

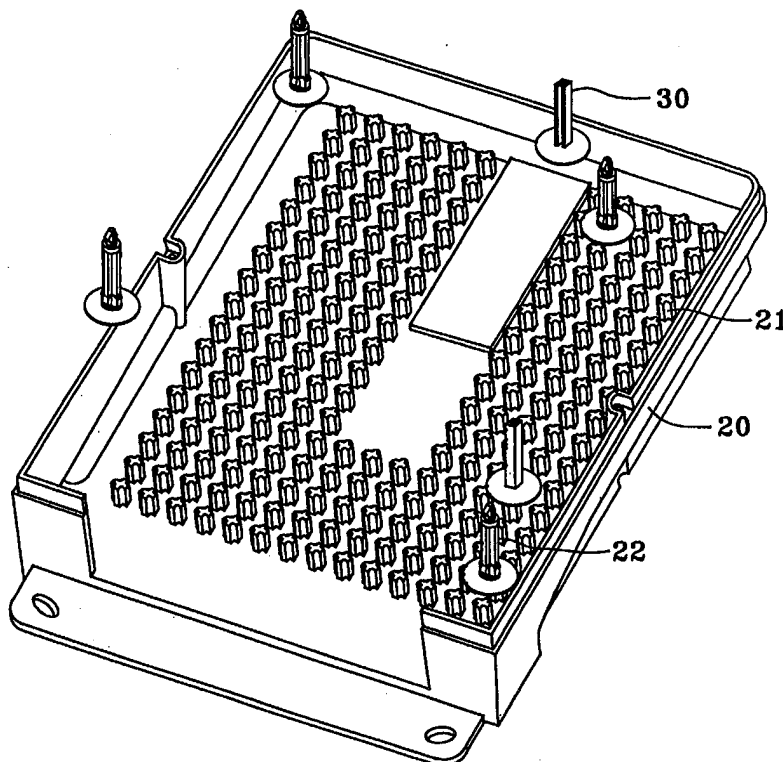


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(21) International Application Number: PCT/EP98/03165 (22) International Filing Date: 20 May 1998 (20.05.98) (30) Priority Data: 9712157.8 11 June 1997 (11.06.97) GB (71) Applicant (for all designated States except US): SCHLUMBERGER INDUSTRIES LIMITED [GB/GB]; 1 Kingsway, London WC2B 6XH (GB). (72) Inventors; and (75) Inventors/Applicants (for US only): SLATOR, Kevin [GB/GB]; 3 Lidgate Court, Felixstowne IP11 8XX (GB). GOLDING, Bruce [GB/GB]; 4 Mannal Walk, Grange Farm, Kesgrave, Suffolk IP5 2GF (GB). BOND, William [GB/GB]; 11 Landsdowne Road, Felixstowe, Suffolk IP11 9HG (GB). (74) Agent: DUPONT, Henri; Schlumberger Industries S.A., Direction Technique/Propriété Intellectuelle, 50, avenue Jean-Jaurès, Boîte postale 620-05, F-92542 Montrouge Cedex (FR).		(81) Designated States: CA, CN, HU, JP, NO, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i>

(54) Title: METER BASE ASSEMBLY**(57) Abstract**

A meter base assembly for the housing of a meter characterised in comprising a meter base (20) formed from a moulded plastic material, at least one face of the inner surface being provided with a plurality of fixing elements (21) integral with the base and adapted to mechanically engage with one more interchangeable support attachments (22, 30), the fixing elements (21) being arranged in the form of a regular matrix such that the support attachments (22, 30) may be positioned in a plurality of different configurations within the base.



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METER BASE ASSEMBLY

The present invention relates to a meter base assembly for the housing of a meter, in particular an electronic electricity meter.

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Conventionally, electricity meter housings have been made of bakelite, this material being chosen for its strength and resilience and its electrical insulating characteristics. Inside the housing, the mechanical elements of the measurement subassembly (disk, driving magnets etc) are fixed in place by means of a number of screws or other permanent fixing means. The majority of electricity meters currently in use have this kind of construction. More recently, a moulded plastic has been used as the housing material, in particular in the case of electronic based electricity meters where the heavy mechanical elements of a conventional electromechanical meter have been replaced by circuit boards and other lightweight electronic components.

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In such meters, the circuit boards are usually mounted in the base on a number of support columns arranged around the periphery of the base. These columns are located in a fixed position in the base and are formed as an integral part of the base in the moulding process. Other electronic elements may be mounted by other mechanical supports within the base. An example of such a base is shown in the European Patent Application 97400184.4 in the name of AEG Zähler GmbH.

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The problem with such conventional bases is that they are typically configured for one particular meter design. In the case of a modification to the circuitry of the meter, a reconfiguration of the mould may be required. Additionally, the need to use other fixing means such as adhesives, screws or welding techniques increases the cost of such bases. For reasons of economy of scale, it would be advantageous to provide a meter housing that could be easily modified to be used in a number of different meters with varied circuit arrangements and that avoids the need to use other fixing means of the kind described.

