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(54) **WRENCH SOCKET FOR FIRE HYDRANT VALVE**

(57) A wrench socket (1) is disclosed for a hydrant valve (B) that is provided with a body (co) having symmetrically opposed sides (la), a stem (st) and a handwheel (vo). The socket (1) comprises a front part (2) having a curved wall (20) provided with an opening (21) and inner surface (23), a rear part (4) for its coupling with a wrench and an intermediate part (3) joining the front part (2) to the rear part (4). The intermediate part (3) has an

inner cavity (30, 31) designed to receive the stem (st) without the handwheel (vo) when the socket (1) is inserted on the valve (B), and the inner surface (23) is a continuous surface tangent to the symmetrically opposed sides (la) of the body (co) so that the socket (1) inserted on the valve (B) exerts a torque on the body (co) by means of the wrench for screwing or unscrewing the valve (B).

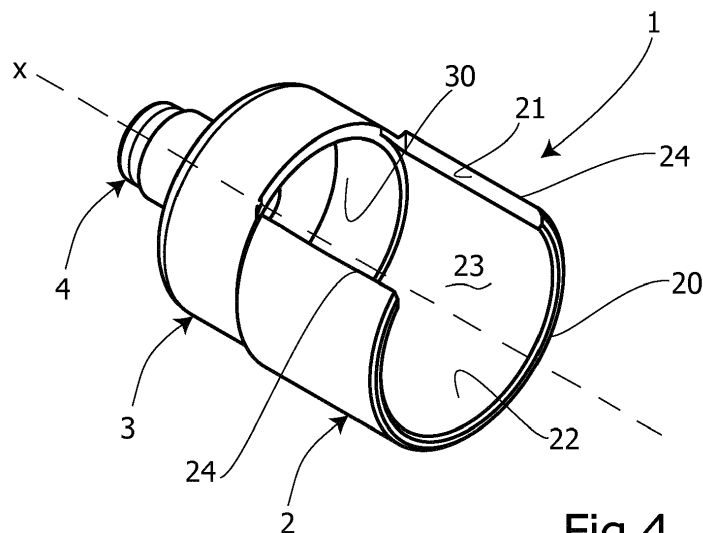


Fig.4

Description

[0001] The invention relates to a wrench socket for fire hydrant valve. In particular, the invention relates to a wrench socket for wall fire hydrant valve that is normally inside a fire box. As shown in Figure 1, the fire hydrant box is generally made of a box C, which can be fixed on the wall or supported by a pedestal, with frangible front safety glass, a hydrant valve B, a lance D and a fire hose E. The hydrant valve B has a body *co*, a stem *st* and a handwheel *vo*. The body *co* of the hydrant valve B has symmetrically opposed sides *la* and a threaded end *fi* for a connection to the water supply A while the hydrant valve B is installed inside the box C. The hydrant valves B commonly used in the fire boxes are the fire hydrant valve UNI 70 and the fire hydrant valve UNI 45, represented respectively in Figures 2 and 3. UNI is the acronym of Ente nazionale italiano di unificazione (Italian National Unification Body). The fire hydrant valve will be called below also hydrant valve, or simply valve.

[0002] Given the large size of the valves, installers and maintenance technicians often experience difficulty in mounting and demounting the valve located inside the box C, as well as face risks of injury in the use of normal tools such as pliers and wrenches.

[0003] In automotive field there are already wrench sockets for assembly and disassembly of parts. E.g., US 5,035,162 describes an inner tie rod tool of a rack and pinion steering mechanism. According to an embodiment of US 5,035,162, the inner tie rod tool includes a shaft having first and second ends, and a longitudinal bore extending within the shaft. The first end of the shaft provides an attachment for a socket wrench. The second end of the shaft is connected to a fitting provided with a bored stem for receiving the inner tie rod of the steering mechanism. The fitting includes an outer wall which defines two chambers, both having a different shape of a regular hexagon, which define a first socket and a second socket. A slot extends through the outer wall of the sockets to the chambers and terminates with jaws connected by a circular wall to receive the inner tie rod. However, the jaws do not serve to exert a torque to the inner tie rod, as the torque is exerted only to the nut by the hexagonally shaped chambers of the fitting. For various reasons, the tool according to US 5,035,162 cannot be used for mounting and demounting hydrant valves, such as those shown in Figures 2 and 3. The torque to the valve must be applied to the valve body and not to a nut or other polyhedral surface connection element, as instead allowed by an inner tie rod in a pinion and rack steering mechanism. Furthermore, the dimensions of the pipe to be connected to the socket are such that it is impossible to use them in a fire box.

[0004] US 2004/0035259 describes a DIN connector wrench. The wrench socket includes a first socket portion, having a cylindrical shape with a bore, adapted to receive a driving member of a torquing tool, and a second socket portion having inner faces which are adapted to

engage the polyhedral periphery of the DIN connector. The inner faces are angularly oriented to each other according to a polyhedral shape and disposed along planes substantially perpendicular to the cylindrical first socket portion. The inner faces bound an open gripping region such that the inner faces are slidably engagable with the DIN connector along a plane perpendicular to the inner faces. The wrench socket further includes a mid portion connecting the first socket portion to the second socket portion and receiving non rotatable parts.

It is understood that the socket according to US 2004/0035259 could not allow a fire valve to be mounted and demounted, due to the fact that there is no polyhedral part on the valve that can be engaged by the second socket portion. Furthermore, the valve stem would prevent the socket to be applied in order to exert a torque on the valve.

[0005] EP 1 447 176 A1 describes a screwing and unscrewing device of a fastener for fixing a tubular element on a support. This device has a connecting head for the connection with a torsion member, a clamping sleeve receiving the fastener and an intermediate portion consisting of a vertical stem. The connecting head and the clamping sleeve are coaxial, and the intermediate portion is axially offset with respect to them. The screwing and unscrewing device of EP 1 447 176 cannot be used in mounting and demounting the fire valve because the latter is devoid of a nut or other part having a polyhedral surface.

[0006] The aforementioned documents concern tools for use in the automotive field. There are, however, patent documents concerning tools intended for use in plumbing work in the house.

[0007] US 1,434,401 relates to a wrench which may be readily engaged with a nut in a pipe line or on a fixture, where the nut, due to the confined space in which it is located, cannot be readily engaged by an ordinary wrench. The wrench has a head with a socket that has an opening for embracing the pipe and then moving along thereto so that the wrench may be engaged with the nut to be turned. An operating handle is provided in the end opposite to the head and is connected with the latter. US 1,434,401 serves to demount a faucet from a sink and addresses a problem similar to that of the present invention because it has been designed to work in a confined space. However, the tool according to US 1,434,401 is applied to a nut that fastens the faucet to the basin and would not be usable for a fire valve devoid of a nut or other polyhedral surface.

[0008] US 6,701,807 discloses a socket device with an off-center slot for loosening and tightening connectors positioned in confined locations. The slot allows a pipe to pass through the socket that has a nut retaining region. This nut retaining region is positioned adjacent to a first face of the socket and has a centerline that is offset from the centerline of the socket body. A socket driver port is located in the second face of the socket opposite to the first face and has a centerline that is offset from the cen-

terline of the socket body. This arrangement allows a socket rotation within a confined area. Also for the socket device according to US 6,701,807, the fact is that it is designed for mounting and demounting a nut, and this nut is absent in the fire valve concerned by the invention.

