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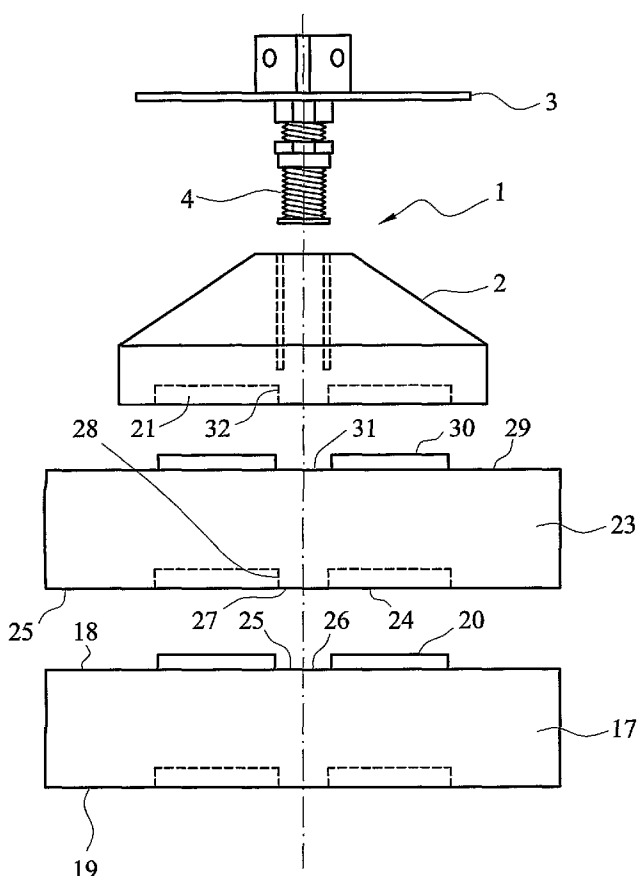
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(54) Title: PORTABLE FOUNDATION



(57) Abstract: There is described a portable foundation assembly for a structure, comprising: a footing member adapted to sit on the ground; a support member having a support surface adapted to engage the structure at a chosen location; the support member being provided with a base member and height adjustment means located in the base member. There is also described a method of supporting a structure which comprises the use of one or more such portable foundation assemblies.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

PORTABLE FOUNDATION

The present invention relates to portable foundations and particularly, but not exclusively, to portable foundations for semi permanent or pre-fabricated structures, including buildings, such as log cabins. The present invention also relates to methods of construction and parts for construction of such portable foundations

Foundations provide a stable base on which to stand a structure, and serve to distribute the structure's load.

10

Known foundations for, for example, pre-fabricated buildings such as log cabins, are constructed in the same way as those for permanent structures, such as domestic dwellings. A network of trenches is excavated, having a layout corresponding to that of the load bearing walls of the cabin. Concrete is poured into the trenches and allowed to set (so-called "poured concrete foundations"). The cabin is constructed on the set concrete which supports the full length of each load bearing wall.

When structures, and especially pre-fabricated structures, are constructed, or placed on the foundations, any errors or inaccuracies during construction of the foundations can have a serious effect on the structure. For example, if the foundations are incorrectly measured and the structure does not fit on top of them, the structure may be incorrectly supported and, possibly, unsafe.

Poured concrete foundations are labour intensive to construct, not least because of the need to excavate, and are relatively costly both in terms of materials and time. Whilst

the cost may be justifiable for permanent structures, the same may not be the case for semi-permanent or pre-fabricated structures where poured concrete foundations may provide an over-engineered solution. In other words, poured concrete foundations may be unnecessarily robust for semi-permanent or pre-fabricated structures. Indeed, pre-fabricated structures are usually chosen because of, inter alia, the speed in which they may be erected. Therefore, the use of conventional poured concrete foundations may often introduce unnecessary delays in the use of such structures or buildings.

In addition, poured concrete foundations are inflexible in the sense that, once laid, they cannot be moved, repositioned or adjusted.

Some semi-permanent buildings, such as static caravans or mobile homes, have adjustable legs but these serve only to allow levelling of the pre-constructed building at fixed points.

Attempts have been made to overcome or mitigate the problems encountered with existing conventional poured concrete foundations. Thus, for example, US Patent No. 5,516,069 describes an adjustable construction support apparatus which comprises a poured concrete footing assembly and a tube assembly retained in the footing assembly. A threaded collar is attached to a top portion of the tube assembly and a threaded shaft has complementary threads to the collar. A nut is welded to the shaft for receiving a wrench. However, the device of US '069 suffers from a number of disadvantages. From Fig. 3 of US '069 it can be seen that when the threaded shaft is substantially extended to support a structure the shaft will tilt or careen and be at risk

of buckling and/or collapsing. Furthermore, the adjustable support of the prior art is also disadvantageous in that, in operation, the threaded shaft must rotate.

US Patent application No. 2003/0033760 also describes a foundation support. Indeed,

5 US '760 identifies that over extension may be a problem, but addresses by providing a stop at the distal end of a threaded jack rod. The system does not address the tilt or careen that may occur upon overextension.

We have now discovered a novel design of an adjustable construction support which

10 overcomes or mitigates the disadvantages of the prior art systems.

According to a first aspect of the present invention there is provided a portable foundation assembly for a structure, comprising: a footing member adapted to sit on the ground; a support member having a support surface adapted to engage the
15 structure at a chosen location; the support member being provided with a base member and height adjustment means located in the base member.

The term "ground" as used herein should be understood to mean any surface upon which it is desired to construct a structure, be that soil, sand, grass, concrete, tarmac
20 or anything else, and whether at ground level or not. For example, the "ground" could be an unlevelled soil surface or the tarmac surface of a fourth floor car park.

The footing is preferably adapted to engage with the base member. Any conventionally known engaging means may be utilised. However, preferably, the
25 footing and the base member may be adapted to interengage in mating fashion. Thus,

the footing may be provided with a male portion and the base member with a female portion. It will be understood by one skilled in the art that it is within the scope of the invention for the footing to be provided with a female portion and the base member with a male portion. Preferably, the male portion of the footing is, in use, on the upper surface of the footing whilst the female portion of the base is, in use, on the underside of the base member. The male and female portions may preferably be integral to the footing and/or the base member. The male and female portions may be substantially circular in cross section and the circumferential edge of the male and female portions may be chamfered to assist location of the footing and the base member together. When the male and female portions are substantially circular as hereinbefore described, then each of the male and female portions may be keyed, so as to prevent excessive rotational movement and facilitate more precise positioning of the footing and the base member.

