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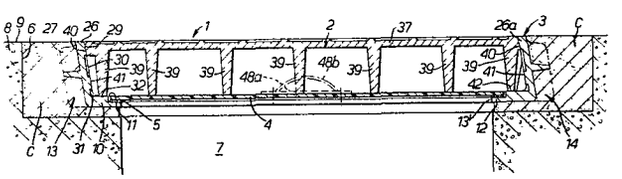
(71) Applicant: **THE DOVER ENGINEERING WORKS LIMITED, Dour Iron Foundry, Dover Kent CT16 2LE (GB)**

(72) Inventor: **Bowley, Clive, 9 Thompson Close, Walmer Deal Kent (GB)**

(74) Representative: **Allden, Thomas Stanley et al, A.A. THORNTON & CO. Northumberland House 303-306 High Holborn, London WC1V 7LE (GB)**

## (54) Removable covers and frames therefor.

(57) A manhole cover unit 1 comprises a cover 2 which is seated in a frame 3 to cover over a pit opening 7 the mouth of which is bounded by the frame. To protect the cover 2 against the effect of effluent gases escaping from the pit opening 7 when the unit 1 is used in a sewerage system, a barrier plate 4 is seated on a base flange 10 of the frame 3 so as to extend across the mouth of the pit opening below the cover. The barrier plate 4 is of a material which is resistant to corrosion such as a glass fibre reinforced synthetic plastics. To ensure that effluent gases do not escape past the barrier plate 4, a gasket 5 is bonded around its margin to seal against the base flange 10 on a ledge 12 thereof formed by a rebate 11. The gasket 5 is urged into sealing engagement with the ledge 12 by the weight of the cover 2 when resting on the base flange 10. The cover may have a solid top braced by a honeycomb ribbed structure on its underside. The cover 2 and frame 3 may be of cast iron.



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# Removable covers and frames therefor.

This invention relates to removable covers (particularly, but not exclusively, manhole covers) for openings and frames in which such covers are supported.

According to the invention there is provided a cover unit for a pit opening, comprising a frame for bounding the mouth of the opening, a cover seated in the frame to close off the opening, and a gas impervious barrier plate which is supported by the frame to extend across the opening beneath the cover and which is urged by the weight of the cover into making a gas-tight seal with the cover to inhibit the passage to the cover of any gaseous material passing up the opening.

In a preferred embodiment, the cover unit comprises a cast iron frame defining a well having an open base and a perimeter around the base, a cast iron cover mounted in the frame well to be supported on the base and close off the opening therein and fit against the perimeter of the frame, the mating surfaces of the cover and the frame having a machined finish so that there is metal-to-metal contact therebetween, and a barrier plate which is impervious to gas and which is not subject to corrosion by effluent gases from sewerage supported by the base of the frame below the cover and spanning the opening in the open base, the weight of the cover pressing the plate downwardly upon the frame base by which the plate will provide a gas

impervious barrier between the underside of the cover and effluent gases from sewerage when the cover unit is used in a sewerage system.

In order that the invention may be well understood the preferred embodiment thereof, given by way of example, will now be described with reference to the accompanying drawings, in which:

Figure 1 is a plan view of a manhole cover unit;

Figure 2 is a section along line II-II of Figure 1;

Figure 3 is a section along line III-III of Figure 1;

Figure 4 is an end view to a larger scale of a side bar of the frame of the same manhole cover unit;

Figure 5 is a scrap view also to a larger scale of one end of a front or back end bar of the same frame; and

Figure 6 is a cross-sectional view of the end bar shown in Figure 5.

Referring first to Figures 1 to 3, a manhole cover unit 1 comprises a cover 2 seated in a frame 3. Also seated in the frame 3 is a plate 4 which seals against the frame as by the interposition between the two of a sealing gasket 5. Whilst the weight of the cover 2 is mainly taken by the frame 3, the cover bears against the plate 4 so ensuring a seal as between the gasket 5 and the frame.

