expressly incorporated into this detailed description, with each claim standing on its own as a separate embodiment of this invention.

[0030] Furthermore, while some embodiments described herein include some but not other features included in other embodiments, combinations of features of different embodiments are meant to be within the scope of the invention, and form different embodiments, as would be understood by those in the art. For example, in the following claims, any of the claimed embodiments can be used in any combination.

[0031] As can be seen from Fig. 1, according to the preferred embodiment of the invention, a panel of laminated glass comprises four conductive layers 1, which are electrically separated from each other. The four conductive layers 1 are provided on one side of a first sheet

of glass, not depicted. Preferably, the four conductive layers 1 are obtained thanks to a first step of deposition of a global conductive layer on all the surface of one side of the first sheet of glass and to a second step of patterning (e.g. thanks to a laser ablation or chemical etching) the global conductive layer such as to provide the four conductive layers 1.

[0032] As can be seen further, three light emitting diodes 2 are provided. Each of the three light emitting diodes 2 is electrically connected to one conductive layer 1 and to another conductive layer 1. Each of the light emitting diodes may be associated, in the panel, with passive devices such as batteries, resistors, capacitors and/or inductors or may include active devices such as transistors, light sources, switches, microprocessors of microcontrollers, chips, ASICs, FPGAs, memories, transmitters, receivers, wireless transceivers, detectors such as optical or mechanical detectors or sensors, etc.

[0033] Fig. 2 shows an equivalent circuit diagram of the panel of laminated glass according to the preferred embodiment of the invention, comprising light emitting diodes 2 and resistances 3 connected in series. In this way, the resistance 3 of the equivalent circuit diagram equals to the (inner) resistance 3 of the conductive layer 1, as shown in Fig. 1.

[0034] The conductive layer 3 can be provided in a substantially, neutral chemical vapour deposition (CVD) coating stack comprising an SiO_xC_y undercoat and an overlying $\text{SnO}_2\text{:F}$ -coating, wherein the resistance 3 of the conductive layer 1 is ≥ 3 ohm per square, preferably ≥ 5 ohm per square and more preferably ≥ 8 ohm per square. The electrical insulation between the conductive layers 1 can be provided by laser ablation of about 70 microns width. As an alternative, the deposition of the conductive layers 1 can be done in a partial way, which eliminates the need for laser ablation for creating the electrical insulation between the conductive layers 1. The LED can be provided for instance as a packaged LED manufactured by the company Nichia.

[0035] As stated before, the conducting layer 1 comprises a resistance 3, so that the luminous intensity of the light emitting diodes 2 can be controlled by a voltage-regulated power source. Further, according to the invention, the luminous intensity of the light emitting diodes 2 can be controlled by electrical power that is pulse-width modulated. In this way, it is possible to dim and/or control the luminous intensity of the light emitting diodes by a voltage-regulated power source and/or by a voltage source providing electrical power that is pulse-width modulated. Preferably, the electrical power is pulse-width modulated with ≥ 100 Hz, preferably with ≥ 400 Hz and more preferably with ≥ 800 Hz. In this way, invention allows for a simple and inexpensive way to control the luminous intensity of an light emitting diodes 2 provided in a panel of laminated glass.

[0036] Fig. 3 shows a top view of a part of a panel of laminated glass according to another preferred embodiment of the invention. As can be seen, a plurality of light

emitting diodes 2, which are connected in series by the conductive layers 1, are connected in parallel to a busbar 4. The busbar 4 is connected to the conductive layer 1 and/or the conductive layer 1 is connected to the light emitting diode 2 by means of gluing and/or soldering. Further, the busbar 4 allows for the provision of electrical power to the conductive layer 1.

[0037] Power is supplied to the light emitting diodes from busbar 4. The electrical power is pulse modulated, e.g. pulse-width modulated with a frequency of ≥ 100 Hz, preferably with a frequency ≥ 400 Hz and more preferably with a frequency ≥ 800 Hz. It is to be noted, that according to the preferred embodiment of the invention the luminous intensity of the light emitting diodes is a function of the frequency at which the electrical power is pulse-modulated, e.g. pulse-width modulated.

