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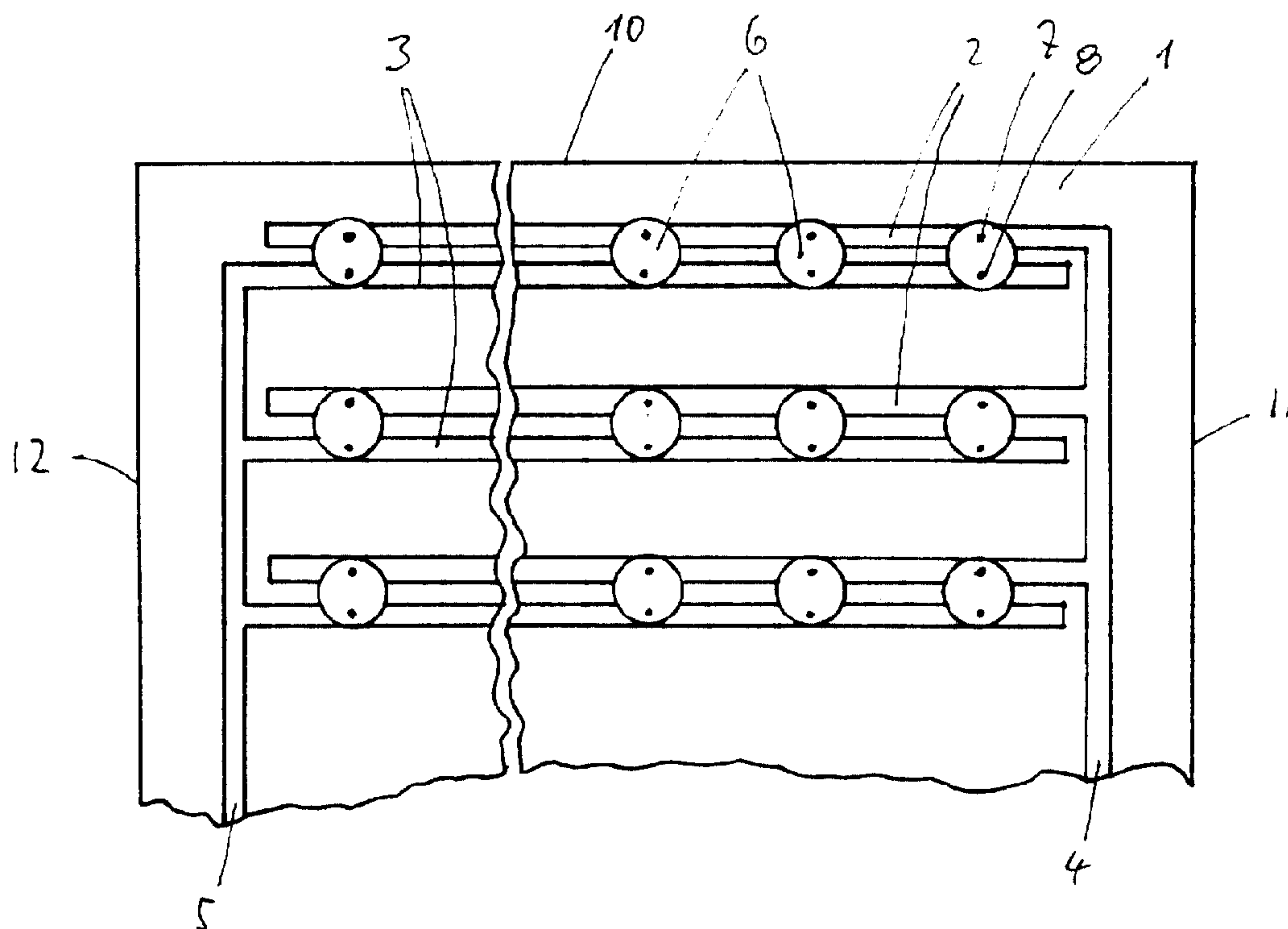
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(54) Titre : APPAREIL D'ECLAIRAGE POUR PRESENTOIR