The frame 3 is set in a rebate 6 around the mouth of the pit opening 7 in the floor 8 or the like whose surface is referenced 9. The rebate 6 would have a concrete infill C to bed down and firmly secure the frame 3 around the mouth of the pit opening 7. As such, it would only be the interior surfaces of the frame which would be exposed to the effluent gases and the

like emitted up the pit opening 7 when the manhole cover unit 1 is used in a sewerage system.

The purpose of the plate 4 which overlies the base of the frame 3 and which is sealed thereagainst by the gasket 5 is primarily to provide a gas impervious barrier as between the effluent gases from the pit opening 7 and the underside of the cover 2. Where the cover 2 is of cast iron, there can be a tendency for its underside to be subject to corrosion upon exposure to sewerage effluent gases. By interposing the barrier plate 4 between the cover 2 and the effluent gases, and making the plate itself of a gas impervious, non-corrosive material, the cover is sealed off from exposure to the effluent gases and so protected against corrosion under their influence. At the same time, the internal surfaces of the frame 3 are largely also isolated by the barrier plate 4 from the effluent gases and hence when the frame also is of cast iron it too is saved by the plate from corroding. In point of fact, the cover 2, as will hereinafter be described, makes sealing contact with the frame 3 such that much of the frame would be sealed oii by the cover itself from exposure to the effluent gases, but the barrier plate 4 ensures that there is little or no escape of those gases from the pit opening so that there results only the minimal amount of gas at most which could escape past the cover to the frame.

A suitable non-corrosive material for the barrier plate 4 would be a glass reinforced synthetic plastics material, but other materials may be equally as suitable. The gasket 5 may be of neoprene suitably bonded all round the margin of the barrier plate 4. Although not preferred, the gasket 5 could be separate from the barrier plate 4 and, perhaps, bonded to the frame 3.

It is found that cast iron covers and frames are

somewhat prevalent to corrosion, particularly in semi-desert areas, where they are exposed to a high degree of humidity and condensation. The corrosion problem is compounded in the same environment where the manhole unit is used in sewerage systems since it is also found that the sewerage, or rather its effluent gases, can be particularly corrosive to cast iron. By the use of the sealed barrier plate 4, the problem of corrosion in such an environment is reduced.

There is also a need where sand is present for the manhole cover unit 1 to be so constructed as to inhibit the ingress of sand into the pit opening 7. The sealing contact, which has been briefly referred to, made by the cover 2 within the frame 3 is sufficient in itself to prevent effectively sand from infiltrating between the cover and the frame into the pit opening. However, the barrier plate 4 will make for a completely sand proof unit since any sand which may manage to penetrate the unit will simply collect on top of the barrier plate.

Therefore, the barrier plate 4 serves the dual purpose of sealing off the pit opening 7 both to prevent the passage of effluent gases out of the opening and into contact with the cover 2, and to prevent the passage of sand from the environment into the opening (the latter in conjunction with the sealing contact between the cover and its frame 3.)

The base of the frame 3 is an effectively continuous horizontal flange 10 running completely around its inside. The flange 10 is rebated at 11 to provide a ledge 12. It is on that ledge 12 that the barrier plate 4 seats with its gasket 5 making a seal with the ledge. The ledge 12 is immediately adjacent the mouth of the pit opening 7 so that the seal is effected actually at the pit opening with the result that a minimal area of the frame 3 will be subject to the corrosion attack of the

effluent gases. More particularly, it is the inner vertical perimeter face 13' of the ledge 12 which is the only part of the frame 3 not isolated by the barrier plate 4 from the noxious gases.

The thickness of the barrier plate 4 with its sealing gasket 5 relative to the depth of the flange rebate 11 is important. If the plate is too thin, the cover 2 will not actually contact it, and it is the weight of the cover which presses the gasket 5 into sealing engagement with the ledge 12. If the plate 4 is too thick, the plate will hold the cover 2 off the flange 10, and the cover and the frame are fashioned so that the cover should make continuous horizontal sealing contact with the flange. In practice, the barrier plate is deformable and is made slightly oversize in thickness to an extent such that the weight of the cover 2 will compress the plate sufficiently to allow the cover to seat on the frame 3.

Describing now the construction of the frame 3 in more detail, the frame is constituted by four perimeter bars, namely (and these are terms of the art) a front end bar 13, a back end bar 14, a left hand side bar 15 and a right hand side bar 16, which are bolted together at 17 at the corners of the frame so as together to form a rigid structural unit.