Most likely, a structure will be supported by a plurality of portable foundation assemblies according to the first aspect of the invention as hereinbefore described. Each foundation is adapted to engage the structure at any of a number of different locations so as not to be dedicated to one location. Each foundation may be deployed at a location corresponding to a structure load point. For instance, a log cabin may use four such foundations, one at each corner of the cabin. However, the number of load points will depend upon the design layout and the size of the building. Thus, for example, for a log cabin, the load points are typically not more than 3m apart. Each foundation may be fastened to the structure by bolting a part of the structure to the support member.

In a preferred aspect of the invention the assembly is also provided with one or more spacer members, that is, a spacer member which, in use, is located between the footing and the base member of the support. The number of spacer members used may vary from one structure to another. Indeed if a structure is being placed upon
5 uneven ground or sloping ground, the number of spacers may be varied from one assembly to another.

The spacer members may be stacked and may be adapted to interengage one another in mating fashion as hereinbefore described. The mating portions are preferentially
10 the same or similar to those found in the footing member and the base member so that the one or more spacer members may also engage with the footing and the base member respectively, to be locatable in relation to one another and so as not to slip relative to one another. The use of the one or more spacer members is especially advantageous in minimising the extension or overextension of the height adjustment
15 means.

The size of the one or more spacer members may vary, although they will preferentially be of a size corresponding to that of the footing. The depth of the spacer (i.e. in use, the height adjustment that is provided) is largely governed by the
20 desire for the spacer to remain manually portable. Thus, the spacer may have a depth of from 2.5 to 15 cm, preferably 5 to 10 cm. Two preferred embodiments are a spacer with a depth of 5cm and a spacer with a depth of 10 cm. The footing member may, preferably, be of the same or similar dimensions to the spacer.

It will be appreciated by one skilled in the art that the spacer members as hereinbefore described may be sold separately to the portable foundation assembly. Furthermore, the spacer members for use with the portable foundation assembly are novel *per se*.

5 Therefore, according to a further aspect of the present invention we also provide a spacer member adapted for use with a portable foundation assembly as hereinbefore described, wherein, in use, the spacer member has a lower surface adapted to engage with a footing/upper surface of an adjacent spacer member and an upper surface adapted to engage with a support base/ lower surface of an adjacent spacer member.

10

Thus, according to this aspect of the invention each spacer member adapted for use with a portable foundation assembly is provided with a male and female portion, enabling engagement with the corresponding component parts of the assembly. Preferably, in use, the spacer is provided with a male portion on its upper surface and
15 a female portion on its lower surface.

A benefit of a portable foundation according to each aspect of the invention is that adjustment is possible by virtue of the adjustment means both during and after construction. During construction of a building, it is preferable to align and level all
20 walls of the building before commencing work on the roof. After construction, the building may move because, for instance, of earthquake or permafrost, and compensation for the movement is desirable. Thus, for example, minor adjustments may be made by altering the height adjustment means located in the base member. Alternatively, substantial adjustments may be made by adding or removing a spacer

member, thus avoiding unnecessary and potentially dangerous overextension of the height adjustment means located in the base member.

The footing and/or the one or more spacer members preferentially comprise substantially the same or similar dimensions.

In use, the base member may have a bottom surface and a top surface and preferably the bottom surface is of greater area than that of the top surface. It is advantageous to have a base member in which the bottom surface is of greater area than the top surface as this provides greater stability, e.g. for less material. A larger bottom surface also helps to distribute the load through the support member and the height adjustment means to a wider area. This can be important if the surface on which the portable foundation is placed is soft, as the load will be spread and any sinking and/or movement may be reduced. However, it is not essential that the bottom surface is larger than the top: the base member can be any appropriate shape which provides the necessary base function. Therefore, in a preferred embodiment, the base member comprises a frustum. Thus, it may be generally frustopyramidal in shape or frustoconical in shape. However, it is preferably frustopyramidal and especially a frusto square based pyramid. Alternatively or in addition, the base member may be decorative in appearance. When the base member is decorative, the footing member and/or the one or more spacer members may also be similarly decorative.

The bottom surface of the base member is typically between 30 and 50 cm wide, i.e. when the base member is a frusto square based pyramid, the bottom surface of the base member may cover an area of substantially 1,500 cm².

Preferably, the base member, the footing and the optional one or more spacer members, are made of substantially the same material. Preferably, the material is concrete, more preferably pre-cast concrete which may optionally be reinforced or strengthened.

In a particularly preferred embodiment, the support member may comprise a support plate. However, the support member may be realised in a number of different ways, so long as it fulfils the requirement to provide a support surface adapted to engage the structure. The support member may also comprise locating means for locating the structure on the support surface. For instance, in the case where the support member comprises a plate, a flange may be provided, substantially perpendicular to and upstanding from the plate, for locating the structure. If the plate is intended to support a corner of a structure the flange itself may be shaped to correspond with the corner of the structure, for example, the flange itself may be a substantially right-angled flange. Alternatively, if the plate is intended to support a longitudinal beam or plinth, a plurality of flanges may be provided. Such flanges whilst upstanding from the plate, may be positioned on alternating sides of the plate, e.g. in a zigzag pattern, so as to securely locate against the sides of the longitudinal beam or plinth. The support member may engage a bottom surface of the structure, and the engagement may be inboard of the edge of the surface so as not to overlap the edge and, for example, interfere with the run-away of water from the edge.

Preferably, the height adjustment means comprises a threaded rod connected at one end, say by welding, to the support member and received at the other in a rod

receiving opening in the base, and a nut, wherein rotation of the nut adjusts the spacing between the base member and the support member. Optionally, the adjustment means may comprise a washer disposed between the nut and the top surface of the base member. When the height adjustment means comprises a threaded

5 rod, the base member may include a corresponding tube assembly located in the base member. The tube assembly may comprise internal threads complementary to the threaded rod. However, it is preferred that the tube assembly is internally substantially smooth, i.e. it is not threaded. Therefore, the tube assembly may comprise a hollow chamber or a lined chamber, e.g. a smooth metal or plastics lining.

10 When the tube assembly is not threaded, the nut may comprise an integral sleeve which is located inside the end of the tube assembly, such that, in use, the nut/sleeve is rotated to cause the threaded rod to adjust in height. However, because the tube is unthreaded, the threaded rod does not rotate.

