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(54) Ground surface access assemblies

(57) A ground surface access assembly (10) includes a frame (14) defining an access opening (50) and a cover (22), which is mountable to the frame (14) within the opening (50). The cover (22) includes a substantially planar part (24) and a reinforcement arrangement (52). The reinforcement arrangement (52) includes a first reinforcement part (16) projecting upwardly from an upper surface (26) in use of the planar part (24) and a second reinforcement part (30) projecting downwardly from a lower surface (28) in use of the planar part (24).

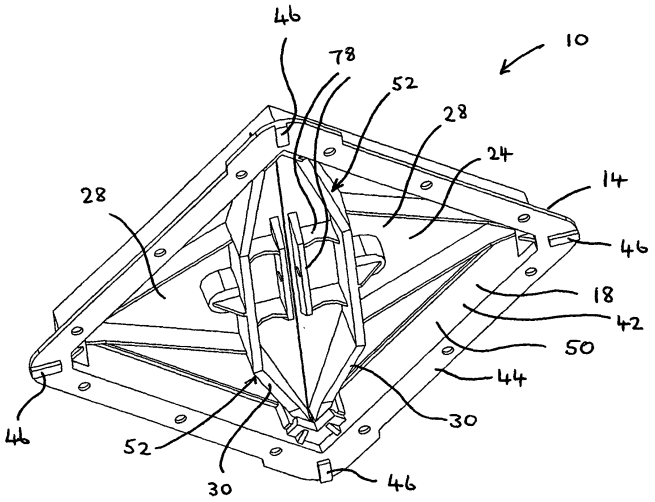

Fig 2

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Description

[0001] The present invention relates to ground surface access assemblies, and covers and frames therefor.

[0002] Ground surface access assemblies such as gullies and manhole covers and frames are used in areas such as roadway services to provide access to underground services such as, for instance, drainage services and cable ducting. Such assemblies are commonly formed of cast iron and include a frame defining an access opening and a cover which is mounted to the frame in the opening. The assemblies have to be constructed to withstand a specified test regime which includes withstanding a test load, the amount of which is dependent on the particular location and trafficking for which the assembly is designed.

[0003] The testing regime applicable to ground surface access assemblies for use in locations such as roadways is currently set out in European Standard EN 124. In testing, an assembly must withstand a specified design load applied through a pad or plate to the cover or covers over the central part of the opening without an undue amount of deformation. Further constraints on the designers of such assemblies include ensuring that the product can be relatively easily manufactured; that product weight is minimised for cost and handling reasons; ensuring ease and safety of stacking of products for efficient transportation and storage; and ensuring ease of use for installers.

[0004] In this specification, the terms "upper" and "lower" are used relative to the orientation of a ground surface access assembly in an in use condition, in which the frame is supported on a support surface.

[0005] According to a first aspect of the present invention, there is provided a ground surface access assembly, the assembly including a frame defining an access opening, a cover mountable to the frame within the opening, the cover including a substantially planar part and a reinforcement arrangement, the reinforcement arrangement including a first reinforcement part projecting upwardly from an upper surface in use of the planar part and a second reinforcement part projecting downwardly from a lower surface in use of the planar part.

[0006] According to a second aspect of the present invention, there is provided a cover for a ground surface access assembly, the assembly including a frame defining an access opening, the cover mountable to the frame within the opening, the cover including a substantially planar part and a reinforcement arrangement, the reinforcement arrangement including a first reinforcement part projecting upwardly from an upper surface in use of the planar part and a second reinforcement part projecting downwardly from a lower surface in use of the planar part.

[0007] The cover may include a raised, upwardly projecting surface pattern which is formed on the upper surface, and the first reinforcement part may form at least part of the raised pattern.

[0008] Possibly, the shape and location of the first reinforcement part when viewed in plan corresponds with the shape and location of second reinforcement part, so that the second reinforcement part is located substantially oppositely and below the first reinforcement part. Hence, the first and second reinforcement parts may in use under load act together, and may act substantially as a simple beam.

[0009] The maximum width of the first reinforcement part may be greater than the maximum width of the second reinforcement part.

[0010] The assembly may include a plurality of covers, and may include two covers. The or each cover may be substantially triangular in plan. The or each cover may include a plurality of mountings, and may include three mountings.

[0011] The first reinforcement part may project above the upper surface by a first reinforcement part projection height of at least 2mm. The first reinforcement part projection height may be less than 6mm, and may be approximately 4mm.

