(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 535 085 B1**

(12) # EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **02.08.95** (51) Int. Cl.[6]: **F15B 15/20**

(21) Application number: **91911689.7**

(22) Date of filing: **29.05.91**

(86) International application number:
PCT/SE91/00377

(87) International publication number:
WO 91/19907 (26.12.91 91/29)

(54) **HOLDING DEVICE FOR PISTON POSITION SENSOR WITH CLAMPING DEVICE.**

(30) Priority: **20.06.90 SE 9002201**

(43) Date of publication of application:
07.04.93 Bulletin 93/14

(45) Publication of the grant of the patent:
02.08.95 Bulletin 95/31

(84) Designated Contracting States:
DE FR GB IT

(56) References cited:
EP-A- 0 191 924

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EP 0 535 085 B1

Description

The invention concerns a holding device for a piston position sensor, being displaceably mounted on the outside of a fluid pressure cylinder, particularly for the sensing of a magnetic field generated by at least one permanent magnet being attached to the piston of the fluid pressure cylinder, which holding device comprises an essentially U-shaped yoke, being displaceable along and fastenable to the outside of the cylinder tube by means of fastening elements.

Such a holding device is previously known from EP-A1-0 191 924, wherein the U-shaped yoke consists of two clamping jaws enclosing the cylinder tube, which is circular-cylindric and not equipped with any external tension rods, guides or the like. The clamping jaws are thus tightened directly against the smooth cylinder tube.

Further, there is another type of piston position sensors available on the market being provided with a clamping device for the clamping to a tension rod, which extends along the outside of the cylinder tube. Nowadays, however, there is a tendency not to use cylinders with tension rods of this kind; instead, cylinder tube profiles are used being extruded integrally with longitudinal beads having internal channels, which may either contain tension rods or be provided with internal threads at the ends, so that cylinder end plates may be fastened to the ends of the cylinder tube by means of fastening screws engaging these threads.

The aim of the invention is to achieve a holding device which may be used with the latter type of fluid pressure cylinder without external tension rods, yet facilitating safe mounting of the above mentioned type of piston position sensor with a clamping device, being available on the market.

This aim is achieved by a holding device having the features stated in claim 1, the holding device thus being characterized in that the essentially U-shaped yoke is displaceable along and fastenable to at least one guide being formed on the outside of and integrally with the cylinder tube, that a holding element is partly inserted into and fastenable within the yoke, said holding element being provided with a protruding holding pin, and that the piston position sensor is provided with a clamping device, by means of which the piston position sensor is clampable onto said protruding holding pin.

Hereby it is possible to use relatively inexpensive piston position sensors of the previously known type. Also the piston position sensor may easily be detached from the holding pin without detaching the yoke from its fastened position on the guides. This means that the piston position sensor may be dismounted and remounted without altering the adjusted position of the yoke.

Other suiteable features of the holding device according to the invention are stated in the dependent claims and will be explained in the following detailed description of two embodiments, reference being made to the appended drawings.

Fig. 1 shows, in a cross-sectional view, a cylinder tube with a holding device mounted thereon, according to a first embodiment;

Fig. 2 shows the holding device according to Fig. 1 and a part of the cylinder tube in longitudinal section;

Fig. 3 shows, in a cross-sectional view, an upper part of the cylinder tube with a holding device (according to Fig. 1 and 2) and a piston position sensor mounted thereon; and

Fig. 4 shows, in a cross-sectional view, a second embodiment of the holding device.

Fig. 1 and 2 thus illustrate a cylinder tube 1 of a fluid pressure cylinder, the cylinder end plates at the ends of the cylinder tube and a displaceable piston with associated piston rod inside of the cylinder tube not being shown. The cylinder tube 1, which is preferably manufactured from an aluminium alloy, has on the one hand, longitudinal beads 2 with through holes 3 therein for fastening screws (not shown) for the end plates and, on the other hand, dovetail shaped longitudinal beads 4 on opposite sides of the cylinder tube 1, with undercut, mutually parallel guide grooves 4a, 4b, formed at their longitudinal edges, for a holding device 5, according to the invention, being displaceable along the cylinder tube.