[0009] US 2007/0012143 discloses a socket for a wrench adapted to remove or install a 90-degree elbow on a dishwasher for attaching the waterline to the water conduit on the dishwasher. The socket comprises a generally cylindrical main body, a drive end, and a central cavity defined by an interior surface. The drive end comprises a female driver configured to cooperate with a male drive projection on a socket wrench. The main body of the socket comprises a notch or opening for receiving the neck and waterline end of the elbow. The interior surface of the central cavity is polyhedral and corresponds to the polyhedral shape of the elbow. This socket could not be used to mount and demount the fire valve because it does not allow the valve stem to be received in any way. In addition, the socket has a polyhedral shape that would not grip the smooth surface of the fire valve.

[0010] The main object of the present invention is to provide a socket-type tool like those described above, but which can be used in mounting and demounting a fire valve.

In particular, an object of the invention is to provide a tool which minimizes the risk of damage and injuries for the installer in mounting and demounting a fire valve.

Specifically, an object of the present invention is to provide a tool for safely carrying out mounting and demounting operations of UNI 70 and UNI 45 valves.

Furthermore, an object of the invention is to allow a reduction in the mounting and demounting times of the UNI 70 and UNI 45 fire valves. Even more specifically, an object of the invention is to provide a socket which can be operated with a conventional wrench.

[0011] Therefore, as defined in claim 1, a wrench socket is provided for a hydrant valve provided with a body, a threaded connecting portion for joining the body to a hose of a hydrant, a stem and a handwheel, the body of the hydrant valve having symmetrically opposed sides and a threaded end for connection to a water supply, the socket comprising:

- a front part having a curved wall provided with an opening, the inner surface of the curved wall delimiting a chamber,
- a rear part shaped for its coupling with a wrench along a common axis; and
- an intermediate part joining the front part to the rear part,

wherein

the intermediate part of the socket has an inner cavity designed to receive the stem of the valve without the handwheel when the socket is inserted on the valve, with the socket opening permitting the threaded connecting portion to pass, and

the inner surface of the curved wall is a continuous surface tangent to the symmetrically opposed sides of the body of the valve so that the socket inserted on the valve exerts a torque on the body of the valve by means of the wrench coupled to the rear part of the socket for screwing or unscrewing the valve.

[0012] The socket according to the invention can be made by either combining several pieces or mechanical working that uses chip removal from one workpiece. All adapted materials such as metallic or plastic materials can be used.

[0013] Embodiments of the invention will be described referring to the enclosed drawing in which:

Figure 1 is a front view of a fire box according to the prior art;

Figure 2 is a longitudinal cross-section of a UNI 70 type fire valve;

Figure 3 is a longitudinal cross-section of a UNI 45 type fire valve;

Figure 4 is a top perspective view of a first embodiment of a socket according to the invention;

Figures 5 to 7 are a top plan view, a bottom plan view and a side view, respectively, of the first embodiment of the socket according to the present invention;

Figure 8 is an end view from the front side of the first embodiment of the socket according to the present invention;

Figure 9 is a central longitudinal cross-section taken along line A-A in Figure 8;

Figure 10 is a schematic side view of the first embodiment of the socket represented with thickened lines, as inserted from the top in a UNI 70 type fire valve represented with dashed lines in its part inside the socket;

Figure 11 is a top perspective view of a second embodiment of a socket according to the invention;

Figures 12 to 14 are a top plan view, a bottom plan view and a side view, respectively, of the second embodiment of the socket according to the present invention;

Figure 15 is an end view from the front side of the second embodiment of the socket according to the present invention;

Figure 16 is a central longitudinal cross-section taken along line B-B in Figure 15; and

Figure 17 is a schematic side view of the second embodiment of the socket represented with thickened lines, as inserted from the top in a UNI 45 type fire valve represented with dashed lines in its part inside the socket.

[0014] Reference is made initially to Figure 4 which is a top perspective view of a first embodiment of a wrench socket for hydrant valve. In particular, the socket 1 of the first embodiment of the invention is intended for use with the UNI 70 type hydrant valve B shown in a central longitudinal cross-section in Figure 2. The UNI 70 type hy-

drant valve B is provided with a body *co*, a stem *st* and a handwheel *vo*.

The body *co* of the UNI 70 type hydrant valve B has symmetrically opposed sides *la* and a threaded end *fi* for the connection to the water supply A while the valve B is installed inside the box C, as shown in Figure 1. On the opposite side to the connection to the water supply A, the valve B has a threaded connecting portion *ra* for joining the valve B to the hose E of the hydrant D.

The socket 1 comprises a front part 2, an intermediate part 3 and a rear part 4. The front part 2 has a curved wall 20 provided with an opening 21. The inner surface of the curved wall 20, which defines a chamber 22, is indicated as 23. The opening 21 of the curved wall 20 is delimited by edges 24, 24, which correspond substantially to the generatrices of the curved wall 20. The opening 21 of the front part 2 extends, therefore, along whole length of the front part 2. The opening 21 allows the socket 1 to be inserted on the valve B.

As shown, the curved wall 20 has a cylindrical shape, but it should be understood that other curved forms of solid of rotation are possible. In fact, as will be seen later on, it is critical that the inner surface 23 of the curved wall 20 is a continuous surface tangent to the symmetrically opposed sides *la* of the body *co* of the UNI 70 valve B so that the socket 1 inserted, coaxially to the stem *st* on the valve itself exerts a torsion on the body *co* of the valve by means of a wrench coupled to the rear part of the socket 1 for screwing or unscrewing the valve. The edges 24, 24 of the front part 2 of the socket 1 are located laterally to the threaded connecting portion *ra* of the UNI 70 valve B.

The socket 1 is also shown in Figures 5 to 9 which are a top plan view, a bottom plan view and a side view, an end view from the front side and a central longitudinal cross-section taken along line A-A, respectively, in Figure 8.

The rear part 4 is configured for the coupling of the socket 1 with a wrench not shown along a common axis *x* (Figures 8, 9). The intermediate part 3 joins the front part 2 to the rear part 4.

According to the present invention, the inner surface 23 of the curved wall 20 is a continuous surface tangent to the symmetrically opposed sides *la* of the body *co* of the UNI 70 valve B so that the socket 1 can be inserted from above on the UNI 70 valve B, represented in Figure 10, which is a schematic side view of the socket 1 shown with thickened lines.

The insertion of the socket on the valve coaxially with the valve stem *st* can take place only after removal of the handwheel *vo* from the stem *st*. The chamber 22 of the front part 2 is cylindrical and has a central axis *x* coinciding with the common axis *x*, mentioned above, of the rear part of the socket and of the wrench not shown in the drawings.

The intermediate part 3 of the socket 1 has an internal cavity 30 and a hole 31 designed to receive the stem *st* of the UNI 70 valve B without the handwheel *vo*.

Then, the intermediate part 3 of the socket 1, as shown in particular in Figure 9, is shaped like a cup with an inner cavity 30, which coaxially continues the chamber 22 of the front part 2 of the socket 1, and narrows into the coaxial hole 31.

The rear part 4 of the socket 1 has a female coupling portion for a corresponding male organ of the wrench not shown.

As is known, the female coupling portion of the rear part 4 of the socket 1 has a polyhedral internal surface 40, for example as shown, with a square cross-section.

[0015] According to the invention, the female coupling portion is communicating with said coaxial hole 31 of the intermediate part 3 of the socket 1.

For mounting and demounting the UNI 70 valve B from the fire box C, the socket 1 is inserted on the body *co* of the valve B after the removal of the handwheel *vo*. Once inserted, the end of the stem *st* happens to be in the intermediate part 3 of the socket 1, while its front part 2 embraces the sides *la* of the body *co* of the valve B with the internal curved surface 22 tangent to the sides *la* thereof.

To facilitate mounting and demounting operations, the wrench can be of the swivel type if the dimensions of the box do not allow the introduction of a rigid wrench.