[0012] Possibly, the frame includes a plurality of side walls and a plurality of spacer projections, which may extend downwardly from the side walls to space the side walls from a support surface.

[0013] According to a third aspect of the present invention, there is provided a frame for a ground surface access assembly, the frame including a plurality of side walls and a plurality of spacer projections, which extend downwardly from the side walls to space the side walls from a support surface.

[0014] The side walls may include an upstanding part, and may include a flange part, which may extend outwardly from a lower part in use of the upstanding part. Each spacer projection may extend from an in use lower surface of the flange part. The spacer projections may be located outboard of the upstanding part, so that when stacked the upstanding part of one frame locates between the spacer projections of an adjacent frame.

[0015] The frame may include at least three spacer projections.

[0016] Each spacer projection may project by a spacer projection height of at least 5mm. Possibly, the spacer projection height is not more than 15mm, and may be approximately 10 mm.

[0017] An embodiment of the present invention will now be described by way of example only and with reference to the accompanying drawings, in which:-

Fig. 1 is a perspective view of a ground surface access assembly;

Fig. 2 is a perspective view from below of the ground surface access assembly of Fig 1;

Fig. 3 is a side view of the ground surface access assembly;

Fig. 4 is a view from above of a cover;

Fig. 5 is a view from below of the cover of figure 4;

Fig. 6 is a sectional view of part of the cover of Figs 4 and 5, as indicated by the section line VI-VI in Figs 4 and 5.

[0018] Figs 1 to 3 show a ground surface access assembly 10, the assembly 10 including a frame 14 defining an access opening 50 and a pair of substantially identical covers 22 mountable to the frame 14 within the opening 50.

[0019] The frame 14 and the covers 22 could be formed by casting, and could be formed of cast iron, and could be formed of ductile iron.

[0020] Each of the covers 22 is substantially triangular in plan, having a pair of corners 54 which subtend an angle of substantially 45° and a 90° corner 56, each cover 22 including a relatively long hypotenuse side 58 which extends between the 45° corners 54 and a pair of relatively short sides 60, each of which extend between one of the 45° corners 54 and the 90° corner 56. Each cover 22 includes a mounting 34 projecting downwardly from the lower surface 20 at each of the corners 54, 56.

[0021] Each cover 22 includes a substantially planar part 24 and a reinforcement arrangement 52, the reinforcement arrangement 52 including a first reinforcement part 16 which projects upwardly from an upper surface 26 of the planar part 24 and a second reinforcement part 30 which projects downwardly from a lower surface 28 of the planar part 24.

[0022] The first reinforcement part 16 includes a main beam part 62 which extends substantially along a curved line extending between the two 45° corners 54, a pair of secondary reinforcement parts 64 which extend from the main beam part 62 towards the 90° corner 56, and a keyhole reinforcement part 66.

[0023] In the embodiment shown, the first reinforcement part 16 forms a raised, upwardly projecting surface pattern 70 on the upper surface 26. In other examples, the surface pattern 70 could also include other projecting elements, which could be in the form of text and/or other shapes, and which could be of a different height to the first reinforcement part 16. The other projecting elements would not form part of the first reinforcement part 16.

[0024] As shown in figure 6, the first reinforcement part 16 projects upwardly from the upper surface 26 by a first reinforcement part projection height 68. In one example, the first reinforcement part projection height could be at least 2 mm, and could be less than 6 mm, and optimally could be approximately 4 mm.

[0025] The second reinforcement part 30 includes a main beam part 72 which extends substantially along a curved line extending between the mountings 34 of the two 45° corners 54, a pair of secondary reinforcement parts 74, which extend from the main beam part 72 towards the mounting 34 of the 90° corner 56, and a keyhole reinforcement part 76.

[0026] The reinforcement arrangement 52 also includes other reinforcement features 78 projecting downwardly from the lower surface 28, which could be in the form of auxiliary beams, webs, etc, which do not form part of the second reinforcement part 30.

[0027] The planar part 24, the first reinforcement part 16 and the second reinforcement part 30 are formed integrally.