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The requirement to provide a meter housing particularly capable of being modified for re-use in a number of a different products has become particularly important with the globalisation of the marketplace, since it is now not uncommon for each of the various elements in a product to be manufactured in separate locations, with one plant manufacturing the housing, another plant the metrology components etc. The ability to provide a meter base assembly capable of being easily adapted to a number of different products is particularly valuable in this context.

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According to the present invention the meter base assembly is characterised in comprising a meter base formed from a moulded plastic material, at least one face of the inner surface being provided with a plurality of fixing elements integral with the base and adapted to mechanically engage with one or more interchangeable support attachments, the fixing elements being arranged in the form of a regular matrix such that the support attachments may be positioned in a plurality of different configurations within the base.

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The mechanical engagement between the support attachments and the fixing elements can be realised by, for example, a snap-fit joint between the support attachment and the fixing element. However, in order to reduce the complexity of the moulded fixing element the fixing elements and support attachments in a preferred embodiment are adapted to mechanically engage by means of an interference fit between the fixing elements and support attachments.

30

In one embodiment, the fixing elements may take the form of a female socket adapted to engage with a male pin of the support attachments. For example, in one realisation the fixing elements take the form of a matrix of recesses of substantially square cross-section adapted to form an interference fit with a pin of substantially circular cross-section formed on the support attachment.

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Alternatively, the fixing elements may take the form of a male pin

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5 adapted to engage with a female socket of the support attachment. In an example of this alternative realisation the fixing elements may take the form of a matrix of pins having a substantially cruciform cross-section adapted to form an interference fit with a socket of substantially circular cross-section formed on the support attachment.

10

In a particularly preferred embodiment of the invention the fixing elements and support attachments are adapted to fit together in a limited number of one or more predetermined orientations. For example, in the case of a simple interference fit, where the parts
15 normally have no predetermined orientation and may even be rotated once joined together, the support attachment may be provided with a projection to prevent rotation of the attachment relative to the fixing element.

20 In the case of a support attachment comprising a male pin of substantially circular cross-section one or more external projections may be provided on the pin to engage the faces of the female recesses of the fixing elements so as to prevent rotation. Alternatively, in case of a support attachment comprising a female socket, one or more internal
25 projections may be provided in the socket to engage the faces of the male pin of the fixing element so as to prevent rotation.

Providing a fixed orientation of the support attachments relative to the fixing elements is particularly important in the case where the support
30 attachments are adapted to support vertically mounted components (see below).

In a typical realisation, the support attachments have a substantially columnar form. In order to provide further stability the support
35 attachment may also comprise a flange formed around the support attachment in the region of the base of the attachment, the flange being adapted to bear upon the uppermost surfaces of at least the engaged fixing element. Depending on its relative size and the type the flange may also bear upon the upper surfaces of other fixing elements
40 in the matrix for additional support.

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Usually the support attachment will include at least one horizontal support surface adapted to support components, such as circuit boards, in parallel with the plane of the meter base. As well as, or instead of such a supporting surface the support attachment may also include a
10 vertically extending slot adapted to hold components arranged perpendicular to the plane of the base.

For ease of manufacture, the support attachment may also be formed from a moulded plastic, although other materials may be used.

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The invention also extends a meter base adapted to be used in a meter base assembly as described above and formed from a moulded plastic material, at least one inner surface of the base being provided with a plurality of fixing elements integral with the base and arranged in the
20 form of a regular matrix. In a similar manner, the invention extends to a support attachment adapted to be used in a meter base assembly as described above.

There will now be described, by way of example only, a number of
25 embodiments of the present invention, with reference to the attached figures in which :

Fig. 1 shows a meter base according to a first embodiment of the invention ;

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Fig. 2 shows a support attachment adapted to engage the meter base of Fig. 1 ;

Fig. 3 shows a partly cut-away view of the base and support element of
35 this first embodiment engaged in use ;

Fig. 4 shows a meter base according to a second embodiment ;

Fig. 5 shows a number of possible fixing element designs that may be
40 used in a meter base of this second embodiment ;

5 Fig. 6 shows a support attachment adapted to engage the meter base of this second embodiment ;

10 Fig. 7 shows a partly cut-away view of the base and support attachment of the second embodiment when engaged ;

Fig. 8 shows a view of modified support attachments for use in the first and second embodiments and which are adapted for engagement in fixed orientations ;

15 Fig. 9 shows a view of a meter base and support attachments according to the second embodiment together with an alternative support attachment particularly adapted to hold components in a vertical orientation.

20 Referring to Fig. 1, a meter base 1 according to a first embodiment of the invention is shown. The meter base is formed from a moulded plastic and defines the bottom part of a meter housing. In use, a cover part is fitted over the base, engaging with the edge 2 of the peripheral wall 3 to seal the meter housing. The meter 1 is provided with an array
25 of fixing elements 4 arranged in a regular matrix along the bottom inner surface of the meter base. In this embodiment, the fixing elements 4 take the form of a female socket having a substantially square cross-section. As will be seen, these elements engage specially
30 shaped support attachments by means of an interference fit.