(54) Title: LIGHTING DEVICE FOR A CABINET



(57) Abrégé/Abstract:

A lighting device consists of a plurality of light-emitting diodes (6) fixed on the surface of a glass plate (1) and which are electrically connected to conductor tracks (2, 3) disposed on the glass plate (1) as a thin and invisible layer. The conductor tracks (2, 3) and their terminals (4, 5) are disposed on the same surface of the glass plate (1) as the light-emitting diodes (6). The glass plate (1) thus formed can be used both in the frame of a sales or display cabinet, to illuminate the display, as a display window pane to illuminate the display or for advertising purposes, where the conductor tracks do not affect the optical characteristics of the glass plate (1) on account of the invisibility.

ABSTRACT

A lighting device consists of a plurality of light-emitting diodes (6) fixed on the surface of a glass plate (1) and which are electrically connected to conductor tracks (2, 3) disposed on the glass plate (1) as a thin and invisible layer. The conductor tracks (2, 3) and their terminals (4, 5) are disposed on the same surface of the glass plate (1) as the light-emitting diodes (6). The glass plate (1) thus formed can be used both in the frame of a sales or display cabinet, to illuminate the display, as a display window pane to illuminate the display or for advertising purposes, where the conductor tracks do not affect the optical characteristics of the glass plate (1) on account of the invisibility.

Lighting Device for a Cabinet

BACKGROUND OF THE INVENTION

(1) FIELD OF THE INVENTION

5 This invention relates to a lighting device consisting of a plurality of light-emitting diodes fixed on the surface of a support plate and electrically connected to conductor tracks disposed on the support plate.

(2) DESCRIPTION OF THE PRIOR ART

10 Such a lighting device is already known. Thus an infrared projector is described in the catalog of summer 1997 of the company Westfalia, Industriestrasse 1, 58083 Hagen, Germany on page 61 below, which is formed from a plurality of infrared light-emitting diodes arranged in a matrix and disposed on a printed circuit board. The current supply for the light-emitting diodes is effected by conductor tracks which are located on the side of the printed circuit board facing away from the populated side.

15 Light-emitting diodes have the advantage over incandescent lamps that they convert the major part of the electric power supplied into light and thus generate only a little heat. It is true that the luminous efficiency of an individual light-emitting diode is not very high, so that an arrangement of a plurality of light-emitting diodes is desirable, as has already been mentioned.

20 It should be noted that a printed circuit board transparent to light is known from DE-PS 4 208 922 in a flat display for illuminating background surfaces, light-emitting diode chips being disposed on its inside and each being bonded via a corresponding wire. A reflecting layer is provided opposite the inside on the housing surrounding the printed circuit board, so that light radiated rearwardly from the light-emitting diodes is reflected through the transparent printed circuit board. The space between the printed circuit board and the housing is moreover filled with a potting compound acting as a scattering body. Normal conductor tracks, i.e. non-transparent, can be used since the conductor tracks do not affect the intensity of the light generated by the light-emitting diodes and thrown back by the reflective layer because of the scattering body.

30 A cabinet with rotatable presentation surfaces is known from FR-OS 2 624 712. The multi-sided cabinet of columnar form has side parts of glass and has a lighting device in

the upper part and disk-shaped presentation surfaces in the interior, which are circular and are fixed at intervals above one another at their centers on a vertical shaft extending through the cabinet, while the shaft can be set in rotation by a drive device fitted in the upper part of the cabinet. The disk-shaped presentation surfaces consist of glass.

5 Finally a substrate for reception of electronic components is known from WO 97/03460. The substrate consists of a glass plate, on which are fitted electronic components in the form of thin film elements such as for example diodes, capacitors and resistors, which are covered with a protective layer. The conductor tracks for connecting the said components to a chip are connected together via a wiring layer, which is applied lithographically. The
10 intended advantage of such a construction is a high packing density.

