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(54) **An electroluminescent illuminated sign**

(57) An electroluminescent illuminated sign comprises at least one electroluminescent sheet (1) powered by an alternating voltage generator (5), and at least one support (2) for an image (2a) to be lit, placed on the top of

the electroluminescent sheet (1), on which support (2) the image (2a) to be lit contrasts with the remaining surface (2b) of the support (2), so that when the support (2) is placed over the electroluminescent sheet (1) only the image (2a) stands out.

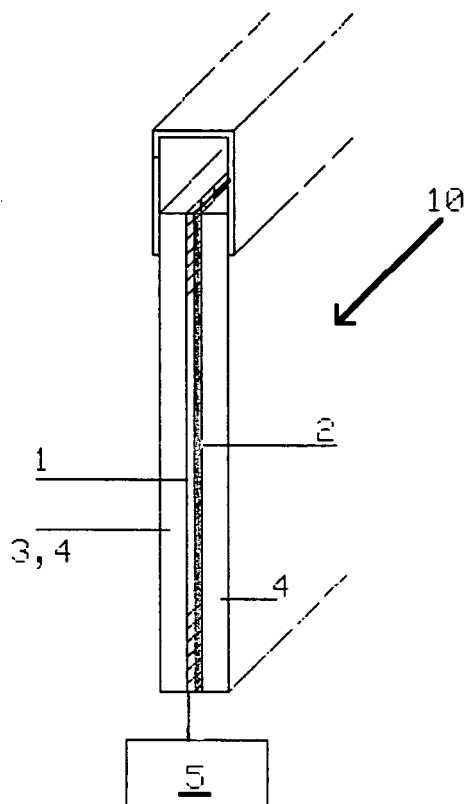
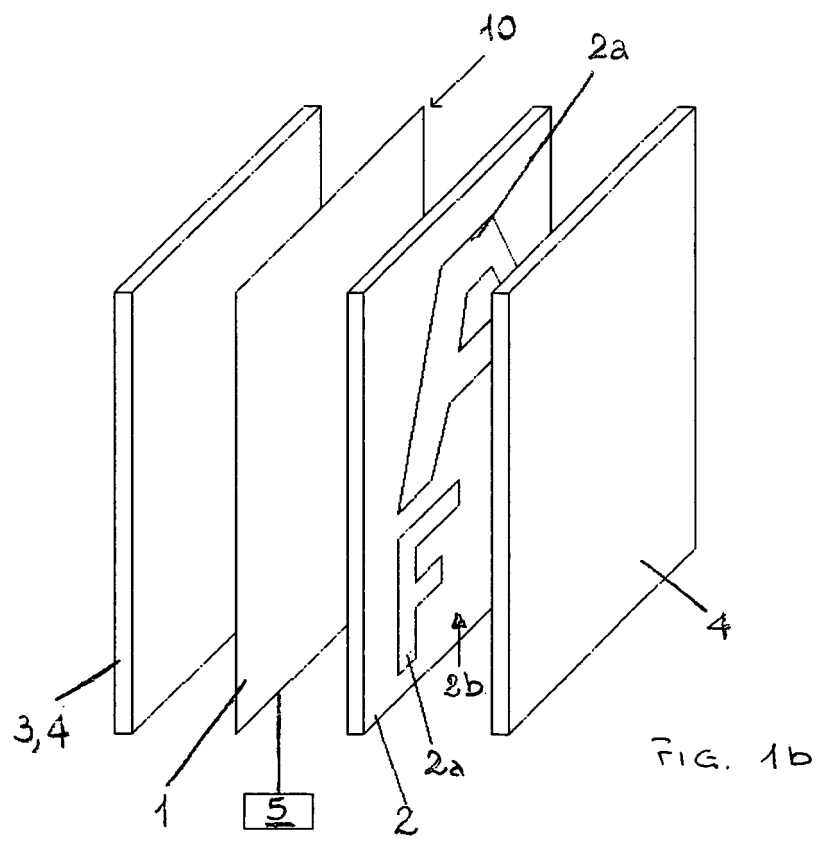


FIG. 1a



Description

[0001] The present invention relates to an electroluminescent illuminated sign.

[0002] Illuminated signs are one of the most widely used instruments for making the presence of a business visible along roads: the possibility of being noticed even in the dark allows one to draw the attention of persons who, in that particular moment, are looking for a certain product or service.

[0003] At present, illuminated signs are made using neon tubes assembled in various ways according to the dimensions of the sign.