Such a support attachment is shown in Fig. 2. In this case, the columnar support attachment 5 comprises at its base a male pin 6 having a substantially circular cross section and adapted to engage a
35 fixing element when inserted in the base. The support attachment which is made of a moulded plastic also comprises a flange 7. The uppermost part of the attachment is provided with a horizontal surface, not visible from this angle but indicated by the arrow 9. In use, horizontally arranged components such as circuit boards rest on
40 this surface and are held in place by the lower face 10 of the crown 11

5 of the attachment. In a similar manner, other horizontally disposed components may be held on the upper face of the element 12, lower down on the attachment. As will be later described, support attachments with alternative upper parts, in particular for holding vertically arranged components, are also possible.

10 Figure 3 shows the engagement of the support attachment 5 in the meter base 1. As will be seen, the pin 6 of the support attachment forms an interference fit with the square cross-section of the fixing element 4. The flange 7 bears upon the upper surface of the walls
15 around the recess of the element as well as the walls of the immediately neighbouring elements in order to provide extra stability.

By means of the simple mechanical engagement between support attachment and fixing element and the matrix array of fixing elements
20 in the base any number of configurations of support attachments in the base are possible, the support attachments being plugged into the positions required for each meter design. Manufacturing costs can be reduced as the same moulded base may be used for different meters. The same principle applies to manufacturing of the support
25 attachments which may be made in a large quantity and used as required.

The first embodiment relates to an arrangement of male support attachments and female fixing elements. As will be seen from Figs. 4
30 to 7, the inverse is possible. Referring to Fig. 4 the base 20 in this case is provided with a matrix array of male fixing elements 21 having a substantially cruciform cross-section. Fig. 5 shows three possible variations on this design.

35 Referring to Fig. 6, the support attachment 22 in this case is provided with a female socket 23 of generally circular cross-section. The remaining parts of the support attachment remain unchanged and are noted by the same reference numbers.

40 As shown in Fig. 7, the socket 23 of the support attachment 22 forms

5 an interference fit with the fixing element 21 in the same manner as round pin and square socket for the previous embodiment. As will be clear, other male/female arrangements are equally possible, include the use of square cross-section male fixing elements etc. Equally, whilst the embodiments shown describe interference fit engagements, 10 the use of a snap-fit type joint would be equally possible.

In the above embodiments, the support attachments may fitted in position in the base in any orientation. In the case where only horizontally disposed components are to be supported the orientation of 15 the piece is relatively unimportant. Conversely, where vertically disposed components are required it is necessary to ensure that these are not displaced by rotation of the piece. Whilst this can be prevented by, for example, holding a vertical component between two support attachments, it would nevertheless be helpful to include a means for 20 fixing the orientation of an attachment.

A means of providing this is shown in Fig.8 with respect to two support attachments. In the case of the male attachment 5, the pin 6 includes an external projection 25. In use, this projection will be accommodated in 25 one of the corners of the square-shaped recess of the female fixing elements shown in Figs. 1 and 3 and the piece will be locked in place. In a similar manner, the socket 23 of the female support attachment 22 is provided with an internal projection 26 adapted to engage the cut-away parts of the cruciform male fixing elements of Figs. 4 and 5. In 30 both cases, the support attachment may only be inserted in one of four predetermined orientations and will be fixed in place in this orientation once inserted.

Fig. 9 illustrates a larger scale perspective view of the base and 35 support attachments of the second embodiment shown in Fig. 4 to 7. The figure also shows a modification in which a columnar support attachment 30 having an upper body and provided with a simple U shaped cross-section defining a vertical slot. This attachment, which has the same female socket and flange as the other attachments, is 40 particularly adapted to hold vertically disposed components such as

5 circuit boards. Those support elements not yet fixed in place are represented graphically as floating above the surface of the base.

A number alternative embodiments of the invention have been described above. It will nevertheless be clear to one skilled in the art
10 that alternative realisations using different forms of male/female attachments and different bases are equally possible without departing from the scope of the claimed invention.

CLAIMS

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1. A meter base assembly for the housing of a meter characterised in
10 comprising a meter base formed from a moulded plastic material,
at least one face of the inner surface being provided with a
plurality of fixing elements integral with the base and adapted to
mechanically engage with one or more interchangeable support
15 attachments, the fixing elements being arranged in the form of a
regular matrix such that the support attachments may be
positioned in a plurality of different configurations within the
base.
2. A meter base assembly as claimed in claim 1 in which the fixing
elements and support attachments are adapted to mechanically
20 engage by means of an interference fit between the fixing
elements and support attachments.
3. A meter base assembly as claimed in claim 1 or 2 in which the
fixing elements take the form of a female socket adapted to
engage with a male pin of the support attachments.
- 25 4. A meter base assembly as claimed in claim 3 in which the fixing
elements take the form of a matrix of recesses of substantially
square cross-section adapted to form an interference fit with a pin
of substantially circular cross-section formed on the support
attachment.
- 30 5. A meter base assembly as claimed in claims 1 or 2 in which the
fixing elements take the form of a male pin adapted to engage
with a female socket of the support attachment.
6. A meter base assembly as claimed in claim 5 in which the fixing
elements take the form of a matrix of pins having a substantially
35 cruciform cross-section adapted to form an interference fit with a

