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(54) **Poly valve device for gas tank**

Vorrichtung mit mehreren Ventilen für einen Gasbehälter

Dispositif poly-valve pour réservoir de gaz

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(73) Proprietor: **LUXEMBOURG PATENT COMPANY
S.A.
7440 Lintgen (LU)**

(72) Inventors:
• **Goffin, Claude
6761 Chenois (BE)**

• **Bauer, Philippe
57310 Rurange lés Thionville (FR)**

(74) Representative: **Lecomte, Didier et al
Lecomte & Partners Sàrl
P.O. Box 1623
1016 Luxembourg (LU)**

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Description

Technical field

[0001] The present invention is directed to a poly valve for a gas tank, more particularly for a gas tank of a vehicle, preferably a LPG tank.

Background art

[0002] Patent document EP 1 688 650 A1 disposes a poly valve device according to the preamble of claim 1.

[0003] A poly valve device for a LPG tank is already known from FR 2 816 033 A (GIAT INDUSTRIES) 03.05.2002. The device disclosed therein comprises a valve body with a flange for mounting on a gas tank, an overfill sensing means, an electrically operated overfull protection valve connected to the overfill sensing means, a valve means for delivering gas to the end user and a liquid level gauge transmitting its information electrically via a wire connection through the poly valve body.

[0004] This arrangement is quite bulky since it requires enough places on the valve body for mounting the series of devices mentioned here above. Additionally, there is a need for reducing the size of such poly valve devices, in particular in order to reduce the diameter of the hole of the tank receiving such a valve device to 48 mm.

Disclosure of the invention

[0005] The present invention seeks to solve the above mentioned problem by proposing a poly valve device for a gas tank, according to claim 1.

[0006] Preferably the overfill protection valve is mounted on the valve body by fitting and crimping.

[0007] The overfill protection valve can comprise a generally cylindrical overfill protection valve body, one end of which being fitted and crimped in a corresponding bore of the valve body.

[0008] The level indicator means comprises an elongated element rotatably supported on the valve body and generally perpendicular to the flange, a first end of the elongated element cooperating with the hinged section of the level sensing means and the second end of the elongated element transmitting by its rotation the information of the level of liquid in the tank to the external side of the valve body.

[0009] The second end of the elongated element can comprise magnetic means designed for transmitting the rotational position of the elongated element to an indicator on the external side of the valve body.

[0010] The first end of the elongated element can comprise a slot distant from a rotational axis of the elongated element and engaging with the rod or a pivot of the hinged section.

[0011] The overfill protection valve can comprise a piston with sealing means for closing the overfill protection valve, the piston having a polygonal, preferably hexagonal, section.

onal, section.

[0012] Preferably the piston has a passage from an upper side with the sealing means to a lower side of the piston and the overfill protection valve further comprises an overfill protection valve body and a control valve operated by the level sensing means and able to close a chamber of the overfill protection valve formed by the lower side of the piston and the overfill protection valve body.

Brief description of the drawings

[0013] Figure 1 is a view of the poly valve device of the present invention.

[0014] Figure 2 is a sectional view of the poly valve device of figure 1.

[0015] Figure 3 is a perspective view of the device of the present invention.

Best Mode for Carrying Out the Invention

[0016] The poly valve device comprises a valve body 1 with a flange 2 for sealingly mounting on a flat portion of a gas tank, for example, a gas powered vehicle. The device comprises a series of devices for fulfilling a series of functions:

[0017] - A shut-off valve for gas delivery to the end user. This valve is located approximately in the middle of the valve body 1 (it cannot be seen on the figures) and mounted from the upper side of the valve body. The valve is actuated by a magnetic coil screwed on top of the shut-off valve. This magnetic coil is apparent on the top of the valve illustrated on the figures.

[0018] - An overfill protection valve 3 mounted on the lower side of the valve body within the contour of the flange. The details of this protection valve are illustrated on figure 2 which shows a hollow overfill protection valve body 11 fitted in a bore 12 of the valve body. The overfill protection valve is thereby in fluid connection with a passageway made in the valve body 1 extending from the lower side to the lower side of this latter. The passageway is in connection with a fill port 4 on the upper side of the valve body 1.

