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(54) **Mirror with back illumination**

Spiegel mit Rückseitenbeleuchtung

Miroir rétro-éclairé

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(73) Proprietor: **Dubiel Vitrum Sp. J.
34-700 Rabka Zdrój (PL)**

(72) Inventor: **Dubiel, Andrzej
34-700 Rabka-Zdrój (PL)**

(74) Representative: **Tabor-Kmiecik, Katarzyna
Kancelaria Patentowa dr Wojciech Tabor
ul. Mazowiecka 28A/8-9
30-019 Krakow (PL)**

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Description

[0001] The subject of invention is a mirror with back illumination where a mirror plate is a fragment of a surface conducting light emitted to the area in front of the mirror.

[0002] Solutions of illuminated mirrors are known in which on the mirror plate there are light-conducting chemically or mechanically matted surfaces without a reflective layer. Light-conductive surfaces illuminate the area in front of the mirror with the use of light sources, such as light-emitting diodes (LEDs), mounted on the back of the mirror. One of such solutions, shown in the German utility model No. DE 2020040D0705U, has a rectangular mirror plate supported in a frame by a channel-shaped section, covering edges of the mirror plate with its arm ends. There is free space between the frontal surfaces of mirror edges and section centre in which strips of light-emitting diodes (LEDs) are affixed to an inner surface of a web. Parallel to the edge of the mirror plate is a rectangular, frame-like light-conductive surface illuminating the area in front of the mirror by means of LED light-beam introduced circumferentially in the direction parallel to a transparent surface of the mirror plate.

[0003] The Polish patent application for invention No. P-398408 describes a back-illuminated mirror with a light-conductive surface. The mirror plate from behind has a tightly attached shield which covers the entire surface of the plate. The shield is a thin-walled plastic fitting, vacuum-thermoformed from a sheet. The circumferential edge of a rim is covered with a flexible and springy U-shaped seal. The seal is fastened with bolt connectors affixed to the mirror plate. Electric lighting system components are installed between the mirror plate and the shield.

[0004] Document DE102006015865 A1 discloses a mirror with back illumination according to the preamble of claim 1.

[0005] The mirror according to the invention - similarly to the above patent descriptions - has a transparent mirror plate with a reflective layer and at least one freely shaped light-conductive surface being illuminated from behind by strips of light-emitting diodes and being enclosed in a sealed shield.

The essence of the invention lies in the fact that the sealed shield is in the form of a thin-walled vacuum-thermoformed plastic fitting and has at least one lighting channel covering the at least one freely shaped light-conductive surface along its edges. The lighting channel shape is similar in its cross-section to a letter C whose side walls end with an outwardly directed rim, adjacent to the mirror plate while the LED strips are affixed to the inner surface of both side walls of the lighting channel.

[0006] The shield is preferably made of a material with a low absorption of light, especially in white.

[0007] It is also beneficial when the shield is connected with the mirror plate by means of bolt connectors which are glued to the mirror plate and which press down the shield by preloading washers embedded in hollows and

by a seal affixed under the rim.

[0008] Another advantageous solution features a shield whose edges are glued to the mirror plate.

The mirror can be suspended by means of hanging holes made in the shield. Around these hanging holes the wall is reinforced by a glued metal plate or by Z-shaped metal hangers with a height greater than the shield thickness, which have one arm affixed to the back surface of the mirror plate, in a fragment with a reflective layer, and which have a hanging hole in a corner of the second arm.

[0009] Interior design is enhanced by a version where a decorative motif, rich in colours and design elements, with a light-conductive layer is applied on the inner side of the mirror plate, within the light-conductive surface.

[0010] The presented mirror according to the invention emits light by diffuse radiation directed orthogonally towards the mirror plate, with homogeneous luminosity. The light is energy efficient due to the fact that space of the lighting channel is reduced to the cross-wise dimension of the light-conductive surface. The lighting channel has a low-absorption surface, and white shield material is especially preferred. The structure is light with a thin mirror, and a vacuum-thermoformed shield made of a thin plastic sheet is inexpensive and flexible when changing the design.

