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(54) Mounting system for lighting fixtures

(57) The present invention concerns a mounting system (1) for at least one fixture (4), including a ceiling panel (2) with a top side and an underside which is provided with a covering, and where in the ceiling panel (2) there is made a preferably rectangular, elongated opening (8) with a number of side edges, and at least one fixture box (3) which is provided with at least one open side, where the open side of the fixture box (3) is connected with the top side of the ceiling panel (2).

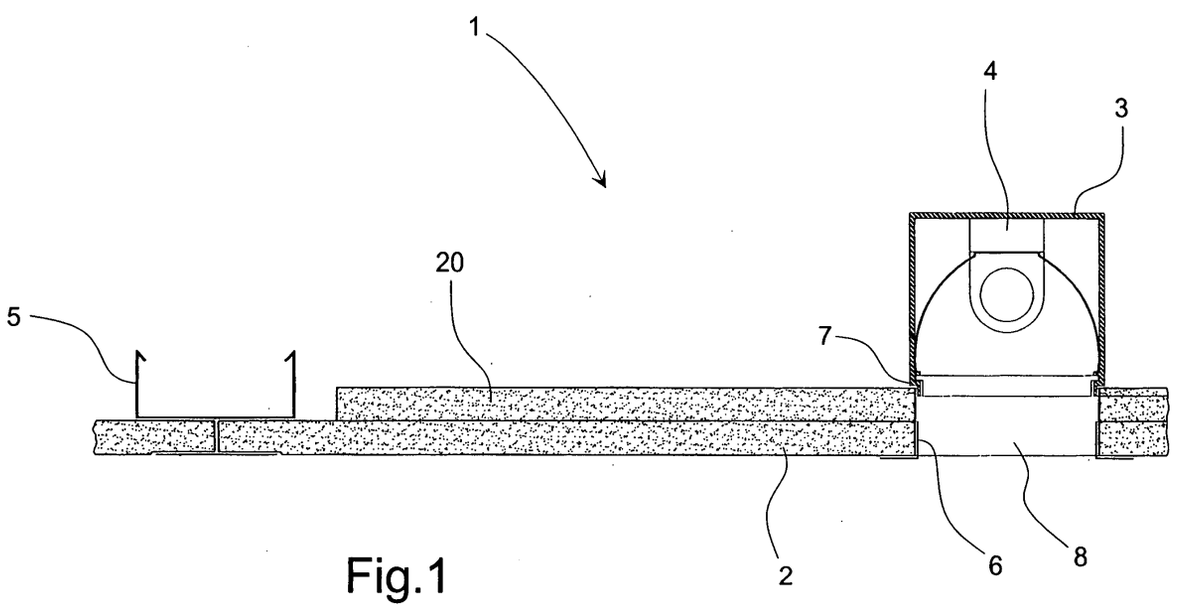

Fig.1

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Description

[0001] The present invention concerns a mounting system for at least one fixture, including a ceiling panel with a top side and an underside which is provided with a covering, and where in the ceiling panel there is made a preferably rectangular, elongated opening with a number of side edges, and at least one fixture box which is provided with at least one open side.

Background of the Invention

[0002] Fixture boxes with flanges extending down under the ceiling panel while getting hold of the underside of the ceiling panel simultaneously with the fixture box at the top side of the ceiling plate being provided with clamping abutments are visible and project down into the room. Therefore, they have an unwanted visual effect and they will not be relevant in buildings where unobtrusive design of the ceiling lighting is desired.

[0003] In order to avoid the above problem with visible fixture boxes, there is provided fixture boxes that are fastened at the underside of the ceiling panel with screws or the like through contact surfaces, after which felt is used for covering the contact faces, and where irregularities are filled up subsequently.

[0004] However, there are several drawbacks in using such a fixture box:

- The contact surfaces of the fixture box and the ceiling panel material are working under the action of temperature changes and moisture. This entails that the felt for covering the contact surfaces cracks and the filling cracks, something which is very visible at the underside of the ceiling panel.
- Typically, different workmen mount the ceiling panels and the fixture boxes. This implies that problems may arise for e.g. carpenters and electricians to get enough space when they are to be at the same place at the same time.
- It is very difficult to mount the boxes so that the suspended ceiling gets a uniform appearance on the entire visible ceiling face. It is difficult to perform a uniform finish, particularly around the openings for the fixture boxes in the ceiling panels.
- The filled underside does not have the same absorbing properties as the underside of the ceiling panel, which can cause unwanted play of colours when the underside of the ceiling panel is treated with e.g. paint or the like.

Purpose of the Invention

[0005] It is therefore the purpose of the present invention to provide a mounting system for at least one fixture box in a ceiling panel, where mounting of ceiling panels and fixture box is simplified, and where simultaneously there may be performed a uniform finishing of the underside of the suspended ceiling.

[0006] This is achieved with an apparatus as described in the introduction of claim 1, and where the open side of the fixture box is connected with the top side of the ceiling panel.

Description of the Invention

[0007] In order to simplify the mounting process, the open side of the fixture box is connected with the top side of the ceiling panel so that the fixture box lies on the top side of the ceiling panel, implying that no parts of the fixture box are protruding down below the underside of the ceiling panel, and that the fixture box is not fastened with screws or the like in order to stay in the desired position. In order to get a uniform finish around the opening for the fixture box, it is important that the ceiling panel is not perforated at the underside when the fixture box is mounted.

[0008] The mounting process is thereby simplified since the electrician can install the electric installations in the interspace between the ceiling and the suspended ceiling, after which the carpenter can put up the ceiling panels, and the underside of the ceiling panels can be surface treated, after which the electrician can mount and connect the fixture box. In this way, the carpenter and the electrician will not work at the same place at the same time.

[0009] Furthermore, it will be possible to perform a uniform finishing of the underside of the suspended ceiling, as the opening in the ceiling panel does not have to be filled up.

[0010] The ceiling panel in which a fixture box is to be mounted, is provided with an elongated opening in which the fixture box is to be placed. In a preferred embodiment of the invention, this elongated opening is prefabricated so that the carpenter only has to know where a ceiling panel with an opening is to be fitted. This implies that the carpenter does not have to cut out the openings in a standard ceiling panel, and that openings in the ceiling panels become more uniform.

[0011] For easy fitting the fixture box, it is designed so that it has a height which is less than the width of the opening, and that the open side of the fixture box has a width at least corresponding to the width of the opening in the ceiling panel.

[0012] This implies that the fixture box can be inserted in the opening by turning it 90° to one side. When the fixture box subsequently is up in the interspace between the ceiling and the suspended ceiling, the fixture box is turned 90° back and may be disposed with the open side down against the top side of the ceiling panel. As the open side of the fixture box has a width at least corresponding to the width of the opening in the ceiling panel, the fixture box will remain lying at the top side of the ceiling panel.