This holding device 5 for a piston postion sensor comprises a U-shaped yoke 6, the shanks 7 and 8 of which at their ends are formed with inwardly projecting gripping edges 7a, 8a, engaging the guide grooves 4a and 4b, respectively. The yoke 6 may be made of metal but is preferably produced out of a rigid plastic material, rendering the yoke a certain dimensional flexibility as well as good sliding properties relative to the guide grooves 4a, 4b. The dimensional flexibility is further increased by longitudinal weakenings 6a, 6b in the web portion 6c of the yoke adjacent to the respective shank. At one end, as seen lengthwise, the shanks 7, 8 are provided with bevels or recesses 7b, 8b (Fig. 2, 8b not visible) in the respective corner area to enable the displacement of the yoke close to the respective end plate. The yoke 6 is thus displaceable along the whole length of the cylinder tube 1 (for the positioning close to the second end plate, the yoke may be snapped out of the guide grooves 4a, 4b and turned 180°, so that the bevelled corner portions 7b, 8b, abut said second end plate) and may be positioned and fixed in a desired position by means of a transverse fastening screw 9, which, when tightened, presses the

shanks 7, 8 of the yoke towards each other in the area of the fastening screw 9, i.e. near one end of the yoke 6 close to the gripping edges 7a, 8a, so that the latter frictionally engage the guide grooves 4a, 4b and thereby lock the yoke in a well-defined position. The threaded end portion of the fastening screw 9 (not visible in the figures) is in threaded engagement with a nut, which is non-rotatably guided in a recess in the opposite shank 8.

A holding body or element 10 with a protruding pin 10b, onto which a piston position sensor 12 (Fig. 3) is fastenable, comprises an essentially cylindrical portion 10a (Fig. 2) which is dimensioned to be inserted between the shanks 7, 8 of the yoke with a certain play. When the holding element 10 is inserted into position, with the end surface abutting the fastening screw 9, a second transverse fastening screw 13 may be inserted through a hole in the shank 7 and through a circumferential groove 14 in the cylindrical portion 10a of the holding element to an opposing hole in the shank 8, where a nut (not shown) engaging the thread of the fastening screw 13 is non-rotatably arranged in a recess (not shown) in the shank 8. When the fastening screw 13 is tightened, the shanks 7, 8 are pressed together, so that they will be mutually parallel along the whole length of the yoke 6 (by tightening only the first fastening screw 9 the shanks will diverge somewhat in the direction towards the opening into which the holding element 10 is inserted). At the same time the engagement of gripping edges 7a, 8a to the guide grooves 4a, 4b is increased.

By means of the transverse fastening screws 9 and 13 the holding element 10 is locked axially inside the yoke 6 while being rotatable around the axis of the cylindrical portion 10a, the circumferential groove 14 making such a rotation possible. This rotatability is utilized for the adjustment of the axially protruding holding pin 10b to a desired radial distance from the outside of the cylinder tube 1. The holding pin 10b is namely excentrically placed relative to the axis of the cylindrical portion 10a, as best illustrated in Figs. 1 and 3.

Through this adjustability the fastenable piston position sensor 12 may be adjusted in such a way that its sensor element is placed close to the outer surface of the cylinder tube, irrespective of the diameter of the particular cylinder tube. The adjusting operation is facilitated by the free end surface of the holding pin 10b being provided with an internal hexagonal recess 11, so that the whole holding element may be rotated to a desired rotational position by means of a hexagon screw driver. The recess 11 may of course be replaced by a slot for an ordinary screw driver. The holding element 10 may be locked in the adjusted rotational position by means of a locking screw 15, which is screwed through a threaded through hole in the web portion 6c of the yoke 6c.