[0019] A check valve is located in the passageway in order to allow a flow of gas from the fill port to the gas tank and to block any counter flow from the tank to the fill port.

[0020] The overfill protection valve body 11 is generally cylindrical and comprises a piston 17 slidably mounted therein. This piston has sealing means at its upper end in the form here of an elastomer o-ring arranged in a circular nut. This o-ring cooperates with a seat in the overfill protection valve body 11. The piston is held in its upper position as shown in figure 2 by means of a resilient means like a spring. The piston has a cavity which is in connection with the upper side of the piston via a passageway along its longitudinal axis. The lower side of the piston and the interior of the overfill protection valve de-

fine a chamber 20. The lower side of the overfill protection valve body has a control valve which is designed for shutting off the chamber 20. The upper surface of the piston in contact with the gas when refilling and the resilient means of the piston are dimensioned such that, upon refilling, the piston 17 is lowered down under the refill pressure. A small portion of the refill gas flows through the passageway of the piston to the chamber 20 and through a control valve 19 which is held in an open position by a level sensing means 5. When a predetermined level of liquid gas is reached upon filling, the level sensing means releases the control valve 19 which is normally closed from an opened position to a closed position. This has for effect to close the exit of the chamber 20 and therefore to increase the pressure in the chamber 20. This increase of pressure has for effect to lift the piston 17 and to close the overfill protection valve. This closing movement is due to the difference of surfaces on the upper side and the lower side of the piston 17. The higher the refill pressure is, the more the protection valves closes thereby providing an improved overfill protection valve.

[0021] - A level indicator comprising a rod 6 arranged perpendicularly to the flange surface of the poly valve device, the angular position of which being coupled to the position of a level sensing means 5, and level indicating means on the external side of the valve body 1 and coupled to the rod 6 in order to indicate the level of liquid in the tank. The rod 6 supported by a bearing element 21 in order to be able to freely rotate. The bearing element is preferably made of plastic and supports the rod 6 at two locations, i.e. at a first location close to the valve body 1 and at a second location distant from the valve body 1. Figure 2 shows indeed such a supporting element with a first major bearing section close to the valve body 1, an elongate element extending from this major bearing section with a second minor bearing section in the form of a clip. The lower end 15 of the rod 6, i.e. close to the second minor bearing section of the supporting element 21 features a section extending essentially perpendicularly to the longitudinal axis of the rod. This section is preferably in the form of an opened slot and engages with a moving part of the level sensing means 5. The angular position of the rod 6 is therefore dependent on the level of liquid in the tank. The upper end 8 is designed to transmit its angular position to the external side of the valve body 1. Preferably, the upper end 8 comprises a permanent magnet with a magnetic field main direction generally perpendicular to the longitudinal axis of the rod 6. The level indicating means preferably comprise a section 7 for indicating the level to the user and a section 9 which receives the information about the level from the rod 6. Preferably, the section 9 comprises permanent magnets, the magnetic field of which being coupled with the magnetic field of the upper end 8 of the rod 6. The rod does not therefore need to traverse the valve body 1. An alternative to the magnetic coupling means could be the use of any known electrical angular

sensor or encoder like a hall-effect one for example, which would be connected to the level indicating means by means of electrical leads or wires traversing the valve body.

[0022] - A pressure relief valve which is not apparent on the figures.

[0023] The poly valve device has been rendered particularly compact by means of a series of measures.