15 In a particular aspect of the present invention the threaded rod is either relatively short in length or is provided with a stopper to prevent overextension. It is preferred that the length of the rod and the corresponding length of the tube assembly are substantially similar (but less) than the depth of the base member. The base member is in turn of a substantially similar depth to the footing member and/or spacer

20 members as hereinbefore described. Similarly, the length of the rod may also vary depending upon the diameter of the rod. However, preferably the length of the rod may be substantially similar to the depth of the footing member and/or spacer. Therefore a preferred length of rod may be 5 cm or 10 cm.

The present invention is particularly applicable to wooden structures, such as log cabins. The construction of foundations for log cabins by known techniques requires a significant outlay in time and material. The present invention, if desired, can be deployed directly on to firm ground. However, in most instances, removal of topsoil
5 and creation of a firm base will be preferable.

For some building sites, a small area of concrete just larger than the area of the bottom surface of the base member may be prepared. Even with the required preparation of a small area of concrete, the present invention still has distinct advantages, as the
10 present invention is moveable relative to the prepared concrete area and, as such, accurate measurements are not required.

Furthermore, prior art foundations need to be substantially flat, to enable the structure's load to be evenly distributed within the walls of the construction. The
15 spacing member adjustment means of the present invention means that, where the desired location of a building structure is not substantially flat, the location does not have to be levelled prior to construction. A plurality of portable foundations according to the present invention can be deployed at load points in the structure, and then adjusted as required according to the level of the ground to ensure the structure is
20 level.

The present invention is particularly advantageous in regions which are prone to earthquakes. Especially when the structure supported by the foundation is wooden, as wooden structures are particularly resistant to earthquakes.

If the ground has become uneven due to an earthquake or subsidence, the foundations may no longer support the structure evenly. In a situation such as this, the portable foundations of the present invention can be adjusted by height and location to accommodate the ground movement.

5

According to a further aspect of the present invention there is provided a wooden structure comprising a plurality of portable foundation assemblies according to the present invention.

10 In addition we provide a method of supporting a structure which comprises the use of one or more portable foundation assemblies as hereinbefore described. We further provide a method of erecting a structure which comprises supporting the structure by the use of one or more portable foundation assemblies as hereinbefore described.

15 Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 illustrates a side view of a first embodiment of a portable foundation according to the present invention;

20

Fig. 2 illustrates a side view of a second embodiment of a portable foundation according to the invention, which includes a footing member;

Fig. 3 is a side view of the disassembled portable foundation assembly including a
25 footing member and a spacer;

Fig. 4 is a side view of the assembled portable foundation assembly shown in Fig. 3;

Figs. 5(a) to (c) are side, end and plan views respectively of a spacer member;

- 5 Figs. 6(a) to (c) are side, end and plan views respectively of a support base member;
and

Fig. 7 is a side view of a support member.

- 10 A portable foundation assembly (1) for a log cabin (not shown) is shown comprising a
base member (2), a support member (3) and a height adjustment member (4) which
holds the support member (3) spaced apart from the base member (2).

- The base member (2), which is concrete, is shown as a generally frusto square based
15 pyramid shape. It has a bottom surface (5) and a top surface (6).

- The support member (3) comprises a plate (7), of generally triangular shape (right-
angled triangle) in plan view, having a top side (8), providing a support surface
adapted to engage the bottom surface of the log cabin, and a bottom side (9).
20 Upstanding from the plate (7), adjacent one edge (10) (the hypotenuse edge), of the
plate (7) is a perpendicular flange (11) which serves as a locating lip. The flange (11)
extends into a recess (not shown) in the bottom surface of the cabin and is fastened to
the fabric of the cabin by a bolt (not shown).

The height adjustment member (4) comprises a threaded rod (12), a nut (13) and a washer (14). The rod (12) is welded at its top end (as shown) to the bottom side (9) of the plate (7), approximately at its centre. The other lower end of the rod (12) extends into a passage (15) in the base member (2). Furthermore, the nut (13) is screwed on to the rod (12) and the washer (14) is positioned between the top surface (16) of the base member (2) and the nut (13). The support member (3) is thereby held spaced apart from the base member (2). The spacing between the base member (2) and the supporting member (3) or, in other words, the height of the supporting member (3) above the base member (2), may be adjusted by turning the nut (13) relative to the threaded rod (12), using an appropriately sized spanner.

With reference to Fig. 2, in an alternative embodiment to that shown in Fig. 1 (although like parts have been given the same reference numerals), the foundation assembly (1) is provided with an additional footing member (17) adapted to sit underneath the base member (2).

The footing member (17) has a top surface (18) and a bottom surface (19). Provided on the top surface (18) is a central, raised male portion (20) which is generally circular in plan view. There is a correspondingly shaped recessed female portion (21) in the bottom surface (5) of the base member (2) such that the footing member (17) and the base member (2) interengage in mating fashion. In the embodiment shown the footing member (17) is (optionally) provided with a correspondingly shaped recess (22) in its bottom surface (19) so that it may also act as a spacer if desirable.

With reference to Fig. 3 a disassembled portable foundation assembly (1) comprises a footing member (17), a spacer member (23), a frustum shaped base member (2), a support member (3) and a height adjustment member (4) which holds the support member (3) spaced apart from the base member (2).

5

The footing member (17) has a top surface (18) and a bottom surface (19). Provided on the top surface (18) is a central, raised male portion (20) which is generally circular in plan view. There is a correspondingly shaped recessed female portion (24) in the bottom surface (25) of the spacer (23) such that the footing member (17) and the spacer (23) interengage in mating fashion. In the embodiment shown, the male portion (20) is provided with a keyed region (25) in the form of a recess (26). The female portion (24) is also provided with a corresponding keyed region (27) in the form of a raised portion (28). The keyed regions (and) act prevent excessive rotational movement and facilitate more precise positioning of the footing member (17) and the spacer (23).

The spacer (23) has an upper surface (29) which is also provided with a male region (30) adapted to interengage with the female portion of the base member (2). The male portion (30) of the spacer (23) is provided with a keyed region (31) and the female portion (21) of the base member (2) is provided with a corresponding keyed region (32).

With reference to Fig. 4, the portable foundation assembly (1) of Fig. 3 is shown in assembled form. Thus, the footing member (17) is positioned on the ground (not shown) and the raised male portion (20) interengages with the female portion (24) of

the spacer (23). Similarly, the raised male portion (30) of the spacer (23) interengages with the female portion (21) of the base member (2). It will be understood by one skilled in the art that a plurality of spacer members (23) may be used in the assembly (1).