As mentioned above the piston position sensor 12 itself is of a known type, including a sensor element 12a, from which an electric cable 16 with power supply and signal conduits emerges, a fastening screw 12b and a clamping jaw 12c actuated thereby. Thus, the piston position sensor 12 is fastenable on the holding pin 10b. If desired, the holding pin 10b may be provided with a scale or markings, so that the piston position sensor 12 may be dismounted and remounted in exactly the same position on the holding pin.

In the second embodiment according to Fig. 4, the U-shaped yoke 6' is turned with its shanks 7', 8' away from the cylinder tube 1', the web portion 6'c of the yoke 6' lying on a longitudinal bead 16' with an inner, undercut, essentially T-shaped guide groove 4' formed on the outside of the cylinder tube 1'. A displaceable nut 17' is seated within this groove and is in threaded engagement with a screw 18', the head 18'a of which is countersunk in an inner recess in the web portion 6'c of the yoke 6'. The yoke 6' is thus displaceable along the bead 17' and the groove 4' as well as fastenable in a desired position by means of the screw 18'.

The holding element 10' with its excentrically arranged longitudinally protruding holding pin 10'b, is in this case directly fastenable between the shanks 7', 8' of the yoke 6' by means of the two fastening screws 9', 13', of which (as in the previous embodiment) one, namely the fastening screw 9', serves as an axial abutment when inserting the cylindrical portion 10'a of the holding element 10' between the shanks 7', 8' and the other, namely the fastening screw 13', locks this portion 10'a axially in the inserted position through cooperation with a circumferential groove 14'. After rotational adjustment, the holding element 10' may be fixed by tightening the two fastening screws 9', 13'.

Claims

1. Holding device for a piston position sensor (12; 12') being displaceably mounted on the outside of a fluid pressure cylinder, which holding device (5;5') comprises an essentially U-shaped yoke (6;6'), being displaceable along and fastenable to the outside of the cylinder tube (1;1') by means of fastening elements (9,13:18'17'), **characterized** in

- that the essentially U-shaped yoke (6;6') is displaceable along and fastenable to at least one guide (4;4') being formed on the outside of and integrally with the cylinder tube (1;1');
- that a holding element (10;10') is partly inserted into and fastenable within the

yoke (6;6') said holding element being provided with a protruding holding pin (10b;10'b); and

- that the piston position sensor (12) is provided with a clamping device (12b,12c), by means of which the piston position sensor is clampable onto said protruding holding pin (10b;10'b).

2. Holding device according to claim 1, **characterized** in that the holding pin (10b;10'b) protrudes in parallel to said at least one guide (4,4').

3. Holding device according to claim 1 or 2, **characterized** in that the holding element (10;10') is movable within the U-shaped yoke for adjustment of the radial distance between the holding pin (10b;10'b) and the outer surface of the cylinder tube (10,10').

4. Holding device according to claim 3, **characterized** in that the holding element (10;10') is rotatable within the U-shaped yoke (6;6') and that the holding pin (10b;10'b) is excentrically located relative to the centre of rotation.

5. Holding device according to claim 4, **characterized** in that the free end surface of the holding pin (10b;10'b) is provided with a recess (11;11'), e.g. a slot for a screw driver or an internal recess for a hexagon screw driver, to facilitate rotational adjustment of the pin (10b) by means of a tool.

6. Holding device according to claim 4 or 5, **characterized** in that the portion (10a;10'a) of the holding element (10;10') which is insertable into the yoke (6;6') is essentially cylindrical and provided with a circumferential groove (14;14'), which cooperates with a screw (13;13') extending between the shanks (7,8;7',8') of the yoke (6;6') for axial locking of the holding element (10;10') in an inserted position within the yoke (6;6').

7. Holding device according to any one of the claims 4-6, **characterized** in that at least one locking screw (15) is screwable through the yoke (6) for rotational locking of the holding element (10) in an adjusted rotational position.