[0011] The mirror according to the invention is described on the example of several design versions shown in the figure. Individual figures show as follows:

- Fig. 1, 2 and 3 - a rectangular bathroom mirror, respectively, in front view, rear view, and cross-section along the AA line indicated in Fig. 2.
- Fig. 4, 5, 6 and 7 - a round wall mirror, respectively, in front view, rear view, and in fragmentary sections indicated in Fig. 5 by C-C and D-D letters,
- Fig. 8 and 9 - a rectangular decorative mirror in front and rear view,

[0012] The bathroom mirror illustrated in Fig. 1, 2 and 3 has a rectangular mirror plate (1) with two light-conductive surfaces (2) in a form of two strips parallel to lateral vertical edges. The back surface of the mirror plate (1) is covered with a shield (3), which is vacuum-thermoformed from a thin sheet of white plastic and positioned on a wooden form. The shield (3) has two cavities on both sides with a shape similar in its cross-section to a letter C, covering the light-conductive surfaces (2) along their edges and forming channels (4) for light emitted by LED strips (5) which are affixed to the inner surface of side walls (6). Side walls (6) of lighting channels (4) are ended with outwardly directed rims (7) which are adjacent to the mirror plate (1). The shield (3) is connected to the mirror plate (1) by means of bolt connectors (8) which are glued to the mirror plate (1) and which press down the shield (3) by preloading washers (10) embedded in hollows (9) and by a seal (11) affixed under the rim (7). The shield (3) also features hanging holes (12), around which the wall is reinforced by a glued metal plate (13).

The shaping of the central part of the shield (3) between the lighting channels (4) - hollows (9), hanging holes (12), and horizontal cavities in which the electrical equipment with a power adapter (17) is mounted, make the shield (3) rigid, tight and allow for the safe use of the mirror in rooms exposed to high humidity.

[0013] A round wall mirror illustrated in Fig. 4, 5, 6 and 7 has a light-conductive surface (2) in the form of a concentric ring at the outer edge of the mirror plate (1). This version features a shield (3) which covers only the peripheral surface of the lighting channel (4), affixed with its rim (7) to the mirror plate (1). The central part of the mirror plate (1) is open and features affixed two hangers (14) in the upper part and two spacers (16) in the lower part, all of which are spaced at the corners of a square, and a power adapter (17) in the middle.

Z-shaped, bent hangers (14) from sheet metals have a height greater than the shield (3) thickness, are affixed with one arm to the back surface of the mirror plate (1), and have a hanging hole (12) in a corner of the second arm.

[0014] A decorative mirror illustrated in Fig. 8 and 9 has two light-conductive surfaces (2). The one with a larger surface area is located on the left vertical side of the mirror and, on the inner side of a mirror plate (1), it features an affixed film with a decorative motif (15) printed with the use of light-conductive paints. The second light-conductive surface (2), in the form of a horizontal strip located along the upper edge of the mirror plate (1), has an illuminating function only. Both surfaces are covered with two different shields (3), affixed to the mirror plate (1). As in the case of the above-described mirrors, hangers (14) and spacers (16) are glued to the mirror plate in the open space between the shields (3).