[0013] In an embodiment of the invention, the width of the open side of the fixture box is greater than the

width of the opening in the ceiling panel, whereby it is possible to place the fixture box loosely at the top side of the ceiling panel, so that the fixture box is only connected to electric/mechanical connections or piping.

[0014] In order to retain the fixture box to the opening in the ceiling panel, the fixture box is provided with contact members at opposite long sides of the open side of the fixture box, and which contact members are designed as sockets that bear against the top side and the side edges of the opening in the ceiling panel.

[0015] These contact members have an angular part that bears against the top side of the ceiling panel and a socket part that extends down with a length into the opening and bears against a part of the side edges of the opening in the ceiling panel. A fixture panel with this type of contact members will be secured in the opening and cannot be laterally displaced, however, it will not be possible to displace the fixture box longitudinally.

[0016] As an alternative, these contact members can be designed as angles that originate from the long sides of the fixture box and in over the ceiling panel, and be designed with downwards directed projections which due to the weight of the fixture box and the fixture are bearing against the top side of the ceiling panel, whereby the fixture box is retained.

[0017] In order to connect a fixture box after mounting in the opening in the ceiling panel, the opening in the ceiling panel has greater length than the fixture box. This implies that there is access to the interspace between the ceiling and the top side of the ceiling panel. The access can be used for connecting the fixture box to the electric network, to air ducts and/or piping.

[0018] In order to cover the part of the opening which is not filled by the fixture boxes, the mounting system includes a number of blank-off plates which may be disposed either releasably connected to the fixture boxes, or designed with a width which is greater than the width of the opening in the ceiling panel, so that they, like the fixture boxes, can be disposed at the top side of the ceiling panel.

[0019] In order to get a uniform impression of the mounted fixture box, the lower edge of the blank-off plate is mounted in the opening in such a way that it lies at the same level as the lower edge of the fixture box.

[0020] This implies that it will be difficult to see the transition between fixture box and blank-off plate when standing on the floor and looking up into the opening, and blank-off plate and fixture will appear as a unified element.

[0021] In an embodiment of the invention, the blank-off plates are only used as screen plates that cover the remaining part of the opening in the ceiling panel.

[0022] In a second embodiment of the invention, the blank-off plates are adapted for mounting measuring/sensor means, signal emitters, emergency lighting or sprinklers, where:

- the measuring/sensor means can be microphones, thermometers, smoke detectors, motion sensors and the like, so that these devices can be hidden instead of being installed in the open in the room;
- the signal emitters can be loudspeaker, bells, warning lamps and the like that emit a visual or audio signal, if an undesired situation arises, e.g. an audio signal emitter may transmit a message or a wailing note in case of fire;
- emergency lighting can be a smaller fixture or a bulb unit that is lit if all other light in the room disappears;
- sprinklers can be installed, e.g. together with a smoke detector, so that by fire alarm or strong smoke/heat development, activation of the sprinklers will be effected.

[0023] In a further embodiment of the invention, the blank-off plates are designed with different shape that may constitute a uniform transition between different fixture members.

[0024] If a number of fixture boxes are to mounted in the suspended ceiling in immediate continuation of each other, the ceiling panels can be mounted staggered so that one elongated opening is formed in the room. In that way, e.g. a number of fixture boxes with different functions may be mounted.

[0025] The present invention has been described used for mounting fixtures in a suspended ceiling. These fixtures can be of different kinds, so that said fixture boxes are arranged for mounting lighting, air-conditioning, ventilation and/or sensors, where the fixture boxes:

- may be provided with sockets for common light bulbs, sockets for fluorescent tubes and the like for lighting;
- may be provided with connections for air ducts or flexible tubes for an air-conditioning system for air-conditioning;
- may be provided with filter and/or couplings for air ducts or flexible tubes for a ventilation system for ventilation;
- may be provided with sensors detecting movement, sound, smoke, temperature and the like for monitoring.

[0026] When using one of the above fixtures, the at least one open side of the fixture box can be designed so that it appears as partly open, e.g. it may be partly covered with a grating element, a guide plate, screen or the like.

[0027] A light fixture is mounted in a suspended ceiling by means of the present invention and consists of the following steps:

- all hidden installations are made ready;
- suspensions for the ceiling panels are mounted according to the prescriptions of the ceiling panel manufacturer;
- the ceiling panels are mounted, and ceiling panels

in which fixtures are to be mounted are provided with prefabricated openings;
- the underside of the ceiling panels are surface coated, e.g. painted;
- the fixture box including lighting fixture is turned so that it is possible to insert the fixture box in the opening in the ceiling panel;
- the fixture box is passed up through the opening and turned so that the contact members of the fixture box bears against the side edges of the opening;
- the light fixture in the fixture box is connected to power; and
- blank-off plates are disposed over the uncovered parts of the opening.

[0028] Similar mounting procedures are effected when mounting e.g. air-conditioning, ventilation and/or sensors.

[0029] By placing the fixture box including fixture at the top side of the ceiling panel while at the same time making a spacing between the underside of the fixture box and the underside of the ceiling panel, it is possible e.g. to have a sensation that light comes out of holes in the ceiling. In order to produce this spacing between the underside of the fixture box and the underside of the ceiling panel, the ceiling panel is made of a number of plate elements which are joined.

[0030] A joining of a number of plate elements will furthermore imply that the carrying capacity of the ceiling panel is increased considerably, and that there is a considerable reduction of the risk that the ceiling panel cracks/splits during transport from the factory to the site of mounting and in connection with the workmen's handling of the ceiling panel.

[0031] In an embodiment of the invention, the ceiling panel is made as a sandwich construction where upon the lowermost ceiling panel there is provided one or more ceiling panels. The dimension of these further ceiling panels may vary from being of the same dimension as the lower ceiling panel to having a dimension that only just encircles the opening.

[0032] In a second embodiment of the invention, the ceiling panel has been reinforced with one or more panel parts which are connected with the side edges of the opening in an upright position so that assembling of panel parts and the ceiling panel occurs in the area around the opening. An upright panel part along the side edges of the opening will strengthen the ceiling panel, since the moment of inertia of the ceiling panel is considerably increased. The joint between the upright panel part and ceiling panel can be hidden behind a covering which is applied a peripheral edge of the opening.

[0033] In an alternative embodiment of the invention, the ceiling panel is made of one thick plate element which is made with a thickness corresponding to the desired spacing between the underside of the fixture box and the underside of the ceiling panel.

[0034] The joining between the panel part and the ceiling panel, or between the ceiling panels, can be performed by means of gluing, either as direct gluing or by means of double-adhesive tape.