[0016] Reference is made now to Figure 11 which is a top perspective view of a second embodiment of a wrench socket 10 for hydrant valve. In particular, the socket 10 of the second embodiment of the invention is intended for use with the UNI 45 type hydrant valve B shown in a central longitudinal cross-section in Figure 3. The UNI 45 type hydrant valve B is provided with a body *co*, a stem *st* and a handwheel *vo*.

The body *co* of the UNI 45 type hydrant valve B has symmetrically opposed sides *la* and a threaded end *fi* for the connection to the water supply A while the valve B is installed inside the box C, as shown in Figure 1.

The socket 10 comprises a front part 5, an intermediate part 6 and a rear part 7. The front part 5 has a curved wall 50 provided with an opening 51. The inner surface of the curved wall 50, which defines a chamber 52, is indicated as 53. The opening 51 of the curved wall 50 is delimited by edges 54, 54, which correspond substantially to the generatrices of the curved wall 50. The opening 51 of the front part 5 extends, therefore, along whole length of the front part 5. The opening 51 allows the socket 10 to be inserted on the valve B.

As already said, the curved wall 50 has a cylindrical shape, but other curved forms of solid of rotation are possible. In fact, it is critical that the inner surface 53 of the curved wall 50 is a continuous surface tangent to the symmetrically opposed sides *la* of the body *co* of the UNI 45 valve B so that the socket 10 inserted, coaxially to the stem *st* on the valve itself, exerts a torsion on the body *co* of the valve by means of a wrench coupled to the rear part of the socket 10 for screwing or unscrewing the valve. The edges 54, 54 of the front part 5 of the socket 10 are located laterally to the threaded connecting portion *ra* of

the UNI 45 valve B. The socket 10 is also shown in Figures 12 to 16 which are a top plan view, a bottom plan view and a side view, an end view from the front side and a central longitudinal cross-section taken along line B-B, respectively, in Figure 15.

The rear part 7 is configured for the coupling of the socket 10 with a wrench not shown along a common axis x (Figures 15, 16). The intermediate part 6 joins the front part 5 to the rear part 7.

According to the present invention, the inner surface 53 of the curved wall 50 is a continuous surface tangent to the symmetrically opposed sides *la* of the body *co* of the UNI 45 valve B so that the socket 10 can be inserted from above on the UNI 45 valve B, represented in Figure 17, which is a schematic side view of the socket 10 shown with thickened lines.

The insertion of the socket on the valve coaxially with the valve stem *st* can take place only after removal of the handwheel *vo* from the stem *st*. The chamber 52 of the front part 5 is cylindrical and has a central axis x coinciding with the common axis x, mentioned above, of the rear part of the socket and of the wrench not shown in the drawings.

The intermediate part 6 of the socket 10 has a hole 61 designed to receive the stem *st* of the UNI 45 valve B without the handwheel *vo*.

Then, the intermediate part 6 of the socket 10, as shown in particular in Figure 16, is shaped like a glass with an inner cavity 60, which coaxially continues the chamber 52 of the front part 5 of the socket 10, and is provided with the above cited coaxial hole 61.

The rear part 7 of the socket 10 has a female coupling portion for a corresponding male organ of the wrench not shown.

As is known, the female coupling portion of the rear part 7 of the socket 10 has a polyhedral internal surface 70, for example as shown, with a square cross-section.

According to the invention, the female coupling portion is communicating with said coaxial hole 61 of the intermediate part 6 of the socket 10.

For mounting and demounting the UNI 45 valve B from the fire box C, the socket 10 is inserted on the body *co* of the valve B after the removal of the handwheel *vo*. Once inserted, the end of the stem *st* happens to be in the intermediate part 6 of the socket 10, while its front part 5 embraces the sides *la* of the body *co* of the valve B with the internal curved surface 52 tangent to the sides *la* thereof.

The wrench, for example a ratchet wrench, is mounted in the female coupling end of the socket. When the valve is fully tightened, once correctly positioned, the socket is removed and the handwheel is mounted again and its locking nut is tightened.

It is understood that a unique inventive concept is at the base of both the embodiments of socket described above, which differ only in their shape to be adapted to the different sizes of the UNI 70 and UNI 45 hydrant valves.

The advantages of the invention are several, first of all the possibility of having a specific tool for mounting and demounting every hydrant valve approved by the standards.

It should be evident that the same inventive concept can be applied to other valves that are difficult to mount and demount, especially if they are large, also used in other industrial fields.

Claims

1. Wrench socket (1; 10) for hydrant valve (B) provided with a body (*co*), a threaded connecting portion (*ra*) for joining the body (*co*) to a hose (E) of a hydrant (D), a stem (*st*) and a handwheel (*vo*), the body (*co*) of the hydrant valve (B) having symmetrically opposed sides (*la*) and a threaded end (*ff*) for connection to a water supply (A), the socket (1; 10) comprising:

- a front part (2; 5) having a curved wall (20; 50) provided with an opening (21; 51), the inner surface (23; 53) of the curved wall (20; 50) delimiting a chamber (22; 52),
- a rear part (4; 7) shaped for its coupling with a wrench along a common axis (x); and
- an intermediate part (3; 6) joining the front part (2; 5) to the rear part (4; 7),

characterized in that

the intermediate part (3; 6) of the socket (1; 10) has an inner cavity (30, 31; 61) designed to receive the stem (*st*) of the valve (B) without the handwheel (*vo*) when the socket (1; 10) is inserted on the valve (B), with the socket opening (21; 51) permitting the threaded connecting portion (*ra*) to pass, and the inner surface (23; 53) of the curved wall (20; 50) is a continuous surface tangent to the symmetrically opposed sides (*la*) of the body (*co*) of the valve (B) so that the socket (1; 10) inserted on the valve (B) exerts a torque on the body (*co*) of the valve (B) by means of the wrench coupled to the rear part (4; 7) of the socket (1; 10) for screwing or unscrewing the valve (B).

2. Socket (1; 10) according to claim 1, wherein the chamber (22; 52) of the front part (2; 5) is cylindrical and has a central axis (x) coinciding with the axis (x) of the part rear (4; 7) of the socket (1; 10).
3. Socket (1; 10) according to claim 1, wherein the opening (21; 51) of the front part (2; 5) extends along the whole length of the front part (2; 5).
4. Socket (1) according to claim 1, wherein the intermediate part (3; 6) of the socket (1) is shaped like a cup which coaxially continues the chamber (22) of

the front part (2) of the socket (1) and becomes a coaxial hole (31).

5. Socket (10) according to claim 1, wherein the intermediate part (6) of the socket (10) is shaped like a plate (60) which forms the base of the chamber (52) of the front part (5) and is provided of a coaxial hole (61). 5
6. Socket (1; 10) according to any one of claims 4 and 5, wherein the rear part (4; 7) of the socket (1; 10) has a female coupling portion for a corresponding male member of the wrench. 10
7. Socket (1; 10) according to claim 6, wherein the female coupling portion of the rear part of the socket has a polyhedral internal surface (40; 70) and communicates with said coaxial hole (31; 61). 15
8. Socket (1; 10) according to claim 7, wherein said polyhedral inner surface (40; 70) has a square section. 20