List of figure markings

[0015]

1. mirror plate
2. light conductive surface
3. shield
4. lighting channel
5. LED strip
6. side wall
7. rim
8. bolt connector
9. hollow
10. preloading washer
11. seal
12. hanging hole
13. metal plate
14. hanger
15. decorative motif
16. spacer
17. power adapter

Claims

1. A mirror with back illumination having a transparent mirror plate (1) with a reflective layer and at least one freely shaped light-conductive surface (2), said at least one freely shaped light-conductive surface (2) being illuminated from behind by strips of light-emitting diodes (5) and being enclosed in a sealed shield (3) **characterized in that** the sealed shield (3) is in the form of a thin-walled vacuum-thermoformed plastic fitting and has at least one lighting channel (4) covering the at least one freely shaped light-conductive surface (2) along its edges, said lighting channel (4) shape is similar in its cross-section to a letter C whose side walls (6) end with an outwardly directed rim (7), adjacent to the mirror plate (1), the LED strips (5) are affixed to the inner surface of both side walls (6) of said lighting channel (4).
2. A mirror according to claim 1 **characterized in that** its shield (3) is made of a material with a low absorption of light, especially in white.
3. A mirror according to claim 1 **characterized in that** the shield (3) is connected with the mirror plate (1) by means of bolt connectors (8) which are glued to the mirror plate (1) and which press down the shield (3) by preloading washers (10) embedded in hollows (9) and by a seal (11) affixed under the rim (7).
4. A mirror according to claim 1 **characterized in that** the rim (7) of the shield (3) is glued to the mirror plate.
5. A mirror according to claim 1 or claim 2 or claim 3 or claim 4, **characterized in that** two hanging holes (12) are made in the shield (3) and around them a wall is reinforced by a glued metal plate (13).
6. A mirror according to claim 1 or claim 2 or claim 3 or claim 4, **characterized in that** Z-shaped metal hangers (14) with a height greater than the shield (3) thickness have one arm affixed to the back surface of the mirror plate (1), in a fragment with the reflective layer, and which have the hanging hole (12) in a corner of the second arm.
7. A mirror according to claim 1, **characterized in that** the light-conductive surface (2) on an inner side of the mirror plate (1) has a decorative motif (15) printed with the use of light-conductive paints.

Patentansprüche

1. Spiegel mit Hinterbeleuchtung, mit transparenter Spiegeltafel (1), mit Reflexionsschicht und mindestens einer frei geformten lichtdurchlässigen Fläche (2), wobei mindestens eine frei geformte lichtdurch-

lässige Fläche (2) von hinten mit den das Licht emittierenden Diodenreihen beleuchtet wird (5) und in einem dichten Gehäuse (3) geschlossen ist, welche die Form einer dünn-schichtigen, thermisch vakuumgeformten Befestigung aus Kunststoff hat und mindestens einen Beleuchtungskanal (4) besitzt, der mindestens eine frei geformte lichtdurchlässige Fläche (2) entlang deren Kante bedeckt, wobei die Form des o.g. Beleuchtungskanals (4) in ihrem Querschnitt an die C-Buchstabe ähnelt, deren Seitenwände (6) mit einem nach außen gerichteten Ring (7) enden, der an die Spiegeltafel (1) eng anliegt, und die LED-Diodenreihen (5) an die innere Seite der beiden Seitenwände (6) des o.g. Beleuchtungskanals (4) befestigt sind.