The side bars 15 and 16 (see also Figure 4) are of similar construction, each being of generally L cross-section with the base of the L being constituted by one run of the flange 10. The upright 18 of the L is slightly inclined to the vertical so that the spacing between the opposite uprights is greater at the top than at their junctions with the respective flanges 10. The internal surface 19 of each upright 18 is relieved along its length at 20 as also is the corner 21 between the upright and the respective flange 10. Apart from that relieving, the internal surface 19 and the upper surface

22 of the flange 10 has a machined finish, the purpose of which is to effect the described sealing contact with the cover 2. Each side bar 15, 16 is strengthened by an interrupted external horizontal rib 23 integral with and running the length of the upright 18, and by two spaced external intermediate vertical flanges 24. Finally, the opposite ends of each side bar 15, 16 terminate in deeper flanges 25, and it is at those flanges that the side bars are bolted to the adjacent end bars 13 and 14. The rib 23 and flanges 24 not only strengthen the side bar but also serve as a key with respect to the concrete infill C.

The front end bar 13 (see also Figures 5 and 6) is also of generally L cross-section with the base of the L being again constituted by one run of the flange 10. Again the upright, referenced 26, of the L is slightly inclined to the vertical in a like manner to the sloping of the side bar upright 18. As before, the upright 26 has integral strengthening vertical flanges 27 and an interrupted horizontal rib 28, which extends substantially its length. The bolting 17 of the two side bar flanges 25 to the front end bar 13 is to the opposite ends of the upright 26. As with the upright and the horizontal flange of each L-section side bar, the internal surface 29 of the upright 26 is relieved at 30 as also is the junction 31 between that upright and the flange 10 integral with it, and apart from that relieving, the internal surface 29 and the upper surface 32 of that same flange is given a machined finish.

The back end bar 14 is generally similar in construction to the front end bar 13 apart from the distinction that the upright of its L-section, although sloping at the same angle as the upright of the bar 13, does so in the opposite direction. The result is that instead of the spacing between the opposite uprights of

the front and back end bars being greater at the top than at the bottom, the spacing is of constant dimension. The upright of the back end bar 14 is denoted by reference 26a but its other components have like references to those identifying their counterparts in the front end bar 13.

To ensure that the joints between the four perimeter bars are seal tight, the faces which abut when the bars are bolted together are each recessed and the mating such recesses are filled with a sealing material, preferably molten lead. The construction is shown in Figures 4 and 5, the lead recess 33 in the end face 34 of the flange 25 of the side bar 15 (or 16) being similar in shape to the mating lead recess 35 in the internal face 29 at each of the opposite ends of the front end bar 13 (or back end bar 14). The bolting 17 is through registering holes 36 in the perimeter bars.

As will be realized from the foregoing description, the frame 3 essentially is constituted by a generally L perimeter section which provides a well into which the cover 2 is sunk to seat on the base of the well and seal both on that base and against the upstanding side faces of the well. The cover 2 would have a perimeter conforming to that of the well to ensure such seating and sealing. The opposite inclination of the sides of the well assists the entry and guidance of the cover into the well, and the same inclination of the ends of the well assists the removal of the cover from the well. The latter is because the cover would be removed by lifting up its forward end, seating that end against the front end bar and sliding the cover forwardly with its underside supported on the side bar flanges 10.

Describing now the cover 2 in more detail, it is a one-piece or unitary member having a solid top plate

37 from which depend a plurality of mutually intersecting longitudinal and lateral ribs 38 and 39, respectively, which form a honeycomb bracing structure on the underside of the top plate to give the cover the necessary dimensional stability and strength.

The front end, back end and opposite side surfaces of the top plate 37, which are all referenced 40, follow the inclinations of and mate with the corresponding surfaces of the frame perimeter bars, and are machined to make sealing contact with them. Likewise, the opposite end surfaces, all referenced 41, of the longitudinal ribs 38 and the lateral ribs 39 also follow the inclinations of and mate with the corresponding surfaces of the frame perimeter bars, and are also machined for the same reason. Finally, the base surfaces, all referenced 42, of the longitudinal ribs 38 and the lateral ribs 39 are machined to make good sealing contact at their opposite longitudinal terminal portions with the base flange of the frame periphery bars.