[0038] It is further preferred that a plurality of electrical or electronic components are provided, wherein the plurality of light emitting diodes are electrically connected in parallel or/and in series by means of a plurality of conductive layers, wherein the light emitting diodes are preferably electrically connected to the conductive layers by means of gluing and/or soldering. The plurality of light emitting diodes may be associated with passive devices such as resistors, capacitors and/or inductors or may include active devices such as transistors, light sources, switches, microprocessors of microcontrollers, chips, ASICs, FPGAs, etc.

[0039] According to this embodiment of the invention, the resistance of the conductive layer is ≥ 3 ohm per square, preferably ≥ 5 ohm per square and more preferably ≥ 8 ohm per square. In this way, the invention allows for controlling the luminous intensity of the light emitting diode using a voltage regulated power source, given that the conductive layer provides a resistance to the light emitting diode connected in series with the conductive layer. Therefore, the invention allows for dimming the luminous intensity of the light emitting diode by controlling the voltage of a power source, wherein the electrical power provided by the power source is preferably pulse-width modulated. This is advantageous over the prior art, as the invention allows for a simple and inexpensive way to control the luminous intensity of an light emitting diode, preferably of a panel of laminated glass.

[0040] Generally, it is possible to supply electrical power to the panel of laminated glass in different ways. However, according to this embodiment of the invention, a busbar 4 is provided, wherein the busbar 4 is arranged on the conductive layer and the busbar 4 is electrically connected to the conductive layer and to the power supply. It is further preferred that the busbar 4 comprises an adhesive copper. The busbar 4 can be electrically connected to the conductive layer and/or to the power supply by means of gluing and/or soldering. In this way, the busbar allows for a simple and convenient way to electrically connect the conductive layer and the power source.

[0041] Fig. 4 show a top view of a part of a panel of laminated glass according to Fig. 3, the plurality of light

emitting diodes 2, which are connected in series by the conductive layers 1, are connected in parallel to a busbar 4. The busbar 4 is connected to the conductive layer 1 and/or the conductive layer 1 is connected to the light emitting diode 2 by means of gluing and/or soldering. Further, the busbar 4 allows for the provision of electrical power to the conductive layer 1. A voltage regulator 10 is connected to provide power to the electrical or electronic components 2. The voltage regulator 10 is adapted to provide pulse modulated voltage regulation, i.e. is a pulse modulated voltage source. It is preferably a pulse-width modulated voltage source. As the light emitting diodes 2 are connected in series each receives the same current. Hence each receives a pulse width modulated current.

[0042] As the light emitting diodes 2 are in a voltage divider, the voltage across each component will be determined by its impedance and the current flowing through it. If the voltage output of the voltage source 10 is reduced this reduces the voltage across each light emitting diode.

[0043] While the invention has been illustrated and described in detail in the drawings and foregoing description, such illustration and description are to be considered illustrative or exemplary and not restrictive; the invention is not limited to the disclosed embodiments. In particular, while the illustration and description discloses a panel of laminated glass, the present invention can also be applied in the case of a panel of glass which is :

- a panel of laminated glass comprising more than two sheets of glass;
- a single glass sheet panel;
- a double or multi glazing panel (in this case interlayer (s) can contain a gas, for instance air or argon).

[0044] Other variations to be disclosed embodiments can be understood and effected by those skilled in the art in practicing the claimed invention, from a study of the drawings, the disclosure, and the appended claims. In the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage. Any reference signs in the claims should not be construed as limiting scope.

Claims

1. Panel of glass, comprising a first sheet of glass, at least two conductive layers (1), at least one light emitting diode (2) and a power source, wherein the at least two conductive layers (1) are provided on one side of the first sheet of glass,

the at least two conductive layers (1) are electrically separated from each other, the at least one light emitting diode (2) is electrically connected to one conductive layer (1) and to another conductive layer (1), and the power source is adapted for providing electrical power with intermittent operation to the one conductive layer to thereby control the power consumption of the at least one light emitting diode, wherein the power source is a voltage-regulated power source, and wherein the panel comprises current regulation means for the at least one light emitting diode, the current regulation means comprising the voltage-regulated power source and the internal resistance of the conductive layers.