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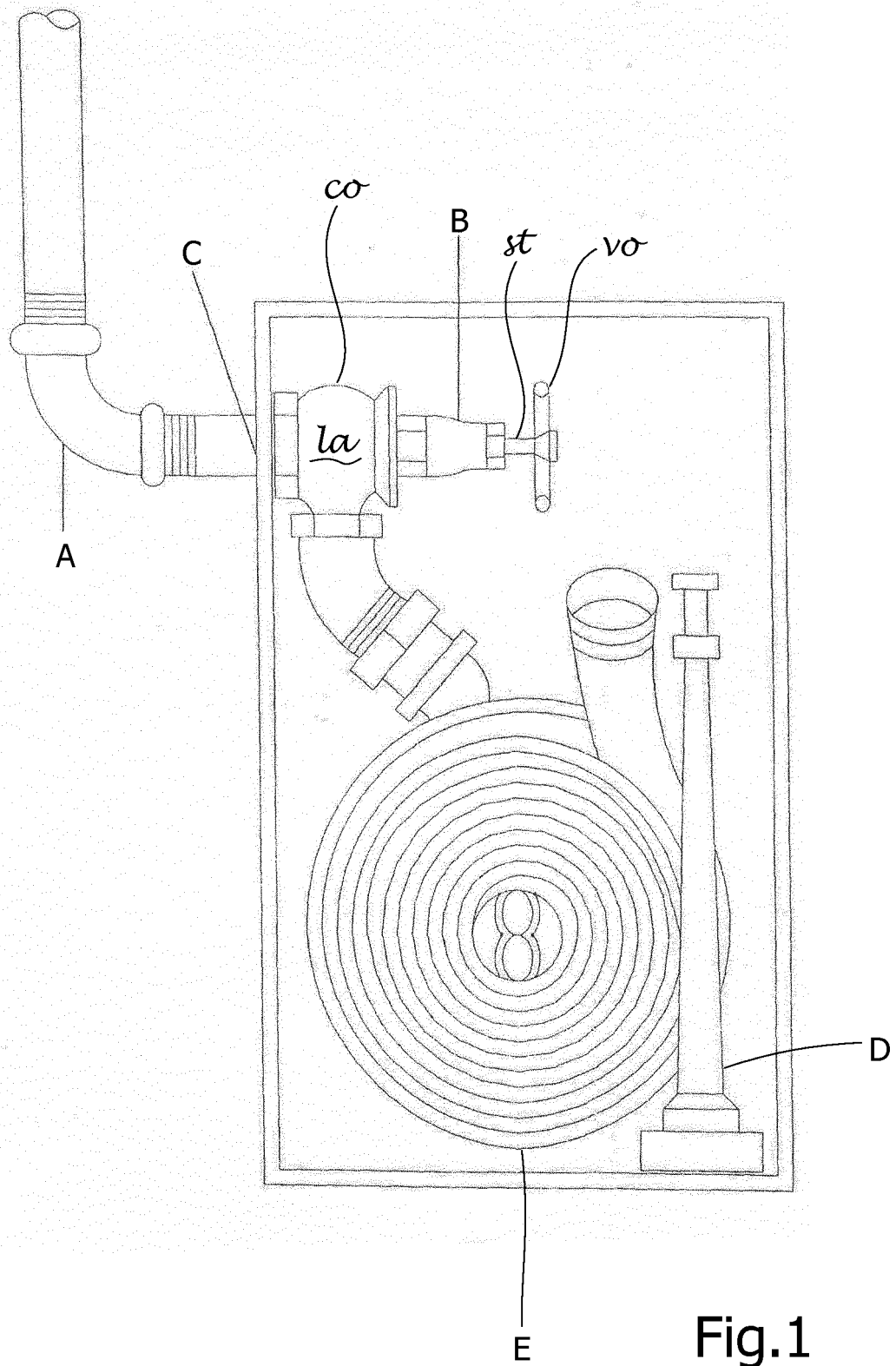
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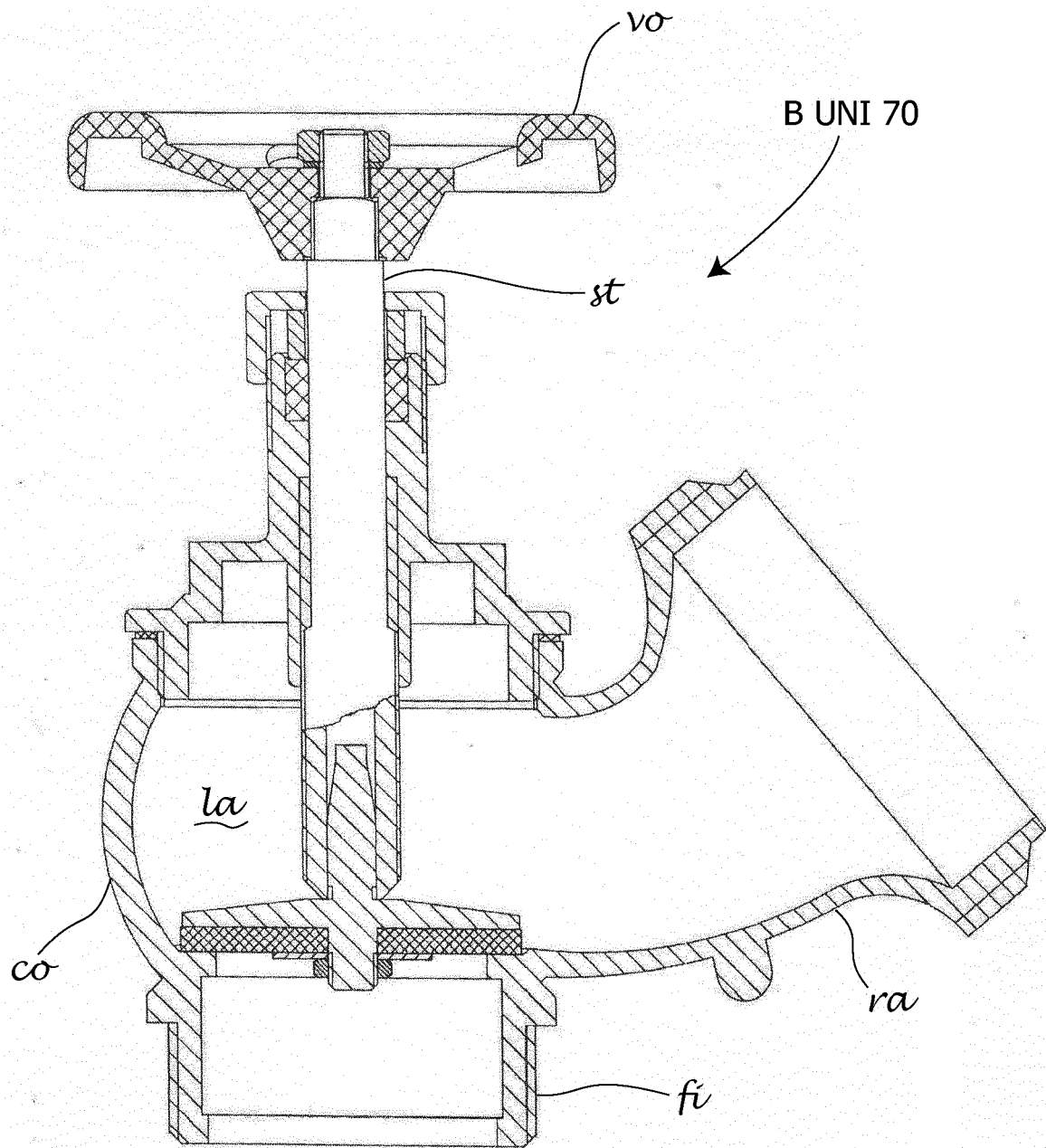