Jackscrew lifting keyholes 43 are provided in the upper surface of the solid top plate 37 at its front end, and guide keyholes 44 in the same upper surface at its sides near to its rear end. Inwardly of the margin 45 of the plate 37, its upper surface is recessed at 46 and gripping lozenges 47 are upstanding over the whole general area of that recessed region.

Whilst a solid top plate construction of cover 2 is shown, other cover structures could be equally as suitable. For example, a cast iron cover with an open top formed by a honeycomb rib structure upstanding from a bottom plate could be used, the open spaces between the ribs being filled in with concrete on site to give the cover the necessary rigidity and strength.

Again, other frames than that herein disclosed

could also be used, one such frame (and open top cover) being as featured in our British Patent No. 1,186,860. Such a frame would, of course, need to be modified so as to accept the barrier plate providing a seal between the cover and the pit opening.

As described, there is a metal-to-metal contact between the cover and the frame. The machining of the respective interfitting surfaces would ensure that the cover and frame is substantially one solid unit with the cover fitting closely within the frame and not rocking therein when subjected to a moving loading as in the case of fast mocing traffic passing thereover. We have found that if one of the cover and frame is machined as by milling and the other is machined as by grinding, that the interfitting grinding and milled surfaces are particularly suitable.

The barrier plate 4 may be provided with a pair of straps 48 at its opposite sides which are secured to the top surface of the plate as by screws 49 engaging in elongated slots 50 in the straps. Thereby, the straps 48 can lie flat against the plate 4, as indicated at 48a, or be raised, as shown at 48b, when the plate is to be lifted and removed from the frame 3. Alternatively and preferably, each of the straps could have its ends immovably fixed to the top surface of the plate and be curved so as to stand at its centre proud of the plate. Such a strap could be of glass reinforced synthetic plastics material with its ends glassed on to the plate.

Whilst the cover and frame are shown as rectangular in plan view, other configurations are, of course, feasible, and the barrier plate could be shaped to suit.

The use of the sealed barrier plate means that covers can be protected against corrosion caused by the pit gases without actually having to either alter their

structure or adapt for them a material which is itself not prone to corrosion or provide a coating of that material on the underside of the cover. The barrier plate provides a simple, inexpensive but yet highly effective means of ensuring long life covers.

Claims:

1. A cover unit for a pit opening, comprising a frame for bounding the mouth of the opening, a cover seated in the frame to close off the opening, and a gas impervious barrier plate which is supported by the frame to extend across the opening beneath the cover and which is urged by the weight of the cover into making a gas-tight seal with the cover to inhibit the passage to the cover of any gaseous material passing up the opening.

2. A cover unit as claimed in claim 1, wherein the material of the barrier plate is a glass reinforced synthetic plastics.

3. A cover unit as claimed in claim 1 or claim 2, wherein the gas-tight seal is made by a sealing gasket between the barrier plate and the frame.

4. A cover unit as claimed in claim 3, wherein the sealing gasket is carried by the barrier plate on the underside thereof.

5. A cover unit as claimed in claim 4, wherein the sealing gasket is of neoprene.

6. A cover unit as claimed in claim 4 or claim 5, wherein the sealing gasket is bonded to the barrier plate.

7. A cover unit as claimed in any of the preceding claims, wherein the frame includes an internal flange on which the cover is supported when seated in the frame, the internal flange being rebated along its inner periphery to provide a ledge around the pit opening, and the barrier plate resting on the ledge below the cover to extend across the opening.

8. A cover unit as claimed in claim 7, wherein the frame has a generally L cross-section the base of which constitutes the internal flange.

9. A cover unit as claimed in claim 8, wherein the frame comprises four perimeter bars joined together at the corners of the frame, each perimeter bar having the generally L cross-section.

10. A cover unit as claimed in claim 9, wherein the perimeter bars are joined together by being bolted together and the joints between the bars are sealed.