[0035] By joining the ceiling panels during production of the ceiling plates it is possible to cut an opening or to shape an opening in the finished ceiling panel. This implies a simplification of the mounting process since no holes are to be cut in the ceiling panels in situ. This will furthermore imply that the ceiling panels with the elongated opening can form part as a standard ceiling panel which is ordered together with other normal ceiling boards or panels.

[0036] For ceiling panels provided as sandwich construction, the individual ceiling panels will typically be joined first and the openings will be cut out subsequently, so that the side edges of the openings become as uniform as possible. Alternatively, the openings can be cut out at first, after which the ceiling panels are joined.

[0037] In order to achieve a uniform appearance of the underside of the ceiling panel and the side edges of the opening, the side edges of the opening in the ceiling panel are provided with a side covering of the same nature as the covering at the underside of the ceiling panel. This implies that no unwanted colour differences and edges will appear when the suspended ceiling is painted, since the side covering and the covering at the underside of the ceiling panel are having the same absorbing capacity.

[0038] In an embodiment of the invention, the side covering of the opening is a part of the covering at the underside of the ceiling panel which has been bent up into the opening and fastened at least along the side edges of the opening. This puts further demands on the production process of the ceiling panels, since the cutting of the opening must not destroy the covering at the underside of the ceiling panel.

[0039] The ceiling panel may e.g. be made with openings in the pressing/moulding process, after which covering on the side faces of the ceiling panel is mounted, and the covering around the opening can be cut, bent up into the opening and fastened along at least the side edges of the opening.

[0040] Alternatively, the ceiling panels can be made with two plies of covering at the underside of the ceiling panel, where the first ply of covering is mounted before making the opening in the ceiling panel, whereas the second ply of covering is mounted after cutting the opening, whereby the covering around the opening can be cut, bent up into the opening and fastened along at least the side edges of the opening.

[0041] In order to achieve a uniform design and at the same time form a sharp edge, in an embodiment of the invention there is provided an edge covering around a peripheral edge between the underside of the ceiling panel and the side edges of the opening in the ceiling panel.

[0042] By providing the peripheral edge with a bent

covering which is fastened to the underside of the ceiling panel and which extends a length up into the opening, the opening will furthermore be protected against deformation through impact and the like, e.g. when fixture box is installed.

[0043] Furthermore, the covering can cover up through the opening, so that all long side edges in the opening is coated with covering. If the covering is provided with a reflecting surface, the covered long side edges in the opening can function as a part of the reflecting screen of the fixture, whereby the light intensity and the scattering of light can be changed and/or increased.

[0044] Depending on the material of which the ceiling panel is made, the covering at the underside of the ceiling panel, the side covering along the side edges of the opening and the edge covering along the peripheral edge is made of one or more of the following materials: paper, cardboard, plastic film and metal film.

[0045] In a preferred embodiment of the invention, the ceiling panels are made of a gypsum material and the covering of paper.

[0046] In order to avoid that the fixture boxes are dislodged by bumping when cleaning or when changing the exchangeable parts of the fixture box or by accidental impacts, the mounting system furthermore includes a bridge member which is adapted for retaining the fixture down against the top side of the ceiling panel.

[0047] This bridge member is mounted displacing in the suspension of the ceiling panels before mounting the fixture box. When the fixture box has been mounted and placed in the desired position, the bridge member is displaced across the top side of the fixture box so that it cannot be lifted out of the opening.

[0048] The bridge member may be designed so that it approximately has a clearance fitting with the height of the fixture box, so that there are only a couple of millimetres between the underside of the bridge element and the top side of the fixture box. This implies that there is room for the ceiling panel, suspension and bridge member to work a bit, depending on temperature and general settling of the building without the fixture box being wedged. This clearance furthermore entails that the bridge member may easily be displaced laterally across the fixture box.

[0049] One or more bridge members are to be placed for each fixture box. However, it must be possible to reach up through the opening when the fixture box has been positioned, and to displace the bridge member across the fixture box.

[0050] By using a mounting system according to the present invention, the following advantages are attained:

- A visually nice mounting of fixture boxes, looking as if light is coming directly out of openings in the ceiling.
- A simple mounting process, where the individual contract words are clearly separated.
- A uniform surface looking as if the side edges in the opening and the underside of the ceiling panel continue into each other.
- Removal of parts of the fixture box situated below the underside of the ceiling panel.

List of Figures

[0051] The invention is explained in more detail in the following in connection with the Figures, on which:

Fig. 1 is a cross-section of a mounting system according to the invention;
Fig. 2 is a cross-section of an alternative embodiment of a mounting system according to the invention;
Fig. 3 is a cross-section of a fixture box according to the invention;
Fig. 4 is a side view of a mounting system according to the invention;
Fig. 5 is a sectional view of a fixture box with a lighting fixture;
Figs. 6-8 are perspective views of a fixture box including fixture and blank-off plate, mounted in a ceiling panel; and
Fig. 9 is a perspective view of a bridge member according to the invention.

Detailed Description of the Invention

[0052] On Fig. 1 is shown a mounting system 1 for mounting a fixture box 3 in a suspended ceiling which includes a suspension rail 5 and a ceiling panel 2 designed with elongated openings 8. In the shown embodiment, the ceiling panel 2 is reinforced with a ceiling panel 20. The elongated opening 8 has been made through both ceiling panels 2, 20. The fixture box 3 with fixture 4 is mounted in the opening 8 where the contact members 7 of the fixture box 3 bear against side edges of the opening 8. The fixture box 3 has a height which is less than the width of the opening 8 so that it is possible to insert fixture box 3 through opening 8. On the peripheral edge 8 in ceiling panel 2 there is fitted a bent covering 6 that protects the peripheral edge.

[0053] On Fig. 2 is shown a mounting system 1 for mounting a fixture box 3 in a suspended ceiling that includes a suspension rail 5 and a ceiling 2 which is designed with elongated openings 8. In the shown embodiment, the ceiling panel 2 around the opening 8 is reinforced with an upright plate part 9 which, apart from increasing the strength of the ceiling panel 2, elevates the fixture box 3 up into the suspended ceiling. The upright plate part 9 is joined with the ceiling panel 2 at the peripheral edge of the opening 8, but the joining is hidden behind a bent covering 6. The contact members 7 of the fixture box 3 are bearing against an edge part of the upright plate part 9.

[0054] On Fig. 3 is shown a fixture box 10 adapted for mounting other types of fixtures (not shown). At the top of fixture 10 is designed an opening 11 that may be used for e.g. connection to air ducts, pipes or flexible hoses.

[0055] On Fig. 4 is shown a side view of a fixture box 3 which is mounted in an elongated opening 8. In connection with the fixture 4 is mounted a grating 12 and a blank-off plate 13 that covers the part of the opening 8 which is not covered by the light fixture 4.