Fig.2

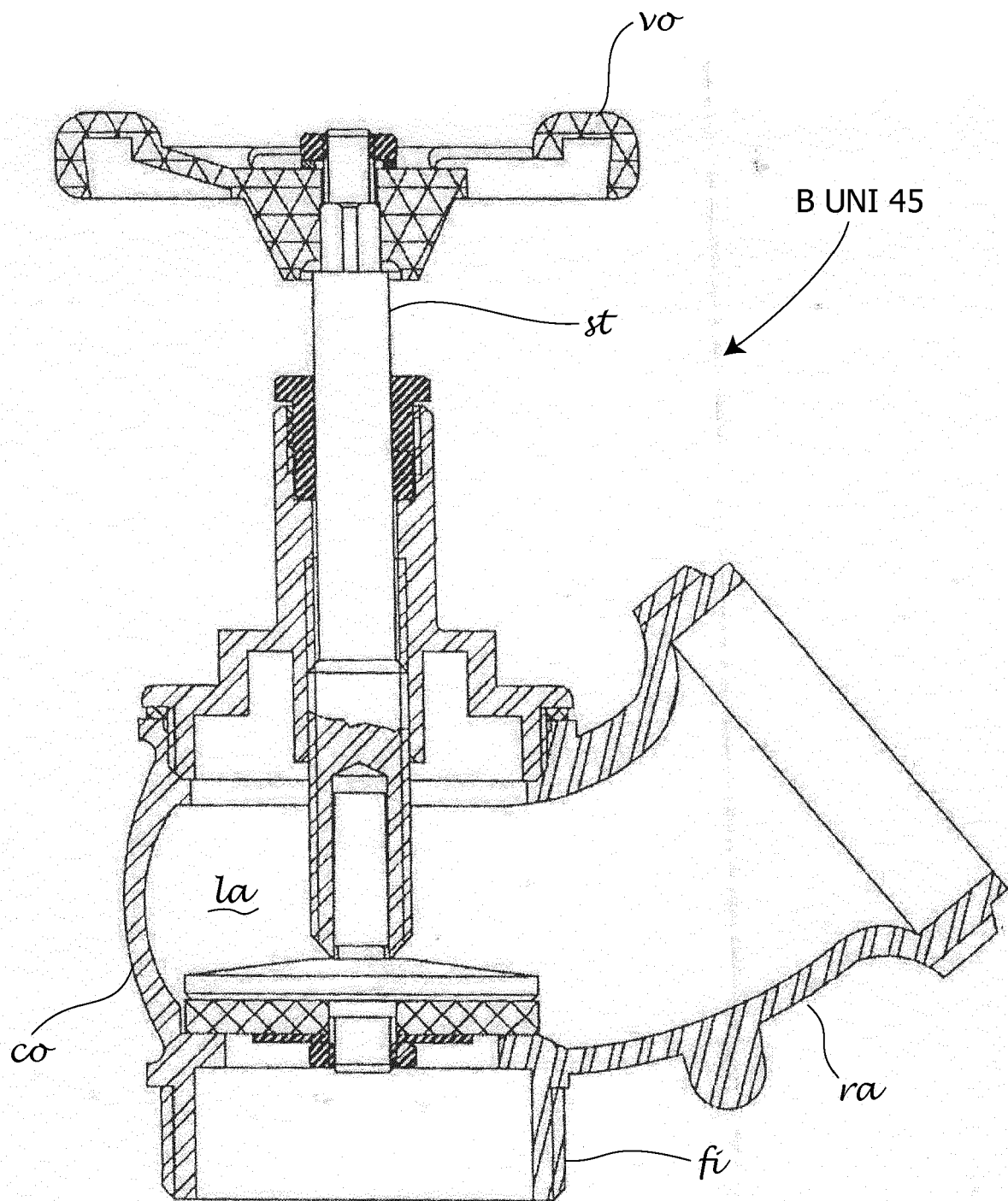
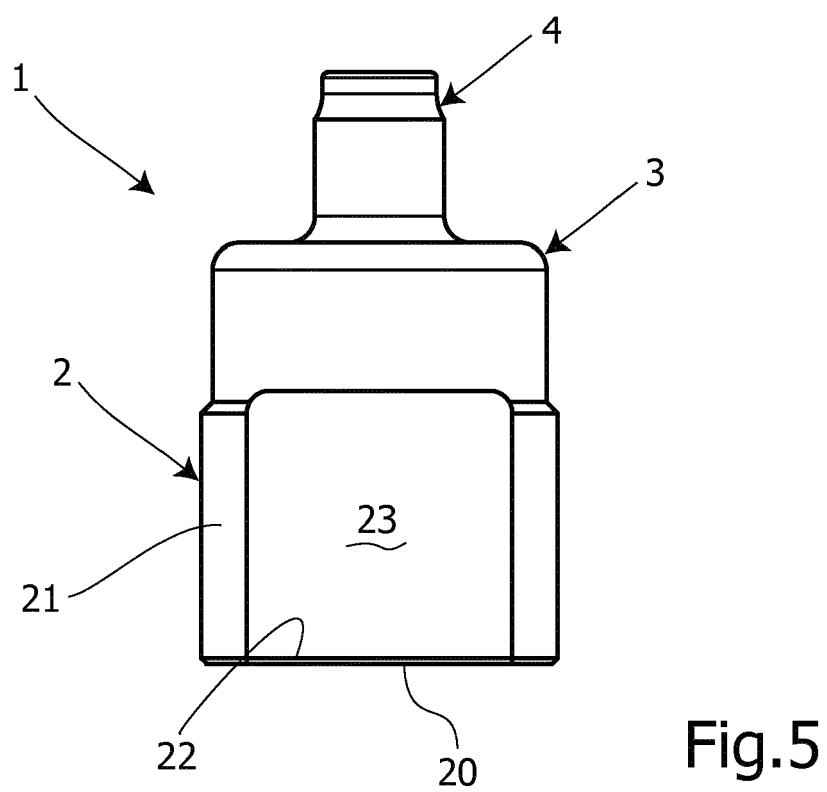
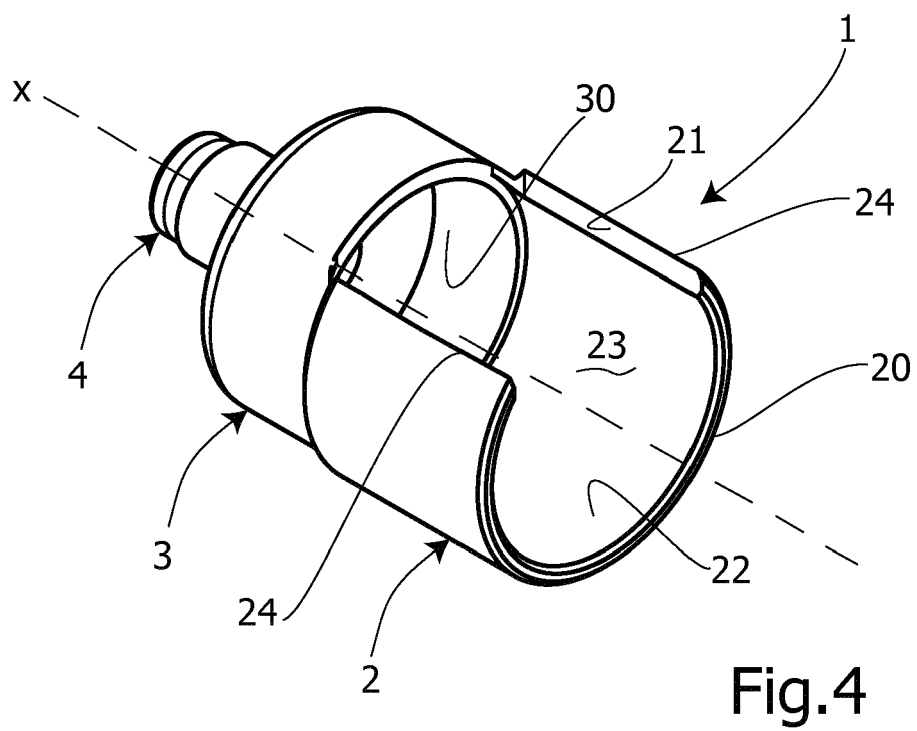