[0024] A first measure is the use of a common level sensing means 5 for both the overfill protection valve and the level indicator. The level sensing means comprises a rod 13 (see figure 1), one end of which being hinged on the overfill protection valve body 11 and the other end of which carrying a floater 10. Figure 1 shows that the rod 13 is bent to 90 degrees close to the floater 10. Many configurations can be contemplated to that respect depending on the design of the tank on which the poly valve device is to be mounted on. The hinged section level sensing means comprises a cam 14 linked to the rod 13 and a pivot 16 traversing the overfill protection valve body 11 and the cam 14. The profile of the cam cooperates with a section of the control valve 19 such that the position of the movable part of this control valve 19 is dependent on the angular position of the cam 14. The pivot 16 comprises a section extending from the overfill protection valve body 11 at approximately 90°. The pivot 16 is firmly fixed to the cam in the present embodiment so that its extending section moves as the rod 13 swings around the pivot axis. The extending section of the pivot engages with the slot extending from the lower end 15 of the rod 6 of the level indicator means. Any variation of the level of liquid in the tank will therefore impart a tilting movement of the rod/floater assembly 13/10 and also a rotation movement of the cam 14 and of the rod 6 of the level indicator means. This change of angular position of the rod 6 will be transmitted to the level indicator 7 on the external side of the valve body 1. When reaching a predetermined level of liquid in the tank, typically about 80-90% of the total capacity, the angular position of the cam and the cam profile are such that the control valve 19 is not maintained in its open position anymore, i.e. practically, the portion of the cam profile in contact with the control valve at this angular position of the cam is lowered such that the control valve 19 closes and the overfill protection valves closes and stop the refilling operation.

[0025] Variations in the design of the hinged section of the rod/floater assembly 13/10 can be considered. Indeed, for example, the end portion of the rod 13 could be bent to approximately 90° and be inserted in the overfill protection valve body and the cam 14 instead of the pivot. The extending section or slot of the lower end 15 of the rod 6 of the level indicator means would then directly engage with the rod 13 of the level sensing means. Many other variations apparent to the skilled person are here-with contemplated. For example, the rod/floater assembly 13/10 could be hinged on the bearing element 21 instead of the overfill protection valve body, or on both

the bearing and the overfill protection valve body.

[0026] A second measure for rendering the poly valve compact is the fitting and crimping of the overfill protection valve body 11 in the poly valve body 1. Indeed, the overfill protection valve body needs to be of a certain size, in particular with respect to its diameter in order to achieve certain performances with respect to the acceptable flow of liquid gas when refilling. The common way for mounting such a valve is by screwing. This requires a certain wall thickness of the bore of the poly valve body 1 where the thread is to be cut, as is well known in the art. At the contrary, the use of the method of fitting followed by crimping requires much less wall thickness of the receiving bore. Additionally, fitting and crimping instead of screwing renders much easier the angular positioning of the overfill protection valve body 11.

[0027] A third measure is the fitting and crimping of the supporting element 21 in a bore of the poly valve body 1. This provides the same advantages with regard to compactness as for the overfill protection valve.

[0028] A fourth measure is the use of a piston 17 for the overfill protection valve of polygonal cross-section. Indeed, it has been found that a circular section of the piston can lead to a jamming of the piston due to impurities in the gas. A polygonal cross-section, preferably a hexagonal cross-section, of the piston reduces the risk of jamming. In order to maximize the flow capacity of the overfill protection valve without increasing its diameter, the stroke of the piston and the size of the side openings in the overfill protection valve body have to be increased and the spring rate has to be relatively low. These three measures can increase the risk of jamming of the piston and the selection of a polygonal cross-section alleviates this difficulty while providing a high capacity overfill protection valve.

Claims

1. A poly valve device for a gas tank comprising a valve body (1) with a flange (2) for mounting the device on the gas tank; an overfill protection valve (3) mounted on an internal side of the valve body (1) with regard to the tank when the device is mounted thereon; a fill port (4) on an external side of the valve body (1) and in communication with the overfill protection valve (3); a level indicator means (6,7) on the internal side of the valve body (1); means (8,9) for transmitting information of the level of liquid in the tank from the level indicator means (6) to the external side of the valve body (1); a valve means mounted on the valve body for delivering gas from the tank to a user; a level sensing means (5) with a floater (10) hinged on the overfill protection valve (3) and/or on the level indicator means (6) and cooperating with both of them for pro-

viding information of the level of liquid; **characterized in that**

the level indicator means (6) comprises an elongated element rotatably supported on the valve body (1) and generally perpendicular to the flange (2), a first end (15) of the elongated element (6) cooperating with the hinged section of the level sensing means (5) and the second end (8) of the elongated element transmitting by its rotation the information of the level of liquid in the tank to the external side of the valve body (1).