[0056] On Fig. 5 is shown a fixture box 3 in which is fitted a light fixture 4 connected to the network via wire 16. The contact members 7 of the fixture box 3 includes an angular par 22 and a socket member 21, where socket member 21 engages the peripheral edge of the opening 8, preventing lateral displacement of fixture box 3 while angular part 22 bears against the top side of the ceiling panel 2, preventing fixture box 3 from falling through opening 8.

[0057] On Fig. 6 is shown a fixture box 3 with fixture 4, grating 12 and blank-off plate 13 which is provided with an aperture 15 for e.g. a sprinkler nozzle (not shown).

[0058] On Fig. 7 is shown how the fixture box (not shown) is mounted in the opening 8 in the ceiling panel 2. The socket part 21 of the fixture box contact members 7 bears against the peripheral edge of the opening 8. Blank-off plate 13 is to cover the part of opening 8 that fixture 4 does not cover. For opening 15 is provided piping 17, e.g. supplying water to the sprinkler nozzle (not shown).

[0059] On Fig. 8 is shown a fixture 4 fully mounted in ceiling panel 2. Blank-off plate 13 is mounted in opening 8 and covers the part of opening 8 which fixture 4 does not cover. In connection with blank-off plate 13 is mounted a sprinkler nozzle 14.

[0060] On Fig. 9 is shown a bridge element 30 that at each end is connected displacing in suspension rails 5. The bridge element 30 is disposed across the top side of the fixture box 3 so that the fixture box 3 is held down against the top side of the ceiling panel 2 and in place in the opening 8.

Claims

1. Mounting system (1) for at least one fixture (4), including a ceiling panel (2) with a top side and an underside which is provided with a covering, and where in the ceiling panel (2) there is made a preferably rectangular, elongated opening (8) with a number of side edges, and at least one fixture box (3) which is provided with at least one open side, **characterised in that** the open side of the fixture box (3) is connected with the top side of the ceiling panel (2).

2. Mounting system (1) according to claim 1, **characterised in that** the fixture box (3) has a height which is less than the width of the opening (8), and that the open side of the fixture box (3) has a width at least corresponding to the width of the opening (8) in the ceiling panel (2).

3. Mounting system (1) according to claim 1 - 2, **characterised in that** the fixture box (3) is provided with contact members (7) at opposite long sides of the open side of the fixture box (3), and which contact members (7) are designed as sockets (21) that bear against the top side and the side edges of the opening (8) in the ceiling panel (2).

4. Mounting system (1) according to claim 1, **characterised in that** the opening (8) in the ceiling panel (2) has greater length than the fixture box (3), as the mounting system (1) furthermore includes a number of blank-off plates (13).

5. Mounting system (1) according to claim 1, **characterised in that** the fixture box (3) is adapted for mounting lighting, air-conditioning, ventilation and/or sensors.

6. Mounting system (1) according to claim 1, **characterised in that** the ceiling panel (2) is made of a number of plate elements (9, 20) which are joined together.

7. Mounting system (1) according to claim 1, **characterised in that** the side edges of the opening (8) in the ceiling panel (2) are provided with a side covering of the same nature as the covering at the underside of the ceiling panel (2).

8. Mounting system according to claim 1, **characterised in that** around a peripheral edge between the underside of the ceiling panel and the side edges of the opening (8) in the ceiling plate (2) there is provided an edge covering (6).

9. Mounting system according to claims 1 - 8, **characterised in that** the covering at the underside of the ceiling plate (2), the side covering along the side edges of the opening (8) and the edge covering along the peripheral edge is made of one or more of the following materials: paper, cardboard, plastic film and metal film.

10. Mounting system according to claims 1 - 9, **characterised in that** the mounting system (1) furthermore includes a bridging member (30) which is arranged for holding the fixture box (3) down against the top side of the ceiling panel (2).