Fig.3



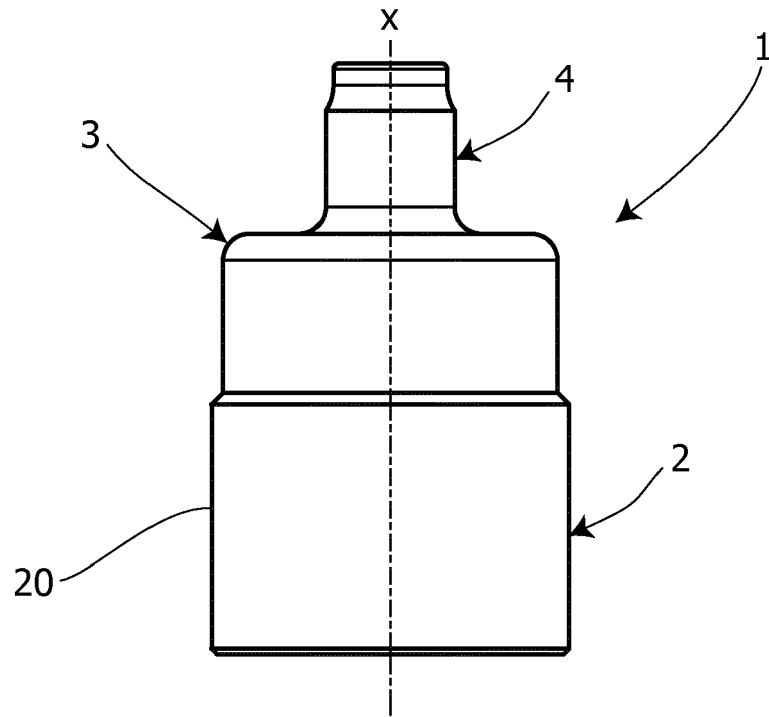


Fig.6

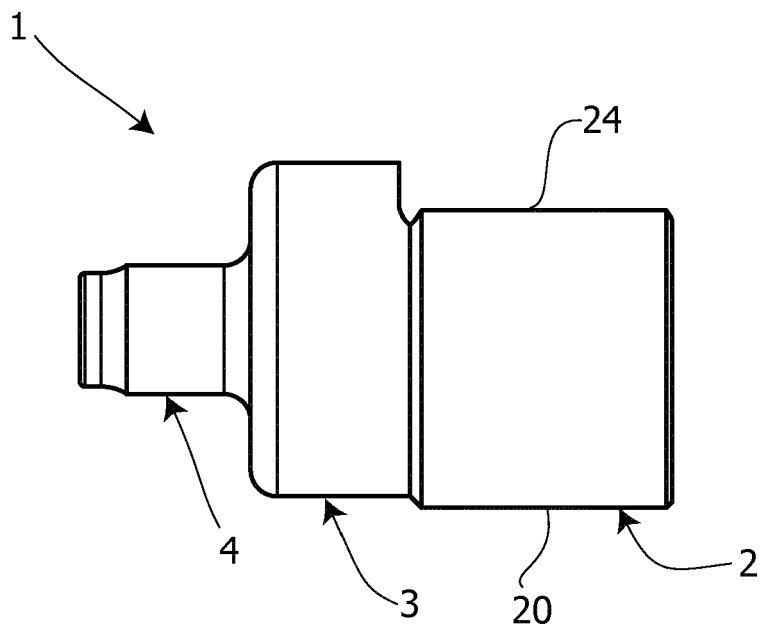


Fig.7

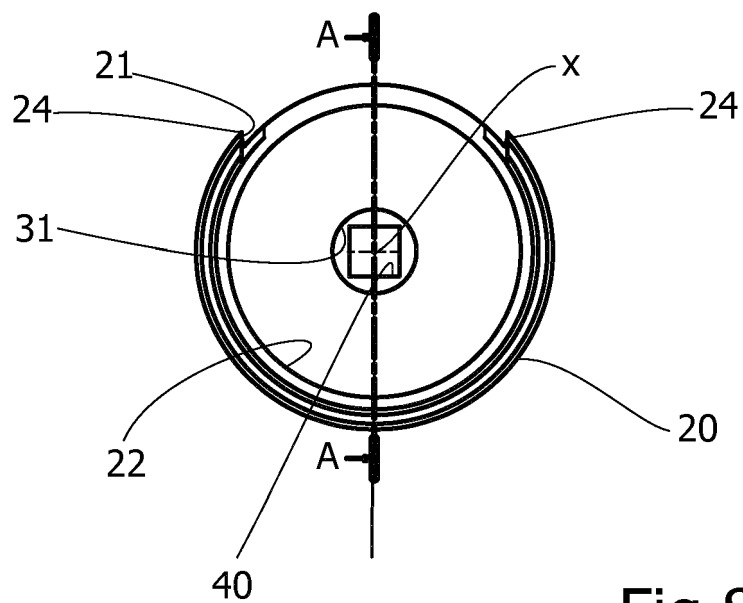


Fig.8

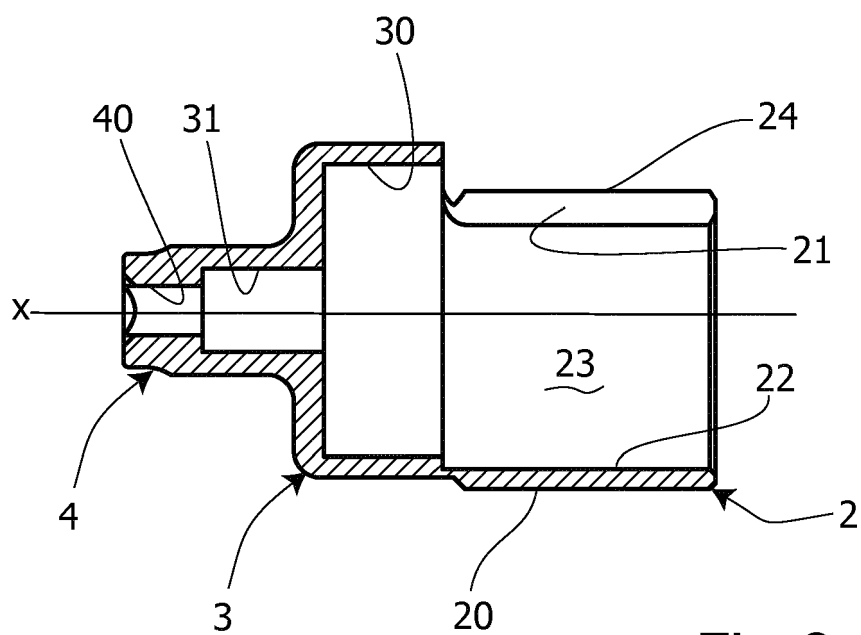


Fig.9

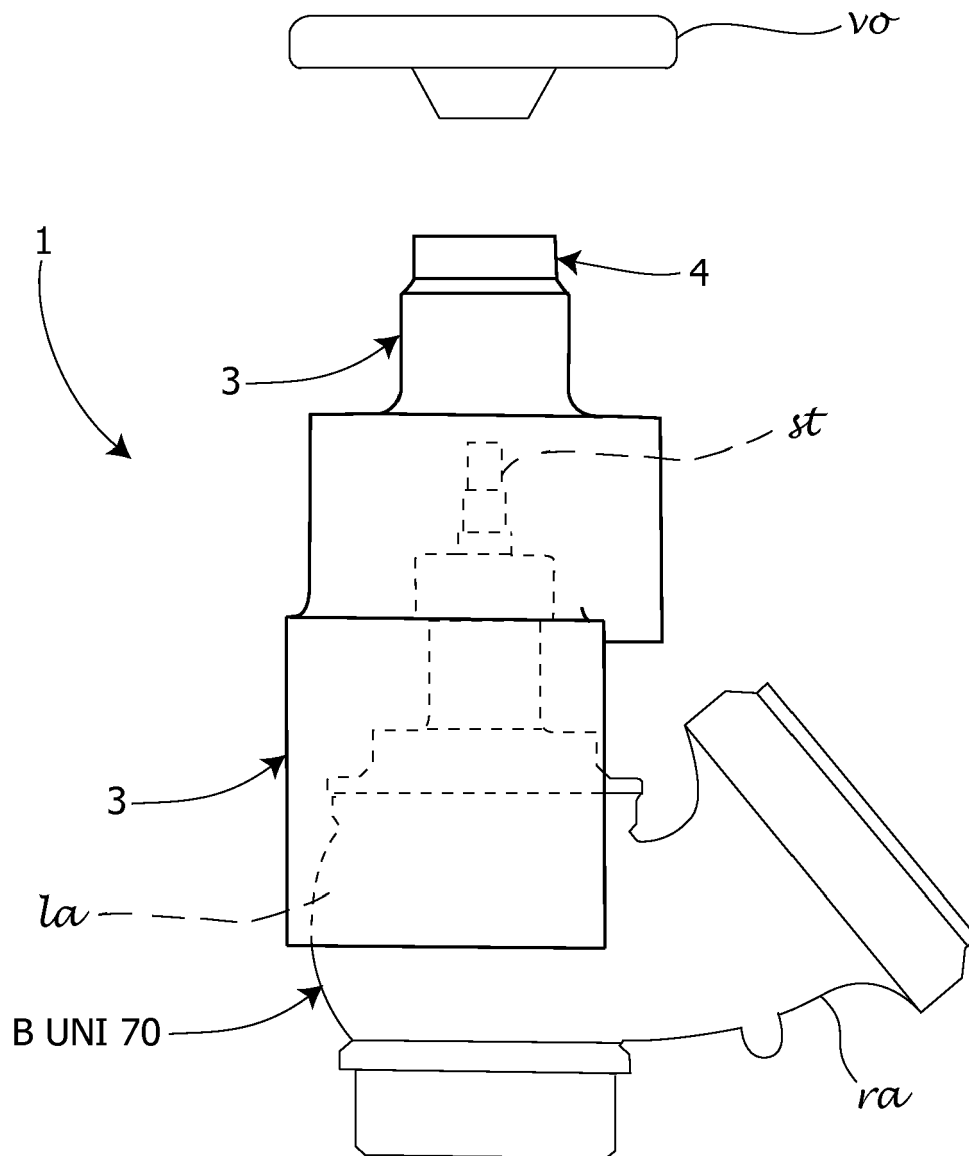


Fig.10

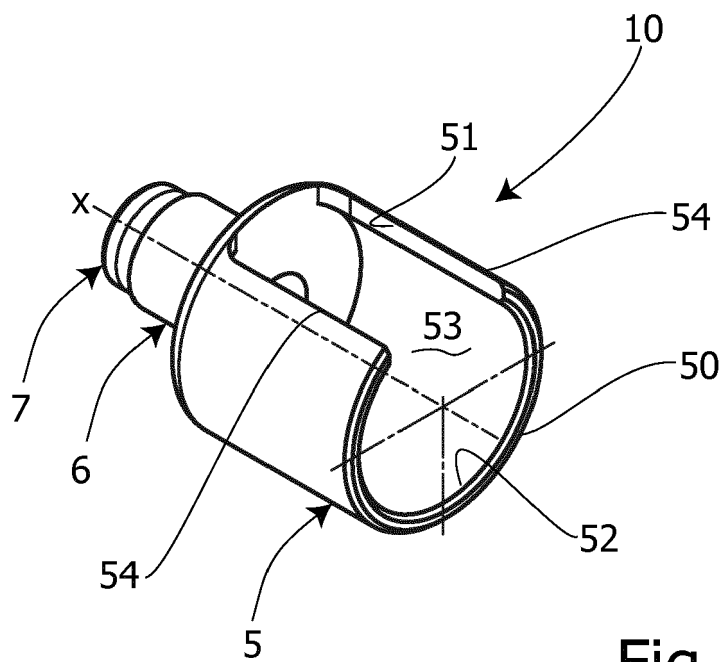


Fig.11

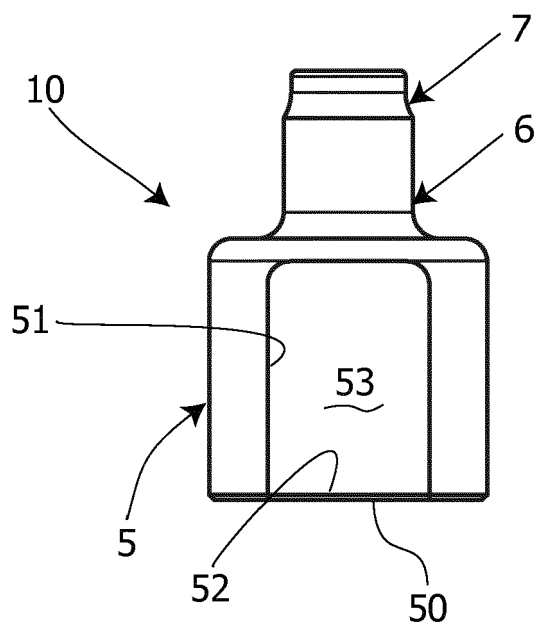


Fig.12