11. A cover unit as claimed in claim 9 or claim 10, wherein the perimeter bars comprise a front end bar, a back end bar, a left hand side bar and a right hand side bar, the uprights of the L cross-section of the two side bars being inclined to the vertical in opposite directions so that the spacing between the opposite uprights is greater at the top then at their junctions with the respective base flanges, and the uprights of the L cross-section of the two end bars being inclined in the same direction and towards the front of the frame.

12. A cover unit as claimed in any of claims 9 to 11, wherein the perimeter bars define a well whose base is constituted by the base flange of each L cross-section bar and whose perimeter is defined by the uprights of the L cross-section bars, the cover being sunk in the well so that not only is it supported on the base flanges but its perimeter generally conforms to and snugly fits against the internal perimeter of the well.

13. A cover unit as claimed in claim 12, wherein those surfaces of the cover and the frame which contact one another have a machined finish.

14. A cover unit as claimed in claim 13, wherein the surfaces of one of the cover and the frame have a milled finish and the surfaces of the other of the cover and the frame have a ground finish.

15. A cover unit as claimed in any of claims 11 to 14, wherein each L cross-section perimeter bar is strengthened by an external rib integral with the upright thereof and extending lengthwise of the upright, and by external flanges also integral with the upright and projecting laterally outwardly thereof and fashioned integral with the lengthwise rib.

16. A cover unit as claimed in claim 15, wherein each perimeter side bar terminates at its ends in further external flanges at which to be bolted to the uprights at the adjacent ends of the two end bars.

17. A cover unit as claimed in any of the preceding claims, wherein the barrier plate has carrier strap means attached to its top surface.

18. A cover unit as claimed in any of the preceding claims, wherein the cover comprises a solid top plate reinforced by a depending honeycomb rib structure, the base of which is supported in the frame and through which the weight of the cover is transmitted to the barrier plate to press the barrier plate against the frame, and the perimeter of the honeycomb rib structure and the solid top plate makes seating contact with the internal perimeter of the frame.

19. A cover unit as claimed in any of the preceding claims, wherein the cover and the frame are of cast iron.

20. A cover unit for a pit opening, comprising a cast iron frame defining a well having an open base and a perimeter around the base, a cast iron cover mounted in the frame well to be supported on the base and close off the opening therein and fit against the perimeter of the frame, the mating surfaces of the cover and the frame having a machined finish so that there is metal-to-metal contact therebetween, and a barrier plate which is impervious to gas and which is not subject to corrosion by effluent gases from sewerage supported by the base of the frame below the cover and spanning the opening in the open base, the weight of the cover pressing the plate downwardly upon the frame base by which the plate will provide a gas impervious barrier between the underside of the cover and effluent gases from sewerage when the cover unit is used in a sewerage system.

