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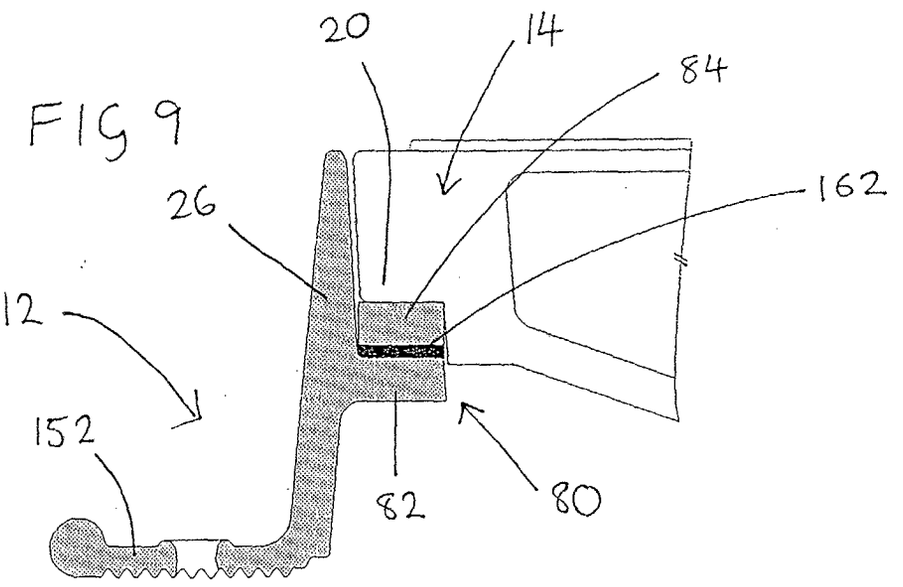
(54) Ground surface access assemblies

(57) A frame arrangement (12) for a ground surface access assembly includes a support member (50) for mounting a cover and a flange (30) for embedding in the ground, the flange (30) extending outwardly from the support member (50). The frame arrangement incorporates an elastically compressible member (62, 162) for cushioning forces transmitted through the frame arrangement to the ground.



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Description

[0001] The invention relates to ground surface access assemblies such as manhole assemblies and gully gratings. Such assemblies allow access to sewers, water hydrants and other below surface installations, via openings in the roads, pavements, etc. above.

[0002] A manhole assembly typically includes a generally rectangular frame and a cover mountable on the frame. The cover can be lifted from the frame or pivoted relative to the frame in order to allow access to the below surface installation. The frame may include an upstanding wall which is approximately rectangular in plan view, and a flange extending outwardly from the base of the wall. Conventionally, the flange is mounted in a mortar bed to retain the manhole assembly in place.

[0003] It is known that applied vehicular forces affect all of the components in a manhole assembly. Typically, the cover receives a load during vehicle overrun and then conveys this load to its adjoining frame component, which in turn transmits the load directly to its encapsulating foundation mortar and, to a significantly lesser extent, to the surrounding road surfacing. This load transmission can be progressive with slow moving vehicles but can be impact-like in nature as the vehicular speeds increase or if the manhole cover is not flush with the road surface. These impact forces can jar the foundation mortar which, if intolerant of this jarring, fails by local overstressing, which is aggravated by any angular features of the frame.

[0004] In addition, even in conditions of progressively applied loads, the frame component still transmits the load without a significant loss in magnitude to the encapsulating foundation mortar. In this case, the frame distorts in both its vertical and horizontal dimensions. This can result in the frame effectively attempting to prise open its encapsulating mortar. This generates high tensile stresses in the mortar surrounding the frame. Traditional mortar foundations are formulated to withstand compressive stresses and are generally intolerant of tensile stress.

[0005] According to the invention, there is provided a frame arrangement for a ground surface access assembly, the frame arrangement including a support member for mounting a cover and a flange for embedding in the ground, the flange extending outwardly from the support member, wherein the frame arrangement incorporates an elastically compressible member for cushioning forces transmitted through the frame arrangement to the ground.

[0006] The support member preferably includes an upstanding wall, which may be provided with one or more seats protruding inwardly therefrom. A cover supported on the support member may be supported on the seats, inwardly of the upstanding wall.

[0007] The support member may be generally rectangular in plan view. The upstanding wall is preferably also generally rectangular in plan view.

[0008] The support member may include a foot portion extending outwardly from the upstanding wall. The foot portion may lie generally perpendicular to the upstanding wall and may extend from the wall all around the perimeter of the wall. The foot portion may include a generally planar lower surface, which may also lie generally perpendicular to the upstanding wall and which may be substantially parallel to a cover mounted on the support member.

[0009] The flange may extend outwardly from a lower part of the upstanding wall. The flange may be generally planar and may lie approximately parallel to a cover mounted on the support member. The flange may have a thickness of between 6mm and 20mm.

[0010] The support member and the flange may each comprise a generally non-compressible material. This material is preferably metallic and may comprise cast iron. The support member and the flange may comprise respectively different materials.

[0011] Preferably the compressible member is located between two non-compressible parts of the frame, the two parts able to move relative to one another.

[0012] The frame arrangement may be formed in first and second parts and the compressible member be provided between the two parts. The first part may comprise the support member and the second part may comprise the flange.