5

With reference to Fig. 5(a) to (c) which represent a spacer member (23), the spacer (23) has an upper surface (29) provided with a male portion (30) adapted to interengage with the female portion of the base member (not shown). The male portion (30) of the spacer (23) is provided with a keyed region (31). The bottom surface (25) of the spacer (23) is provided with a recessed female portion (24). The female portion (24) is also provided with a corresponding keyed region (27) in the form of a raised portion (28).

With reference to Figs. 6(a) to (c) which represent the base member (2), the base member (2) has a bottom surface (33) provided with a female portion (21). The female portion (21) is also provided with a raised keyed region (32). The upper surface (6) of the base member (2) is provided with a passage (15) adapted to house the support member (not shown).

Referring to Fig. 7 which represents a side view of a support member (3), which comprises a plate (7), of generally triangular shape (right-angled triangle) in plan view, having a top side (8), providing a support surface adapted to engage the bottom surface of, e.g. a log cabin, and a bottom side (9). Upstanding from the plate (7), adjacent one edge (10) (the hypotenuse edge), of the plate (7) is a perpendicular flange (11) which serves as a locating lip. The flange (11) extends into a recess (not

shown) in the bottom surface of the cabin and is fastened to the fabric of the cabin by a bolt (not shown).

5 The height adjustment member (4) comprises a threaded rod (12), a nut (13) and a washer (14). The rod (12) is welded at its top end (as shown) to the bottom side (9) of the plate (7), approximately at its centre. The other lower end of the rod (12) extends into a passage of the base member (not shown).

10 Improvements and modifications may be incorporated without departing from the scope of the present invention.

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CLAIMS

1. A portable foundation assembly for a structure, comprising: a footing member adapted to sit on the ground; a support member having a support surface adapted to
5 engage the structure at a chosen location; the support member being provided with a base member and height adjustment means located in the base member.
2. A portable foundation according to claim 1 wherein the footing member is adapted to engage with the base member.
- 10 3. A portable foundation according to claim 2 wherein the footing member and the base member are adapted to interengage in a mating fashion.
4. A portable foundation according to claim 3 wherein the footing member is
15 provided with a male portion and the base member with a female portion.
5. A portable foundation according to claim 4 wherein the male portion of the footing member is, in use, on the upper surface of the footing member whilst the female portion of the base is, in use, on the underside of the base member.
- 20 6. A portable foundation according to claim 4 wherein the male and female portions are integral to the footing member and/or the base member.
7. A portable foundation according to claim 4 wherein the male and female
25 portions are substantially circular in cross section.

8. A portable foundation according to claim 4 wherein the circumferential edge of the male and female portions are chamfered.

5 9. A portable foundation according to claim 4 wherein each of the male and female portions are keyed.

10. A portable foundation according to claim 1 wherein the assembly is also provided with one or more spacer members.

10

11. A portable foundation according to claim 1 wherein the one or more spacer members are stackable and are adapted to interengage one another.

12. A portable foundation according to claim 1 wherein the one or more spacer
15 members are adapted to interengage in a mating fashion.

13. A portable foundation according to claim 12 wherein the mating portions are the same or similar to those in the footing member and/or the base member.

20 14. A portable foundation according to claim 10 wherein the one or more spacer members are dimensioned to be of a size corresponding to that of the footing member.

15. A spacer member adapted for use with a portable foundation assembly according to claim 1.

25

16. A spacer member according to claim 15 wherein, in use, the spacer member has a lower surface adapted to engage with a footing/upper surface of an adjacent spacer member and an upper surface adapted to engage with a support base/lower surface of an adjacent spacer member.

5

17. A spacer member according to claim 16 wherein the spacer is provided with a male portion on its upper surface and a female portion on its lower surface.

18. A spacer member according to claim 16 wherein the footing and/or the one or
10 more spacer members preferentially comprise substantially the same or similar dimensions.

19. A portable foundation according to claim 1 wherein the base member has a bottom surface and a top surface and the bottom surface is of greater area than that of
15 the top surface.

20. A portable foundation according to claim 19 wherein the base member comprises a frustum.

20 21. A portable foundation according to claim 1 wherein the base member, the footing and the optional one or more spacer members, are made of substantially the same material.

22. A portable foundation according to claim 21 wherein the material is concrete.

25

23. A portable foundation according to claim 1 wherein the support member comprises a support plate.

24. A portable foundation according to claim 23 wherein the support plate
5 comprises locating means for locating a structure on the support surface.

25. A portable foundation according to claim 24 wherein the locating means comprises one or more flanges.

10 26. A portable foundation according to claim 1 wherein the height adjustment means comprises a threaded rod connected at one end to the support member and received at the other in a rod receiving opening in the base, and a nut, wherein rotation of the nut adjusts the spacing between the base member and the support member.

15

27. A portable foundation according to claim 26 wherein the rod is provided with a washer disposed between the nut and the top surface of the base member.

28. A portable foundation according to claim 26 wherein the base member
20 includes a tube assembly for location of the rod.

29. A portable foundation according to claim 28 wherein the tube assembly is internally substantially smooth.

30. A portable foundation according to claim 28 wherein the tube assembly comprises a hollow lined chamber.

31. A portable foundation according to claim 26 wherein the threaded rod is either
5 relatively short in length or is provided with a stopper to prevent overextension.

32. A portable foundation according to claim 26 wherein the length of the rod and the corresponding length of the tube assembly are substantially similar to the depth of the base member.

10

33. A wooden structure comprising a plurality of portable foundation assemblies according to claim 1.

34. A method of supporting a structure which comprises the use of one or more
15 portable foundation assemblies according to claim 1.

35. A method of erecting a structure which comprises supporting the structure by the use of one or more portable foundation assemblies according to claim 1.

20 36. A portable foundation or a method substantially as herein described with reference to the accompanying drawings.