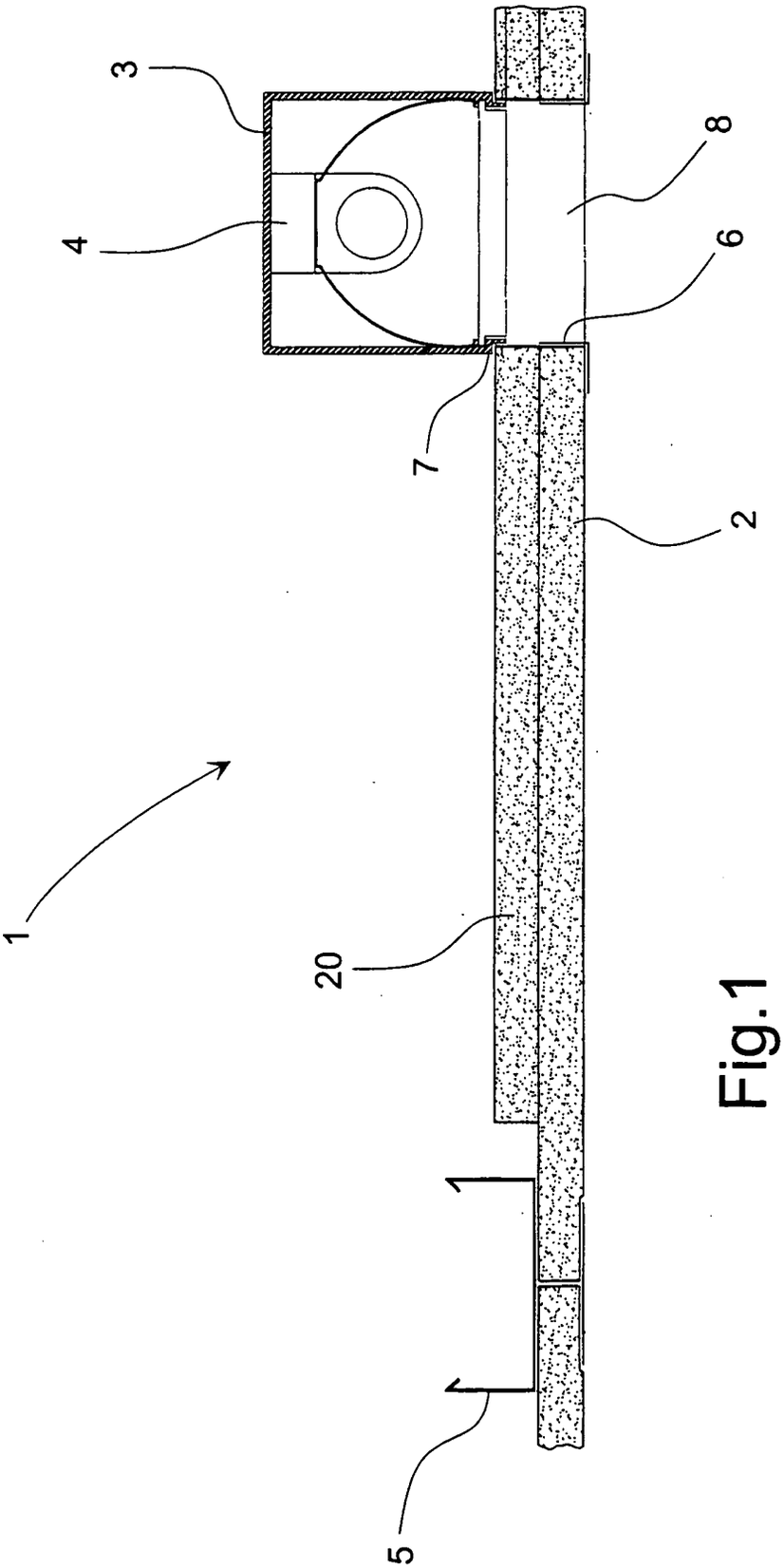


Fig.1

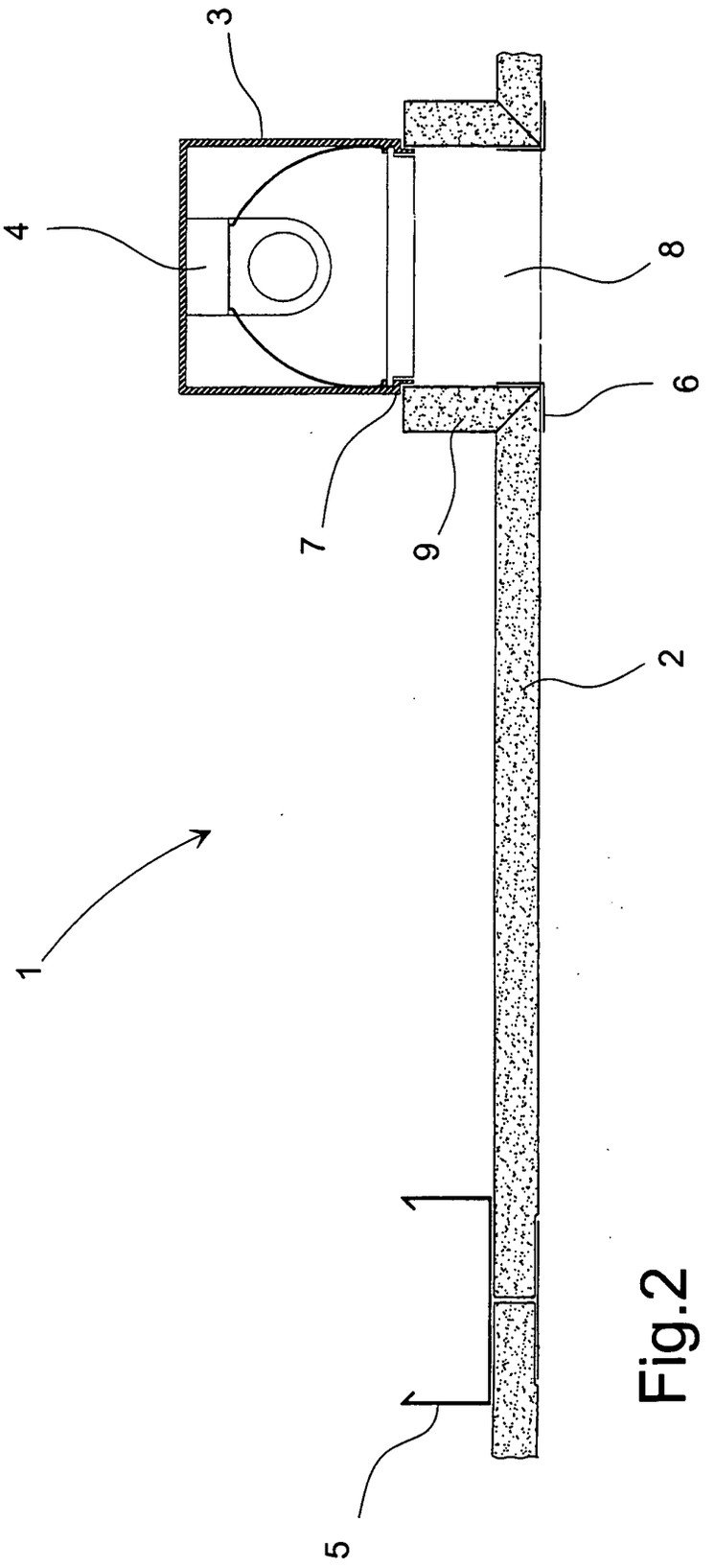
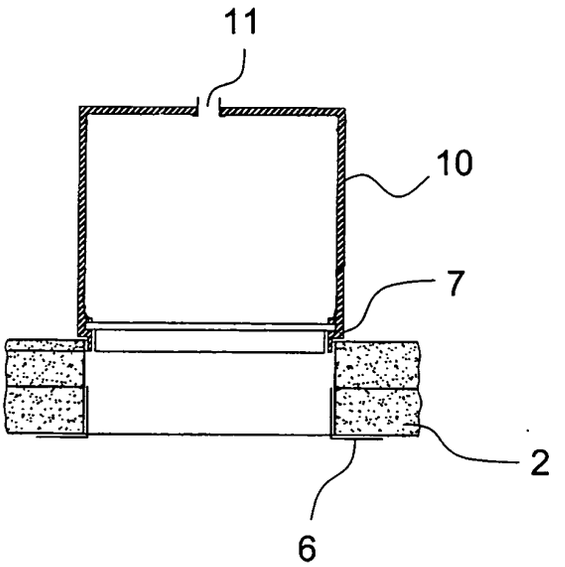