2. Gemäß Anspruch 1 ist der Spiegel dadurch charakteristisch, dass sein Gehäuse (3) aus einem das Licht (insbesondere Weißlicht) gering aufnehmenden Stoff ausgeführt ist.
3. Der Spiegel, gemäß Anspruch 1 ist dadurch charakteristisch, dass das Gehäuse (3) an die Spiegeltafel (1) mittels Schraubenverbindungen (8), die an die Spiegeltafel (1) angeklebt sind, angeschlossen ist und die das Gehäuse (3) nach unten mittels vorbelasteten Unterlagen (10) drücken. Die Unterlagen sind in den Vertiefungen (9) eingesetzt und die Dichtung (11), welche das Gehäuse zusammen mit den Schraubenverbindungen nach unten drückt, ist unter dem Ring (7) befestigt.
4. Der Spiegel, gemäß Anspruch 1 ist dadurch charakteristisch, dass der Ring (7) des Gehäuses (3) an die Spiegeltafel aneklebt ist.
5. Der Spiegel, gemäß Anspruch 1 bzw. gemäß Anspruch 2, bzw. gemäß Anspruch 3, bzw. gemäß Anspruch 4 ist dadurch charakteristisch, dass im Gehäuse (3) zwei Öffnungen zum Aufhängen (12) ausgeführt wurden, und die Wand um diese Öffnungen herum mittels einer angeklebten Metallscheibe (13) befestigt ist.
6. Der Spiegel, gemäß Anspruch 1 bzw. gemäß Anspruch 2, bzw. gemäß Anspruch 3, bzw. gemäß Anspruch 4 ist dadurch charakteristisch, dass die Haken (14) in Form der Buchstabe Z und der Höhe, die nicht größer als die Dicke der Gehäuse (3) ist, einen Arm haben, der an die hintere Fläche der Spiegeltafel (1) in dem Teil mit der Lichtreflexionsschicht befestigt ist und welche eine Öffnung zum Aufhängen (12) in der Ecke des zweiten Armes haben.
7. Der Spiegel, gemäß Anspruch 1 ist dadurch charakteristisch, dass die lichtdurchlässige Fläche (2) an der inneren Seite der Spiegeltafel (1) ein Ziermotiv (15) hat, das mittels den lichtdurchlässigen Farben

eingedruckt wurde.

Revendications

1. Le miroir rétro-éclairé ayant une plaque de miroir transparente (1) avec une couche réfléchissante et au moins une surface en forme libre transmettant la lumière (2), dans lequel au moins une surface en forme libre transmettant la lumière (2) est rétro-éclairée au moyen de séries de diodes électroluminescentes (5) et fermée dans une enceinte étanche (3), qui se présente sous la forme d'une fixation à parois minces, thermoformée sous vide, faite en matière plastique et comporte au moins un canal éclairant (4) recouvrant au moins une surface en forme libre transmettant la lumière (2) le long de son bord, où la forme dudit canal éclairant (4) ressemble de par sa section transversale à la lettre C, dont les parois latérales (6) se terminent par un collier orienté vers l'extérieur (7) adjacent à la plaque de miroir (1), et des séries de diodes DEL (5) sont fixées à la surface intérieure des deux parois latérales (6) dudit canal éclairant (4).
2. Le miroir selon la revendication 1, **caractérisé en ce que** son enceinte (3) est constituée d'un matériau à faible absorption de la lumière, en particulier blanc.
3. Le miroir selon la revendication 1 **caractérisé en ce que** l'enceinte (3) est reliée à la plaque de miroir (1) au moyen d'assemblages boulonnés (8) collés à la plaque de miroir (1), et pressant l'enceinte (3) vers le bas avec les rondelles pré-chargés (10) monté dans des évidements (9), et d'un joint (11) fixé sous le collier (7).
4. Le miroir selon la revendication 1 **caractérisé en ce que** le collier (7) de l'enceinte (3) est collé à la plaque de miroir.
5. Le miroir selon la revendication 1 ou la revendication 2, ou la revendication, ou la revendication 4, **caractérisé en ce que** l'enceinte (3) a deux trous pour accrochage (12), et le mur autour d'eux est renforcé avec une plaque métallique collée (13).
6. Le miroir selon la revendication 1 ou la revendication 2, ou la revendication 3, ou la revendication 4, **caractérisé en ce que** des crochets métalliques (14) sous la forme de la lettre Z d'une hauteur supérieure à l'épaisseur de l'enceinte (3) on un bras fixé à la surface arrière de la plaque de miroir (1) dans le fragment avec la couche réfléchissante et qui ont un trou pour accrochage (12) dans le coin du second bras.
7. Le miroir selon la revendication 1 **caractérisé en ce**

que la surface transmettant la lumière (2) du côté interne de la plaque de miroir (1) possède un motif décoratif (15) imprimé avec des encres transmettant la lumière.