SUMMARY OF THE INVENTION

The object of the invention now consists in significantly developing the use of a lighting device of the kind initially referred to, so that it is suitable in particular for lighting display windows, sales and/or display cabinets.

15 This object is met in that the support plate is formed as a glass plate and in that the conductor tracks are applied as an electrically conducting, thin and invisible or nearly invisible layer on the glass plate.

The glass plate can form one or more parts of a cabinet, only the applied light-emitting diodes but not the conductor tracks being visible. Thus for example a glass plate thus
20 formed can be used as an intermediate floor to receive a display, wherein the light-emitting diodes disposed on the underside radiate light downwardly and illuminate the display underneath, while the display on the intermediate floor is illuminated by the light-emitting diodes of a glass plate formed in the same way, which forms the upper cover of the cabinet. It is also conceivable to fit the lighting device in the frame of a display window frame, where
25 illumination of the display is possible by a suitable arrangement of the light-emitting diodes on the inside of the display window pane. A further field of application is use for advertising purposes, where representation of letters and figures is possible by a suitable arrangement of light-emitting diodes on the inner or outer side of a display window pane, without the optical characteristics thereof being affected in consequence, since the conductor tracks are invisible
30 or at least nearly invisible.

According to a further broad aspect of the present invention there is provided an illumination device which comprises a large number of light-emitting diodes which are secured to a surface of a carrier plate and which are electrically connected to conductor tracks attached to the carrier plate. The device is characterized in that the carrier plate is configured

as a crystal clear glass plate and in that the conductor tracks are applied to the glass plate as an electrically conducting, thin and invisible or practically invisible layer.

According to a further broad aspect of the present invention there is provided the combination of a showcase with the illuminating device as above described and in that the
5 glass plate is inserted as an intermediate base and wherein the light-emitting diodes are located on the underside of the glass plate.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be explained in more detail with reference to an embodiment,

which is shown in the drawings, in which:

Fig. 1 is a plan view of a glass plate,

Fig. 2 is a side view of a glass plate and

Fig. 3 is a perspective view of a cabinet.

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DESCRIPTION OF THE PREFERRED EMBODIMENT

First conductor tracks 2 and second conductor tracks 3 are applied alternately on a surface 9 of a glass plate 1, parallel to one outer edge 10 of the glass plate 1, all the first conductor tracks 2 being connected to a common terminal 4 and all the second conductor tracks 3 to a common terminal 5. The terminals 4 and 5 are likewise formed as conductor tracks which run parallel to the two outer edges 11 and 12 which are perpendicular to the outer edge 10. The distance between the first conductor track 2 and the second conductor track 3 is so chosen that it corresponds to the distance between the first terminal 7 and the second terminal 8 of a light-emitting diode 6. The conductor tracks 2, 3, 4 and 5 and the light-emitting diodes 6 can also be applied on both sides of the glass plate 1. A glass plate 1 is to be understood as a crystal clear glass plate of mineral glass or even of a suitable plastics material.

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The conductor tracks 2, 3, 4 and 5 are applied by evaporation of metal on to the glass plate 1, the dimensions of the individual conductor tracks being so selected that they have sufficient conducting power for the current supply on the one hand and on the other are kept to a thickness such that they remain invisible or at least nearly invisible. Where a light-emitting diode 6 is to be applied each electrical connection point for its two terminals 7 and 8 is tinned on the respective conductor track 2 or 3, so that a soldered connection can be made between the terminals 7, 8 of a light-emitting diode 6 and the conductor tracks 2 and 3.

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Light-emitting diodes which generate a white light are preferably used as the light-emitting diodes 6. Light-emitting diodes of different colors can be used to obtain other tones, with which light-emitting diodes emitting white light can be combined, which applies also for the creation of special effects.

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The use of the lighting device according to the invention in a sales or display cabinet will now be explained in more detail with reference to the illustration according to Fig. 3, although the use of the lighting device is not limited solely to such cabinets. A further field of application of the invention is for example use for lighting or advertising purposes,

where writing and/or figures can be represented by the light-emitting diodes on a display window pane through a suitable arrangement of the light-emitting diodes. The optical characteristics of a crystal clear display window pane are hardly affected by the use of the invention, if it or a part thereof is formed as a glass plate 1.