[0028] The shape and location of the first reinforcement part 16 when viewed in plan as shown in Figs 4 and 5 corresponds with the shape and location of the second reinforcement part 30, so that the second reinforcement part 30 is located substantially oppositely and below the first reinforcement part 16. Thus, the second reinforcement of main beam part 72 is substantially directly below the first reinforcement main beam part 62 as shown in figure 6, and similarly the second reinforcement secondary parts 74 are substantially directly below the first reinforcement secondary parts 64. The applicant has found that this provides the advantage that when subjected to test loading, in which a test load is applied through a pad or plate to the covers 22 above the central part of the opening 50, the first and second reinforcement parts 16, 30 act together as a simple beam. Thus, in the invention, the first reinforcement part 16 extends the depth of the second reinforcement part 30 to increase the effective load-bearing capacity of the cover 22.

[0029] In one example, a first reinforcement part 16 having a first reinforcement part projection height 68 of approximately 4 mm resulted in movement of the position of the neutral axis in a loading condition upwards by approximately 2 mm, when compared with the position of the neutral axis of a cover without a first reinforcement part 16, increasing the second moment of area for the portion in tension and resulting in an increase in load bearing capacity of 3.5 tonnes, an increase of 8.5%. The increase in load-bearing capacity permits the designer to reduce the weight of material in the cover 22, resulting in a cost saving.

[0030] As shown in figure 6, the width 80 of the first reinforcement part 16 is greater than the width 82 of the second reinforcement part 30 to allow for a degree of mismatch during the casting process of mould parts. In one example, the width 80 of the first reinforcement part 16 is approximately 2 mm greater than the width 82 of the second reinforcement part 30.

[0031] The frame 14 includes a plurality of sidewalls 18, the sidewalls 18 including an upstanding part 42 and a flange part 44 which extends outwardly from a lower part in use of the upstanding part 42. The frame 14 includes a plurality of spacer projections 46 which extend downwardly from and in use lower surface 48 of the flange part 44. In the embodiment shown in figure 2, the frame 14 includes four spacer projections 46, each spacer projection 40 being located at a corner of the frame 14. Each spacer projection 46 extends inwardly from an outermost edge of the flange part 44 to a position which

is located outboard of the upstanding part 42 in the vertical plane. This provides the advantage at that, when stacked, the upstanding part 42 of one frame 14 can locate between the spacer projections 46 of an adjacent frame 14, providing a degree of interlock between adjacent frames 14 in a stack, and thus improving the stability of the stack, and also providing a degree of nesting between frames, reducing the overall height of the stack and increasing the storage density.

[0032] Each spacer projection 46 projects by a spacer projection height 86. The spacer projection height 86 could be at least 5 mm, and could be no more than 15 mm. In one example, the spacer projection height 46 could be approximately 10 mm.

[0033] Figure 3 shows the ground surface access assembly 10 in use. The frame 14 is located on a support surface 20. The spacer projections 46 space the sidewalls 18 from the support surface 20. A gap 84 is defined between the spacer projections 46, the lower surface 48 of the flange part 44 and the support surface 20.

[0034] In use in construction, a bedding layer of a settable material such as mortar, resin concrete or an epoxy material is applied to the support surface 20, and the frame 14 located in the settable material so that the spacer projections 46 contact the support surface 20. The settable material fills the gap 84. The gap 84 is arranged so that, when filled, the settable material conforms to a specified minimum thickness.

[0035] The spacer projections 46 permit a reduction in frame material weight, while permitting the overall height of the frame to be maintained, so that the depth of construction of the ground surface access assembly 10 of the invention is similar to that of a conventional ground surface access assembly. In one example, the overall height of a conventional frame is approximately 102 mm, while in the frame of the invention, the height of the sidewalls 18 could be approximately 92 mm and the spacer projection height 86 could be approximately 10 mm.

[0036] The requirement to stack ground surface access assemblies on top of each other imposes a further constraint upon the designer, in that it is important for stability that when stacked, adjacent assemblies make contact between respective sidewalls, rather than between the downwardly extending reinforcement parts and upper surfaces of covers, which could cause rocking and instability. Providing spacer projections 46 which permit nesting of adjacent assemblies would, in the absence of any other modification, increase the risk of contact between cover parts rather than sidewalls. The provision of the reinforcement arrangement 52 of the present invention permits a reduction in projection height of the second reinforcement main beam part 72, reducing the risk of contact between cover parts. Thus, there is a synergy between the provision of the spacer projections 46 and the provision of the reinforcement arrangement 52.

