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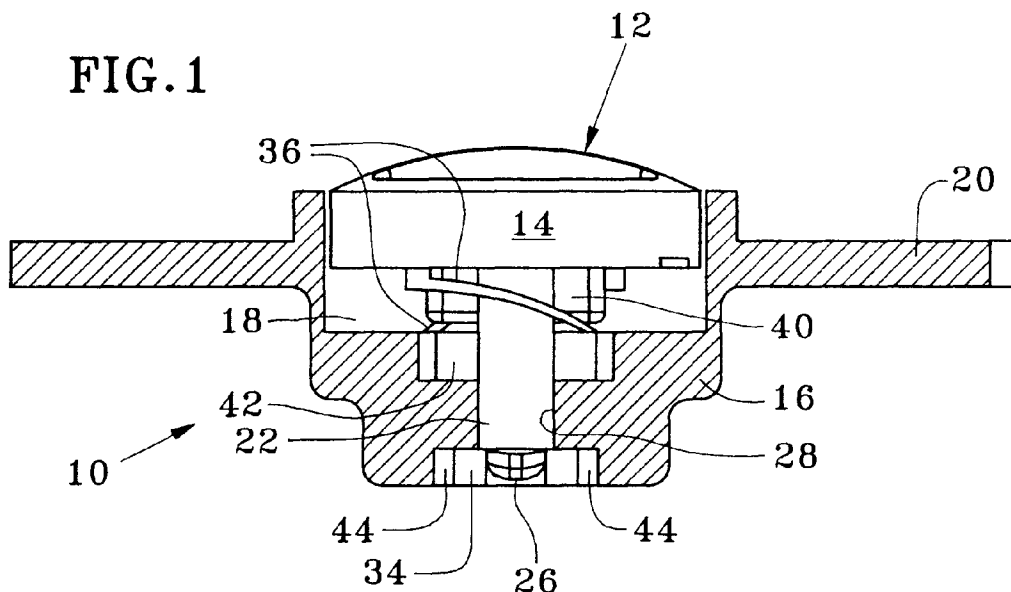
DE ES FI FR GB IT NL SE• **Dickerson, Adrian****Felixstowe, Suffolk IP11 8UJ (GB)**(30) Priority: **26.03.1996 GB 9606375**(74) Representative: **Hawkes, David John****Schlumberger Industries S.A.,****Direction Technique/Propriété Intellectuelle,****50, avenue Jean-Jaurès,****B.P. 620-05****92542 Montrouge Cédex (FR)**(71) Applicant: **SCHLUMBERGER INDUSTRIES LIMITED****London, WC2B 6XH (GB)**

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• **Slator, Kevin John****Felixstowe, Suffolk IP11 8XX (GB)****(54) Push button assemblies**

(57) A push button assembly (10), for use as a maximum demand indication reset button (12) in a poly-phase meter, comprises a one-piece push button (12) mounted in a housing (16) which is moulded integrally with the front face of the meter. The push button (12) is rotatable in the housing between a first rotary position in which it can be pushed into the housing to operate a switch, and a second rotary position, at 90° to the first, in which the push button is prevented from moving into

the housing. The push button has a circular head (14) with integrally moulded spring fingers (36) and a central switch-operating stem (22) projecting from its underside, the stem being axially split to form spring legs (24) having outwardly projecting feet (26) which lock the push button in the housing. The underside of the head also has a diametrically extending web (40), which aligns with and can move into a corresponding recess (42) in the housing only when the push button is in the first rotary position.

FIG. 1

Description

This invention relates to push button assemblies, and is more particularly but not exclusively concerned with a push button assembly for effecting a reset function, especially a maximum demand reset function, in a polyphase electricity meter.

Polyphase electricity meters for consumers of substantial amounts of electricity, eg industrial consumers, are frequently provided with a maximum demand indication capability, that is, they store and can display the maximum demand measured by the meter during each billing period. This capability is provided so that the consumer's bill can be adjusted to reflect maximum demand as well as the total amount of electricity consumed. At the end of each billing period, therefore, the meter reader reads not only the total amount of electricity used, but also the maximum demand indication, and then resets the latter to zero, ready for the next billing period, by means of a reset button.