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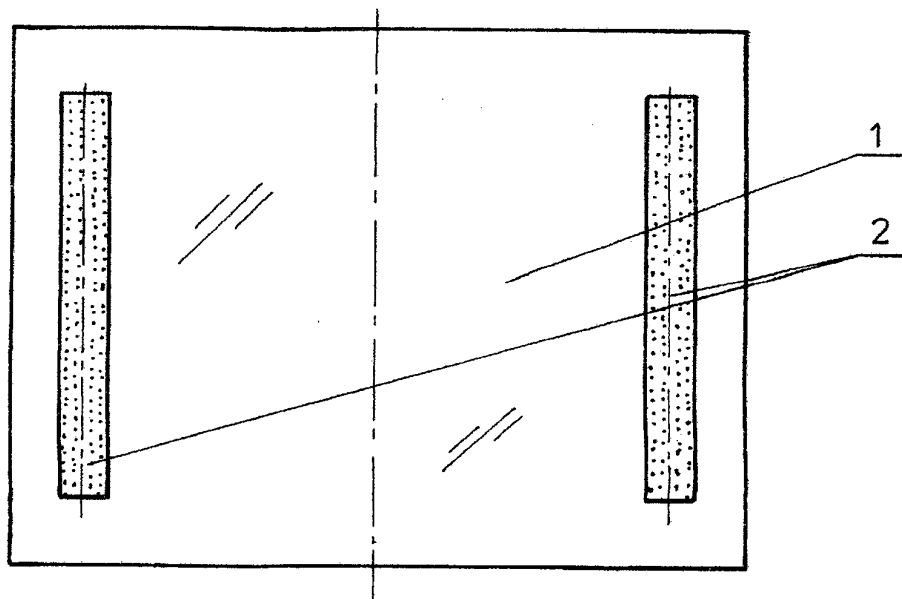