[0037] In one example, a ground surface access assembly conforming to class D400 of European Standard EN 124 which included spacer projections 46 and first and second reinforcement parts 16, 30 had a weight of 65 kg, in comparison with a similar, conventional ground surface access assembly, which had a weight of 75 kg, a reduction in weight of over 13%.

[0038] Various modifications could be made without departing from the scope of the invention. The assembly could include any suitable number of covers, and could include a single cover. The assembly, the frame and the cover or covers could be of any suitable size, shape and configuration. For example, when viewed in plan, the assembly could be substantially triangular, square, rectangular or circular in shape. The assembly, the frame and the cover or covers could be formed by any suitable method or combination of methods, and could be formed of any suitable material, such as aluminium or plastics.

[0039] The reinforcement arrangement could include any suitable number of reinforcement parts, and the reinforcement parts could include any suitable number of elements, of any suitable size, shape or configuration.

[0040] The assembly could include any suitable number of spacer projections, which could be of any suitable size, shape or configuration. To ensure non-rock mounting, the minimum number of spacer projections should be three.

[0041] There is thus provided a ground surface access assembly including a cover and a frame which provides a number of advantages over conventional assemblies. The combination of the reinforcement arrangement of the invention with the spacer projections permits a significant reduction in weight to be achieved, reducing both manufacturing and transport costs and reducing handling risks on site, while providing an access assembly which can be manufactured using conventional materials and methods, and storage density is also increased, reducing storage costs.

Claims

1. A cover (22) for a ground surface access assembly (10), **characterised in that** the assembly includes a frame (14) defining an access opening (50), the cover mountable to the frame within the opening, the cover including a substantially planar part (24) and a reinforcement arrangement (52), the reinforcement arrangement including a first reinforcement part (16) projecting upwardly from an upper surface (26) in use of the planar part and a second reinforcement part (30) projecting downwardly from a lower surface (28) in use of the planar part.

2. A cover according to claim 1, in which the cover includes a raised, upwardly projecting surface pattern (70) which is formed on the upper surface, and the first reinforcement part forms at least part of the raised pattern.

3. A cover according to claims 1 or 2, in which the shape

and location of the first reinforcement part when viewed in plan corresponds with the shape and location of the second reinforcement part, so that the second reinforcement part is located substantially oppositely and below the first reinforcement part.

4. A cover according to any of the preceding claims, in which the maximum width of the first reinforcement part is greater than the maximum width of the second reinforcement part.

5. A cover according to any of the preceding claims, in which the first reinforcement part projects above the upper surface by a first reinforcement part projection height of at least 2mm.

6. A cover according to any of the preceding claims, in which the first reinforcement part projection height is less than 6mm.

7. A frame (14) for a ground surface access assembly (10), **characterised in that** the frame includes a plurality of side walls (18) and a plurality of spacer projections (46), which extend downwardly from the side walls to space the side walls from a support surface (20).

8. A frame according to claim 7, in which the side walls include an upstanding part (42), and a flange part (44) which extends outwardly from a lower part in use of the upstanding part, and each spacer projection extends from an in use lower surface (48) of the flange part (44).

9. A frame according to claim 8, in which the spacer projections are located outboard of the upstanding part, so that when stacked the upstanding part of one frame locates between the spacer projections of an adjacent frame.

10. A frame according to any of claims 7 to 9, in which the frame includes at least three spacer projections.

11. A frame according to any of claims 7 to 10, in which each spacer projection projects by a spacer projection height (86) of at least 5mm.

12. A frame according to any of claims 7 to 11, in which the spacer projection height is not more than 15mm.

13. A frame according to any of claims 7 to 12, in which the spacer projection height is approximately 10 mm.

14. A ground surface access assembly **characterised in that** the assembly includes a frame (14) defining an access opening (50) and a cover (22) mountable to the frame within the opening, in which the cover is as defined in any of claims 1 to 6, and the frame is as defined in any of claims 7 to 13.