[0013] The compressible member is preferably located between the foot portion of the support member and the flange.

[0014] The flange may include a receiving surface for receiving the compressible member. The receiving surface may be substantially planar or include a substantially planar portion, which may be substantially parallel to a cover mounted on the support member. The receiving surface may form part of a cut away portion of the flange, which may be of complementary shape to the foot of the support member.

[0015] The cut away portion of the flange may include a base, which constitutes the planar part of the cut away portion and may further include a ramp portion at its inner side, the ramp portion sloping upwardly from the base. The receiving surface may comprise the base and the ramp portion. The foot of the support member may include a complementary shaped underside, including a planar portion and a sloping portion.

[0016] Preferably the support member and the flange are so shaped that forces transmitted from the seats of the support member through the frame arrangement to the ground result in the compressible member receiving primarily compression forces. Preferably the support member and the flange operate substantially independently of each other under load.

[0017] The compressible member may comprise a sheet of elastically compressible material. The material may be located in the cut away portion of the frame, underneath the foot portion of the support member. Where the cut away portion includes a horizontal portion and a

ramp portion, the compressible member preferably extends over both these portions.

[0018] The compressible member may alternatively be located in the region of a seat on the frame arrangement. Each seat may include an upper and a lower member and a compressible member sandwiched therebetween. The upper and lower members are preferably of metal. The lower member may be formed integrally with the remainder of the frame. The upper member may be formed separately from the remainder of the frame, and may be able to move relative thereto. Preferably the upper and lower members sandwich the compressible member therebetween such that only one edge of the compressible member is exposed. Preferably the seats are shaped such that a cover mounted on the seats of the frame arrangement is not in direct contact with the compressible member. The compressible member may comprise a substantially planar sheet of an elastically compressible material.

[0019] Each seat may include a plurality of compressible members, each being sandwiched between two metal members.

[0020] The compressible material may include an elastomeric material, which may be a polymeric material. Preferably the material is adhesive. Preferably the material is an electrical insulator. Preferably the material is resistant to atmospheric attack and common manhole chamber and road contaminants, and is preferably fire resistant. The compressible member may comprise a liquid rubber which sets in place.

[0021] Preferably the compressible member's properties are such that it does not store sufficient energy during traffic overrun to cause cover throw after the passage of traffic.

[0022] Preferably the support member includes four side portions and four corner portions joining the side portions. The side portions are preferably substantially straight and the corner portions curved. The flange may include foot portions extending outwardly from the corner portions of the support member and edge portions linking the foot portions and extending outwardly from the side portions of the support member. The edge portions may extend outwardly from the support member by between 5mm and 50mm. The foot portions may extend outwardly from the support member by between 20mm and 150mm. However generally, the foot portions extend further outwardly than do the side portions. Each foot portion may include one or more openings passing therethrough.

[0023] The foot portions may include curved outer edges. An elongate bead may extend around at least a part of the outer edges of the foot portions and preferably extends round the whole outer edge of the flange. The bead may protrude upwardly beyond an upper surface of the flange. The bead is preferably of a smooth, curved shape in section and may be substantially circular in section, having a radius of between 5mm and 20mm and preferably about 10mm.

[0024] An undersurface of the flange may be provided with means for providing a mechanical interference between itself and the encapsulating mortar. Such means may include a plurality of projections or recesses. Preferably the projections or recesses have a smooth profile and provide a resistance to movement of the frame arrangement within mortar in any direction substantially parallel to the general plane of the flange.

[0025] According to the invention there is further provided a manhole assembly including a frame arrangement according to any of the preceding fourteen paragraphs and a cover for mounting on the frame arrangement.

[0026] An embodiment of the invention will be described for the purpose of illustration only with reference to the accompanying drawings in which:

Fig. 1 is a diagrammatic plan view of a prior art manhole assembly frame;

Fig. 2 is a diagrammatic plan view of a prior art manhole assembly including a frame and cover;

Fig. 3 is a diagrammatic side elevation of a prior art manhole frame;

Fig. 4 is a diagrammatic sectional view through the frame of Fig. 3;

Fig. 5 is a diagrammatic exploded view through a manhole frame according to a first embodiment of the invention;

Fig. 6 is a diagrammatic sectional view through the frame of Fig. 5 in the assembled position;

Fig. 7 is a diagrammatic exploded view through a manhole frame according to a second embodiment of the invention;

Fig. 8 is a diagrammatic sectional view through the frame according to the second embodiment;

Fig. 9 is a diagrammatic sectional view of a manhole assembly according to a third embodiment of the invention;

Fig. 10 is an exploded view of Fig. 9; and

Fig. 11 is a diagrammatic perspective view of a frame of the third embodiment of the invention.

[0027] Referring to Figs. 1 and 2, there is illustrated a prior art ground surface access assembly in the form of a manhole assembly 10, including a frame 12 and a cover 14. The manhole assembly is of type D400, meaning that it is rated to take forces of up to 400kN. The cover 14 is formed of cast metal such as cast iron and com-

prises two substantially planar triangular parts 16 provided with projections 18 on their upper surfaces. The projections 18 provide for a high friction upper surface of the cover member 14, to allow traffic to pass over the manhole assembly 10 without skidding.