5 In the cabinet shown in Fig. 3 the glass plate 1 is used as an intermediate floor 13, wherein the light-emitting diodes 6 are disposed on the under surface of the glass plate 1. The glass plate 1 can also form the upper part 14 of the cabinet 1 or be fitted to this on the side facing the interior of the cabinet, so that the light of the light-emitting diodes 6 is likewise directed down into the interior of the cabinet. A further use of the glass plate 1 can
10 consist in that it is fitted as a narrow strip in front of a corner 15 of the cabinet, the light-emitting diodes 6 again being disposed on the side of the glass plate 1 facing the interior of the cabinet. It is however also conceivable to dispose the light-emitting diodes 6 for optical reasons on the side of the glass plate 1 facing the corner 15. In addition one or more complete sidewalls 16 or a part thereof can be formed as a glass plate 1. The current supply
15 for the intermediate floor 13, the upper part 14 or for lighting the corner 15 can equally be effected via conductor tracks which are applied on one or more sidewalls 16 and correspond in their construction to the conductor tracks 2 and 3 of the glass plate 1.

 The current supply for the light-emitting diodes on the glass plate 1 fitted in a frame of a cabinet can be effected through a current supply device which is fitted for example in
20 the bottom part 18 of the cabinet. This comprises a rechargeable battery which is charged by a solar cell arrangement on the upper side 17 of the upper part 14. The switching on and off of the current supply device and the brightness control can be effected without wires through a remote control device.

CLAIMS,

1. Illumination device comprising a large number of light-emitting diodes which are secured to a surface of a carrier plate and which are electrically connected to conductor tracks attached to the carrier plate, characterized in that the carrier plate is configured as a crystal-clear glass plate (1) and in that the conductor tracks (2,3) are applied to the glass plate (1) as an electrically conducting, thin and invisible or practically invisible layer.

2. Illumination device according to claim 1, characterized in that connections (4,5) of the conductor tracks (2,3) are also applied to the glass plate (1) as an electrically conducting, thin and invisible or practically invisible layer.

3. Illumination device according to claims 1 or 2, characterized in that the conductor tracks (2,3) and their connections (4,5) are vapour-deposited as a metal layer onto the glass plate (1).

4. Illumination device according to one of claims 1 to 3, characterized in that the conductor tracks (2,3) and their connections (4,5) are applied to one of two surfaces of the glass plate (1).

5. Illumination device according to one of claims 1 to 4, characterized in that the light-emitting diodes (6) are attached to the surface (9) of the glass plate (1) which bears the conductor tracks (2,3) and their connections (4,5).

6. Illumination device according to claim 5, characterized in that the light-emitting diodes (6) produce white light.

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7. Illumination device according to claim 5, characterized in that some of the light-emitting diodes (8) produce white light and the remaining light-emitting diodes (6) produce light of some other colour.

8. Illumination device according to claim 4, characterized in that both surfaces of the glass plate (1) are provided with the conductor tracks (2,3), connections (4,5) of the conductor tracks and the light-emitting diodes (8).

9. Combination of a showcase with an illumination device according to claim 1, characterized in that the glass plate (1) is inserted as an intermediate base (13), the light-emitting diodes (8) being located on the underside of the glass plate (1).

10. Combination of a showcase with an illumination device according to claim 1, characterized in that the glass plate (1) is attached below an upper portion (14) of a showcase or respectively forms the upper portion (14) itself, the light-emitting diodes (8) being located on a side of the glass plate (1) facing an interior of the showcase.

11. Combination of a showcase with an illumination device according to claim 1, characterized in that the glass plate (1) is attached in the form of a narrow strip in one or more corners (15) inside a show case, the light-emitting diodes (6) being located on a side of the glass plate (1) facing an interior of the showcase.