2. A poly valve device for a gas tank according to claim 1, wherein the overfill protection valve (3) is mounted on the valve body (1) by fitting and crimping.
3. A poly valve device for a gas tank according to claim 1, wherein the overfill protection valve (3) comprises a generally cylindrical overfill protection valve body (11), one end of which being fitted and crimped in a corresponding bore (12) of the valve body.
4. A poly valve device for a gas tank according to the preceding claim, wherein the second end (8) of the elongated element (6) comprises magnetic means designed for transmitting the rotational position of the elongated element to an indicator (7) on the external side of the valve body.
5. A poly valve device for a gas tank according to the preceding claim, wherein the first end (15) of the elongated element comprises a slot distant from a rotational axis of the elongated element (6) and engaging with the rod (13) or a pivot (16) of the hinged section.
6. A poly valve device for a gas tank according to the preceding claim, wherein the overfill protection valve (3) comprises a piston (17) with sealing means (18) for closing the overfill protection valve (3), the piston (17) having a polygonal, preferably hexagonal, section.
7. A poly valve device for a gas tank according to the preceding claim, wherein the piston (17) has a passage from an upper side with the sealing means (18) to a lower side of the piston and the overfill protection valve (3) further comprises an overfill protection valve body (11) and a control valve (19) operated by the level sensing means (5) and able to close a chamber (20) of the overfill protection valve (3) formed by the lower side of the piston (17) and the overfill protection valve body (11).

Patentansprüche

1. Polyventilvorrichtung für einen Gastank, umfas-

send:

einen Ventilkörper (1) mit einem Flansch (2) für die Montage der Vorrichtung auf dem Gastank; ein Überfüllsicherungsventil (3), das bezüglich des Tanks, wenn die Vorrichtung an demselben montiert ist, an einer Innenseite des Ventilkörpers (1) angebracht ist;
eine Einfüllöffnung (4) an einer Außenseite des Ventilkörpers (1) und in Verbindung mit dem Überfüllsicherungsventil (3);
ein Füllstandsanzeigemittel (6, 7) an der Innenseite des Ventilkörpers (1);
Mittel (8, 9) zur Übertragung der Information des Flüssigkeitsstandes im Tank vom Füllstandsanzeigemittel (6) an die Außenseite des Ventilkörpers (1);
ein Ventilmittel, das zum Zuführen von Gas zu einem Nutzer am Ventilkörper montiert ist; ein Füllstanderfassungsmittel (5) mit einem Schwimmer (10), der am Überfüllsicherungsventil (3) und/oder am Füllstandsanzeigemittel (6) angelenkt ist und mit beiden zusammenwirkt, um die Information des Flüssigkeitsstandes bereitzustellen; **dadurch gekennzeichnet, dass** das Füllstandsanzeigemittel (6) ein längliches Teil umfasst, das am Ventilkörper (1) drehbar und im Allgemeinen senkrecht zum Flansch gelagert ist, wobei ein erstes Ende (15) des länglichen Teils (6) mit dem angelenkten Abschnitt des Füllstandsanzeigemittels (5) zusammenwirkt und das zweite Ende (8) des länglichen Teils durch seine Drehung die Information des Flüssigkeitsstandes im Tank an die Außenseite des Ventilkörpers (1) überträgt.

2. Polyventilvorrichtung für einen Gastank nach Anspruch 1, bei der das Überfüllsicherungsventil (3) am Ventilkörper (1) durch Einpassen und Quetschen angebracht wird.
3. Polyventilvorrichtung für einen Gastank nach Anspruch 1, bei der das Überfüllsicherungsventil (3) einen im Allgemeinen zylindrischen Überfüllsicherungsventilkörper (11) umfasst, wobei ein Ende desselben in einer entsprechenden Bohrung (12) des Ventilkörpers eingepasst und gequetscht wird.
4. Polyventilvorrichtung für einen Gastank nach dem vorhergehenden Anspruch, bei der das zweite Ende (8) des länglichen Teils (6) magnetische Mittel umfasst, die zum Übertragen der Drehposition des länglichen Teils an eine Anzeige (7) auf der Außenseite des Ventilkörpers vorgesehen sind.
5. Polyventilvorrichtung für einen Gastank nach dem vorhergehenden Anspruch, bei der das erste Ende (15) des länglichen Teils einen von einer Drehachse

des länglichen Teils (6) entfernten Schlitz umfasst und in einen Stab (13) oder einen Drehzapfen (16) des angelenkten Abschnitts eingreift.