15. An assembly according to claim 14, in which the assembly includes a plurality of covers, and may include two covers.

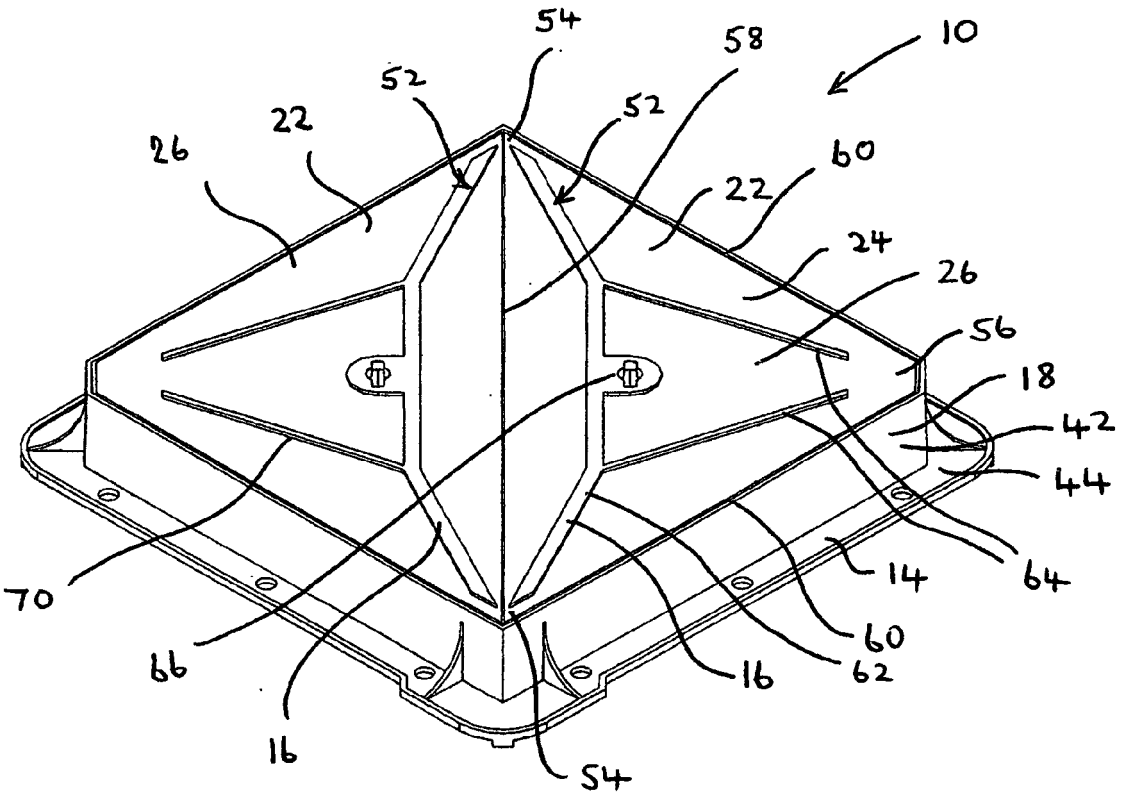