FIG.1

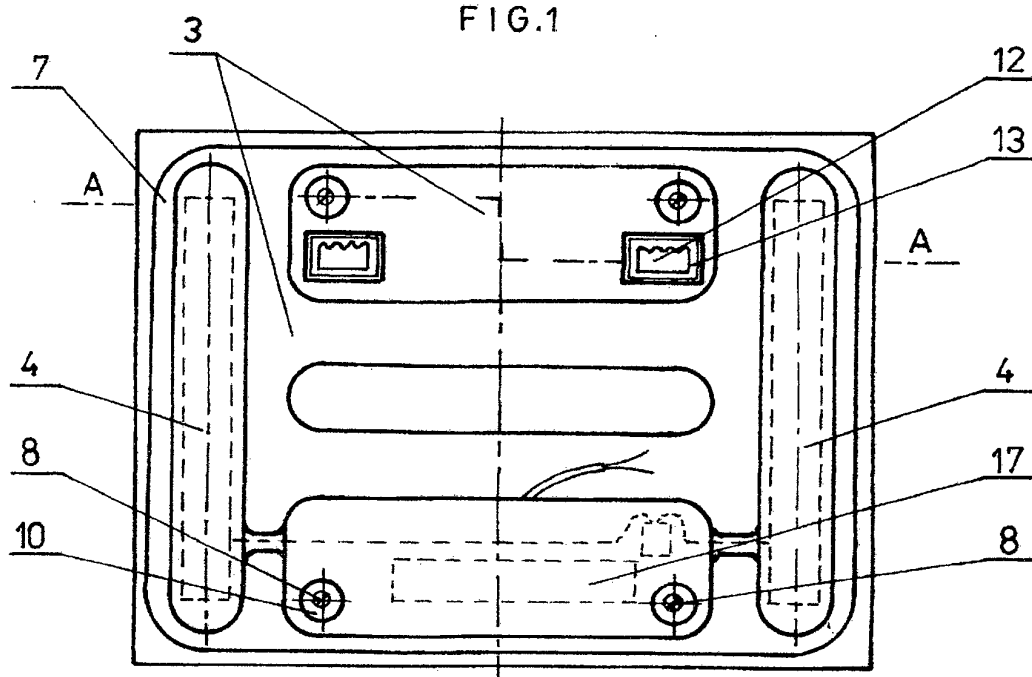


FIG.2

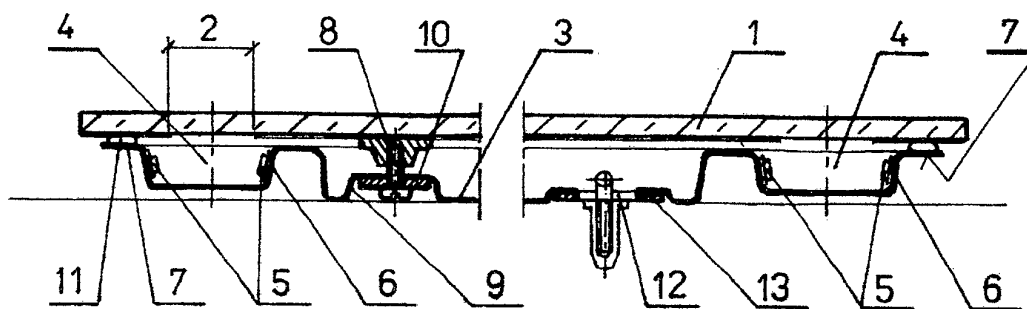


FIG.3

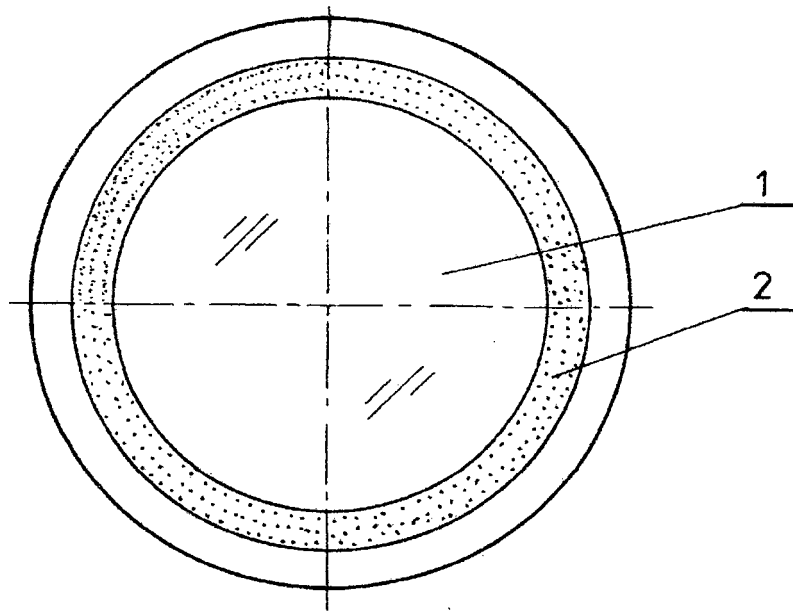


FIG. 4