6. Polyventilvorrichtung für einen Gastank nach dem vorhergehenden Anspruch, bei der das Überfüllsicherungsventil (3) einen Kolben (17) mit Dichtmitteln (18) für das Schließen des Überfüllsicherungsventils (3) umfasst, wobei der Kolben (17) einen vieleckigen, vorzugsweise sechseckigen, Querschnitt aufweist.
7. Polyventilvorrichtung für einen Gastank nach dem vorhergehenden Anspruch, bei der der Kolben (17) einen Kanal von einer Oberseite mit den Dichtmitteln (18) zu einer Unterseite des Kolbens aufweist und das Überfüllsicherungsventil (3) außerdem einen Überfüllsicherungsventilkörper (11) und ein Steuer-ventil (19) umfasst, das vom Füllstanderfassungsmittel (5) betätigt wird und eine Kammer (20) des Überfüllsicherungsventils (3), die von der Unterseite des Kolbens (17) und des Überfüllsicherungsventilkörpers (11) gebildet wird, schließen kann.

Revendications

1. Dispositif polyvanne pour un réservoir de gaz, comprenant :

un corps de clapet (1) comprenant une bride (2) pour le montage du dispositif sur le réservoir de gaz ;
un clapet de protection (3) contre le trop-plein monté sur le côté interne du corps de clapet (1) par rapport au réservoir lorsque le dispositif y est monté ;
un orifice de remplissage (4) sur le côté externe du corps de clapet (1) et mis en communication avec le clapet de protection (3) contre le trop-plein ;
un moyen indicateur de niveau (6, 7) sur le côté interne du corps de clapet (1) ;
un moyen (8, 9) pour transmettre les informations concernant le niveau du liquide dans le réservoir à partir du moyen d'indication de niveau (6) au côté externe du corps de clapet (1) ;
un moyen faisant office de clapet monté sur le corps de clapet pour distribuer du gaz à partir du réservoir à un utilisateur ;
un moyen de détection de niveau (5) comportant un flotteur (10) articulé au clapet (3) de protection contre le trop-plein et/ou au moyen d'indication de niveau (6) et coopérant avec les deux pour fournir des informations concernant le niveau du liquide ;
caractérisé en ce que
le moyen indicateur de niveau (6) comprend un

- élément allongé supporté en rotation sur le corps de clapet (1) et généralement perpendiculaire à la bride (2), une première extrémité (15) de l'élément allongé (6) coopérant avec la section articulée du moyen de détection de niveau (5) et la deuxième extrémité (8) de l'élément allongé transmettant par sa rotation les informations concernant le niveau de liquide dans le réservoir au côté externe du corps de clapet (1). 5
2. Dispositif polyvanne pour un réservoir de gaz selon la revendication 1, dans lequel le clapet (3) de protection contre le trop-plein est monté sur le corps de clapet (1) par emboîtement et sertissage. 10
3. Dispositif polyvanne pour un réservoir de gaz selon la revendication 1, dans lequel le clapet (3) de protection contre le trop-plein comprend un corps de clapet (11) généralement cylindrique procurant une protection contre le trop-plein, dont une extrémité est emboîtée et sertie dans un alésage correspondant (12) du corps de clapet. 15
4. Dispositif polyvanne pour un réservoir de gaz selon la revendication précédente, dans lequel la deuxième extrémité (8) de l'élément allongé (6) comprend un moyen magnétique conçu pour transmettre la position en rotation de l'élément allongé à un indicateur (7) sur le côté externe du corps de clapet. 20
5. Dispositif polyvanne pour un réservoir de gaz selon la revendication précédente, dans lequel la première extrémité (15) de l'élément allongé comprend une fente disposée à distance de l'axe de rotation de l'élément allongé (6) et dans laquelle vient s'insérer la tige (13) ou le pivot (16) de la section articulée. 25
6. Dispositif polyvanne pour un réservoir de gaz selon la revendication précédente, dans lequel le clapet (3) de protection contre le trop-plein comprend un piston (17) comportant un moyen d'étanchéisation (18) pour la fermeture du clapet (3) procurant une protection contre le trop-plein, le piston (17) possédant une section polygonale, de préférence hexagonale. 30
7. Dispositif polyvanne pour un réservoir de gaz selon la revendication précédente, dans lequel le piston (17) possède un passage s'étendant depuis le côté supérieur muni d'un moyen d'étanchéisation (18) jusqu'au côté inférieur du piston, et le clapet (3) procurant une protection contre le trop-plein comprend en outre un corps de clapet (11) procurant une protection contre le trop-plein et un clapet de commande (19) actionné par le moyen de détection de niveau (5) et capable de fermer une chambre (20) du clapet (3) procurant une protection contre le trop-plein, formée par le côté inférieur du piston (17) et par le corps de clapet (11) procurant une protection contre le trop-plein. 35
- de clapet (11) procurant une protection contre le trop-plein. 40
- 45
- 50
- 55