Fig 1

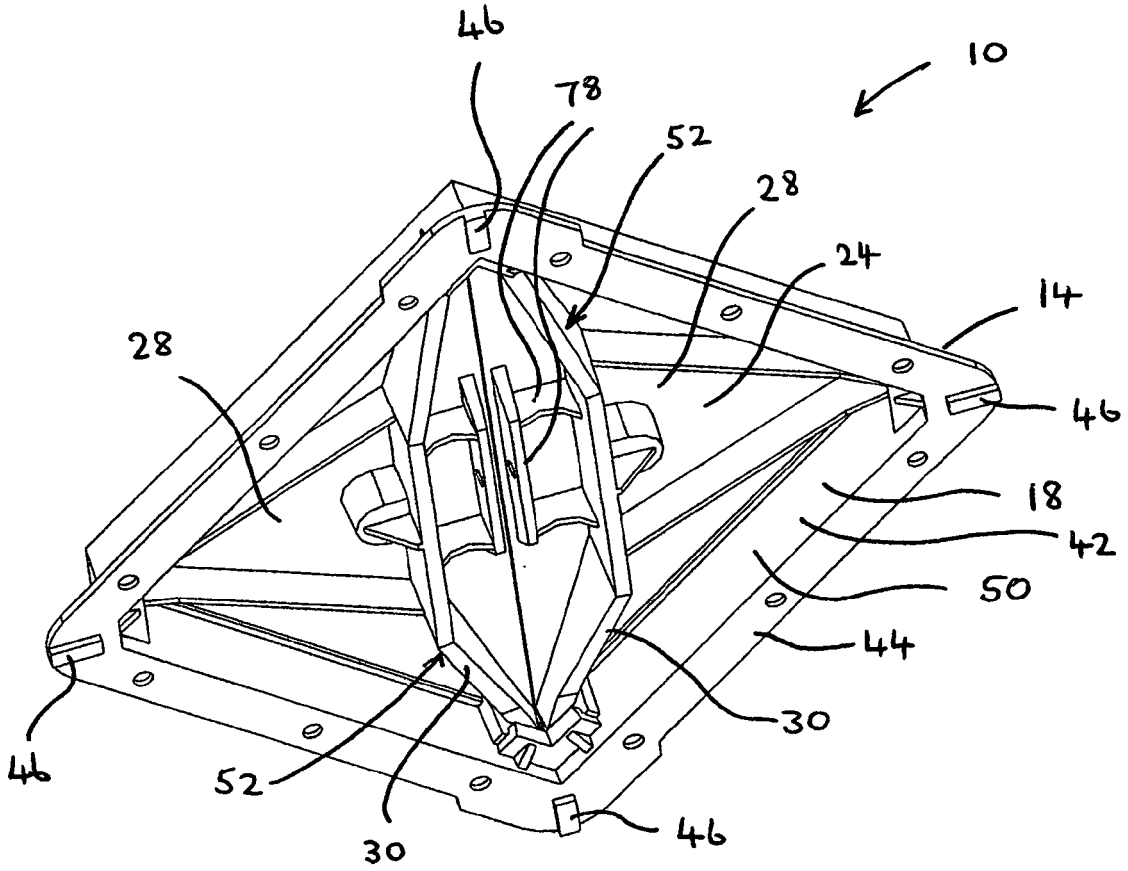

Fig 2

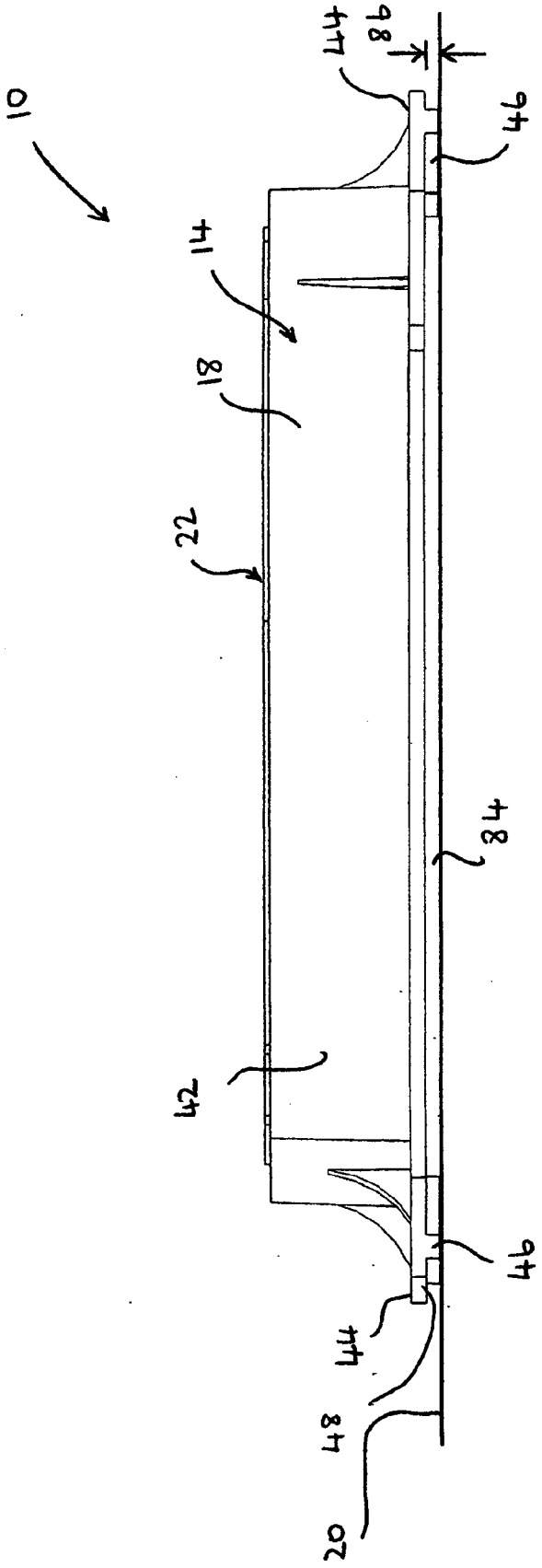

Fig 3

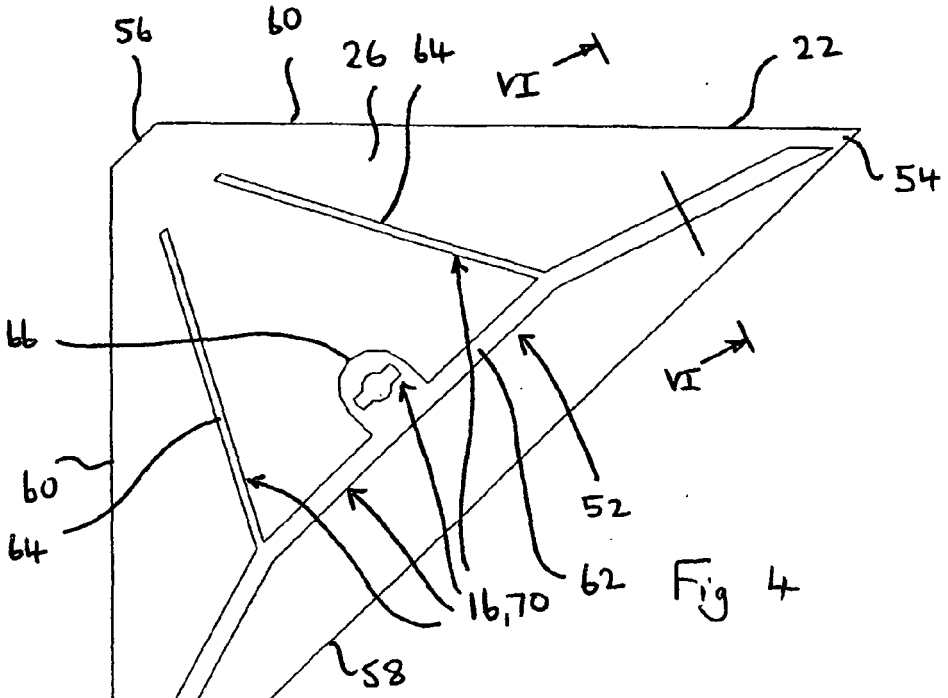