[0028] The frame 12 is generally square in plan view, including straight sides 22 and curved corner regions 24. The frame 12 includes an upstanding wall 26 provided with seats (not illustrated) projecting therefrom in an inward direction. The cover 14 is supported at its edges or corners 20 on the seats.

[0029] Extending outwardly from a base region of the upstanding wall 26 is a generally planar flange 30. Referring to Figs 3 and 4, the flange has a thickness of about 8mm and has upper and lower surfaces 31 and 33 respectively. The lower surface 33 is provided with protruding, smooth nodules 42. The nodules 42 are generally conical in shape, but have curved peaks. The nodules allow the flange 30 to key into a mortar bed so that the grip between the flange 30 and the mortar bed is not solely reliant on friction between the flange and the mortar, but also on the sheer, tensile and compression properties of the mortar.

[0030] At a perimeter of the flange 30, a generally circular cross-section bead 44 is provided. The circular section of the bead 44 helps to minimise the likelihood of failure of the mortar. The bead has no corners to concentrate stress or form initiation sites for cracks.

[0031] Referring to Figs. 5 and 6, a manhole frame 12 according to the invention is formed in two parts, each of a hard metal such as cast iron. The frame 12 includes a support member 50 and a flange member 52. The support member includes an upstanding wall 26 provided with seats (not illustrated), as described with reference to the prior art. However the support member also includes a foot 54 which extends outwardly all around the perimeter of the upstanding wall 26. The foot 54 is generally perpendicular to the upstanding wall 26, and includes a substantially planar, horizontal lower surface 56.

[0032] The flange member 52 consists generally of a flange 30 as described with reference to the prior art. However, the flange member 52 includes a cut away portion 58 of generally complementary shape to the foot 54. The cut away portion 58 has a generally planar, horizontal upper surface 60.

[0033] Located between the upper surface 60 of the cut away portion 58 and the lower surface 56 of the foot 54 is a compression member 62. The compression member 62 comprises a generally planar sheet of an elastically compressible material, between about 1mm and 5mm in thickness. The material is preferably elastomeric and may be polymeric. The material is electrically insulating and is resistant to general manhole assembly contaminants such as salt, engine oil, and other substances generally found on road surfaces.

[0034] The compression member 62 locates between the support member 50 and flange member 52, forming a cushion between the two. It may thus be seen that downward forces transmitted from the cover 14 through the frame 12 to the ground are cushioned by the presence of the compression member 62. The compression member is also strongly adhesive, to hold the support member 50 and the flange member 52 together.

[0035] The shapes of the support member 50 and flange member 52 are such that vehicular forces transmitted through the frame 12 result in the compression member receiving predominantly compression forces during traffic overrun. The compression member is able to return virtually to its original section thickness after stresses from vehicle overrun. However, the shapes of the support member 50 and flange member 52 provide a safety stop in the event of the applied load exceeding the lateral or vertical restraint of the compression member 62.

[0036] The support member 50 and the flange member 52 would be cast as two separate components and assembled into the frame 12. The compression member may be applied in a liquid or in a pre-formed solid state.

[0037] Referring to Figs. 7 and 8, there is illustrated a manhole frame according to a second embodiment of the invention. The frame is generally similar to that of Figs. 5 and 6, and corresponding reference numerals are used. In the Figs. 7 and 8 embodiment, the cut-away portion 58 of the flange member 52, includes a generally planar, horizontal base 66 and a ramp portion 68, sloping upwardly and inwardly from the base. The foot 54 includes an undersurface of complementary shape to the cut-away portion 58 of the flange member 52, and the compression member 62 is located between the undersurface of the foot 54 and a top surface of the cut-away portion 58.

[0038] Referring to Figs. 9 to 11, there is illustrated a manhole assembly according to a third embodiment of the invention. The manhole assembly 10 includes a frame 12 and a cover 14, as in the previous embodiments of the invention. However, in this embodiment, the frame does not include a separate support member and flange member; instead it has an upstanding wall 26 and a flange 152 formed as a unitary component. The upstanding wall 26 is provided with seats 80 projecting therefrom in an inward direction. The cover 14 is supported at its corners 20 on the seats 80. Each seat 80 includes a lower member 82, which is formed as an integral part of the manhole frame 12, and a compression member 162 located above the lower member 82. As in the previous embodiments, the compression member 162 comprises a generally planar sheet of an elastically compressible material, between about 1mm and 5mm in thickness. Located above the compression member 162 is an upper member 84 of the seat 80. The upper member 84 is able to move slightly relative to the lower member 82, as the compressible member 162 is compressed.

[0039] The compression member 162 is sandwiched between the upper and lower members 82 and 84 of the

seat, thus forming a cushion between these two members. The corners 20 of the frame 12 rest on the seats 80 therefore a cushioning effect is provided between the cover 14 and the frame 12.

[0040] By sandwiching the compression member 162 between the upper and lower members 82 and 84 of the seat 80, this ensures that only one edge of the compression member is in contact with the atmosphere and with contamination. This minimises any possible degradation of the compression member 162.

[0041] The compression member 162 functions in a generally similar manner to the compression members 162 of the previous embodiments. However, by providing the compression member relatively high up within the frame 12, the entire body of the frame below the compression member is protected from stresses caused by sudden impacts. These may be caused for example when vehicle wheels drop onto recessed cover. Conventionally, such impacts result in the manhole assembly transmitting the shock to the substructure thus resulting in potential damage.