25

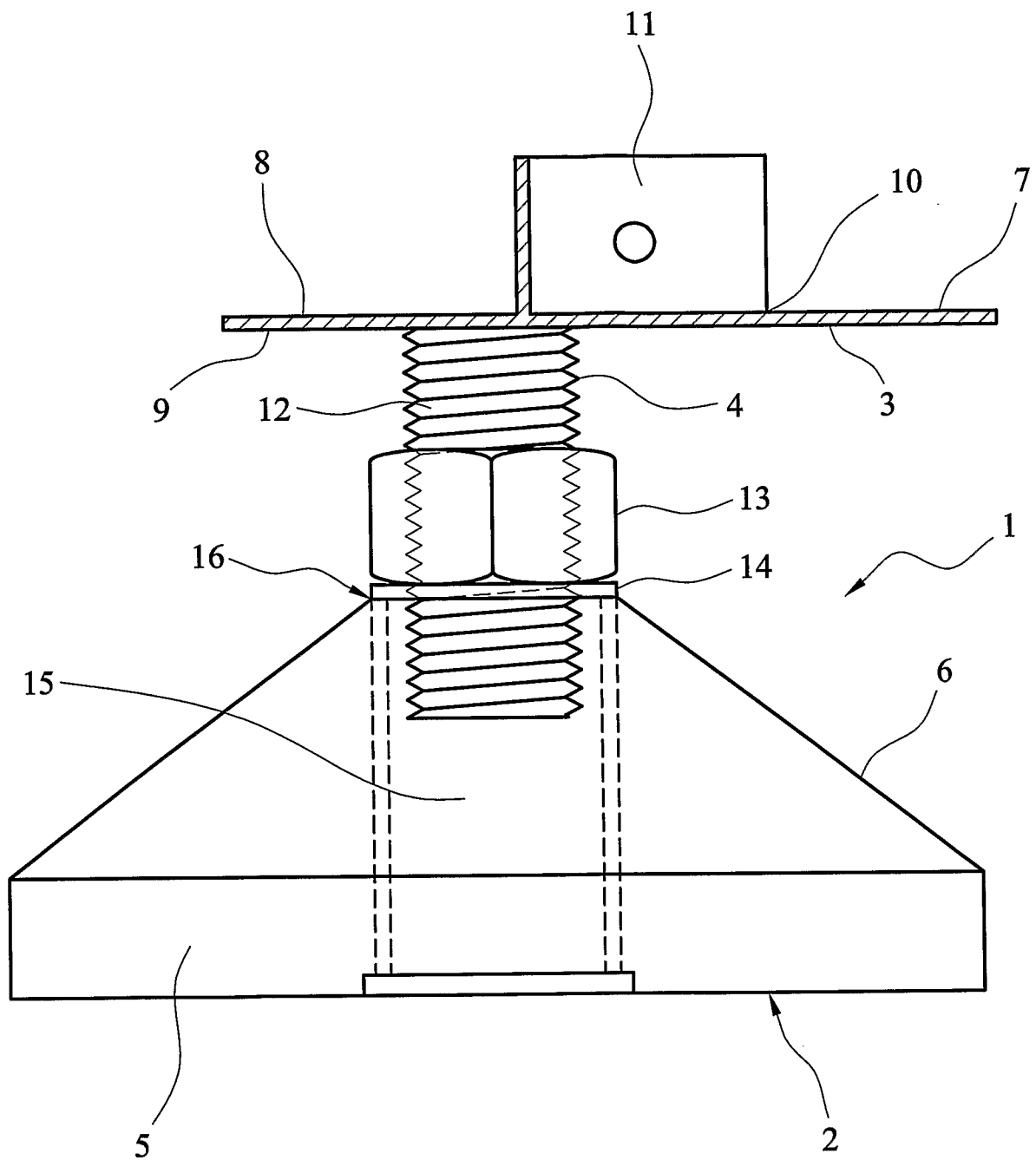


FIG. 1

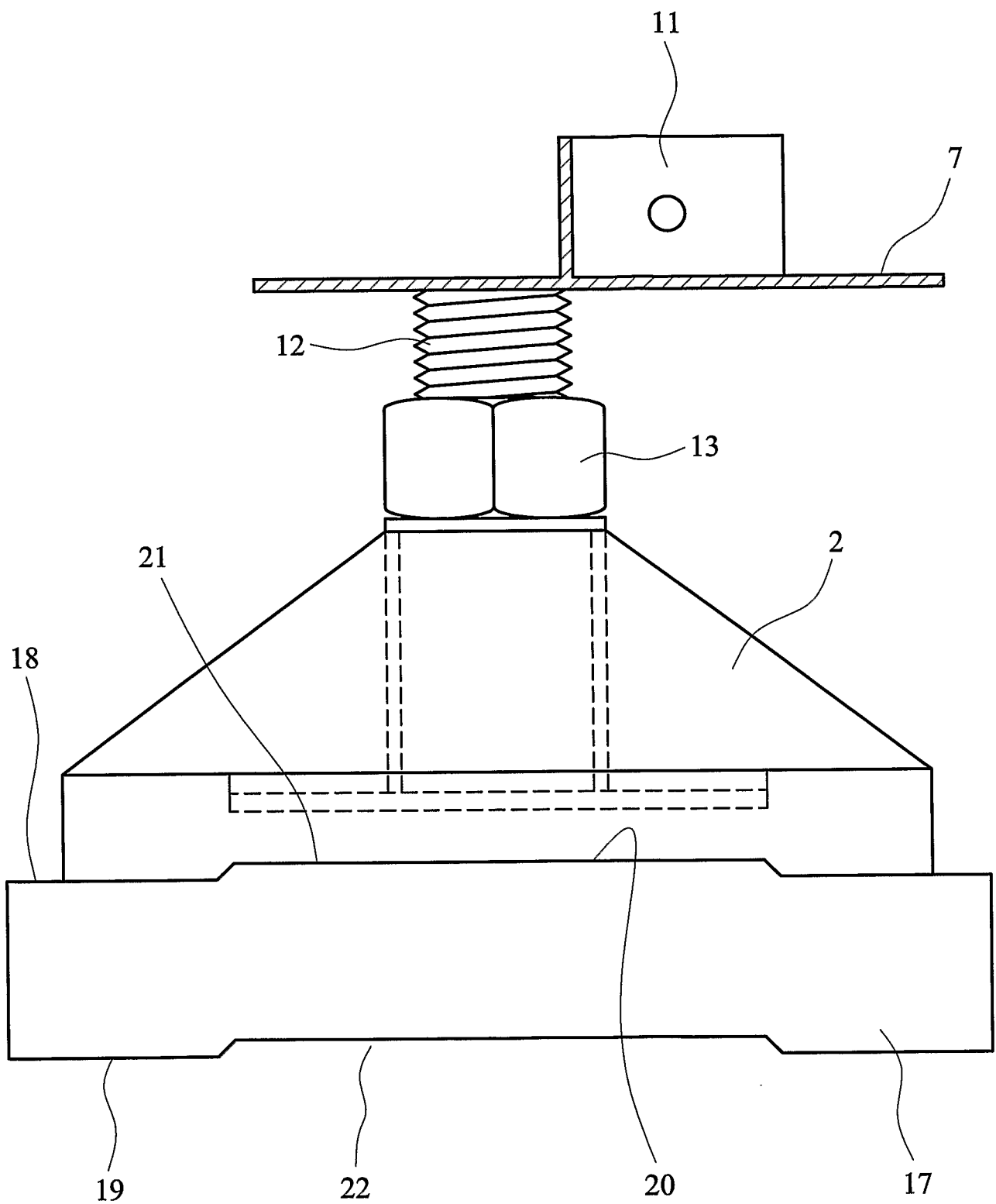


FIG. 2