8. Holding device according to any one of the previous claims, **characterized** in that the shank ends (7a,7b) of the yoke (6) are guided along two mutually parallel guides (4a,4b) and that said fastening elements (9,13) are effective between the shanks (7,8) of the yoke.

9. Holding device according to claim 8, **characterized** in that said two guides are constituted by dovetail slots (4a,4b) formed on the outside of the cylinder tube (1), the shank ends of the yoke (6) being provided with gripping edges (7a,8a) engaging with the dovetail slots, that the insertable portion (10a) of the holding element (10) is insertable between the shanks (7,8) of the yoke with play, so that the shanks may be tensioned against each other by means of said fastening elements (9,13) to achieve frictional engagement between the gripping edges (7a,8a) and the dovetail slots (4a,4b), and that the holding element (10) is lockable within the yoke by means of at least one separate locking element (15).

10. Holding device according to any one of the claims 1-7, **characterized** in that said guide is constituted by an undercut guide groove (4'), in which a portion (17') connected to the web portion (6'c) of the yoke (6') is displaceably seated.

11. Holding device according to claim 10, **characterized** in that said displaceably seated portion is constituted by a nut (17') being in threaded engagement with a screw (18'), which extends through the web portion (6'c) of the yoke (6') and constitutes said fastening element.

12. Holding device according to claim 10 or 11 in combination with any one of the claims 4-6, **characterized** in that the holding element (10') is lockable in a desired rotational position through clamping action between the shanks (7',8') of the yoke (6').

Patentansprüche

1. Haltevorrichtung für einen Kolbenstellungsfühler (12; 12'), welcher an der Außenseite eines Fluiddruckzylinders verschiebbar befestigt ist, wobei die Haltevorrichtung (5; 5') ein im wesentlichen u-förmiges Joch (6, 6') umfaßt, welches verschiebbar entlang und befestigbar durch Befestigungselemente (9, 13: 18', 17') an der Außenseite des Zylinderrohres (1; 1') ist, dadurch gekennzeichnet, daß

- das im wesentlichen u-förmige Joch (6; 6') verschiebbar entlang und befestigbar an mindestens einer Führung (4; 4') ist, welche an der Außenseite von und einteilig mit dem Zylinderrohr (1; 1') ist;
- ein Halteelement (10; 10') teilweise eingeführt in und befestigbar innerhalb des Jochs (6; 6') ist, wobei das Halteelement

mit einer vorstehenden Haltestange (10b; 10'b) versehen ist; und
- der Kolbenstellungsfühler (12) mit einer Klemmvorrichtung (12b, 12c) versehen ist, durch die der Kolbenstellungsfühler an der vorstehenden Haltestange (10b; 10'b) anklemmbar ist.

2. Haltevorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Haltestange (10b; 10'b) parallel zu der wenigsten einen Führung (4, 4') vorsteht.

3. Haltevorrichtung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß das Halteelement (10; 10') innerhalb des u-förmigen Jochs zum Einstellen der radialen Distanz zwischen der Haltestange (10b; 10'b) und der Außenoberfläche des Zylinderrohres bewegbar ist.

4. Kaltevorrichtung nach Anspruch 3, dadurch gekennzeichnet, daß das Halteelement (10; 10') innerhalb des u-förmigen Jochs (6; 6') drehbar ist, und daß die Haltestange (10b; 10'b) exzentrisch relativ zum Drehzentrum angeordnet ist.

5. Haltevorrichtung nach Anspruch 4, dadurch gekennzeichnet, daß die freie Endoberfläche der Haltestange (10b; 10'b) mit einer Aussparung (11; 11') versehen ist, beispielsweise einem Schlitz für einen Schraubenzieher oder einer inneren Aussparung für einen hexagonalen Schraubenzieher, um Dreheinstellung der Stange (10b) durch ein Werkzeug zu erleichtern.