[0042] There is thus provided a frame for a manhole assembly which minimises the damage that vehicular forces cause to the surrounding mortar foundation.

[0043] Various modifications may be made to the above described embodiment without departing from the scope of the invention. The flange member 50 may comprise a plurality of segments to be fixed together at the point of assembly. The support member 50 and the flange member 52 could be made of dissimilar materials. These members have to perform quite different functions and thus materials with different physical properties could be used. The possibility of electrochemical reaction between the dissimilar materials would be reduced by the presence of the compression member 62 separating the materials.

[0044] Instead of constructing the support member and flange member separately, a single unitary frame could be used, with the compression member being provided below the flange 30.

[0045] The shapes of the various components may be altered. For example, the flange could be curved in profile.

[0046] Whilst endeavouring in the foregoing specification to draw attention to those features of the invention believed to be of particular importance it should be understood that the Applicant claims protection in respect of any patentable feature or combination of features hereinbefore referred to and/or shown in the drawings whether or not particular emphasis has been placed thereon.

Claims

1. A frame arrangement (12) for a ground surface access assembly, the frame arrangement (12) including a support member (50) for mounting a cover and a flange (30) for embedding in the ground, the flange (30) extending outwardly from the support member, wherein the frame arrangement (12) incorporates an elastically compressible member (62) for cushioning forces transmitted through the frame arrangement (12) to the ground.

2. A frame assembly according to claim 1, wherein the support member (50) includes an upstanding wall (26), which is provided with one or more seats protruding inwardly therefrom, a cover supported on the support member (50) being supported on the seats, inwardly of the upstanding wall (26).

3. A frame arrangement (12) according to claim 1 or claim 2, wherein the support member (50) and the flange (30) each comprise a generally non-compressible material.

4. A frame arrangement (12) according to claim 3, wherein the compressible member (62) is located between two non-compressible parts of the frame, the two parts able to move relative to one another.

5. A frame arrangement (12) according to claim 4, wherein the frame arrangement (12) is formed in first and second parts and the compressible member (62) is provided between the two parts.

6. A frame arrangement (12) according to claim 5, wherein the first part comprises the support member (50) and the second part comprises the flange (30).

7. A frame arrangement (12) according to claim 6, wherein the support member (50) includes a foot portion (54) extending outwardly from the upstanding wall (26).

8. A frame arrangement (12) according to claim 7, wherein the foot portion (54) includes a generally planar lower surface, which lies generally perpendicular to the upstanding wall (26).

9. A frame arrangement (12) according to claim 8, wherein the compressible member (62) is located between the foot portion (54) of the support member (50) and the flange (30).

10. A frame arrangement (12) according to claim 9, wherein the flange (30) includes a receiving surface (60, 66, 68)for receiving the compressible member (62), the receiving surface (60, 66, 68) being substantially planar or including a substantially planar portion.

11. A frame arrangement (12) according to claim 10, wherein the receiving surface (60, 66, 68) forms

part of a cut away portion of the flange (30), which is of complementary shape to the foot of the support member (50).

12. A frame arrangement (12) according to claim 11, wherein the cut away portion of the flange (30) includes a base (66), which constitutes the planar part of the cut away portion and further includes a ramp portion (68) at its inner side, the ramp portion (68) sloping upwardly from the base (66), the receiving surface (60, 66, 68) comprising the base (66) and the ramp portion (68).

13. A frame arrangement (12) according to claim 12, wherein the foot of the support member (50) includes an underside of complementary shape to the cut-away portion of the flange (30), including a planar portion and a sloping portion.

14. A frame arrangement (12) according to any preceding claim, wherein the support member (50) and the flange (30) are so shaped that forces transmitted from the seats of the support member (50) through the frame arrangement (12) to the ground result in the compressible member (62) receiving primarily compression forces.

15. A frame arrangement (12) according to any preceding claim, wherein the support member (50) and the flange (30) operate substantially independently of each other under load.

16. A frame arrangement (12) according to any preceding claim, wherein the compressible member (62) comprises a sheet of elastically compressible material.

17. A frame arrangement (12) according to any of claims 1 to 5, wherein the compressible member (62) is located in the region of a seat (80) on the frame arrangement (12), each seat (80) including an upper (82) and a lower (84) member and a compressible member (62) (162) sandwiched therebetween.

18. A frame arrangement (12) according to claim 17, wherein the lower member (84) is formed integrally with the remainder of the frame, and the upper member (82) is formed separately from the remainder of the frame, and is able to move relative thereto.

19. A frame arrangement (12) according to claim 18, wherein the upper and lower members sandwich the compressible member (62) therebetween such that only one edge of the compressible member (62) is exposed.

20. A frame arrangement (12) according to any of claims 17 to 19, wherein the seats (80) are shaped such that a cover mounted on the seats of the frame arrangement (12) is not in direct contact with the compressible member (62).

21. A frame arrangement (12) according to any of claims 17 to 20, wherein each seat includes a plurality of compressible members (62), each being sandwiched between two metal members.

22. A frame arrangement (12) according to any preceding claim, wherein the compressible member's (62) properties are such that it does not store sufficient energy during traffic overrun to cause cover throw after the passage of traffic.