It is clearly essential that only the meter reader can operate the reset button, and to this end, present maximum demand reset buttons usually have a sealed wire passing through them when in their "unpressed" state, which wire has to be unsealed and removed before the button can be pressed to effect its reset function. Since the sealed wire can only be fitted by the meter reader or other authorised person, any damage to the wire or its seal is evidence of possible tampering with the reset button.

However, the amount of movement of the button required to effect its reset function is typically rather small, and there is therefore a slight possibility that the sealed wire can be sufficiently flexible to permit such a small amount of movement without visible damage to the wire or its seal. It is an object of the present invention to eliminate this possibility.

According to the present invention, there is provided a push button assembly for operating a switch, the assembly comprising a housing, a push button rotatably mounted in the housing, and spring means disposed between the push button and the housing, the push button being rotatable in the housing between a first rotary position in which the push button can be pushed into the housing against the action of the spring means to operate the switch, and a second rotary position in which the push button is prevented from moving into the housing, the push button and the housing including co-operating means permitting the push button to be sealed in the second position.

In a preferred embodiment of the invention, the push button has a circular head and a switch operating stem extending coaxially from the underside of the head, and the housing defines a cylindrical recess for receiving the button head, the bottom of the recess having an aperture through which the switch operating stem passes to operate the switch, the underside of the button head and the bottom of the recess being co-operatively

shaped such that the button head can be pushed into the recess only when the push button is in the first rotary position. Preferably, the underside of the button head is provided with a web extending diametrically on each side of the switch operating stem, and the bottom of the recess on each side of the aperture is further recessed to receive the web when the push button is in the first rotary position.

Advantageously, the spring means is formed integrally with the underside of the button head, and may comprise a pair of diametrically opposed spring fingers which are shaped to abut the bottom of the recess and to be bent towards the button head as the button head is pushed into the recess. The spring fingers preferably extend in opposite directions, substantially parallel to the web, with one on each side thereof.

Advantageously, the stem is axially split and provided at its lower end with projections shaped to engage the underside of the bottom of the recess, to prevent the push button from being withdrawn from the housing once the lower end of the stem has passed through the aperture. Even more advantageously, the underside of the bottom of the recess is provided with a pocket coaxial with the aperture, the pocket being slightly smaller in diameter than the extent of the projections and having grooves positioned to receive the projections when the push button is in its first and second rotary positions, whereby to tend to hold the push button in each of its first and second rotary positions respectively.

The projections and the web preferably extend at 90° to each other, and the first and second rotary positions are preferably 90° apart.

Conveniently, the head of the push button is provided with a passage extending diametrically through it, and the housing has an upstanding rim provided with diametrically opposed apertures or slots positioned to be aligned with said passage when the push button is in the second rotary position, whereby a wire may be passed through the apertures or slots and the passage to seal the push button in the second rotary position.

The invention also comprises a polyphase electricity meter provided with a push button assembly in accordance with any of the preceding statements of invention, typically as a maximum demand indication reset button, in which the housing of the assembly is formed integrally with the case of the meter, preferably the front of the case.

The invention will now be described, by way of example only, with reference to the accompanying drawings, of which:

Figure 1 is a part-sectional view of a push button assembly in accordance with the present invention, showing the push button in its operational (ie ready to be pushed) state;

Figure 2 is a plan view of the push button assembly of Figure 1;

Figure 3 is a part-sectional view essentially similar to that of Figure 1, but showing the push button in its operated (ie pushed) state;

Figure 4 is a part-sectional view of the assembly of Figure 3, taken at right angles to the plane of Figure 3; and

Figure 5 is a part-sectional view of the push button assembly of Figure 1 to 4, showing the push button in its sealed state.

The push button assembly shown in Figures 1 to 4 is indicated generally at 10, and comprises a push button 12 having a circular head 14 (see Figure 2), and a housing 16 having a cylindrical recess 18 for receiving and rotatably supporting the button head 14. The push button assembly 10 is intended for use as a maximum demand indication reset button in a polyphase electricity meter, and to this end, the housing 16 is moulded integrally with the front face 20 of the meter.