6. Haltevorrichtung nach Anspruch 4 oder 5, dadurch gekennzeichnet, daß der Abschnitt (10a; 10'a) des Halteelements (10; 10'), welches in das Joch (6; 6') einführbar ist, im wesentlichen zylindrisch und mit einer umlaufenden Nut (14;14') versehen ist, welche mit einer Schraube (13; 13') zusammenwirkt, die sich zwischen den Schenkeln (7, 8; 7', 8') des Jochs (6; 6') erstreckt, um das Halteelement (10; 10') in einer eingeführten Position innerhalb des Jochs (6; 6') axial zu sichern.

7. Haltevorrichtung nach einem der Ansprüche 4-6, dadurch gekennzeichnet, daß wenigstens eine Verschlußschraube (15) durch das Joch (6) schraubbar ist, um das Halteelment (10) in einer eingestellten Drehstellung zu sichern.

8. Haltevorrichtung nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß die Schenkelenden (7a, 7b) des Jochs (6) entlang zweier, zueinander paralleler Führungen (4a, 4b) geführt werden, und daß die Befestigungselemente (9, 13) zwischen den Schenkeln (7, 8) des Jochs wirken.

9. Haltevorrichtung nach Anspruch 8, dadurch gekennzeichnet, daß die beiden Führungen aus Schwalbenschwanzschlitzen (4a, 4b) aufgebaut sind, welche an der Außenseite des Zylinderrohres (1) gebildet sind, wobei die Schenkelenden des Jochs (6) mit Greifkanten (7a, 8a) versehen sind, die in die Schwalbenschwanzschlitze greifen, daß der einführbare Abschnitt (10a) des Halteelements (10) zwischen den Schenkeln (7, 8) des Jochs mit Spiel einführbar ist, so daß die Schenkel gegeneinander mittels der Befestigungselemente (9, 13) verspannt werden können, um zwischen den Greifkanten (7a, 8a) und den Schwalbenschwanzschlitzen (4a, 4b) reibschlüssig zu greifen, und daß das Halteelemente (10) innerhalb des Jochs durch wenigstens ein getrenntes Verschlußelement (15) sicherbar ist.

10. Kaltevorrichtung nach einem der Ansprüche 1-7, dadurch gekennzeichnet, daß die Führung aus einer unterschnittenen Führungsnut (4') besteht, in der ein mit dem Stegabschnitt (6'c) des Jochs (6') verbundener Abschnitt (17') verschiebbar sitzt.

11. Haltevorrichtung nach Anspruch 10, dadurch gekennzeichnet, daß der verschiebbar sitzende Abschnitt von einer Mutter (17') gebildet wird, welche im Gewindeeingriff mit einer Schraube (18') steht, und die sich durch den Stegabschnitt (6'c) des Jochs (6') erstreckt und das Befestigungselement umfaßt.

12. Haltevorrichtung nach einem der Ansprüche 10 oder 11 in Verbindung mit einem der Ansprüche 4-6, dadurch gekennzeichnet, daß das Kalteelement (10') in einer gewünschten Drehstellung durch einen Klemmvorgang zwischen den Schenkeln (7', 8') des Jochs (6') sicherbar ist.

Revendications

1. Dispositif de fixation pour détecteur de position de piston (12, 12') étant monté de manière à pouvoir être déplacé sur l'extérieur d'un cylindre à pression de fluide, lequel dispositif de fixation (5; 5') comprend un joug (6; 6') sensiblement en forme de U, pouvant être déplacé et fixé sur l'extérieur du tube de cylindre (1; 1') au moyen d'éléments de fixation (9, 13; 18', 17'), caractérisé en ce que :
- le joug (6; 6') sensiblement en forme de U peut être déplacé et fixé sur au moins un guide (4; 4') étant formé sur l'exté-

rieur du tube de cylindre (1; 1') et d'une seule pièce avec celui-ci;

- un élément de fixation (10; 10') est en partie inséré dans le joug (6; 6') et peut être attaché au sein de celui-ci, ledit élément de fixation étant doté d'une tige de fixation (10b; 10'b) en projection; et
- le détecteur de position de piston (12) est doté d'un dispositif de serrage (12b, 12c), au moyen duquel le détecteur de position de piston peut être serré sur ladite tige de fixation (10b; 10'b) en projection.