- 5 socket of substantially circular cross-section formed on the support attachment.
7. A meter base assembly as claimed in any preceding claim in which the fixing elements and support attachments are adapted to fit together in a limited number of one or more predetermined
10 orientations.
8. A meter base assembly as claimed in claim 7 in which the support attachment is provided with a projection to prevent rotation of the attachment relative to the fixing element.
9. A meter base assembly as claimed in any preceding claim in
15 which the support attachment comprises a flange formed around the support attachment in the region of the base of the attachment, the flange being adapted to bear upon the uppermost surfaces of at least the engaged fixing element.
10. A meter base assembly as claimed in any preceding claim in
20 which the support attachment includes at least one horizontal support surface adapted to support horizontally disposed components in parallel with the plane of the meter base.
11. A meter base assembly as claimed in any preceding claim in
25 which the support attachment includes a vertically extending slot adapted to hold vertically disposed components arranged perpendicular to the plane of the base.
12. A meter base adapted to be used in a meter base assembly as claimed in any of claims 1 to 11 and formed from a moulded plastic material, at least one inner surface of the base being
30 provided with a plurality of fixing elements integral with the base and arranged in the form of a regular matrix.
13. A support attachment adapted to be used in a meter base assembly as claimed in any of claims 1 to 11.

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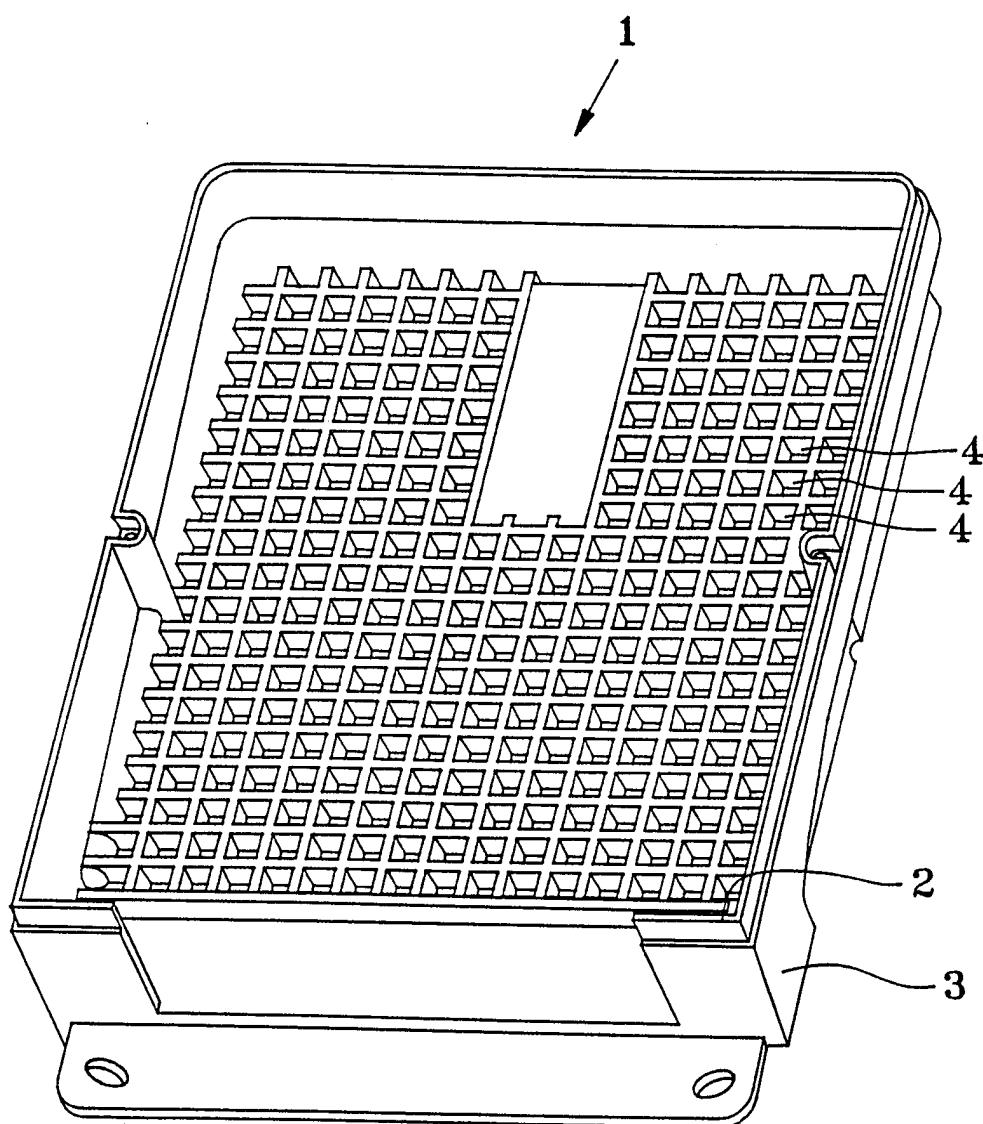