Fig.2

Fig.3



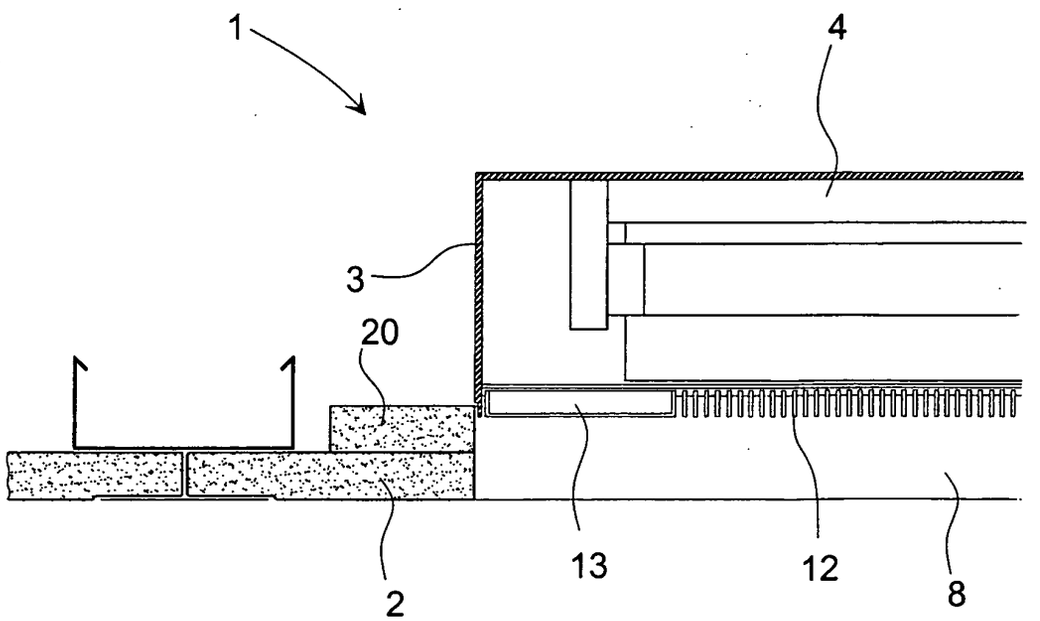


Fig.4

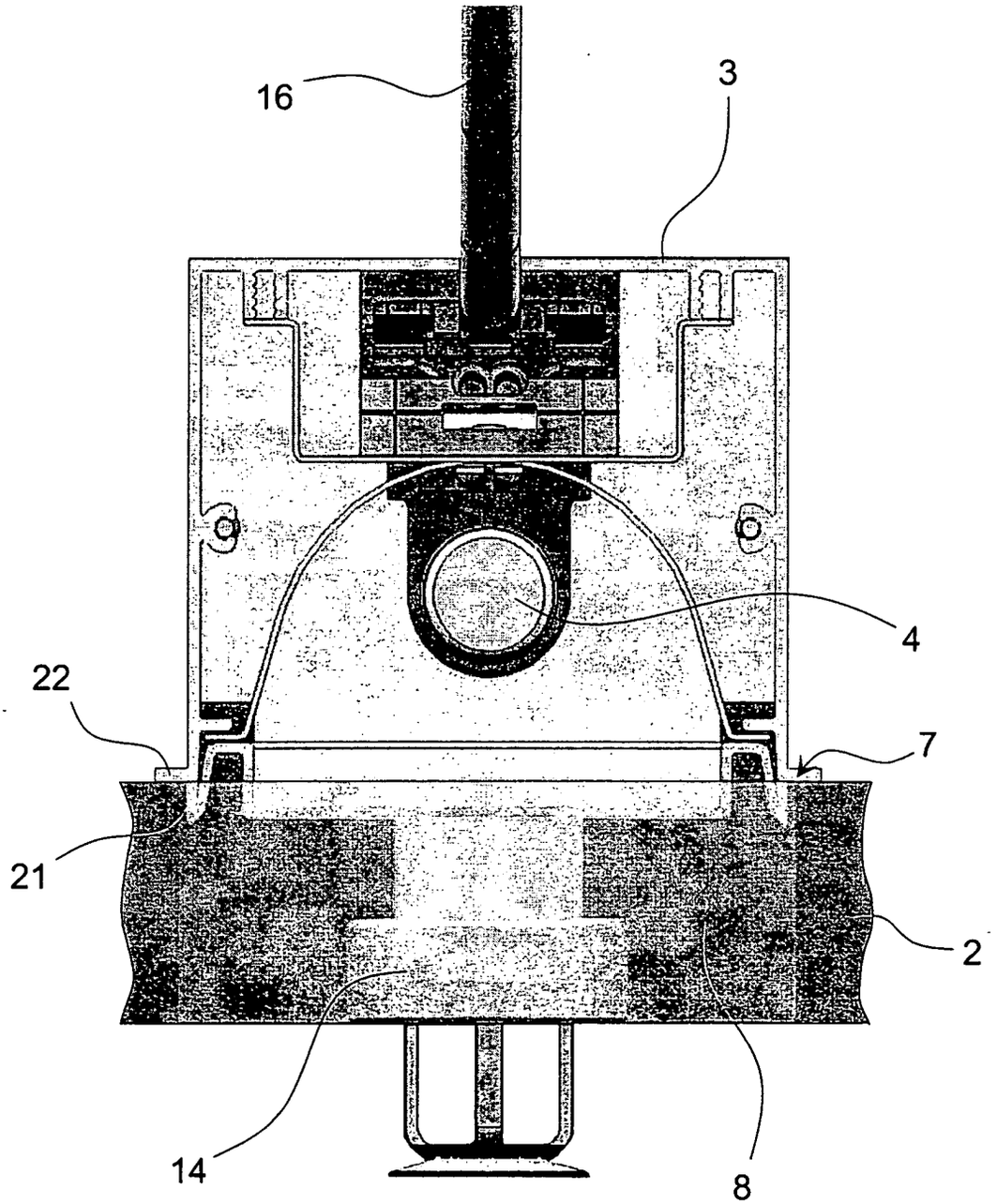