23. A manhole assembly including a frame arrangement (12) according to any preceding claim and a cover for mounting on the frame arrangement (12).

24. Any novel subject matter or combination including novel subject matter disclosed herein, whether or not within the scope of or relating to the same invention as any of the preceding claims.

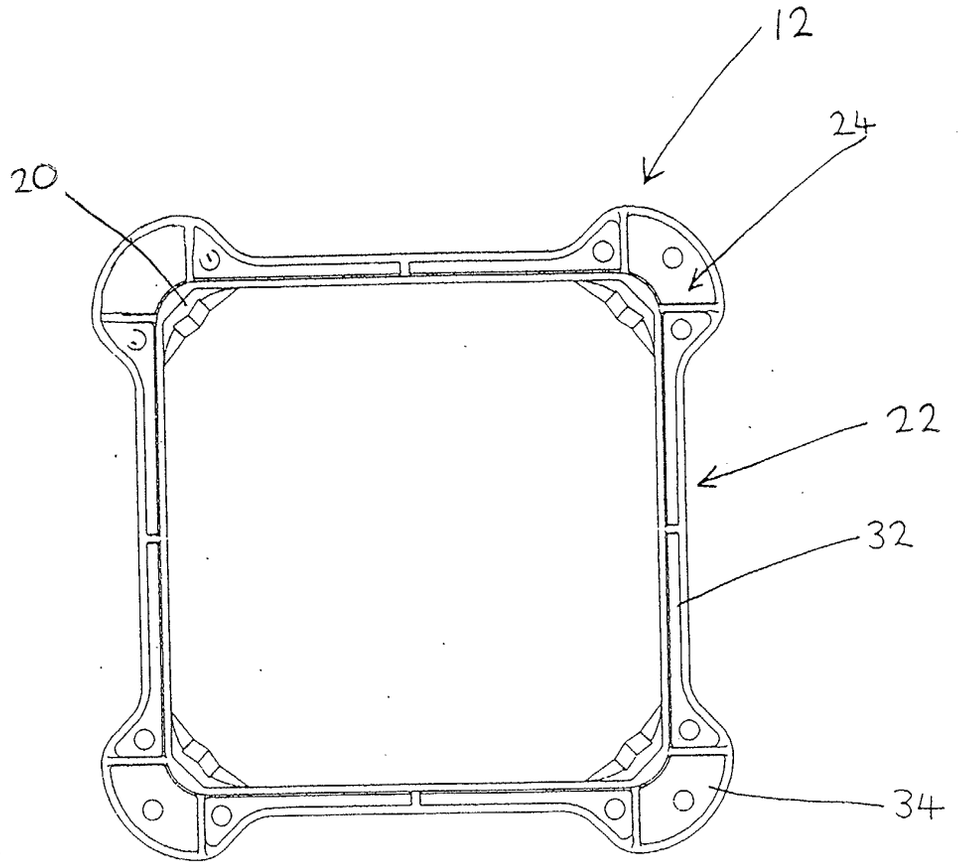


FIG 1

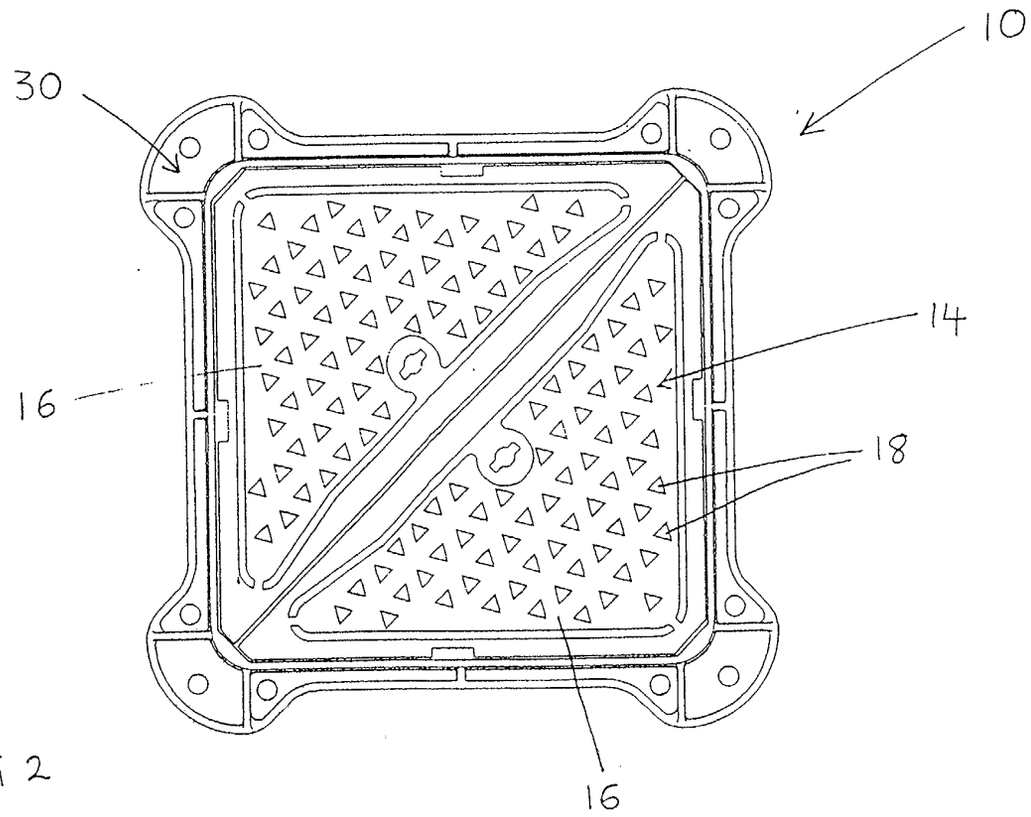


FIG 2

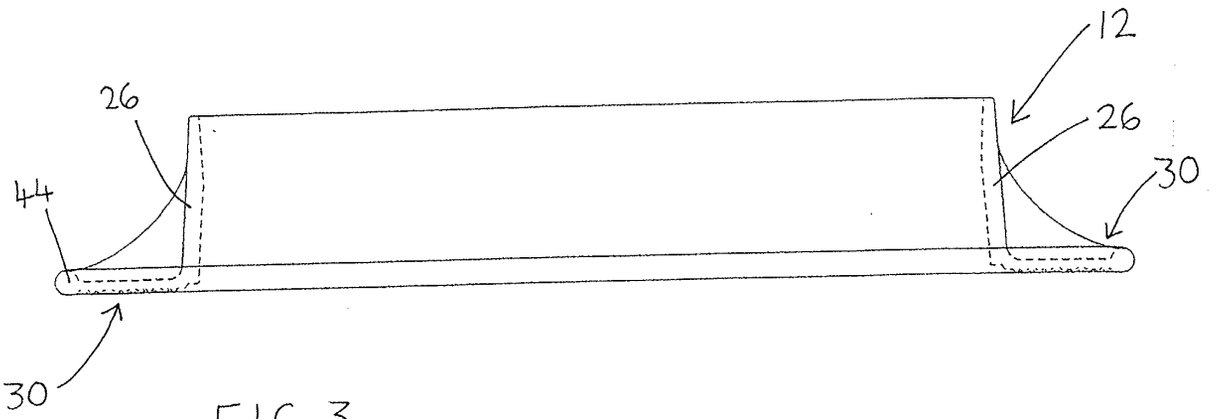


FIG 3

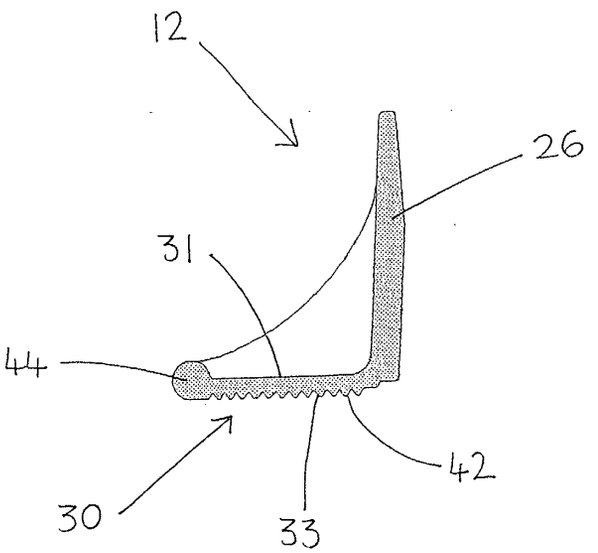


FIG 4