FIG. 1

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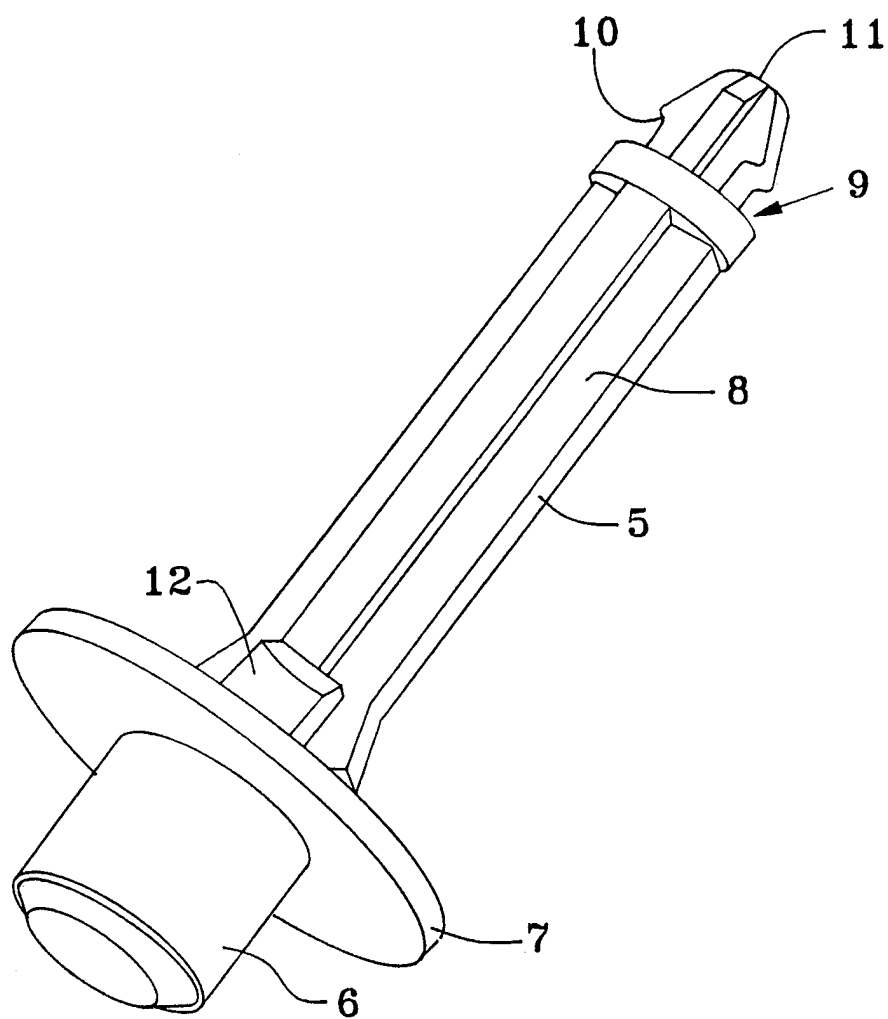


FIG.2

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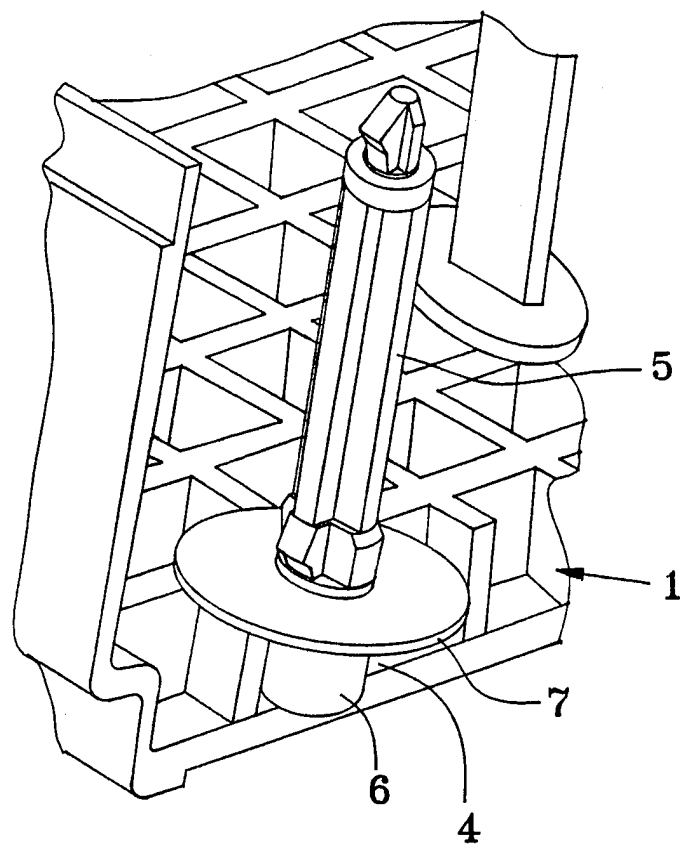