2. Panel of glass according to claim 1, wherein the electrical power is pulse-width modulated.
3. Panel of glass according to claim 2, wherein the electrical power is pulse-width modulated with ≥ 100 Hz, preferably with ≥ 400 Hz and more preferably with ≥ 800 Hz.
4. Panel of glass according to any of the proceeding claims, wherein the resistance (3) of the conductive layer (1) is ≥ 3 ohm per square, preferably ≥ 5 ohm per square and more preferably ≥ 8 ohm per square.
5. Panel of glass according to any of the proceeding claims, wherein a busbar (4) is provided, the busbar (4) is arranged on the conductive layer (1), the busbar (4) is electrically connected to the conductive layer (1) and to the power supply.
6. Panel of glass according to any of the proceeding claims, further comprising a plurality of light emitting diodes (2), or a plurality of groups of light emitting diodes (2), and a controller to control the power supplied to a first light emitting diode (2), or a first group of light emitting diodes (2) independently of a second light emitting diode (2), or a second group of light emitting diodes (2).
7. Panel of glass according to any of the proceeding claims, comprising a second sheet of glass and a plastics interlayer, wherein the first sheet of glass and the second sheet of glass are laminated together via the plastics interlayer and the at least two conductive layers (1) are provided between the plastics interlayer and the first sheet of glass.
8. Method for operating a panel of glass, the panel of glass comprising a first sheet of glass, at least two conductive layers (1) and at least one light emitting diode (2), wherein the at least two conductive layers (1) are provided on one side of the first sheet of glass,

the at least two conductive layers (1) are electrically separated from each other, and
 the at last one light emitting diode (1) is electrically connected to one conductive layer (1) and to another conductive layer (1), the method comprising the steps of
 applying intermittent electrical power to the at least two conductive layers (1) to thereby control the power consumption of the at least one light emitting diode wherein the power source is a voltage-regulated power source, and wherein the voltage-regulated power source and the internal resistance of the conductive layers forms at least a part of a current regulation means for the at least one light emitting diode.

9. Method according to claim 8, wherein the step providing the intermittent electrical power comprises pulse-width modulating.
10. Method according to claims 8 or 9, wherein the resistance (3) of the conductive layer (1) is ≥ 3 ohm per square, preferably ≥ 5 ohm per square and more preferably ≥ 8 ohm per square.
11. Method according any of claims 8 to 10, wherein a plurality of conductive layers (1) and a plurality of light emitting diodes (2) are provided and the plurality of light emitting diodes (2) are electrically connected in series and/or in parallel via the plurality of conductive layers (1).
12. Method according any of claims 8 to 11, wherein the panel of glass further comprises a second sheet of glass and a plastics interlayer, wherein the first sheet of glass and the second sheet of glass are laminated together via the plastics interlayer and the at least two conductive layers (1) are provided between the plastics interlayer and the first sheet of glass.
13. The method according to any of the claims 8 to 12, wherein the panel further comprises a plurality of light emitting diodes (2), or a plurality of groups of light emitting diodes (2), and the method comprises supplying power to a first light emitting diode (2), or a first group of light emitting diodes (2) independently of a second light emitting diode (2), or a second group of light emitting diodes (2).

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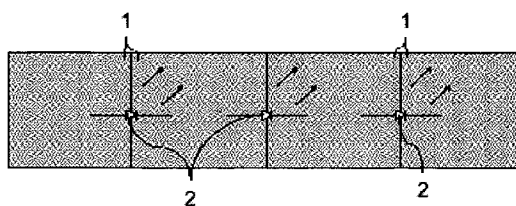