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Fig 4

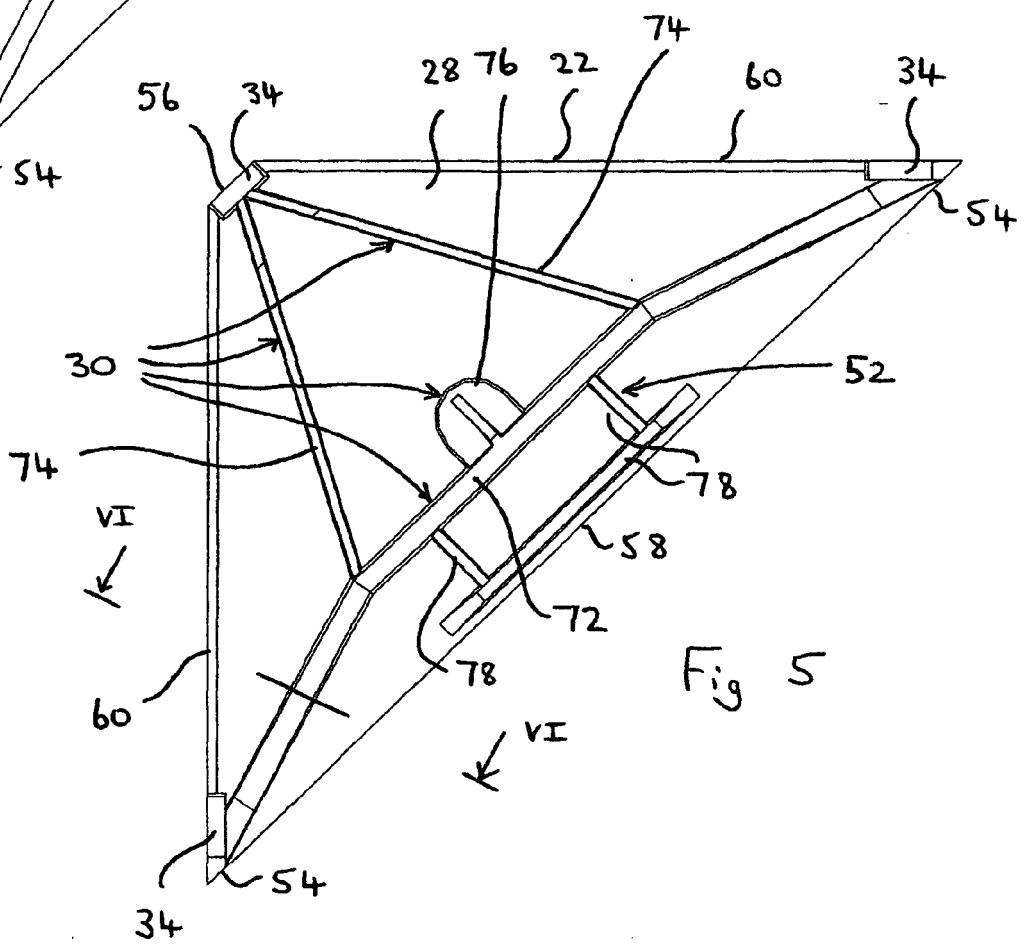
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Fig 5