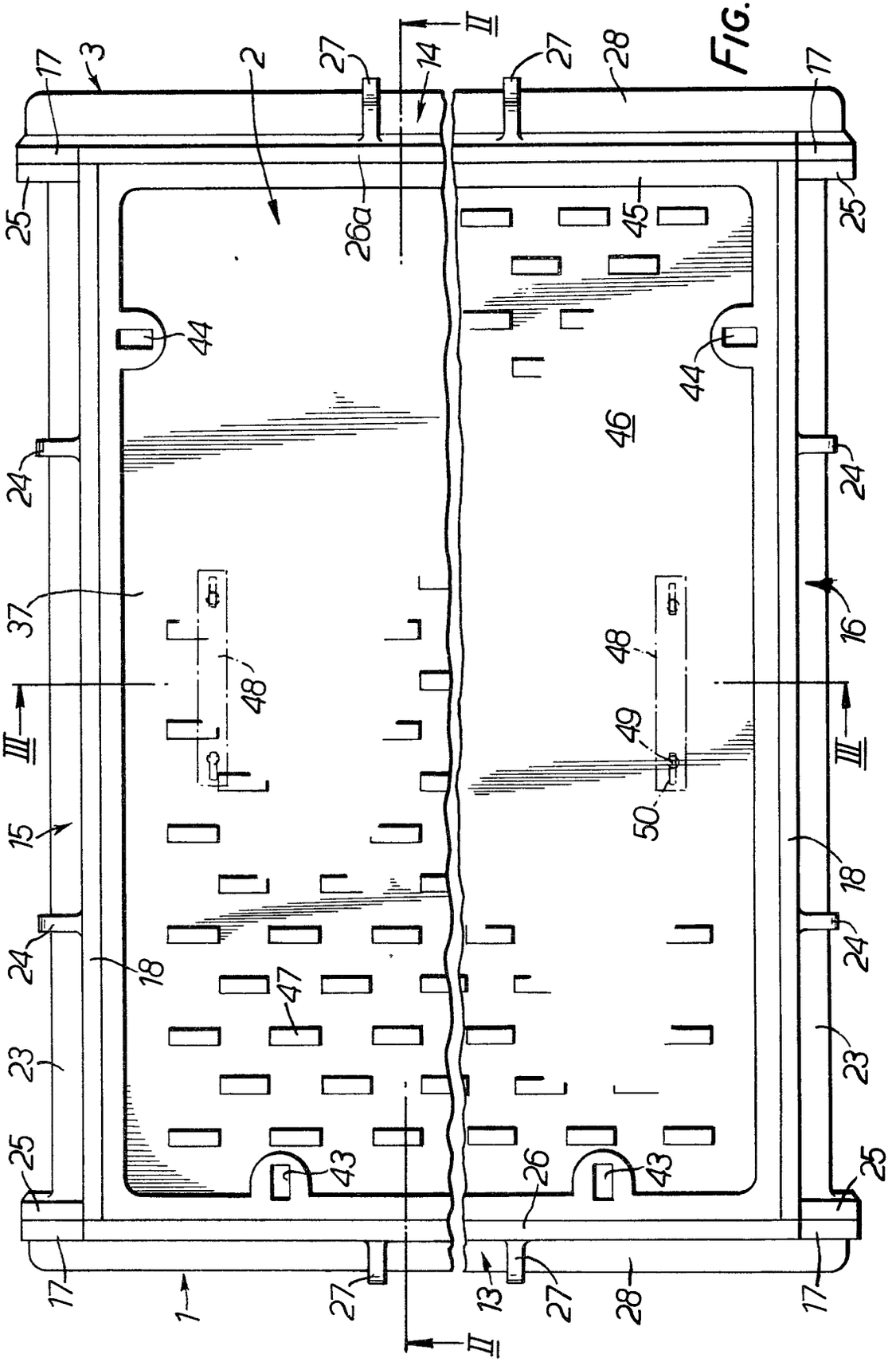
II
III
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FIG. 1.

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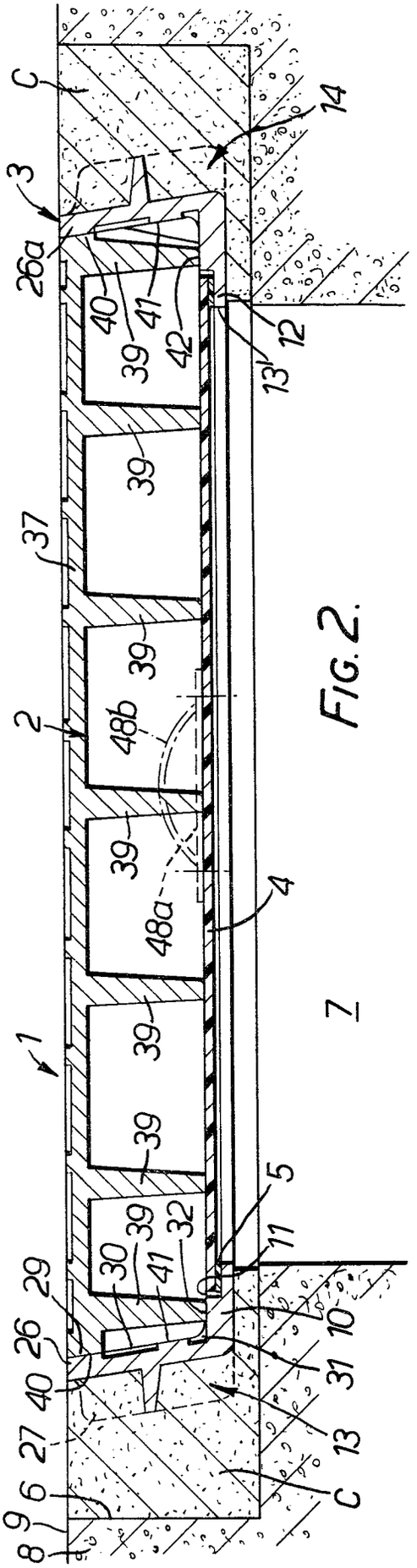

FIG. 2.