As best seen in Figure 4, the button head 14 is provided with an elongate switch operating stem 22 projecting coaxially from its underside, this stem being longitudinally split over most of its length to form two parallel spring legs 24 having respective oppositely outwardly projecting feet 26 at their lower ends. The stem 22 passes through an aperture 28 in the bottom of the recess 18, this aperture being generally circular in section but having two longitudinally extending, oppositely disposed, grooves 30 in its wall to permit the passage of the feet 26 when the spring legs 24 are almost fully squeezed together. The bottom outer ends of the feet 26 are curved (at 32), to provide a cam action which squeezes the legs 24 together as the stem 22 is pushed through the aperture 28 during assembly. Once the feet 26 have passed through the aperture 28, they enter a generally circular recess or pocket 34 formed coaxially with the aperture 28 in the underside of the bottom of the recess 18 (ie the underside of the housing 16), allowing the legs 24 to spring apart and locking the button 12 in the housing 16. The diameter of the pocket 34 is slightly less than the distance between the outer ends of the feet 26 except in two pairs of opposed regions, as will become apparent hereinafter.

As already mentioned, the push button assembly 10 is shown in Figure 1 with the push button 12 in its operational state, in which the button is disposed in a first rotary position with respect to the housing 16 and is capable of being pushed into the housing so that the feet 26 at the bottom of the stem 22 operate a switch (not shown) within the meter: typically, the switch is a membrane-type switch mounted on a printed circuit board (not shown) disposed just beneath the underside of the housing 16. The push button 12 is held in its operational state in two ways: firstly by a pair of opposed spring fingers 36 which are moulded integrally with the underside of the button head 14, one on each side of

the stem 22, and which abut the bottom of the recess 18 on each side of the aperture 28, thus lightly urging the button head 14 upwardly within the recess 18 until the feet 26 engage the underside of the housing 16 within the pocket 34; and secondly, by the engagement of the feet 26 in respective oppositely disposed grooves 38 in the wall of the pocket 34, which engagement lightly resists rotation of the button 12 out of the first rotary position.

The underside of the button head 14 is provided with a substantially planar web 40 projecting downwardly therefrom, this web being symmetrically disposed on each side of the stem 22, substantially wider than the widest region of the aperture 28 (ie the region containing the grooves 30), and extending at right angles to the feet 26. The bottom of the recess 18 is provided with a web pocket 42, whose shape is complementary to that of the web 40 and which is aligned with, and therefore positioned to receive, the web when the button 12 is in the first rotary position. Thus the relative positions of the web 40 and the web pocket 42 permit the button 12 to be pressed to operate the forementioned switch only when the button is in the first rotary position.

With reference now to Figure 5, the push button assembly 10 is shown in its sealed, and therefore inoperable, state, in which the push button 12 is disposed in a second rotary position in the housing 16, at right angles to the first rotary position. In this second rotary position, the web 40, being wider than the aperture 28 and the grooves 30, prevents the push button 12 from being pressed down to any significant extent, since the web immediately comes into abutment with the bottom of the recess 18.

The push button 12 is lightly held in the second rotary position by the engagement of the feet 26 in oppositely disposed grooves 44 in the wall of the recess 34, the grooves 44, best seen in Figures 1 and 3, being angularly spaced by 90° from the grooves 38. However, to prevent its unauthorised use, the push button 12 can also be sealed in its second rotary position. To this end, the button head 14 has a passage 46 passing diametrically through it (see Figures 4 and 5), and the housing 16 has an upstanding rim 48 which surrounds the button head and which is provided with diametrically opposed slots 50 (see Figures 2, 4 and 5). The slots 50 are positioned to be in alignment with the passage 46 when the push button 12 is in its second rotary position, and sealing is effected by passing a wire 52 through the slots 50 and the passage 46, and sealing the opposite ends of the wire with a lead seal 54.