Fig.5

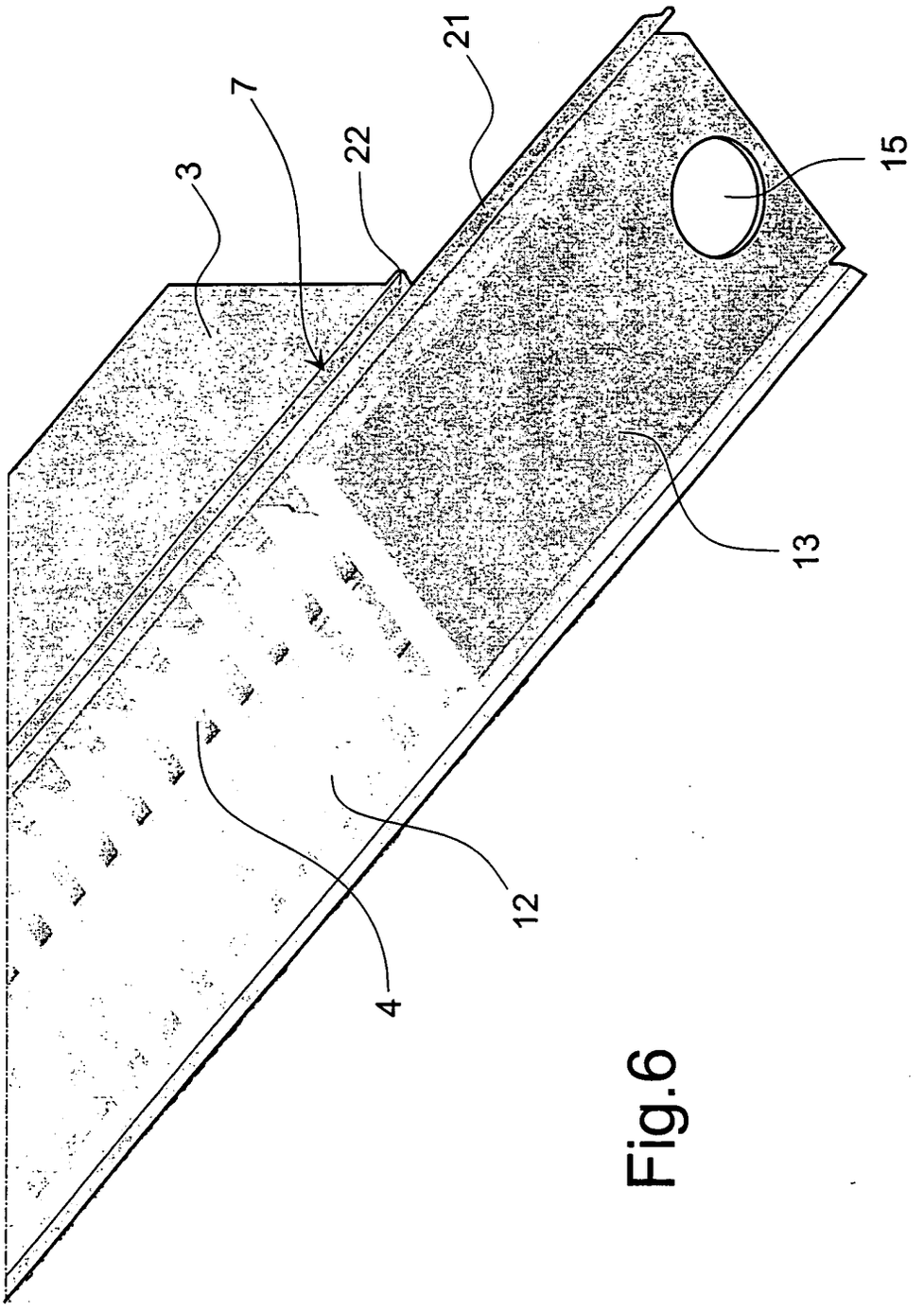


Fig.6

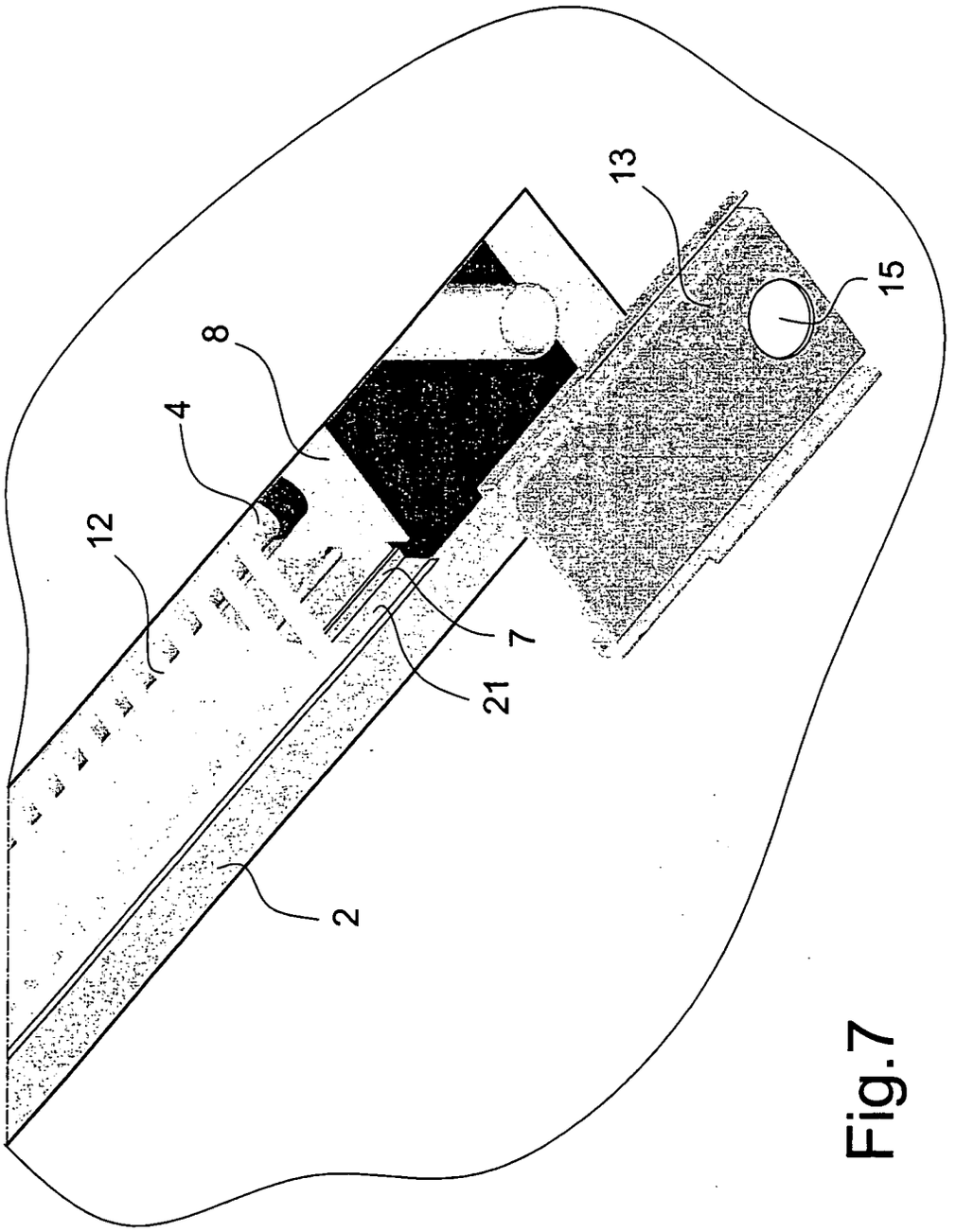