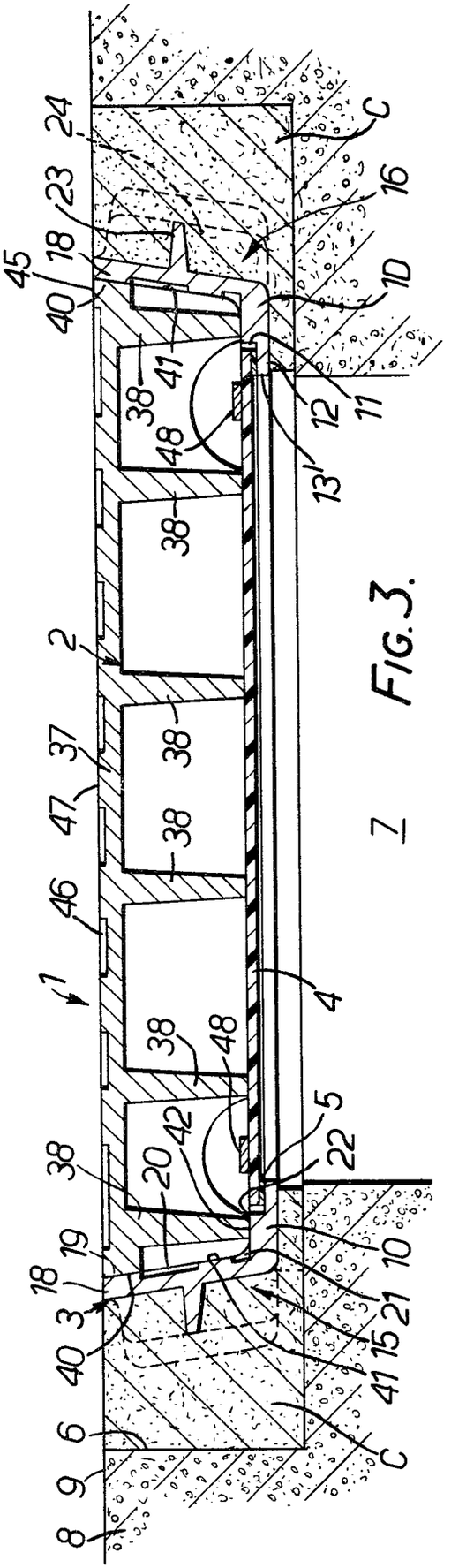

FIG. 3.

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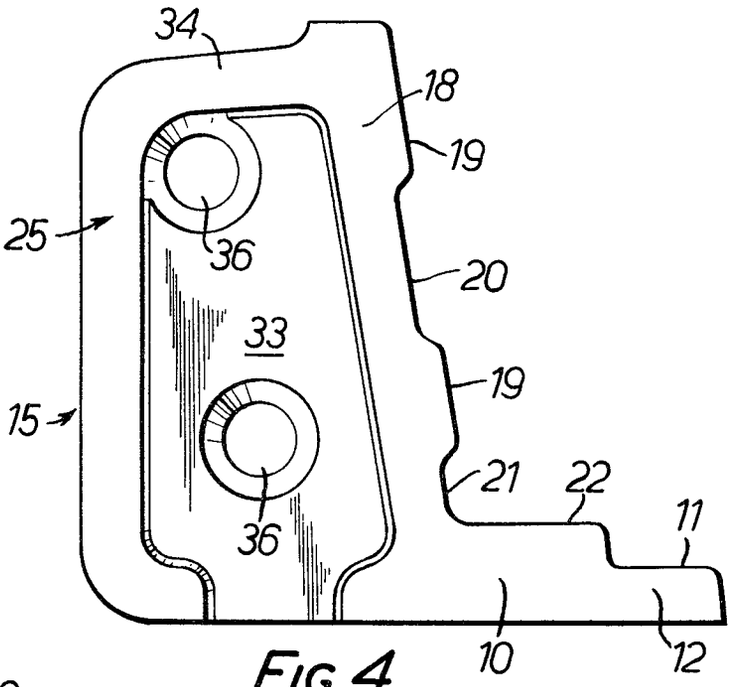