12. Combination of a showcase with an illumination device according to claim 1, characterized in that an entire side wall (16), or a portion of same, of a showcase is formed from

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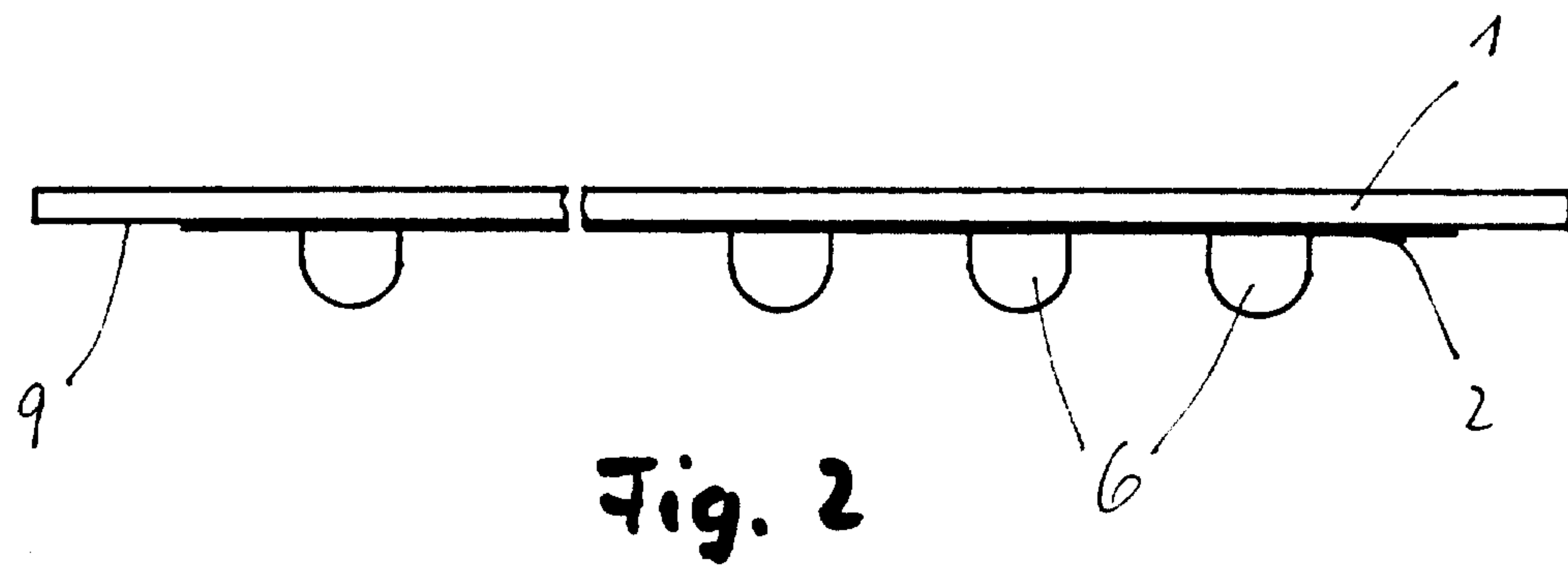
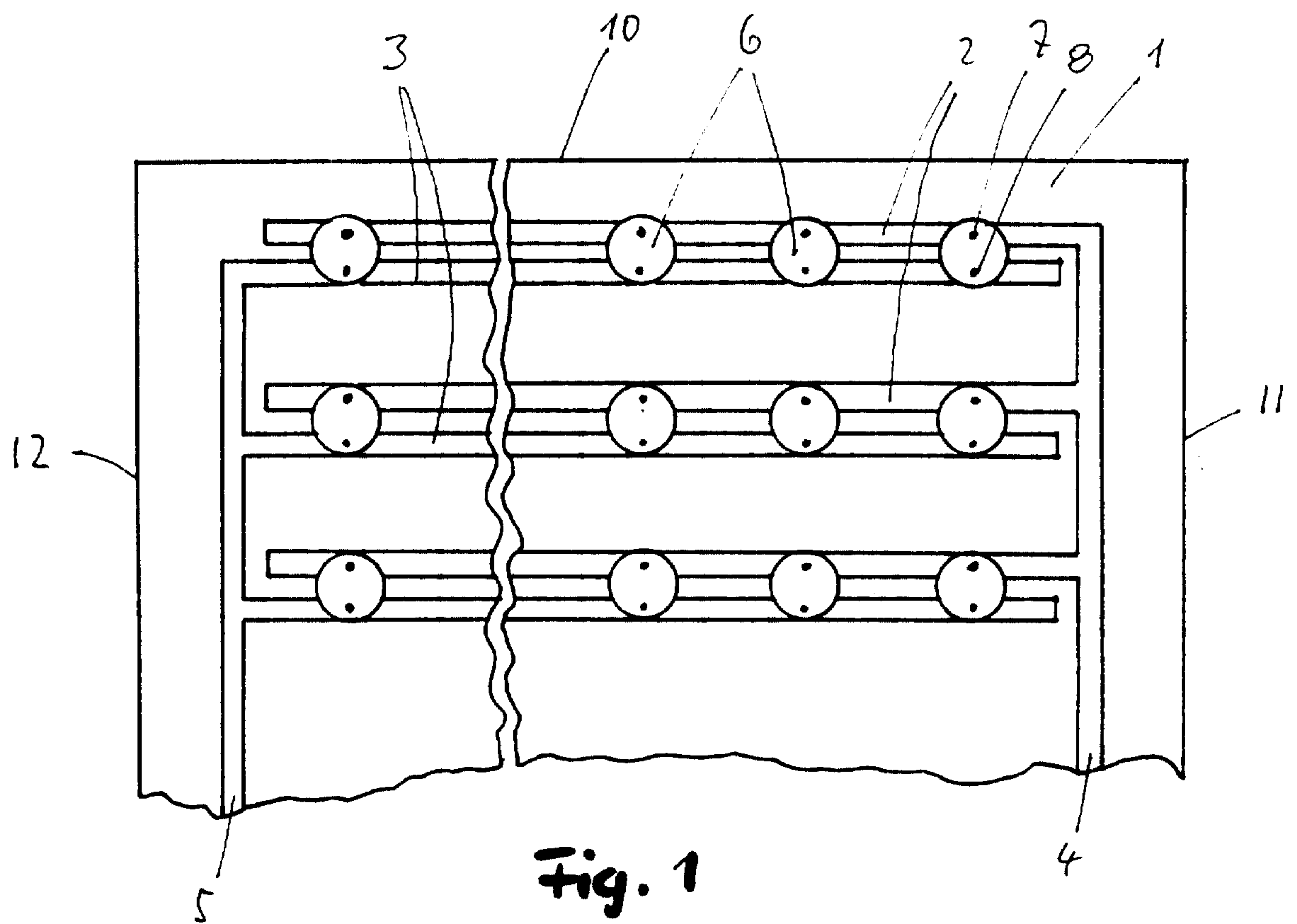
the glass plate (1), the light-emitting diodes (6) being located on a side facing an interior of the showcase.