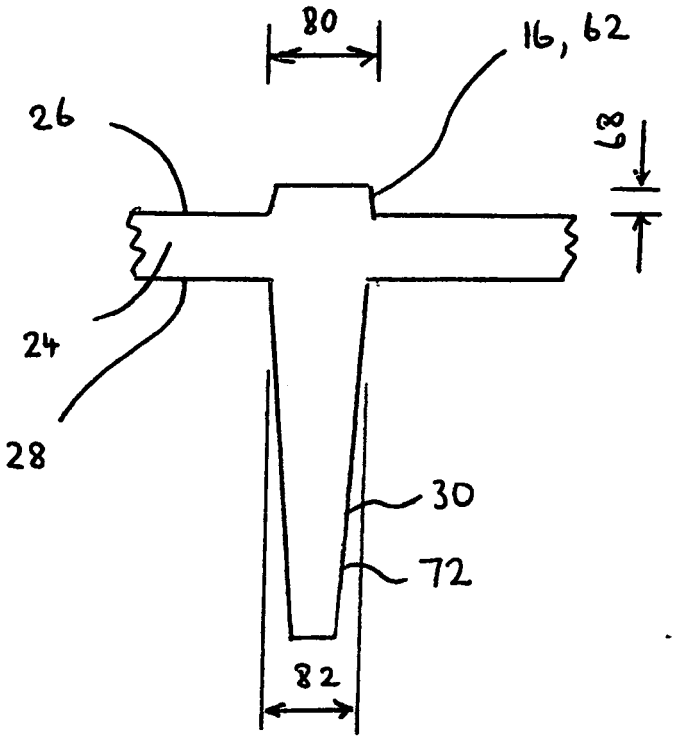

Fig 6

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PARTIAL EUROPEAN SEARCH REPORT

under Rule 62a and/or 63 of the European Patent Convention. This report shall be considered, for the purposes of subsequent proceedings, as the European search report

Application Number
EP 10 25 0420

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 752 584 A2 (ATLANTA IMPEX LTD [GB]; WREKIN WELDING & FABRICATION E [GB]) 14 February 2007 (2007-02-14) * paragraph [0032] - paragraph [0058]; figures 3,4 *	1-6	INV. E02D29/14
A	EP 1 870 524 A2 (WREKIN WELDING FABRICATION & E [GB]; ATLANTA IMPEX LTD [GB]) 26 December 2007 (2007-12-26) * the whole document *	1-6	
A	EP 0 808 951 A1 (NORINCO [FR]) 26 November 1997 (1997-11-26) * the whole document *	1-6	

TECHNICAL FIELDS SEARCHED (IPC)

E02D

INCOMPLETE SEARCH

The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC so that only a partial search (R.62a, 63) has been carried out.

Claims searched completely :

Claims searched incompletely :

Claims not searched :

Reason for the limitation of the search:

see sheet C

Place of search	Date of completion of the search	Examiner
Munich	17 September 2010	Geiger, Harald

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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INCOMPLETE SEARCH SHEET C

Application Number
EP 10 25 0420

The application containing claim groups 1-6, 7-13, and 14-15 each based on an independent claim of product category. In its answer to the request for clarification after Rule 62a, the applicant decided for claim group 1-6 to be subject of this search.

Claim(s) completely searchable:
1-6

Claim(s) not searched:
7-15

Reason for the limitation of the search (non-patentable invention(s)):

The application contains three independent claims to a product.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 10 25 0420

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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17-09-2010

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