FIG. 3

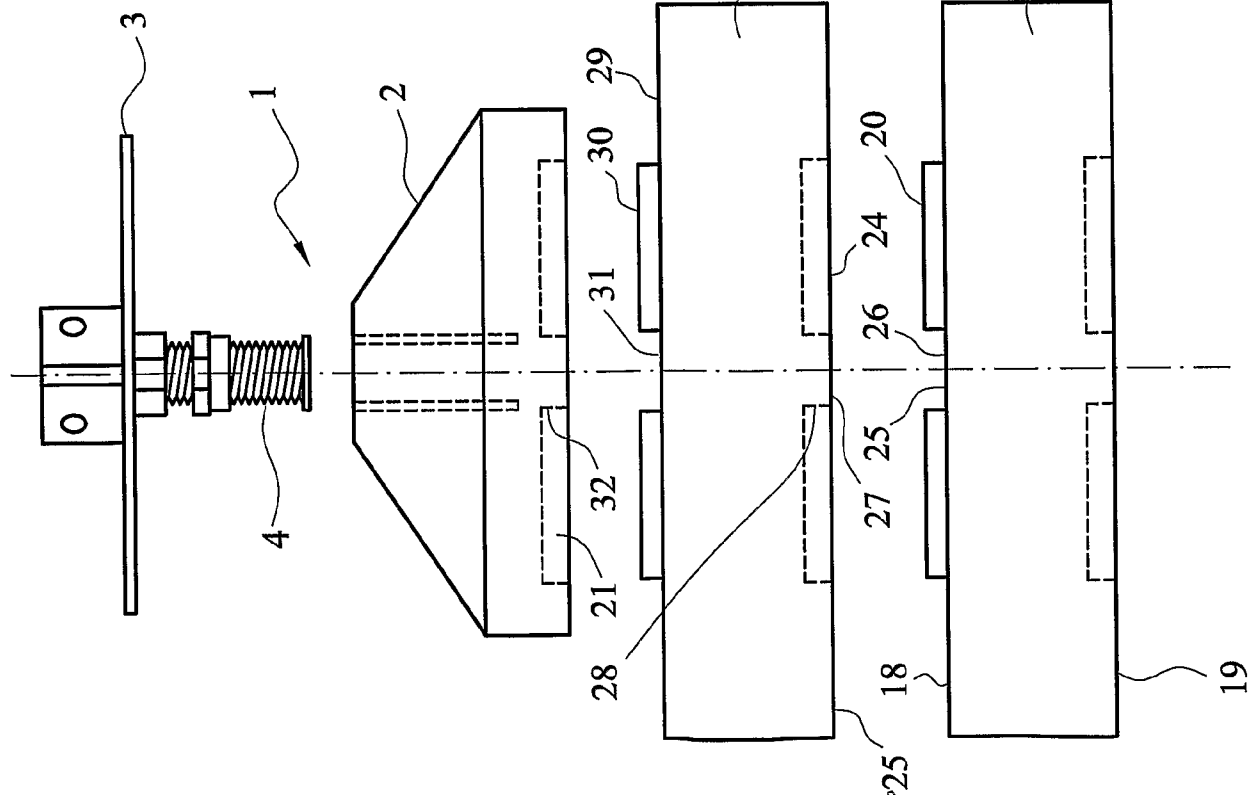


FIG. 4

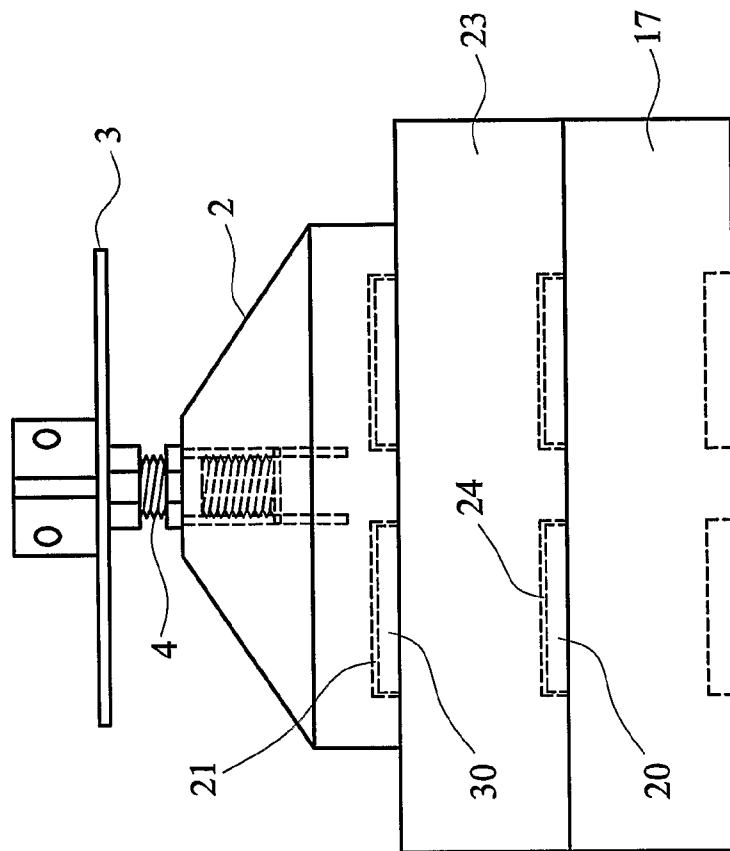


FIG. 5(a)