FIG. 3

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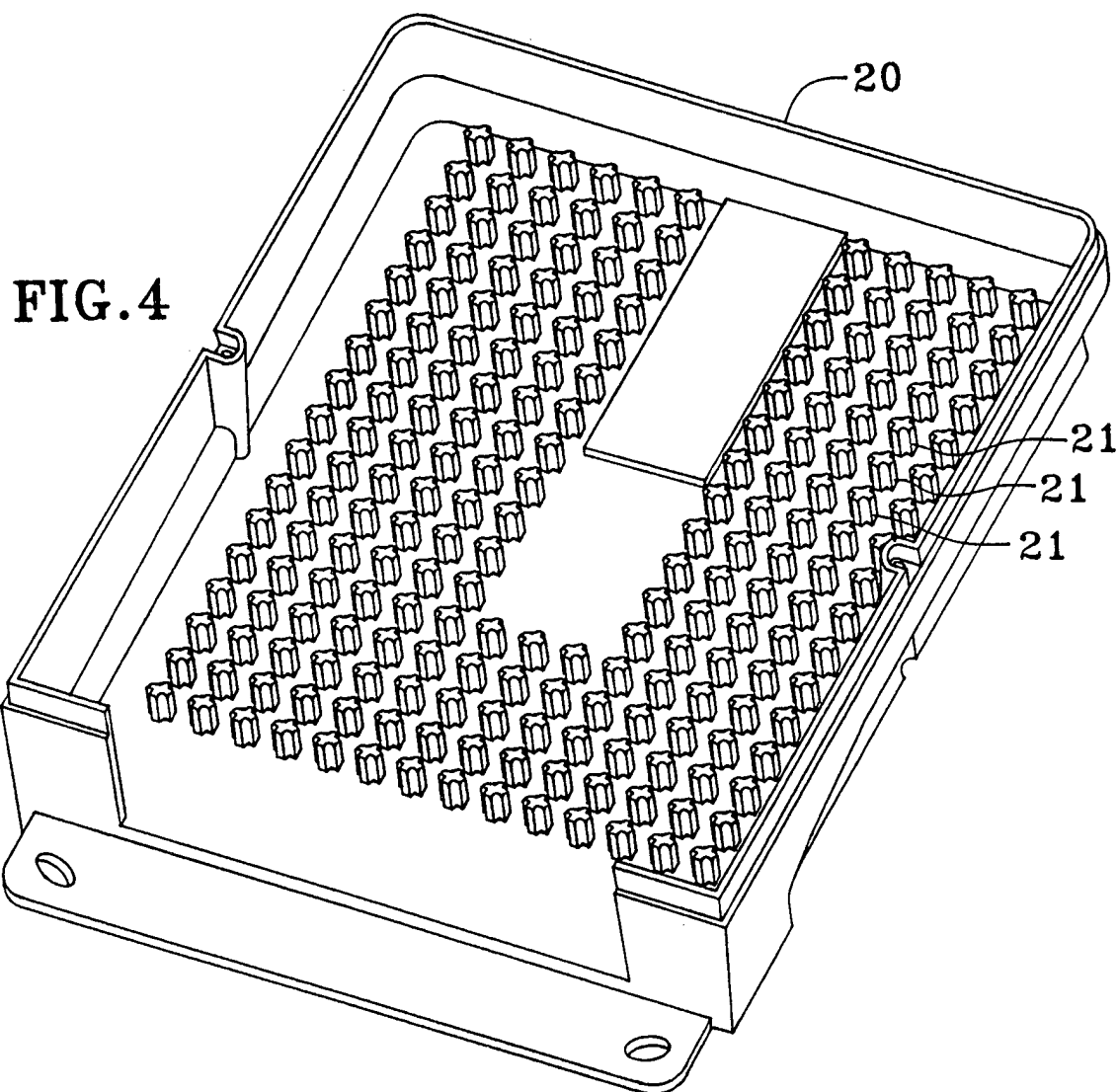
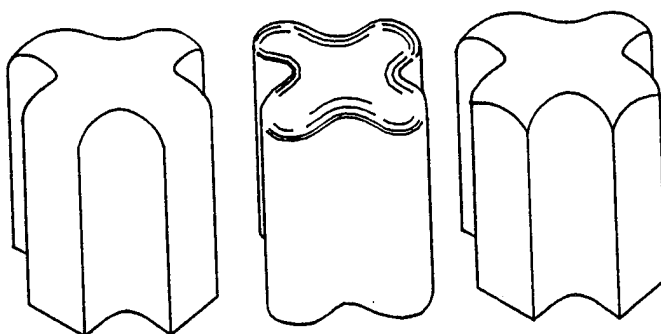