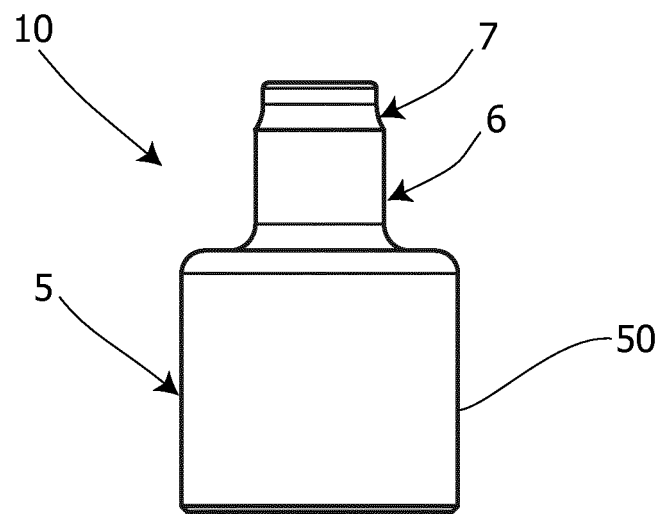


Fig.13

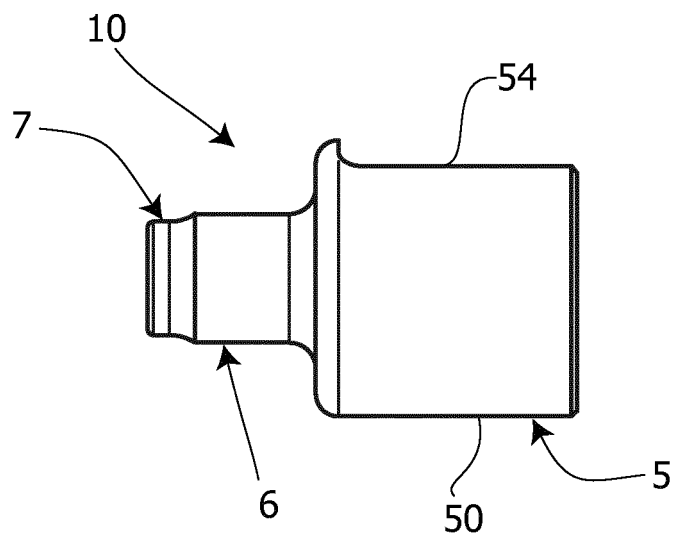


Fig.14

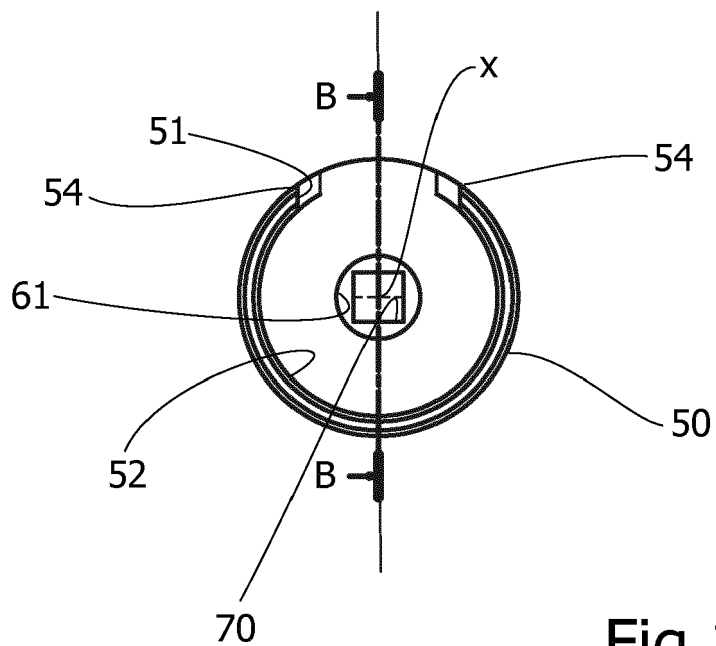


Fig.15

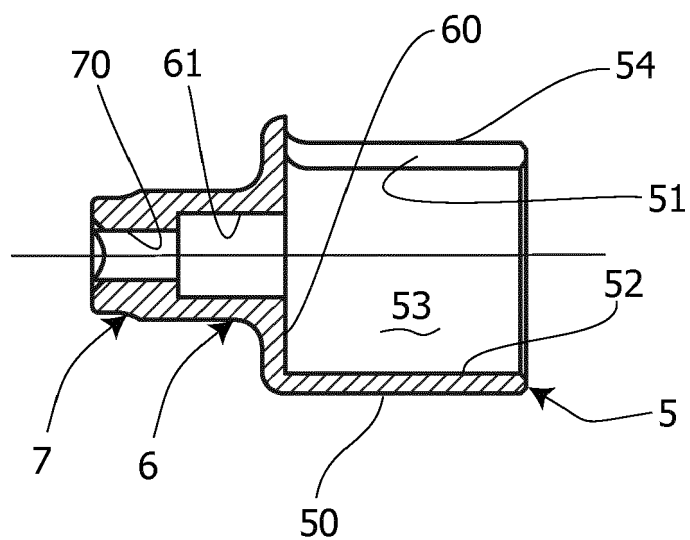


Fig.16

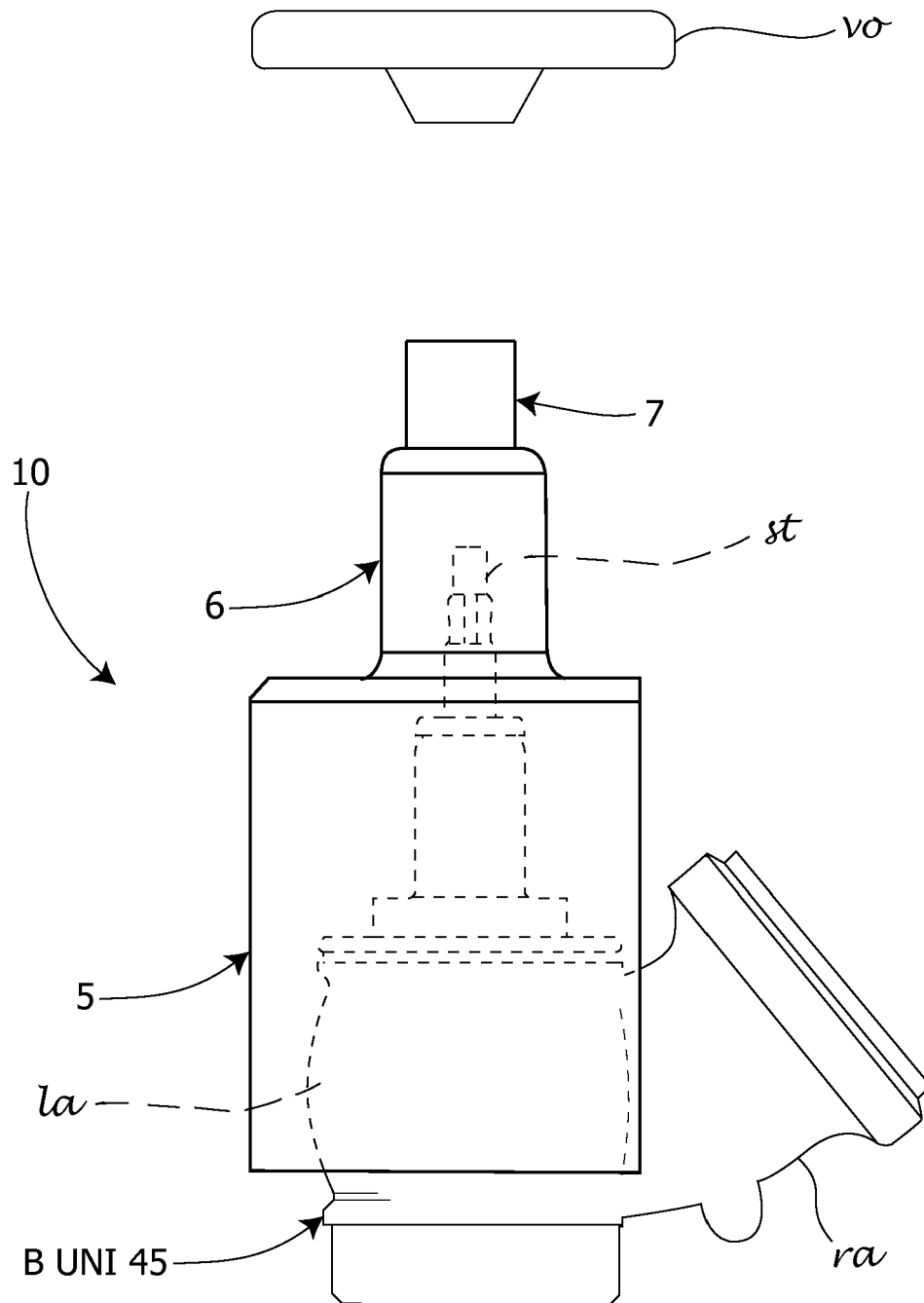


Fig.17



EUROPEAN SEARCH REPORT

Application Number
EP 18 16 9664

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 5 035 162 A (DOUGHERTY DAVID P [US]) 30 July 1991 (1991-07-30)	1-3,5-8	INV. B25B13/06 B25B27/24
Y	* column 3, line 24 - column 3, line 58 * * column 5, line 33 - column 5, line 62 * * figures 6,7-12 *	4	
Y	JP H05 74768 U (-) 12 October 1993 (1993-10-12) * paragraphs [0008] - [0017]; figures 1,3,5,6 *	4	
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