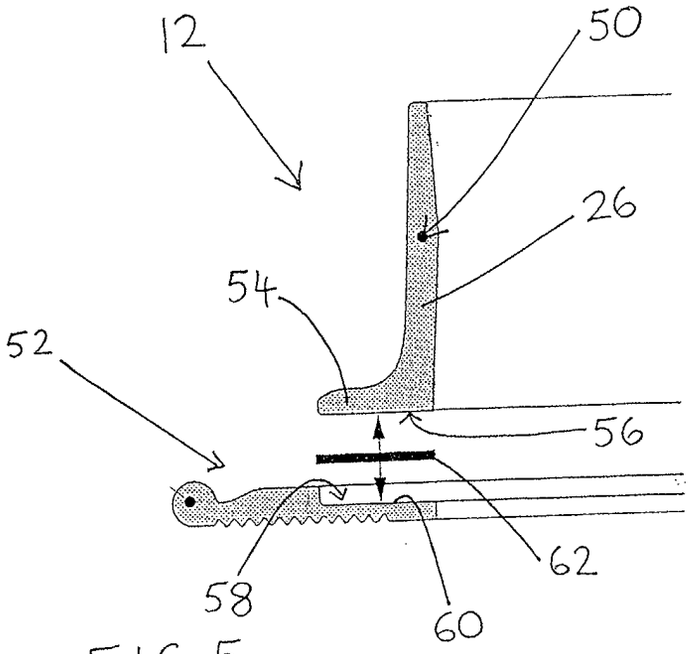


FIG 5

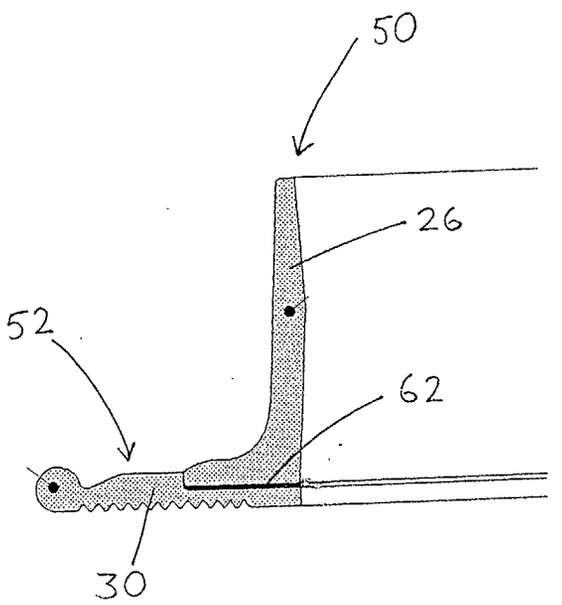


FIG 6

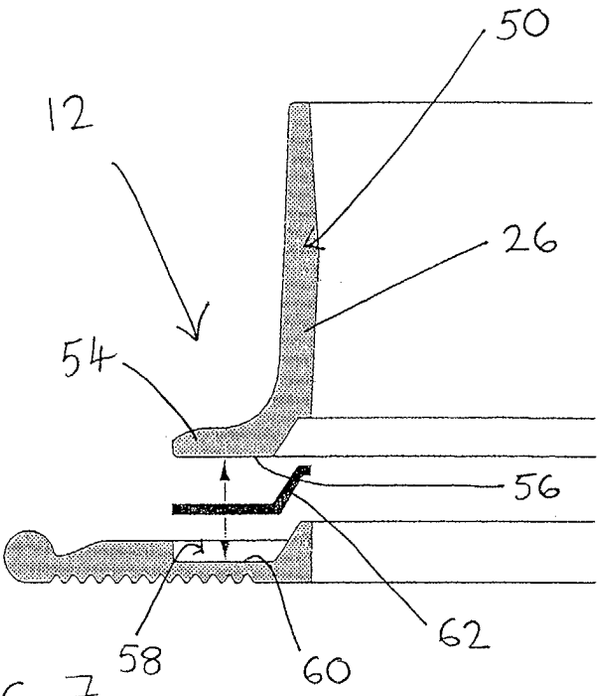


FIG 7

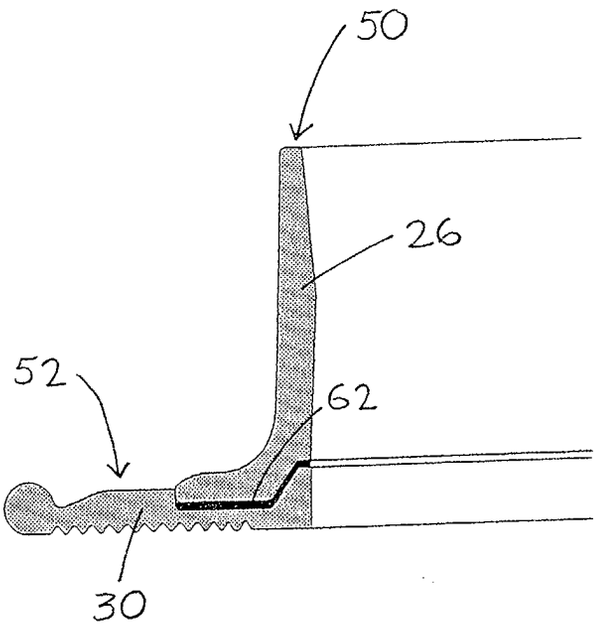


FIG 8

FIG 9

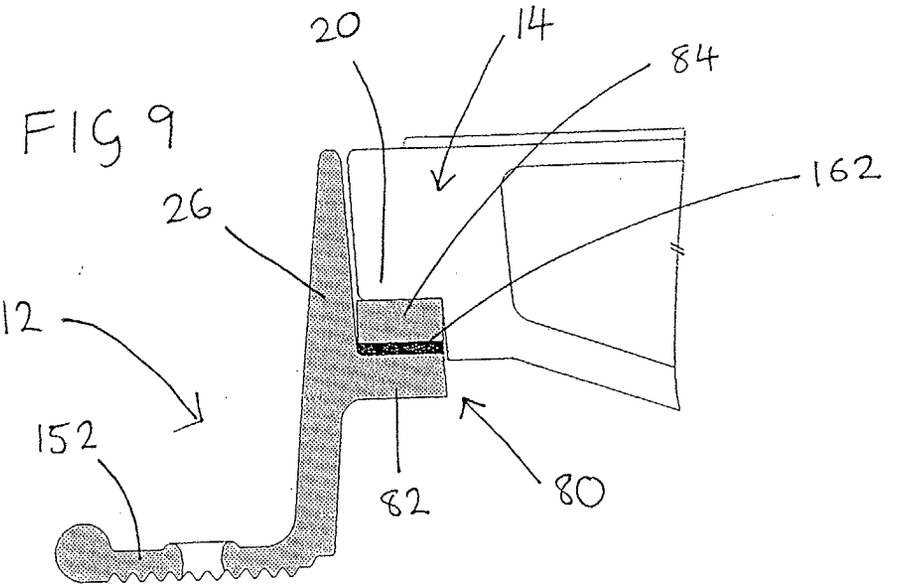
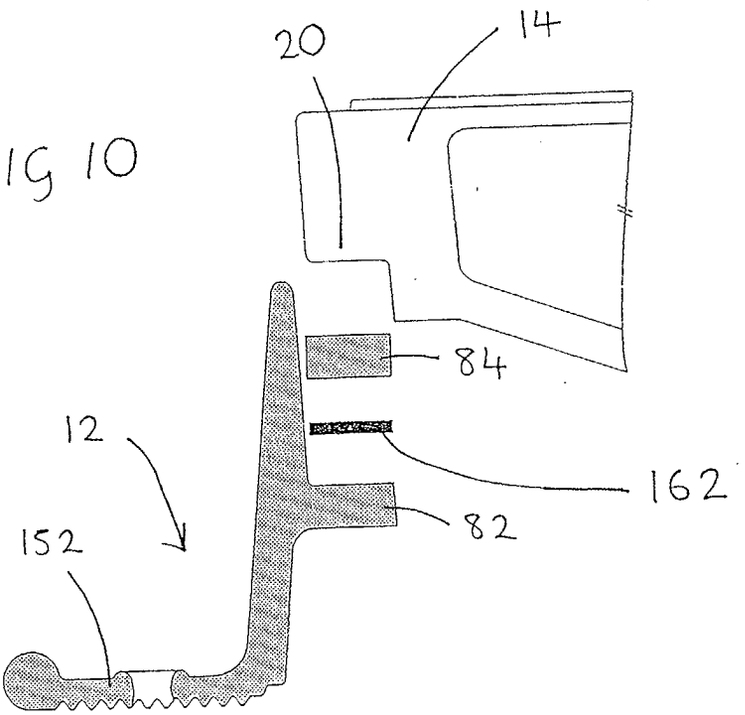