[0004] The disadvantages of this type of signs are many: firstly, they operate at high voltages, and so consume a lot of energy; they also have low efficiency, due to the high absorption; their life is relatively limited, therefore, they require rather frequent servicing and maintenance.

[0005] Often, the particular geometry of the illuminated characters requires the creation of shaped neons, whose substitution is time consuming and expensive. In addition, the sign is rarely seen as evenly lit, since the shapes of the neon tubes and their positioning relative to one another influence their brightness. Even sign installation can create problems, since it must be connected to the mains by cables.

[0006] Finally, to ensure that the sign can be read from both sides, practically double signs have to be made, affecting the thickness, which is already not less than around 10 centimetres for a single sign. Electroluminescence is a phenomenon that has been known since the start of the last century: however, it was not used for a long time due to the lack of suitable materials and prohibitive costs of a technology that was still not refined.

[0007] In recent years, the increasing spread of electroluminescent sheets and strips together with optimisation of production processes has made the use of this technology economically accessible.

[0008] Moreover, although solar energy has been significantly exploited for heating, the relative technology may also be applied in other sectors.

[0009] The aim of the present invention is, therefore, to overcome the above-mentioned disadvantages. This is achieved by combining the technologies relative to electroluminescence and the use of solar energy.

[0010] The main advantage obtained with the present invention is basically the fact that an illuminated sign is obtained with extremely reduced thickness, which requires limited amounts of energy in order to operate. Moreover, in the version in which solar energy panels are used, it does not require cables, which means that it can be placed in isolated areas and installed without necessitating operations to connect it up to the mains.

[0011] Finally, even the costs for its production and maintenance are extremely contained and it is simple and economical to even frequently change the writing or image to be lit.

[0012] Further advantages and features of the invention are more clearly illustrated in the detailed description which follows, with reference to the accompanying drawings, which illustrate a preferred embodiment of the invention without limiting the scope of the inventive concept, and in which:

- Figure 1 is a schematic, perspective side assembly view (Figure 1a) and an exploded view (Fig. 1b), of the invention;
- Figures 2 and 3 are schematic illustrations of two embodiments of the invention.

[0013] With reference to the accompanying drawings, the invention relates to an electroluminescent illuminated sign comprising at least one electroluminescent sheet (1) powered by an alternating voltage generator (5), and at least one support (2) for an image (2a) to be lit, positioned on top of the electroluminescent sheet (1), on which the image (2a) to be lit contrasts with the remaining surface (2b) of the support (2), so that when the support (2) is placed over the electroluminescent sheet (1) only the image (2a) is stands out when lit.

[0014] The sign (10) comprises a metal backing surface (3) and a transparent cover (4), which give it a stiffness acceptable for display without the risk of deforming during use. The cover (4) is preferably made of a plastic material, and, if the sign (10) must be visible from both sides, a second transparent cover (4) substitutes the metal backing surface (3).

[0015] The generator (5) may be made in various ways, particularly according to the place where the sign (10) must be installed. By way of example, two possible application solutions will be described, preferably in different situations.

[0016] In both cases, the generator (5) comprises a device (5b) which converts direct voltage into alternating voltage, suitable for controlling the electroluminescent sheet (1). This device (5b) comprises at least one inverter (51), which, in the solutions illustrated, is of the MOSFET full-bridge type. The inverter (51) supplies a pseudosinusoidal waveform, that is to say, the load, here consisting of the electroluminescent sheet (1), "feels" the voltage at its ends as if it were the mains sinusoidal waveform. This system is advantageous for reducing the characteristic and annoying noise generated by the inverters for standard electroluminescent lamps (operating with a single-transistor "free" oscillator), to prevent inverter overheating and breakage in the absence of the lamp and to continually change the load output frequency. In this way, it is also possible to adjust the brightness of the lamp or switch it on and off electronically, to achieve advertising-type lighting effects.

[0017] In the solution illustrated in Figure 2, relative to a connection to the mains, the generator (5) comprises a device (5a) which converts alternating voltage into direct voltage, so that it can be powered by the mains voltage. This device (5a) in turn comprises a switching power

supply unit (52), designed to convert alternating voltage into direct voltage, so as to control the inverter (51). In the case in question, in particular, the power supply unit (52) generates a direct voltage of around 320 Volts starting with the mains alternating voltage. Moreover, the switching power supply unit (52) comprises an isolating device (53), designed to prevent electric shocks, which isolates the voltage on the electroluminescent sheet (1) from that of the mains. The decision to build the power supply unit (52) with switching technology, using the fly-back configuration with MOSFET, although this is not a constraining feature, allows a reduction of the dimensions, containment of the weight and minimum dissipation for the entire apparatus. Finally, the power supply unit (52) comprises at least two outputs (52a, 52b) with different direct voltage values: the first output (52a) is connected to the inverter (51), the second output (52b), with direct voltage at around 15 Volts, is used to power the entire auxiliary circuitry, for example for inverter (51) control.