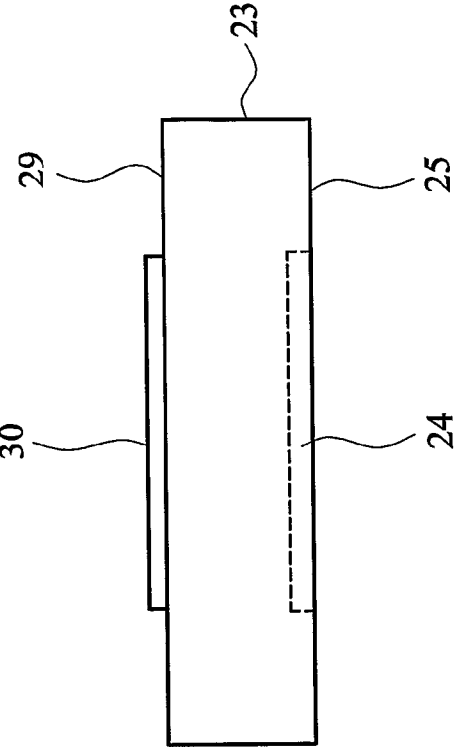
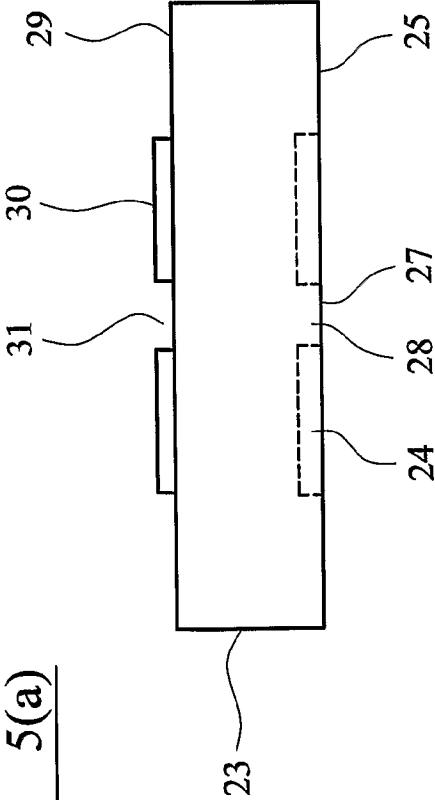


FIG. 5(b)

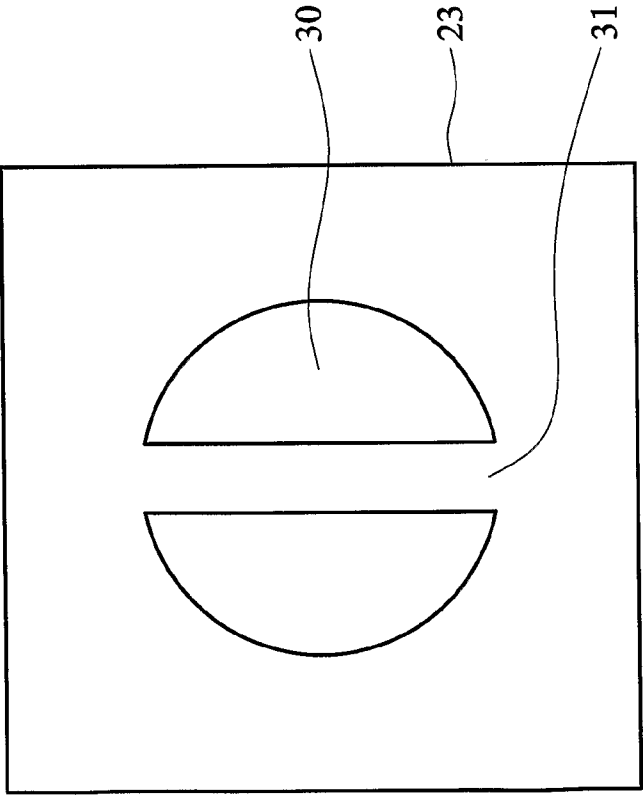


FIG. 5(c)

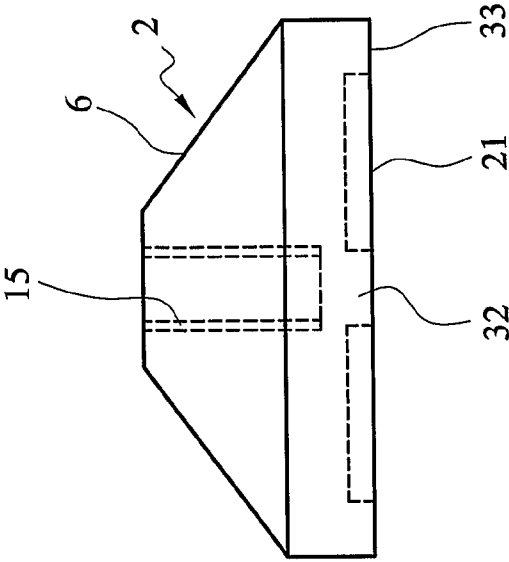


FIG. 6(a)

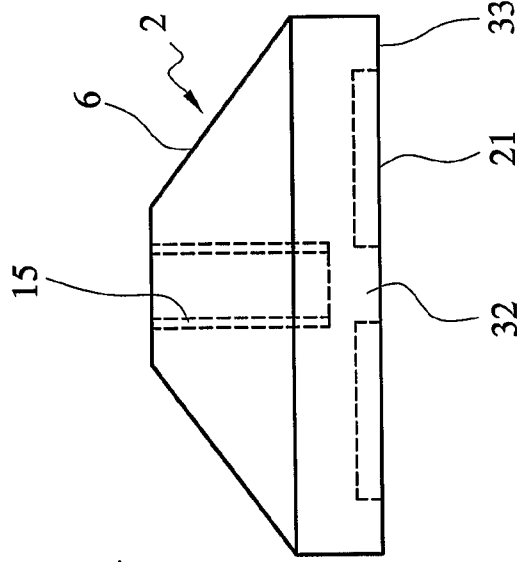


FIG. 6(b)

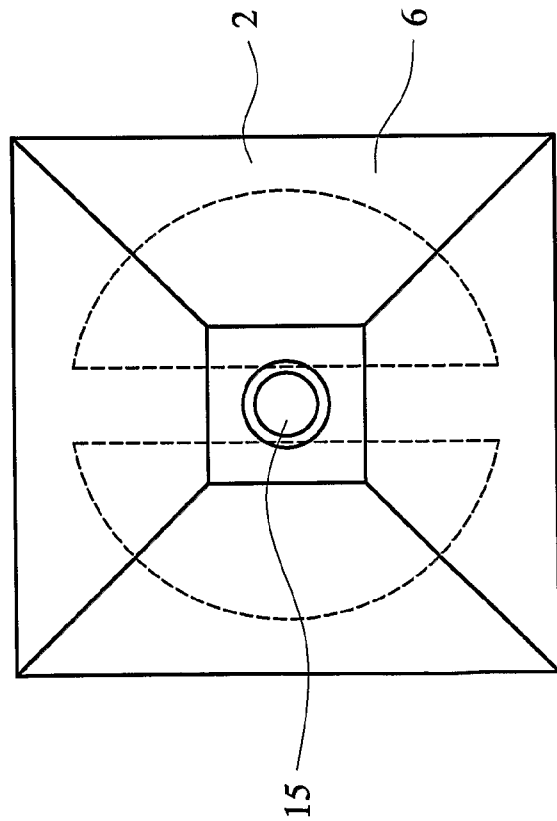


FIG. 6(c)