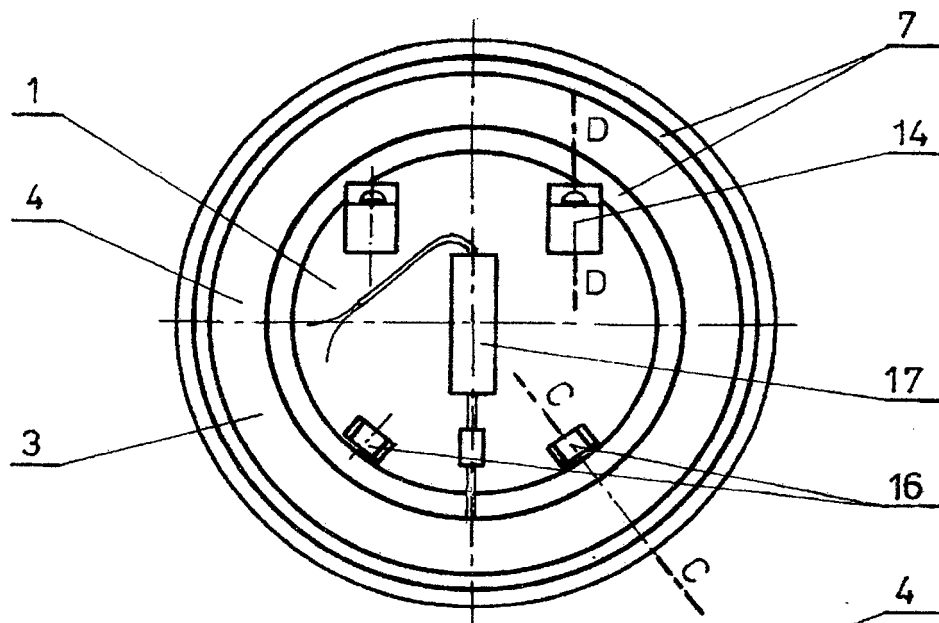


FIG. 5

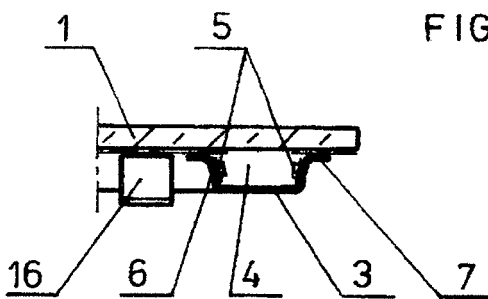


FIG. 6

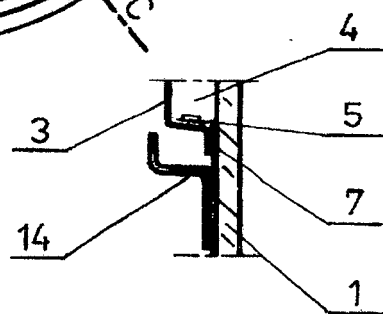


FIG. 7

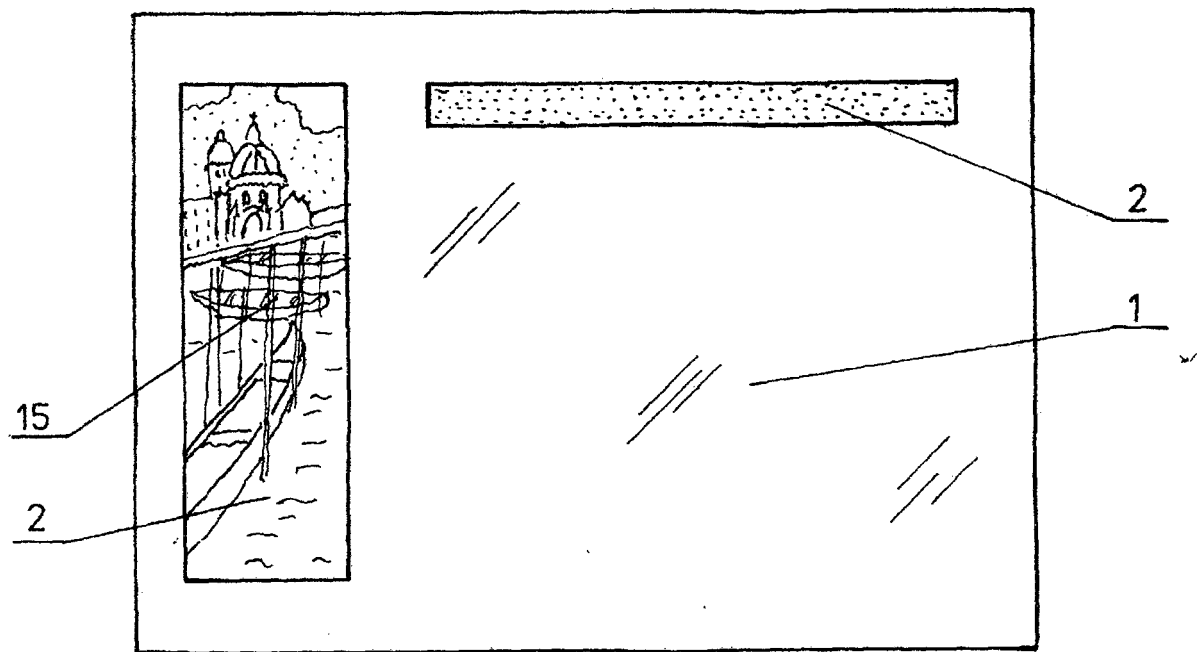