FIG.4.

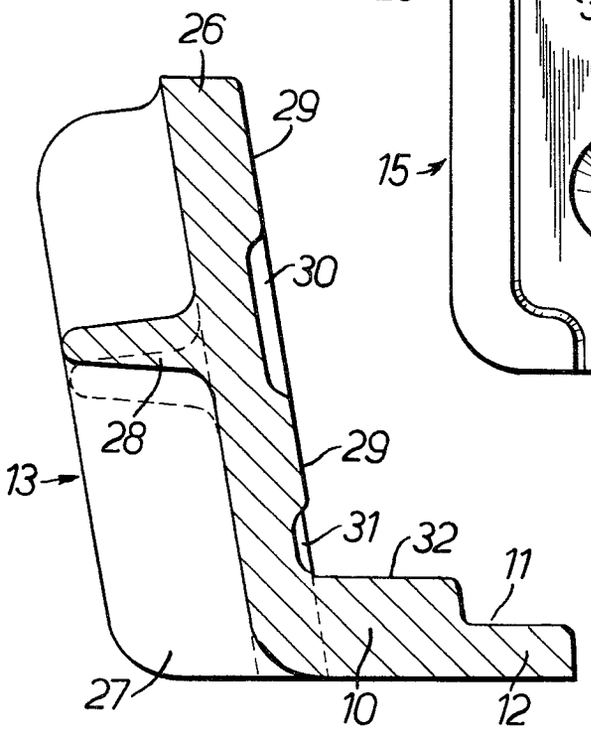


FIG.6.

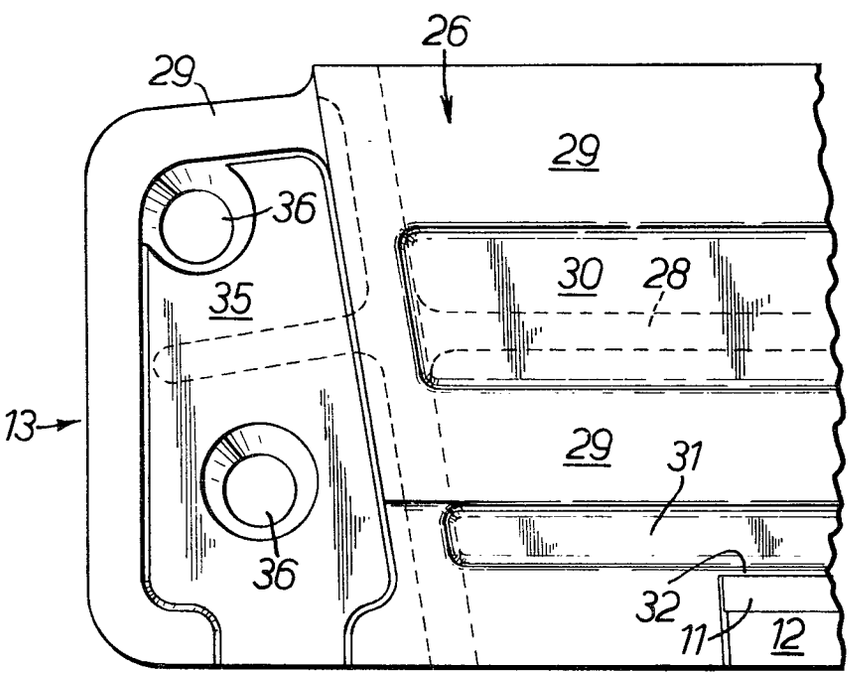


FIG.5.