It will be appreciated that the push button assembly 10 is extremely inexpensive to manufacture, consisting as it does of only two components, viz the push button 12 and the housing 16, the latter being moulded integrally with the case of the meter of which the push button forms part. Additionally, the possibility of unauthorised operation being permitted by slight flexibility of the wire 52 is eliminated, since the push button 12 has to be ro-

tated through 90° before it can be operated.

Many modifications can be made to the described embodiment of the invention. For example, the angular separation of the first and second rotary positions of the push button need not be 90°, but could take any significant value, eg 45°. Also, the web 40 and the complementary web pocket 42 can be replaced by projections and co-operating pockets of other shapes and/or in other positions: or the projection(s) can be provided in the bottom of the recess 18, with the complementary pocket(s) in the underside of the button head 14. Finally, the push button assembly of the invention has applications other than resetting a maximum demand indication in a polyphase electricity meter.

Claims

1. A push button assembly (10) for operating a switch, the assembly comprising a housing (16), a push button (12) rotatably mounted in the housing, and spring means (36) disposed between the push button and the housing, the push button (12) being rotatable in the housing between a first rotary position in which the push button can be pushed into the housing against the action of the spring means (36) to operate the switch, and a second rotary position in which the push button (12) is prevented from moving into the housing (16), the push button and the housing including co-operating means (46, 50, 52, 54) permitting the push button to be sealed in the second position.
2. A push button assembly as claimed in claim 1, wherein the push button (12) has a circular head (14) and a switch operating stem (22) extending coaxially from the underside of the head, and the housing (16) defines a cylindrical recess (18) for receiving the button head, the bottom of the recess having an aperture (28) through which the switch operating stem passes to operate the switch, the underside of the button head (40) and the bottom of the recess (18) being co-operatively shaped such that the button head can be pushed into the recess only when the push button is in the first rotary position.
3. A push button assembly as claimed in claim 2, wherein the underside of the button head is provided with a web (40) extending diametrically on each side of the switch operating stem, and the bottom of the recess on each side of the aperture is further recessed (42) to receive the web when the push button is in the first rotary position.
4. A push button assembly as claimed in claim 2 or claim 3, wherein the spring means (36) is formed integrally with the underside of the button head.
5. A push button assembly as claimed in claim 4, wherein the spring means (36) comprises a pair of diametrically opposed spring fingers which are shaped to abut the bottom of the recess (18) and to be bent towards the button head as the button head is pushed into the recess.
6. A push button assembly as claimed in claim 5, wherein the spring finger (36) extend in opposite directions, substantially parallel to the web (40) with one on each side thereof.
7. A push button assembly as claimed in any one of claims 2 to 6, wherein the stem (22) is axially split and provided at its lower end with projections (26) shaped to engage the underside of the bottom of the recess, to prevent the push button from being withdrawn from the housing once the lower end of the stem has passed through the aperture (28).
8. A push button assembly as claimed in claim 7, wherein the underside of the bottom of the recess is provided with a pocket (34) coaxial with the aperture (28), the pocket (34) being slightly smaller in diameter than the extent of the projections (26) and having grooves (44) positioned to receive the projections (26) when the push button is in its first and second rotary positions, whereby to tend to hold the push button in each of its first and second rotary positions respectively.
9. A push button assembly as claimed in claim 7 or claim 8 wherein the projections (26) and the web (40) extend at 90° to each other, and the first and second rotary positions are 90° apart.
10. A push button assembly as claimed in any preceding claim, wherein the head (14) of the push button is provided with a passage (46) extending diametrically through it, and the housing (16) has an up-standing rim (48) provided with diametrically opposed apertures or slots (50) positioned to be aligned with said passage when the push button is in the second rotary position, whereby a wire (52) may be passed through the apertures or slots and the passage to seal the push button in the second rotary position.
11. An electricity meter provided with a push button assembly (10), in accordance with any preceding claim.
12. A meter as claimed in claim 11, the meter having a maximum demand indication facility and the push button (12) serving as a reset button for said facility.
13. A meter as claimed in claim 11 or claim 12, wherein the housing (16) of the push button assembly (10)

is formed integrally with the case of the meter.