2. Dispositif de fixation selon la revendication 1, caractérisé en ce que la tige de fixation (10b; 10'b) est en projection parallèlement audit au moins un guide (4; 4').

3. Dispositif de fixation selon la revendication 1 ou 2, caractérisé en ce que l'élément de fixation (10; 10') est mobile au sein du joug en forme de U pour réglage de la distance radiale entre la tige de fixation (10b; 10'b) et la surface externe du tube de cylindre (10, 10').

4. Dispositif de fixation selon la revendication 3, caractérisé en ce que l'élément de fixation (10; 10') peut être tourné au sein du joug en forme de U (6; 6') et en ce que la tige de fixation (10b; 10'b) est excentrée relativement au centre de rotation.

5. Dispositif de fixation selon la revendication 4, caractérisé en ce que la surface d'extrémité libre de la tige de fixation (10b; 10'b) est dotée d'un évidement (11; 11'), par exemple d'une fente pour un tournevis ou d'un évidement interne pour un tournevis hexagonal, afin de faciliter le réglage par rotation de la tige (10b) au moyen d'un outil.

6. Dispositif de fixation selon la revendication 4 ou 5, caractérisé en ce que la portion (10a; 10'a) de l'élément de fixation (10; 10') qui peut être insérée dans le joug (6; 6') est sensiblement cylindrique et dotée d'une gorge circonférentielle (14; 14'), qui coopère avec une vis (13; 13') s'étendant entre les jambages (7, 8; 7', 8') du joug (6; 6') pour le blocage axial de l'élément de fixation (10; 10') dans une position d'insertion au sein du joug (6; 6').

7. Dispositif de fixation selon l'une quelconque des revendications 4 à 6, caractérisé en ce qu'au moins une vis de fixation (15) peut être vissée dans le joug (6) pour le blocage par rotation de l'élément de fixation (10) dans une position de rotation ajustée.

8. Dispositif de fixation selon l'une quelconque des revendications précédentes, caractérisé en ce que les extrémités (7a, 7b) des jambages du joug (6) sont guidées le long de deux guides (4a, 4b) parallèles et en ce que lesdits éléments de fixation (9, 13) agissent entre les jambages (7, 8) du joug.

9. Dispositif de fixation selon la revendication 8, caractérisé en ce que lesdits deux guides sont constitués par des gorges de queue d'aronde (4a, 4b) formées sur l'extérieur du tube de cylindre (1), les extrémités des jambages du joug (6) étant dotées de bords de préhension (7a, 8a) s'engageant avec les gorges de queue d'aronde, en ce que la portion pouvant être insérée (10a) de l'élément de fixation (10) peut être insérée entre les jambages (7, 8) du joug avec un jeu, de manière que les jambages puissent être pressés l'un vers l'autre au moyen desdits éléments de fixation (9, 13) pour obtenir un engagement par frottement entre les bords de préhension (7a, 8a) et les gorges de queue d'aronde (4a, 4b), et en ce que l'élément de fixation (10) peut être bloqué au sein du joug au moyen d'au moins un élément de blocage distinct (15).

10. Dispositif de fixation selon l'une quelconque des revendications 1 à 7, caractérisé en ce que ledit guide est constitué par une gorge de guidage évidée (4'), dans laquelle une portion (17') reliée à la portion de dos (6'c) du joug (6') est calée tout en pouvant être déplacée.

11. Dispositif de fixation selon la revendication 10, caractérisé en ce que ladite portion calée tout en pouvant être déplacée est constituée par un écrou (17') étant engagé par vissage avec une vis (18'), qui traverse la portion de dos (6'c) du joug (6') et constitue ledit élément de fixation.