[0018] The other type of use, schematically illustrated in Figure 3, is particularly useful when connecting to the mains is a problem: this involves the use of a device (5c) designed to supply direct voltage.

[0019] The device (5c) comprises at least one solar panel (54), designed to transfer energy to a battery (56), by means of a charge regulator (55), which allows a constant power supply current and voltage to be maintained. To increase the power supply voltage to the inverters (51) which are part of the device (5b), the generator (5) comprises a switching converter (57), designed to supply direct voltage at a level at least 10 times higher than that of the direct input voltage. This converter (57) for controlling two or more inverters (51) was made using solid-state technology, with a high frequency push-pull configuration, able to supply the inverters (51) with a 320 Volt direct voltage, starting with the 12 Volt direct voltage of the battery (56).

[0020] Moreover, a control unit (58), designed to condition device (5b) operation, allows the brightness and the On and Off state of the electroluminescent sheets (1) to be varied, creating optical effects. The control unit (58) is supplied with the battery (56) voltage by means of the charge regulator (55), which is also connected to a photosensitive element (59) which indicates, at dusk, the moment when the sign (10) must light up.

[0021] Although in the two examples described there are one or more inverters (51) for controlling the electroluminescent sheets (1), it should be emphasised that the choice does not depend on the two different types of power supply: in other words, that is to say, using the above information, a technician in the field could create a sign (10) powered from the mains using two or more inverters (51), or a sign powered by solar panels (54) which only uses one inverter (51). Also, in the two cases described, inverters (51) of the same type or different types may be used.

[0022] The invention described may be subject to

many modifications and variations without thereby departing from the scope of the inventive concept. Moreover, all details of the invention may be substituted with technically equivalent elements.

5 [0023] In practice, obviously modifications and/or improvements are possible without departing from the following claims.

10 Claims

1. An electroluminescent illuminated sign, **characterised in that** it comprises at least one electroluminescent sheet (1) supplied with power by an alternating voltage generator (5), and at least one support (2) for an image (2a) to be lit, said support (2) being positioned on the top of the electroluminescent sheet (1), so that the image (2a) to be lit contrasts with the remaining surface (2b) of the support (2), so that when the support (2) is placed over the electroluminescent sheet (1) and only the image (2a) stands out.
2. The sign according to claim 1, **characterised in that** it comprises a metal backing surface (3) and a transparent cover (4), designed to stiffen it.
3. The sign according to claim 1, **characterised in that** it comprises a pair of transparent covers (4), so that it is visible from both sides.
4. The sign according to claim 2 or 3, **characterised in that** the cover (4) is made of a plastic material.
5. The sign according to claim 1, **characterised in that** the generator (5) comprises a device (5a) able to convert alternating voltage into direct voltage, so that it can be powered by the mains.
6. The sign according to claim 5, **characterised in that** the device (5a) comprises a switching power supply unit (52) designed to convert alternating voltage into direct voltage.
7. The sign according to claim 6, **characterised in that** the switching power supply unit (52) comprises an isolating device (53) designed to prevent electric shocks.
8. The sign according to claim 6, **characterised in that** the power supply unit (52) comprises at least two outputs (52a, 52b) with different direct voltage values.
9. The sign according to claim 1, **characterised in that** the generator (5) comprises a device (5c) designed to supply direct voltage.
10. The sign according to claim 9, **characterised in that**

the device (5c) comprises at least one solar panel (54), able to transfer energy to a battery (56), by means of a charge regulator (55), said charge regulator (55) being designed to maintain a constant power supply current and voltage.