Fig.7

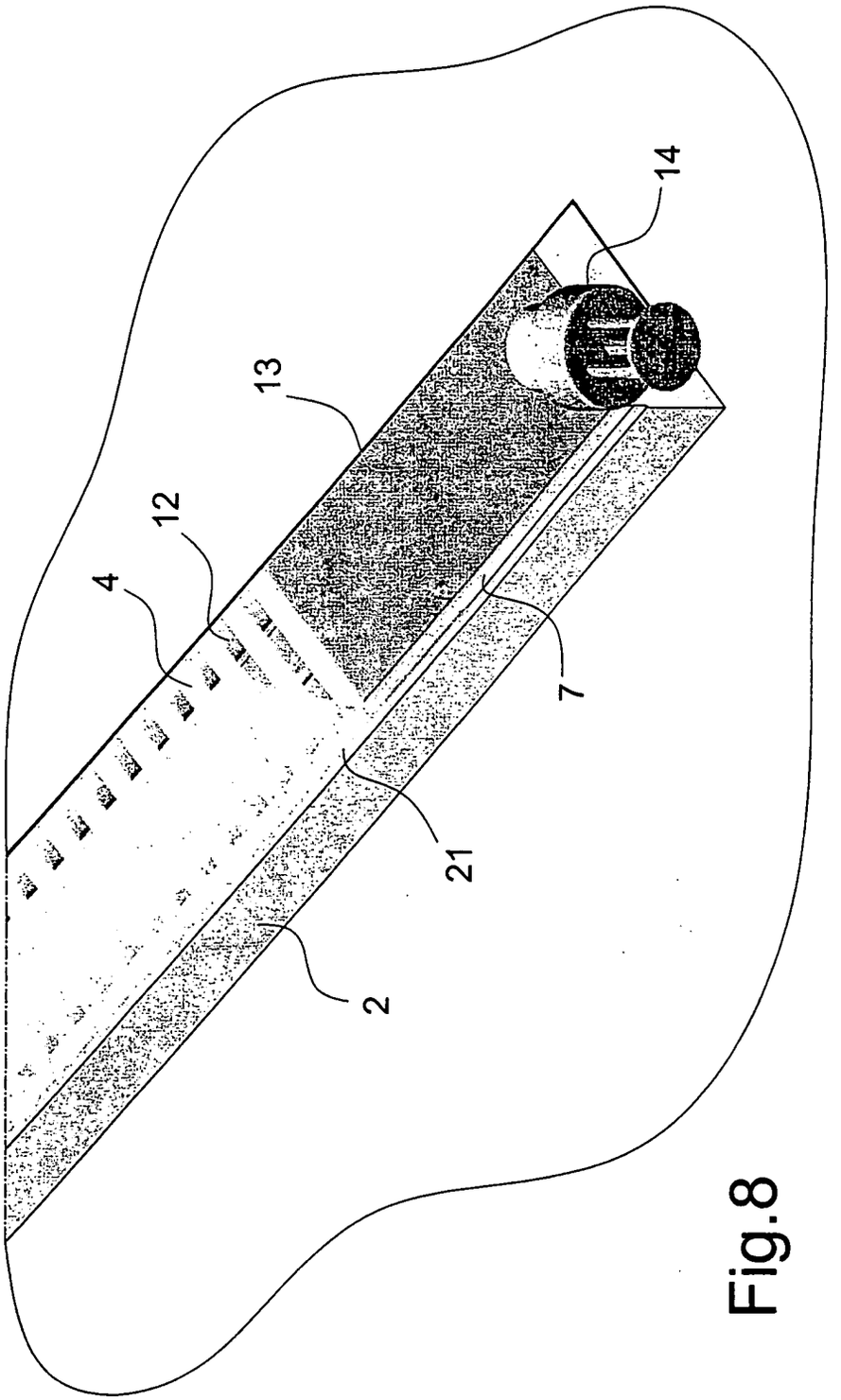


Fig.8

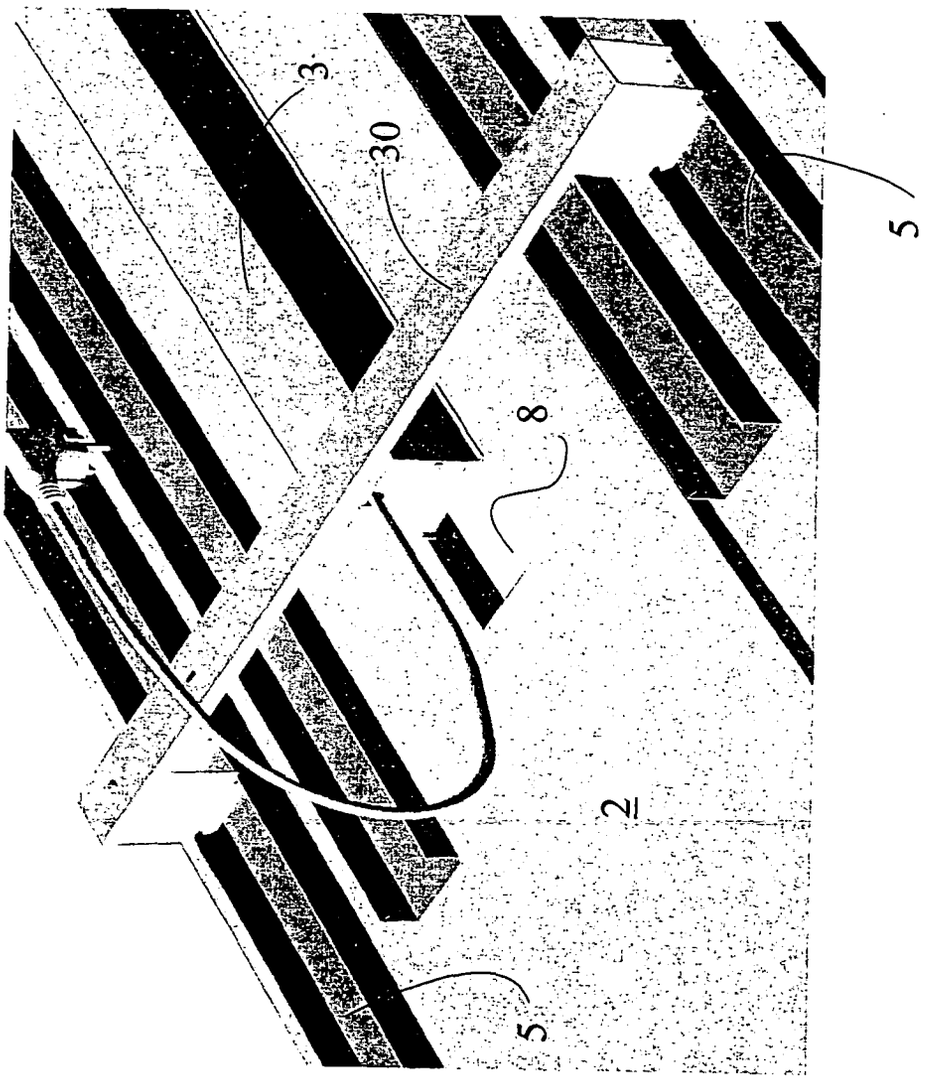


Fig.9