13. Combination of a showcase with an illumination device according to claim 1, characterized in that the light-emitting diodes (6) are supplied with electrical energy by a power supply device which is installed in a showcase.

14. Combination of a showcase with an illumination device according to claim 13, characterized in that the power supply device has an accumulator which can be charged by solar cells attached to an upper face (17) of the showcase.

15. Combination of a showcase with an illumination device according to one of claims 13 or 14, characterized in that the power supply device can be switched on and off by a wireless remote control device and wherein the brightness of the light-emitting diodes (6) can be adjusted via the remote control device.

16. Combination of a showcase with an illumination device according to claim 5, characterized in that supply lines to the connections (4,5) of the conductor tracks (2,3) are configured in the form of conductor tracks which correspond in structure to the conductor tracks (2,3) of the glass plate (1) and which are applied to one or more side walls (16) of the showcase.



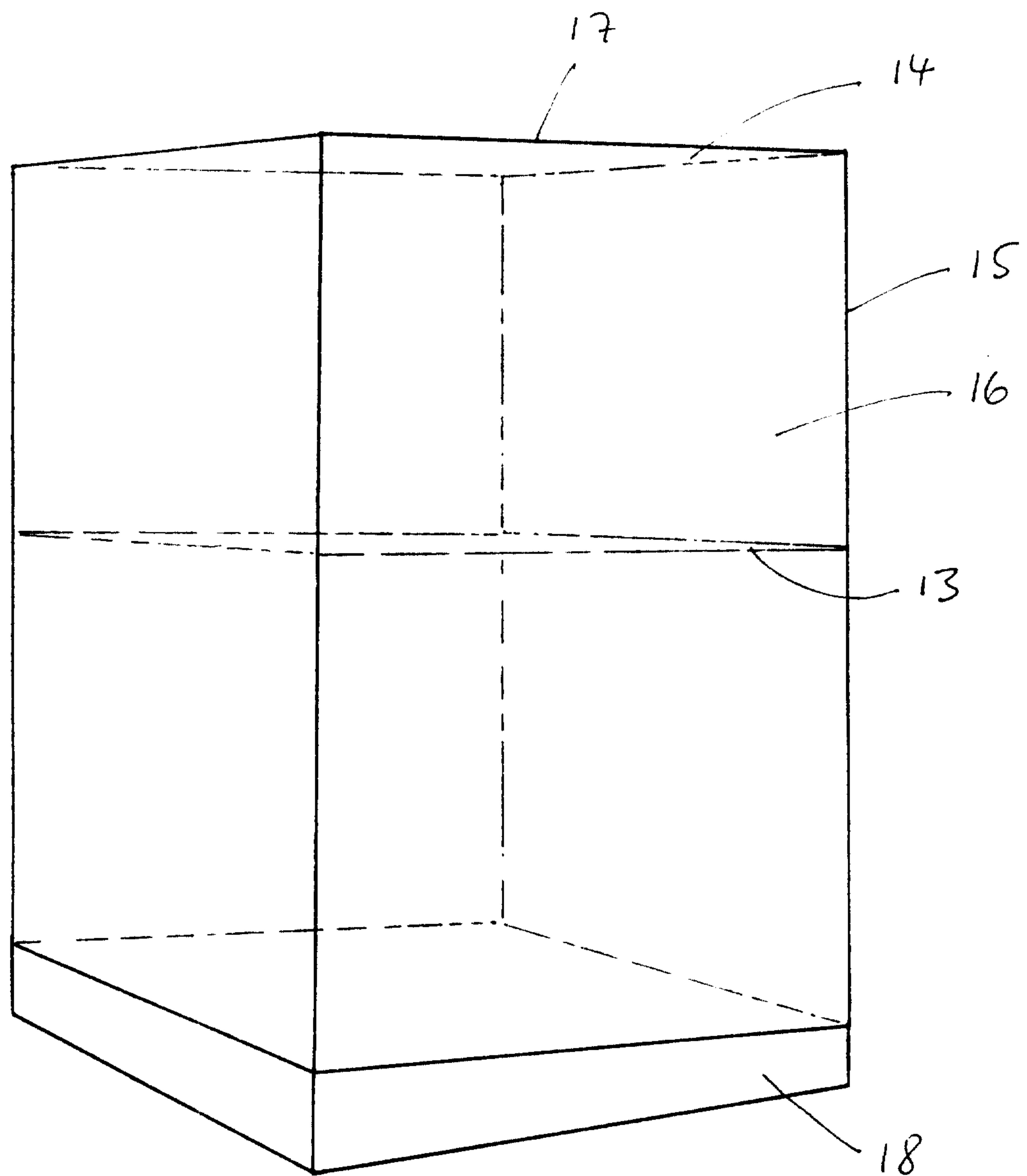


Fig. 3

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