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11. The sign according to claim 9 or 10, **characterised in that** the generator (5) comprises a switching converter (57), designed to supply direct voltage at a level at least 10 times higher than that of the direct input voltage. 10
12. The sign according to claim 5 or 9, **characterised in that** the generator (5) comprises a device (5b) designed to convert direct voltage into alternating voltage, suitable for controlling the electroluminescent sheet (1). 15
13. The sign according to claim 12, **characterised in that** the device (5b) comprises at least one MOSFET full-bridge inverter (51). 20
14. The sign according to claim 13, **characterised in that** the inverter (51) supplies a pseudosinusoidal waveform. 25
15. The sign according to claim 12, **characterised in that** the generator (5) comprises a control unit (58) designed to condition the operation of the device (5b), varying the brightness and the On and Off state of the electroluminescent sheets (1). 30

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FIG. 1

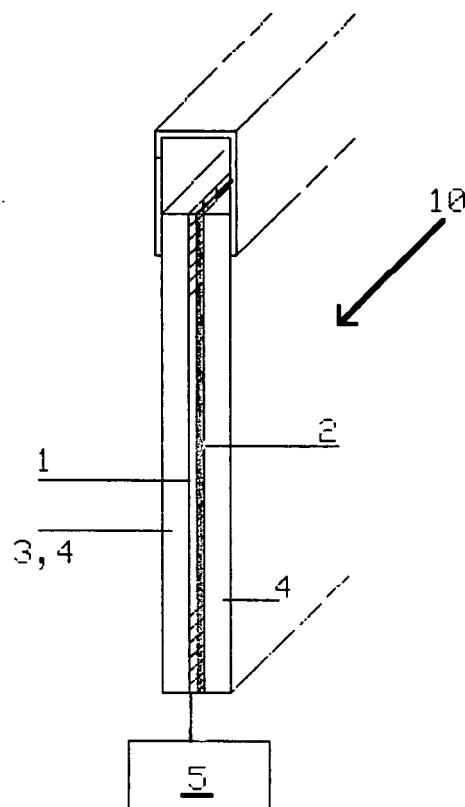


FIG. 1a

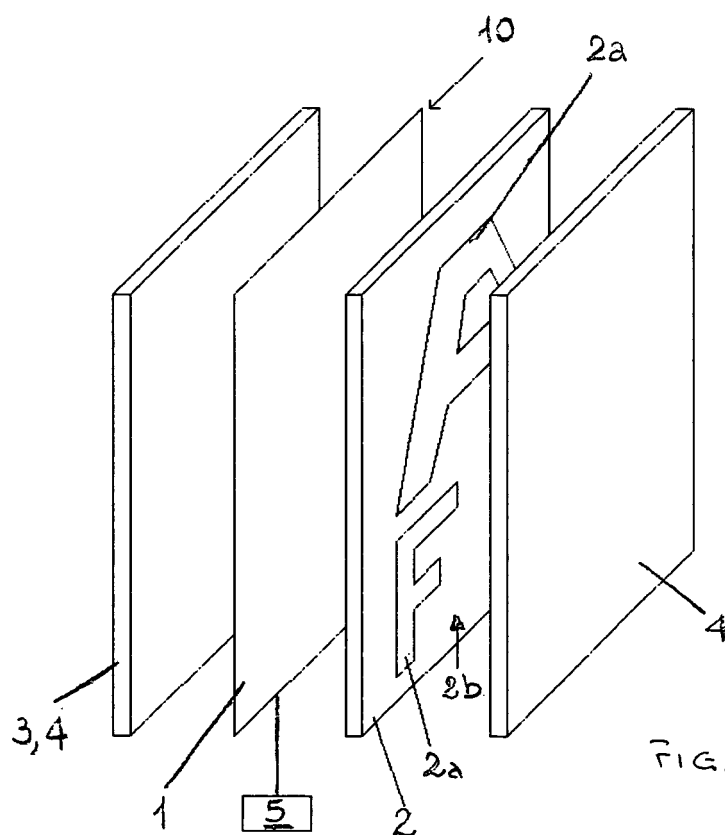


FIG. 1b

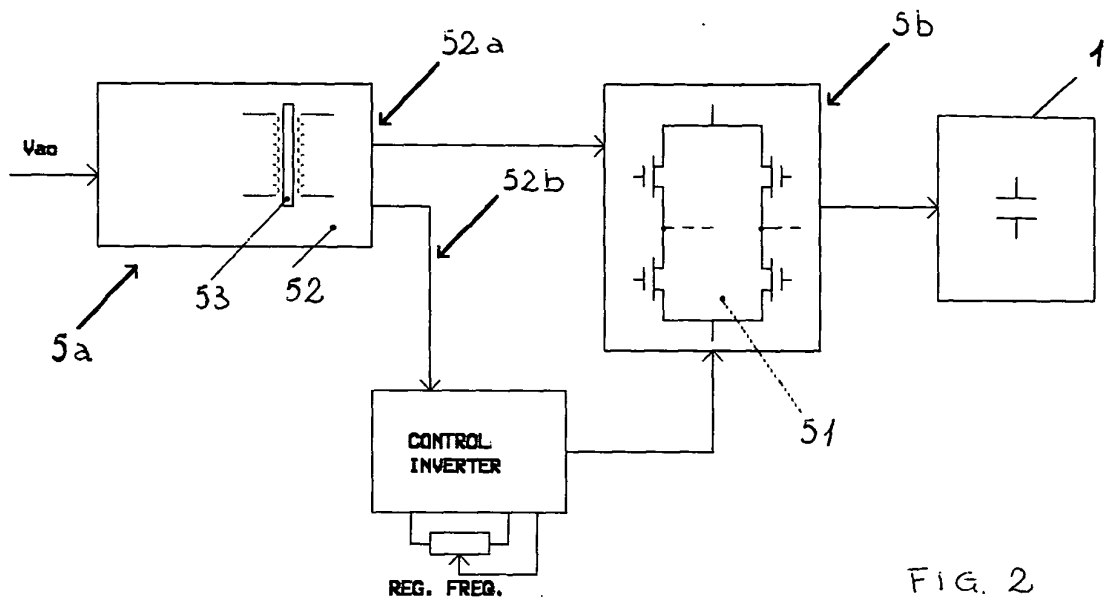


FIG. 2

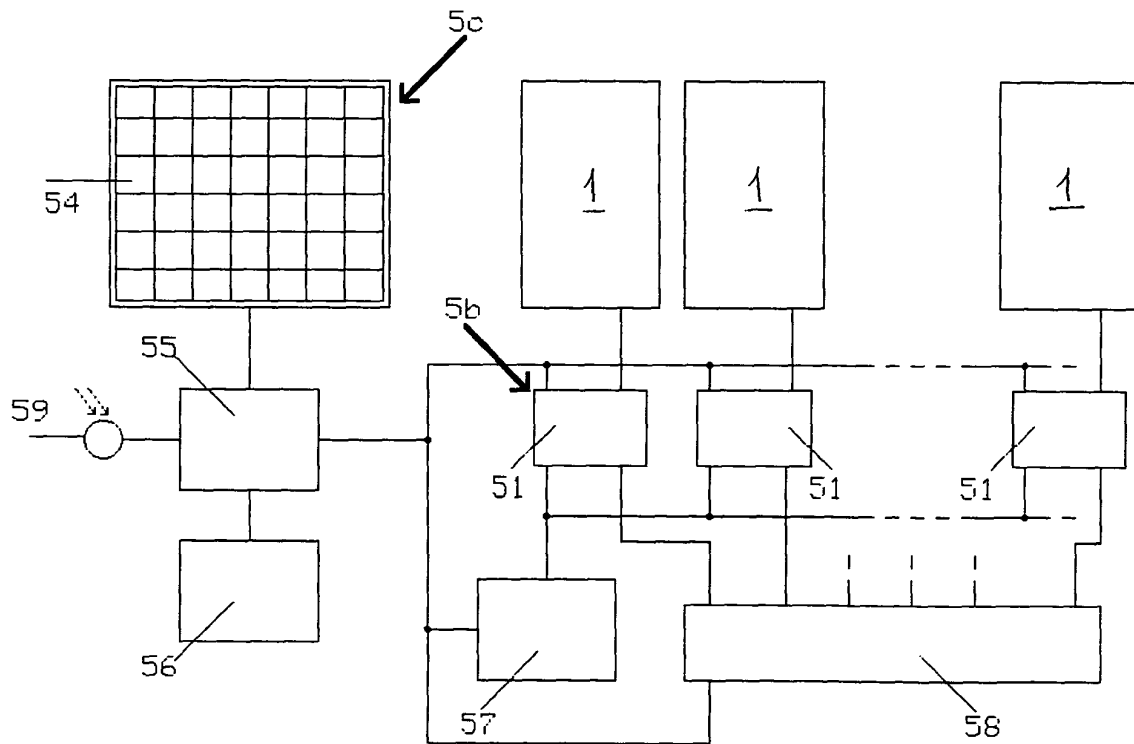


FIG. 3



European Patent
Office

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Application Number
EP 04 01 7816

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 7 April 2005	Examiner Pantoja Conde, A
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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Place of search The Hague		Date of completion of the search 7 April 2005	Examiner Pantoja Conde, A
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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