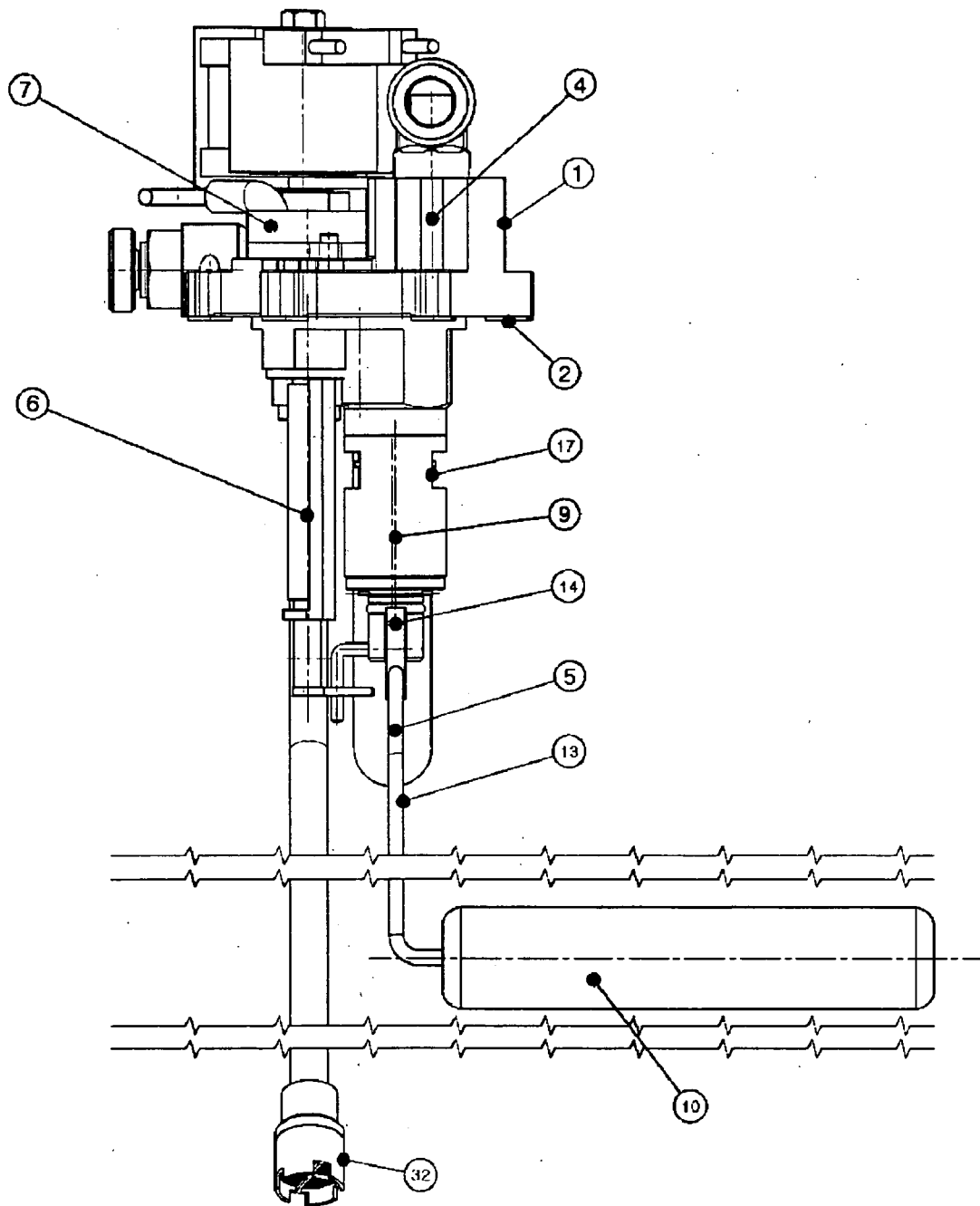


Fig. 1

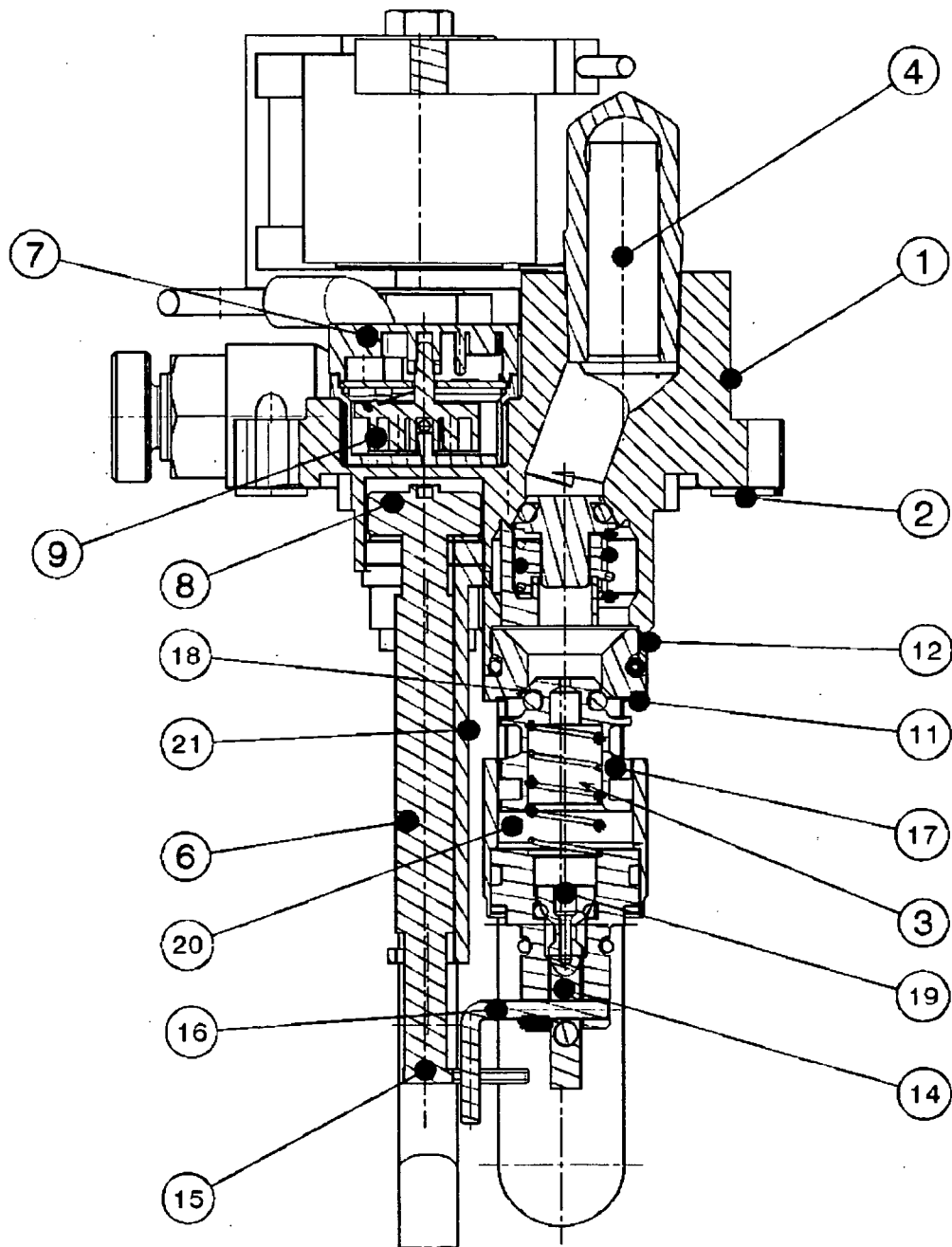