FIG. 5



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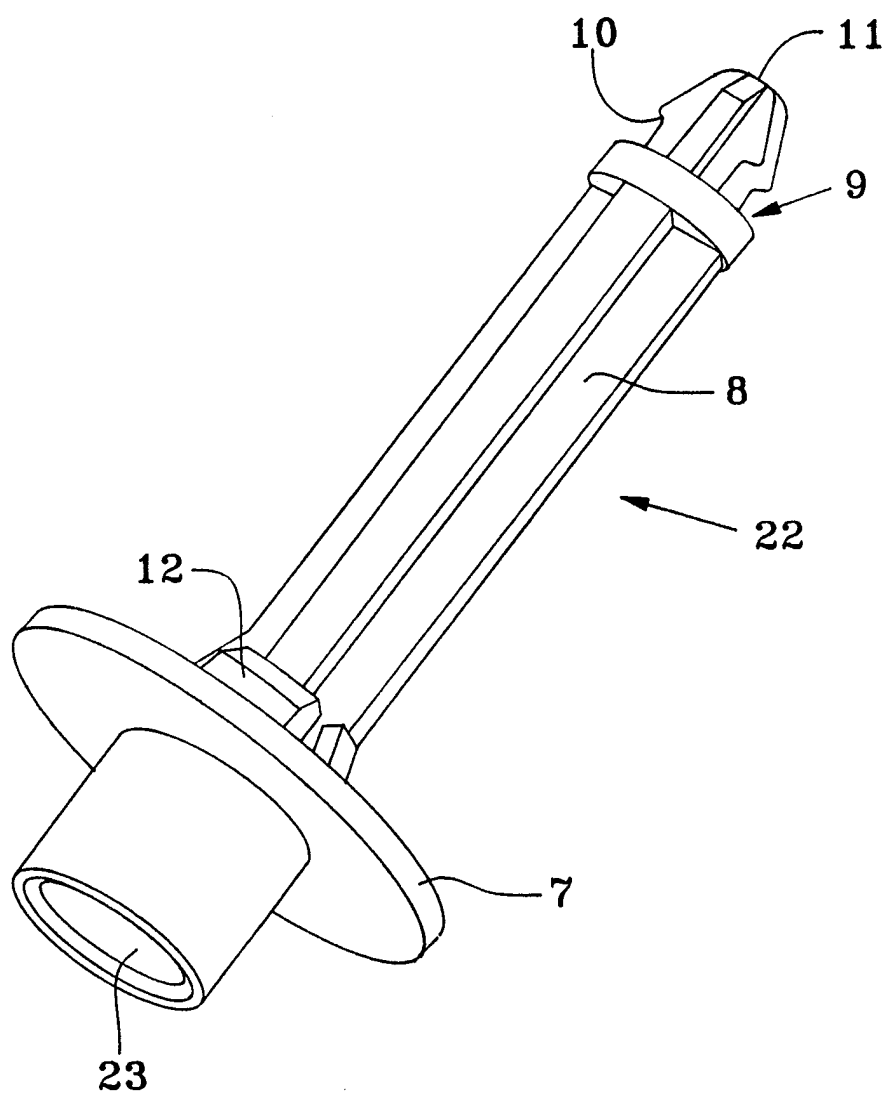


FIG.6

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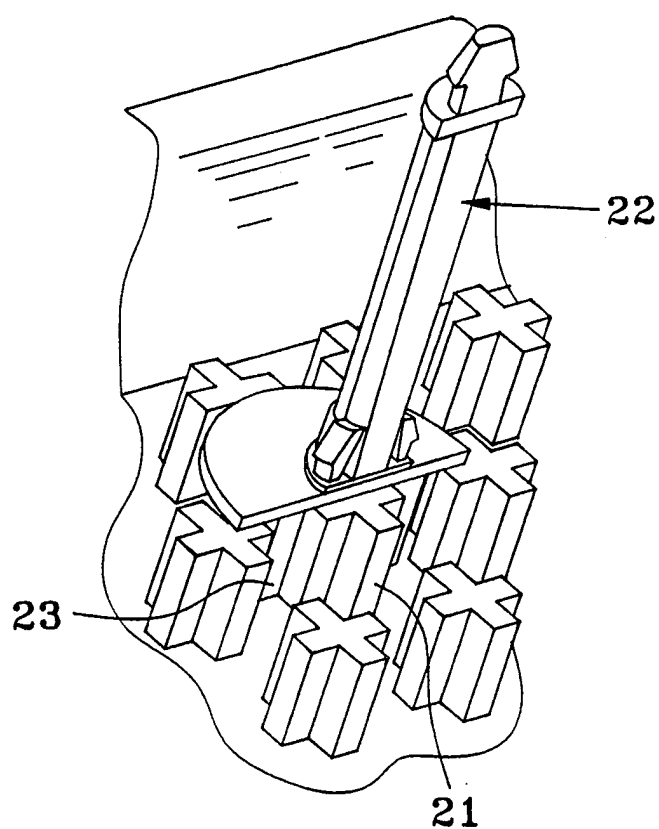


FIG. 7

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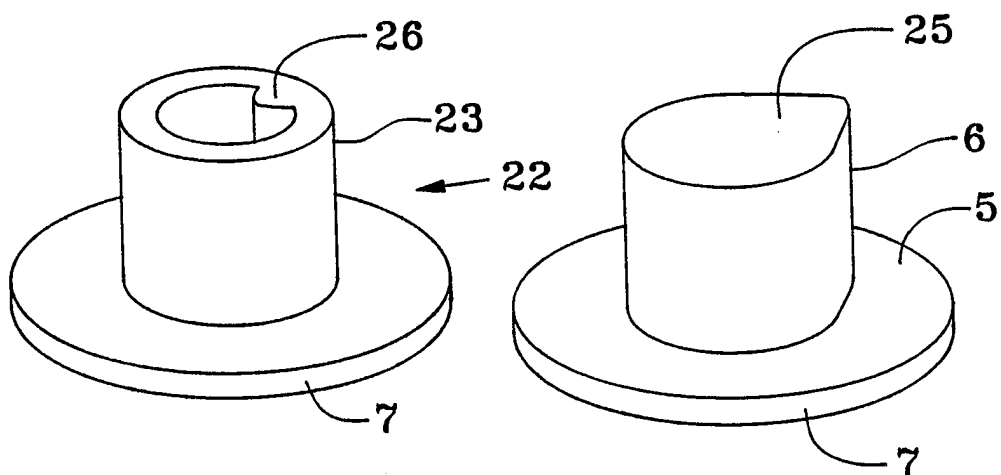