FIG 10



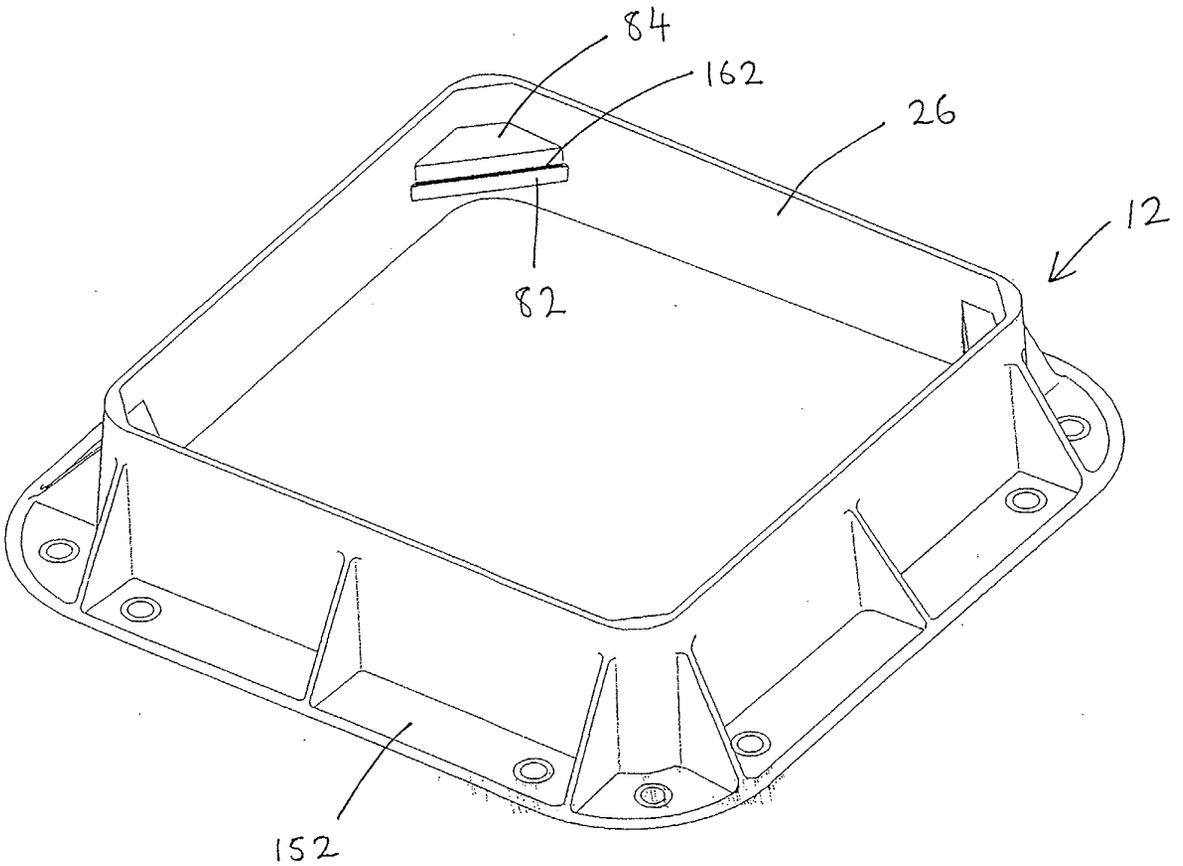


FIG 11

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 25 8491

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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TECHNICAL FIELDS SEARCHED (Int.Cl.7)
E02D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	12 March 2003	Geiger, H

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 02 25 8491

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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