Fig. 2

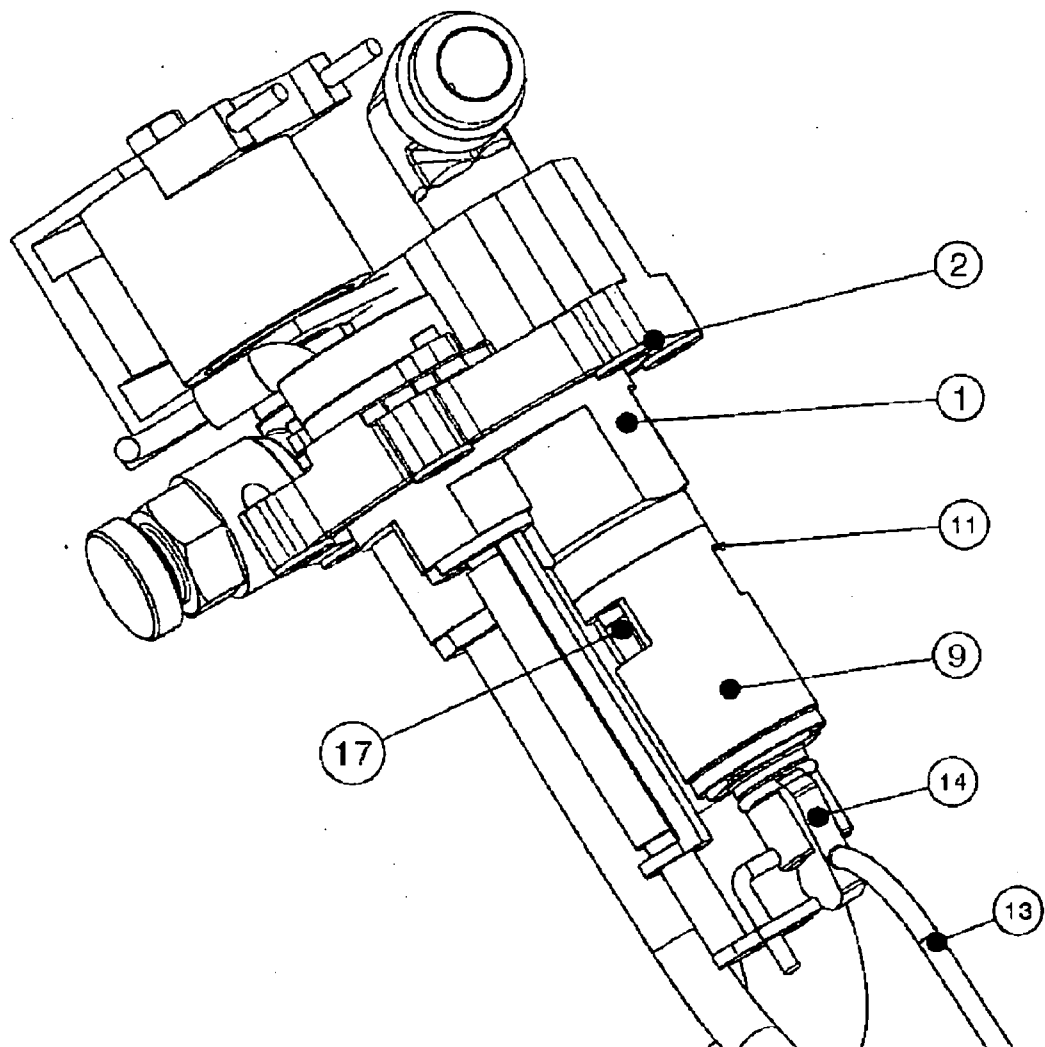


Fig. 3

REFERENCES CITED IN THE DESCRIPTION

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