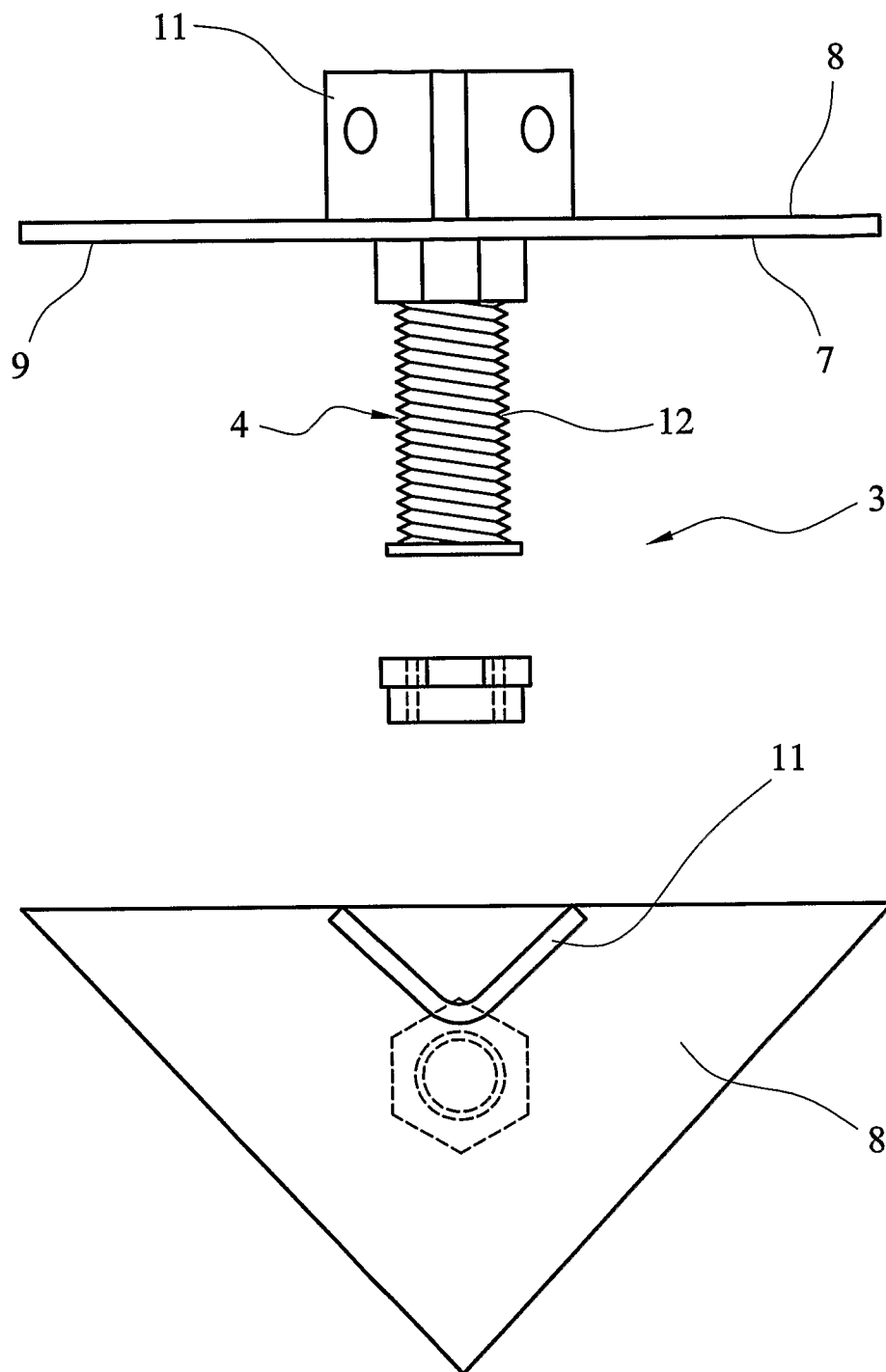


FIG. 7

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2007/000362

A. CLASSIFICATION OF SUBJECT MATTER
INV. E02D27/02 E04B1/36

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E02D E04G E04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	US 7 163 357 B1 (PETERSON JAMES L [US]) 16 January 2007 (2007-01-16) column 7, line 19 - column 8, line 54; figures 2,5,6	1-35
X	EP 0 654 570 A (PIEPENBROCK IND GMBH & CO KG [DE]) 24 May 1995 (1995-05-24) the whole document	1-35
X	EP 0 346 524 A2 (STREIF SCHALUNGSBAU GMBH) 20 December 1989 (1989-12-20) the whole document	1-35
X	US 2004/261330 A1 (OLIVER JAMES [US] ET AL) 30 December 2004 (2004-12-30) paragraph [0017] - paragraph [0024]; figures 1,2,3a	1-35
	----- -/--	



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

30 March 2007

Date of mailing of the international search report

04/06/2007

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Geiger, Harald

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2007/000362

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 295 784 B1 (RICHARD DANNY J [US]) 2 October 2001 (2001-10-02) column 2, line 43 - column 5, line 61; figures 2,3 -----	1-35
X	US 6 718 711 B1 (GILMAN ROBERT L [US]) 13 April 2004 (2004-04-13) figures 5,6 -----	1-35
X	GB 2 086 448 A (RAPID METAL DEVELOPMENTS LTD) 12 May 1982 (1982-05-12) the whole document -----	1-35
X	US 3 742 662 A (BALLOU C) 3 July 1973 (1973-07-03) the whole document -----	1-35

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2007/000362

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 36
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 36

Claim 36 does not contain any searchable features. Instead, this claim is based on a reference to accompanying drawings.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.5), should the problems which led to the Article 17(2) declaration be overcome.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2007/000362

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 7163357	B1	16-01-2007	NONE	
EP 0654570	A	24-05-1995	NONE	
EP 0346524	A2	20-12-1989	DE 3883972 D1	14-10-1993
US 2004261330	A1	30-12-2004	NONE	
US 6295784	B1	02-10-2001	US 2002043043 A1	18-04-2002
US 6718711	B1	13-04-2004	NONE	
GB 2086448	A	12-05-1982	NONE	
US 3742662	A	03-07-1973	NONE	