FIG. 1

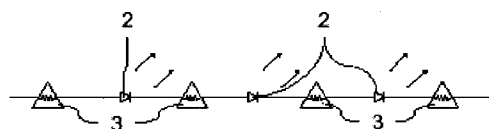


FIG. 2

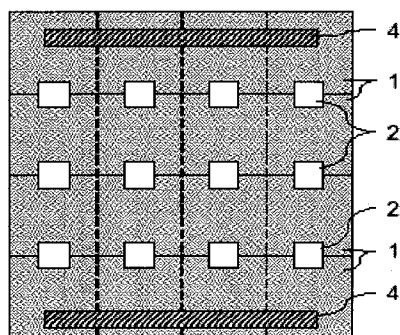


FIG. 3

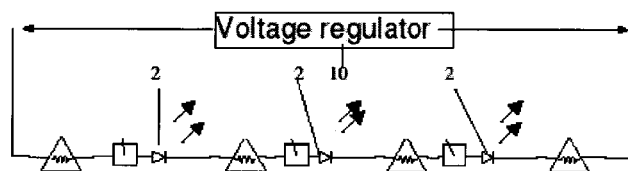


FIG. 4



EUROPEAN SEARCH REPORT

Application Number
EP 08 17 0508

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 840 449 A (GLAVERBEL [BE]) 3 October 2007 (2007-10-03) * column 3, paragraph 27; figure 2 * * columns 1-2, paragraph 13 * * column 2, paragraph 21 *	1-13	INV. H05B33/08
X	EP 1 437 215 A (GLAVERBEL [BE]) 14 July 2004 (2004-07-14) * column 1, paragraph 5-9 * * column 2, paragraph 11 * * column 3, paragraph 21 * * column 5, paragraph 42-44 * * figure 4 *	1-13	
A	US 6 293 687 B1 (POIROT PASCAL [FR] ET AL) 25 September 2001 (2001-09-25)		
A	US 6 270 236 B1 (BRUSSOG INGO [DE]) 7 August 2001 (2001-08-07)		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			H05B
2	Place of search The Hague	Date of completion of the search 19 May 2009	Examiner Benedetti, Gabriele
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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 08 17 0508

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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19-05-2009

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1840449	A	03-10-2007	NONE
EP 1437215	A	14-07-2004	BE 1015302 A3 11-01-2005
US 6293687	B1	25-09-2001	BR 9803494 A 23-11-1999 CN 1216742 A 19-05-1999 DE 69809368 D1 19-12-2002 DE 69809368 T2 09-10-2003 EP 0906001 A1 31-03-1999 FR 2768895 A1 26-03-1999 JP 11154403 A 08-06-1999
US 6270236	B1	07-08-2001	DE 19854899 C1 30-12-1999 JP 2000164012 A 16-06-2000 TW 451501 B 21-08-2001

专利名称(译)	玻璃板包括发光二极管和电压调节装置		
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摘要(译)

本发明涉及一种夹层玻璃板，包括第一玻璃板，至少两个导电层1，至少一个发光二极管2和电源，其中所述至少两个导电层1设置在一侧上。在所述第一玻璃板中，所述至少两个导电层1彼此电分离，所述至少一个发光二极管2电连接到一个导电层1和另一个导电层1，并且所述电源适于通过这种方式，本发明允许通过施加间歇电力来控制发光二极管2的发光强度，从而允许以简单且廉价的方式提供至少一个中断到至少一个导电层1的电力。调暗发光二极管2的发光强度。

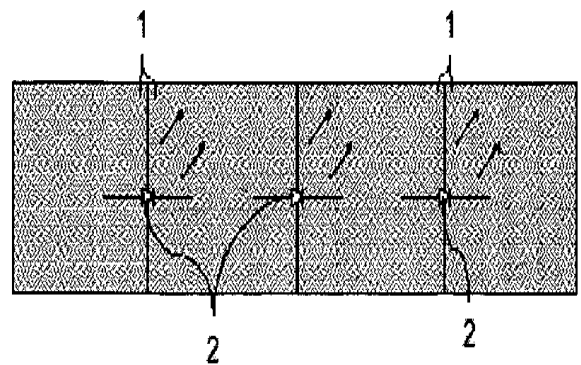


FIG. 1