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FIG.1

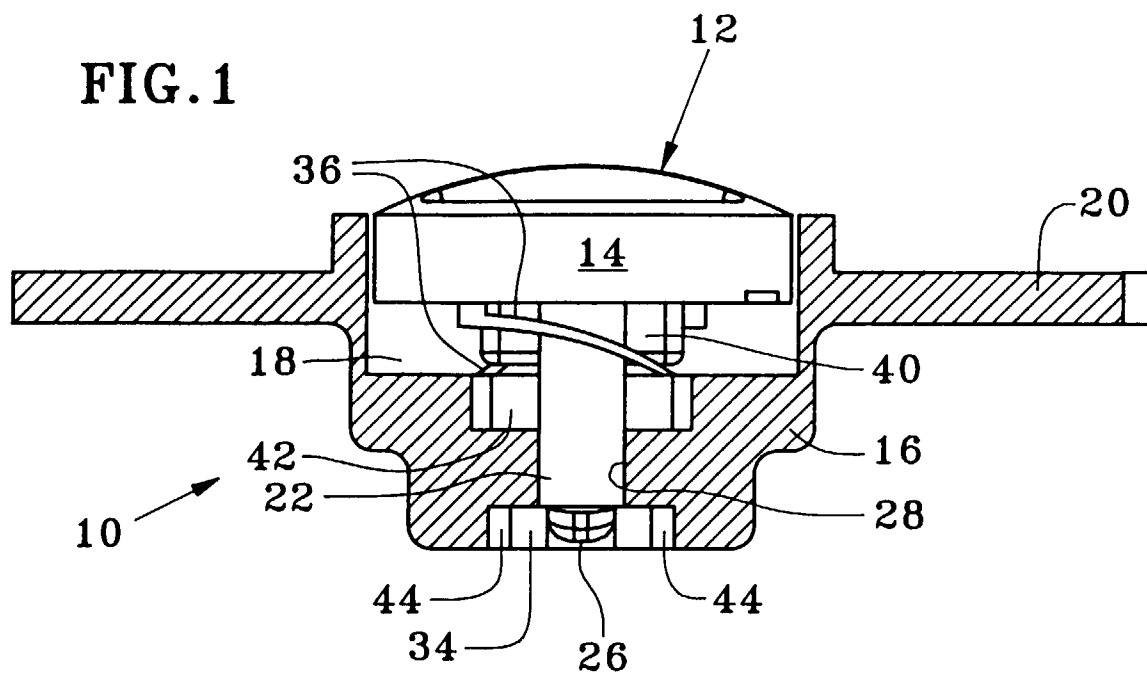


FIG.2

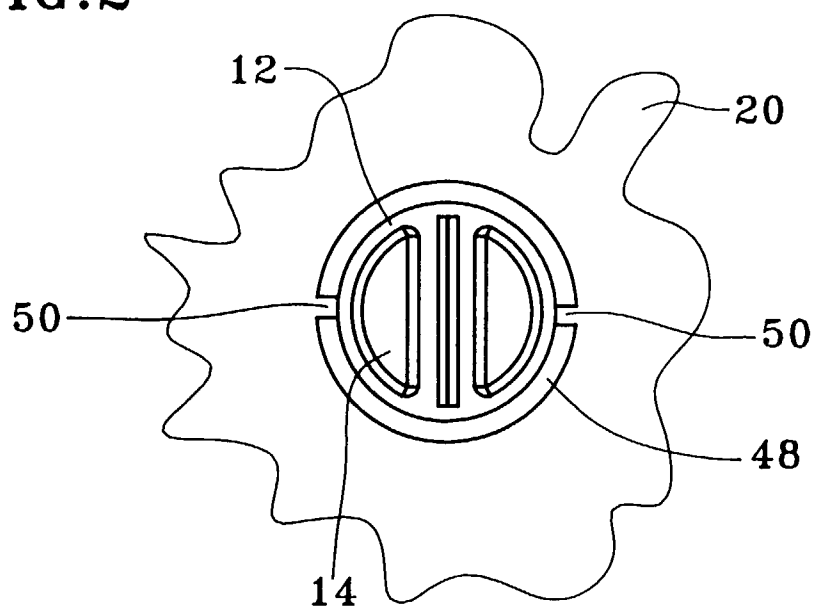


FIG.3

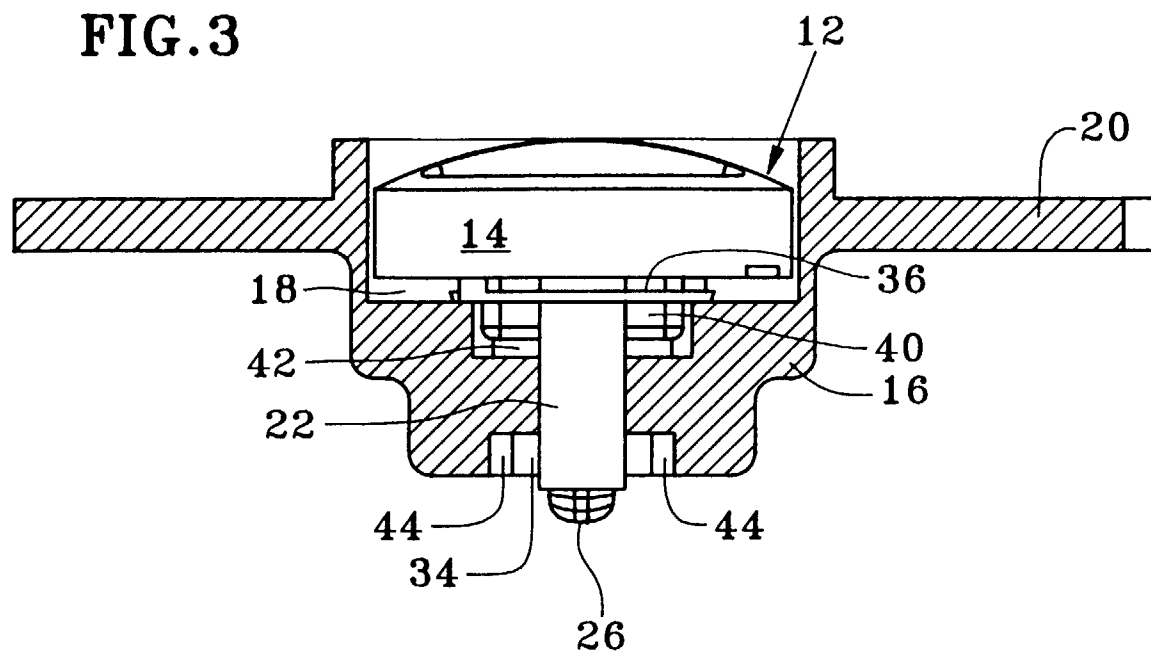


FIG.4

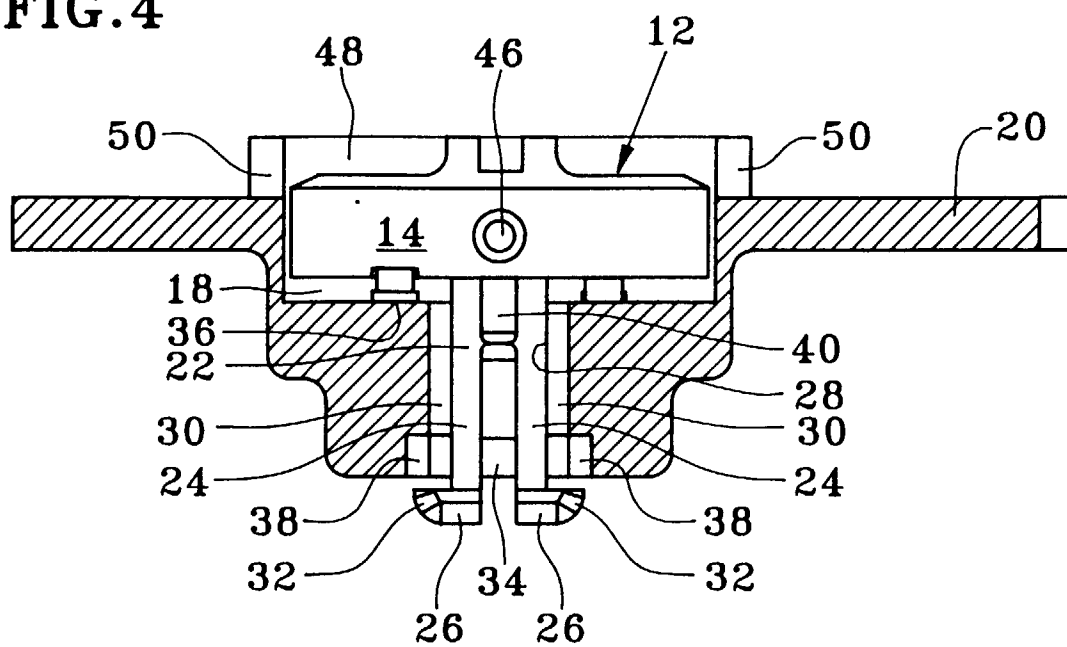
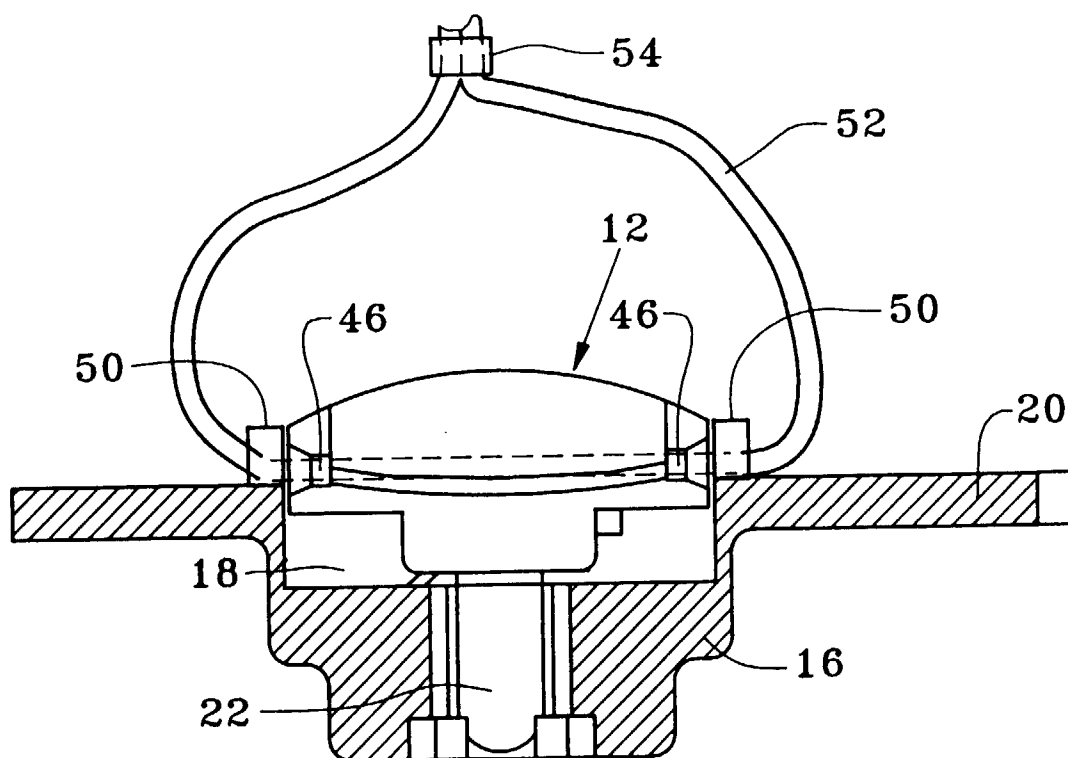


FIG.5





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EUROPEAN SEARCH REPORT

Application Number
EP 97 40 0543

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	CH 272 399 A (HASLER AG) 1 March 1951 * the whole document * -----	1	H01H9/28
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			H01H
The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 30 June 1997	Examiner Mausser, T
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 I : document cited for other reasons & : member of the same patent family, corresponding document			

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