FIG. 8

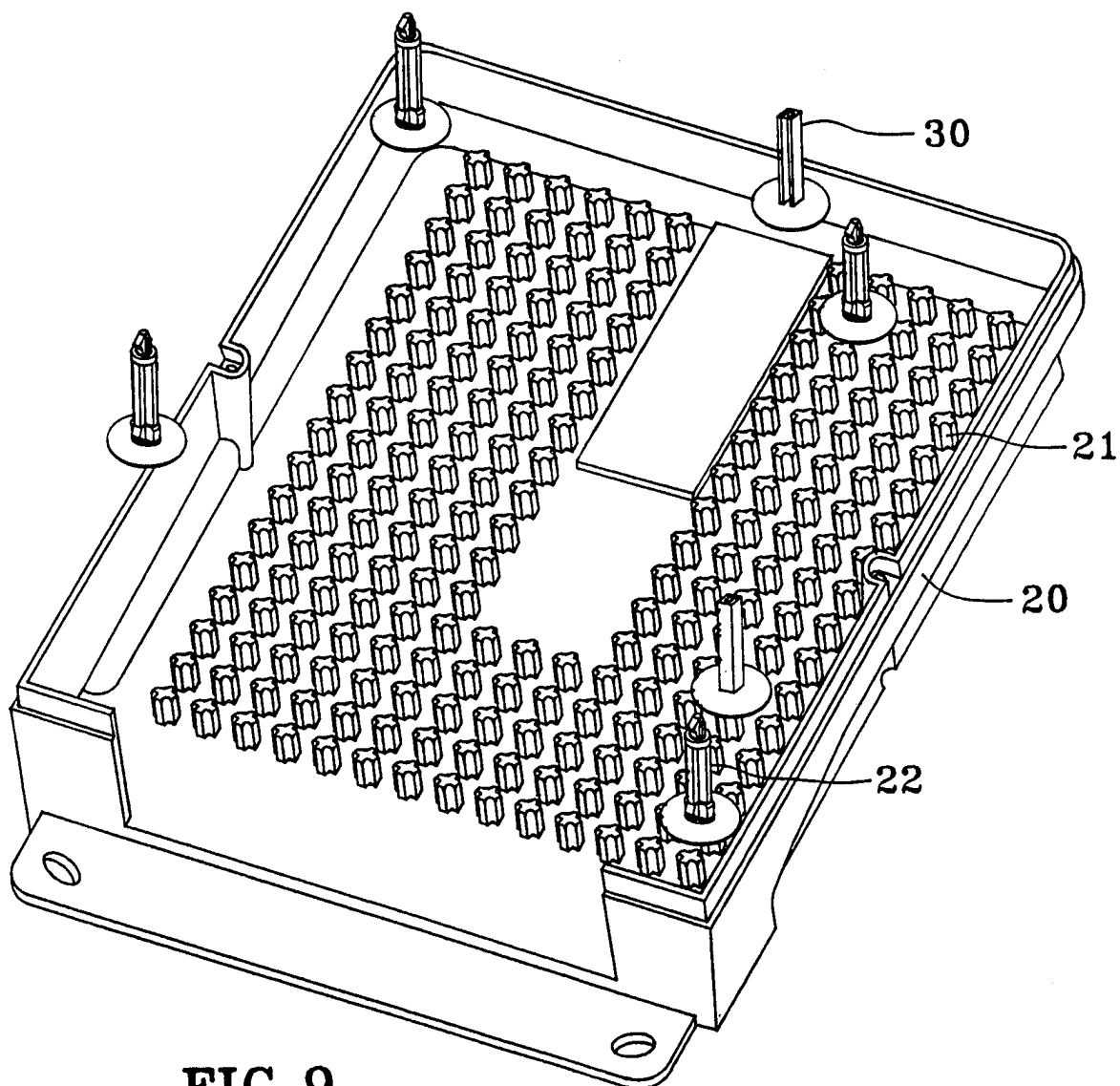


FIG. 9

INTERNATIONAL SEARCH REPORT

national Application No

PCT/EP 98/03165

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 G01R11/04 H05K7/14

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)

IPC 6 G01R H05K

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 25 31 888 A (BOSCH GMBH ROBERT) 10 February 1977	1,3,12,13
Y	see the whole document ---	2,7-10
Y	EP 0 033 850 A (LICENTIA GMBH) 19 August 1981	2
A	see page 3, line 23 - page 4, line 5 see figures 1-3 ---	9,10
Y	US 4 969 065 A (PETRI HECTOR D) 6 November 1990 see column 4, line 1 - line 24 see figures 7,8 --- -/--	7,8



Further documents are listed in the continuation of box C.



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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International Application No

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 136 568 A (HONEYWELL INC) 10 April 1985 see page 6, line 19 - page 8, line 7 see figures 2-4 ---	9,10
A	US 5 014 000 A (SCHLAGHECK JERRY G) 7 May 1991 see column 3, line 28 - line 52 see figure 1 -----	11

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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