FIG. 8

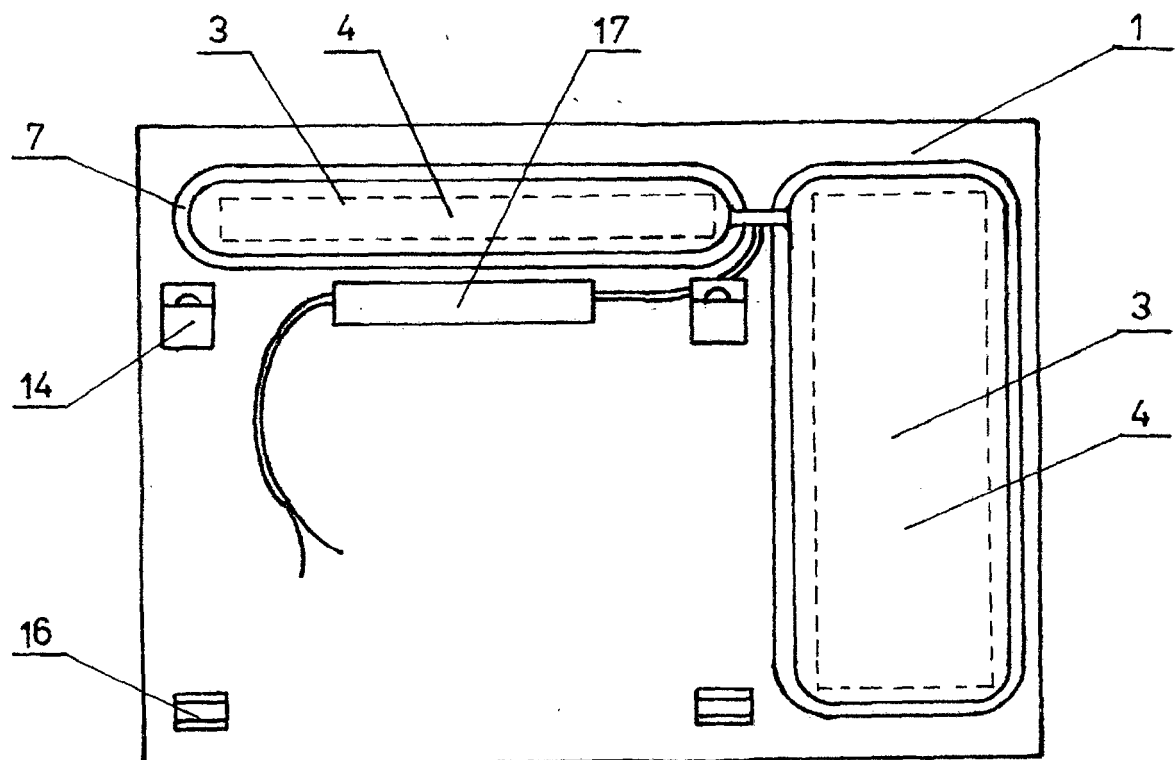


FIG. 9

REFERENCES CITED IN THE DESCRIPTION

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