12. Dispositif de fixation selon la revendication 10 ou 11 conjointement à l'une quelconque des revendications 4 à 6, caractérisé en ce que l'élément de fixation (10') peut être bloqué dans une position de rotation souhaitée par action de serrage entre les jambages (7', 8') du joug (6').

Fig.1

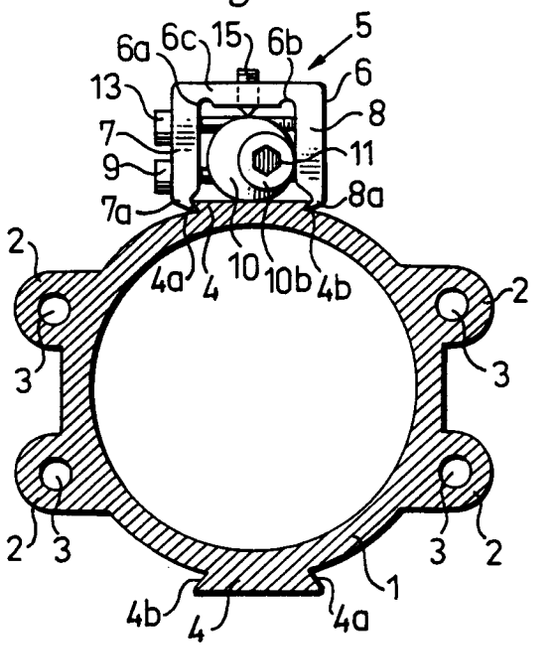


Fig. 2

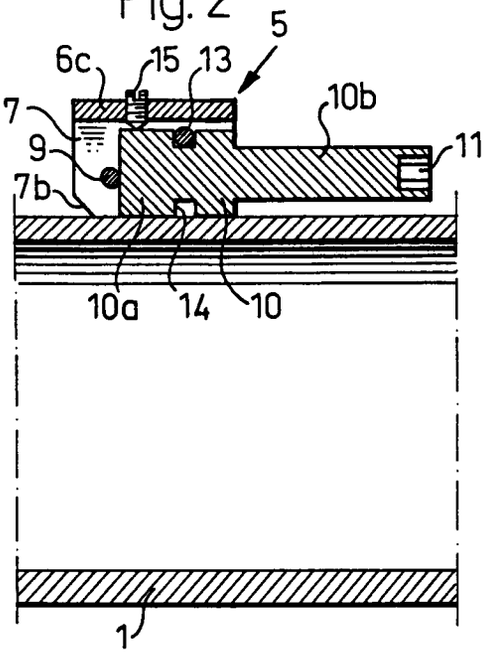


Fig.3

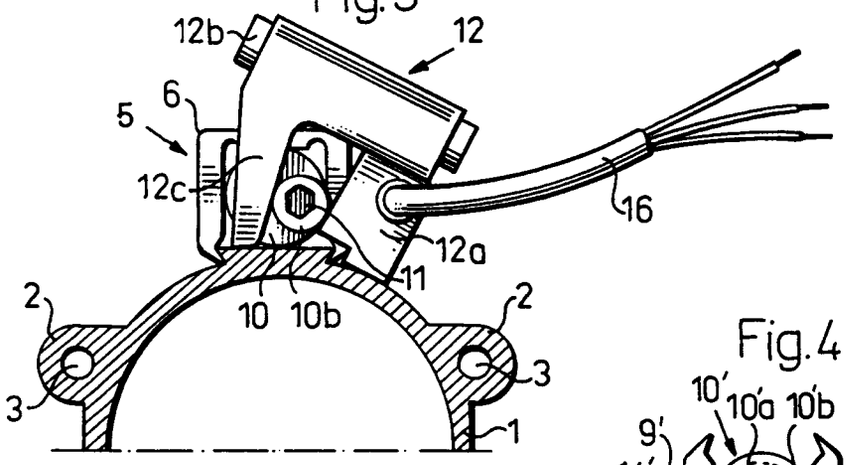


Fig.4

