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<p>(54) Title: A SHUT-OFF VALVE</p>		
<p>(57) Abstract</p>		
<p>A shut-off valve (1, 101) comprising a valve housing (2, 102) provided with a flow passageway (3, 103) and a shut-off member (22, 122) arranged in the housing, said member being displaceable between an open position and a closed position of the valve by means of an actuator device (15, 115). The actuator device comprises a nut member (20, 120) provided with an internal thread (21, 121) having a first thread pitch, and an outer stem member (17, 117) provided with an external thread (19, 119) engaging the internal thread (21, 121) of the nut member, and with an internal thread (18, 118) (21, 121) with a second pitch differing from the first pitch and engaging a corresponding external thread (12, 112) on an inner stem member (6, 106). The threads coacting during the major part of the closing movement of the shut-off member (22, 122) are provided with larger pitch than those coacting during the final part of the closing movement. First coacting stop means (28, 29; 128, 129) are provided between the two members interengaged by means of the threads with the largest pitch, said stop means being adapted to engage each other at the end of the closing movement to ensure a joint turning of the two members in relation to the third member during the final part of the closing movement.</p>		

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Title: A Shut-off ValveTechnical Field

The invention relates to a shut-off valve comprising a valve housing provided with a flow passageway and a shut-off member arranged in said housing and displaceable
5 by means of an actuator device of the stem/nut type between a position, in which the flow passageway is open and a position, in which it is closed, said actuator device comprising a nut member provided with an internal thread with a first pitch, and an outer stem member provided with an external thread engaging the internal thread of the nut member, and with an internal thread having a second pitch differ-
10 ing from the first pitch and engaging a corresponding external thread on an inner stem member, and wherein the threads coacting during the major part of the closing movement of the valve member are provided with larger pitch than those coacting during the final part of the closing movement.

Technical Background

15 A screw/nut device is known from FR 871.203, in which one and the same stem on a first portion is provided with a thread with a large pitch for rapid travel, and on a second subsequent portion is provided with a thread with a small pitch for a more slow travel with great force. In order to engage in both threads, the nut member of this special stem has to comprise a number of projections instead of a conventionally
20 screw thread. Such a nut member is difficult to manufacture and the stress on the individual projections is heavy. Moreover, two successive threads are bulky.

SE-B-385.952 discloses an actuator device of the screw/nut type comprising a threaded stem, upon which a stem nut is arranged having an internal thread engaging the stem and an external thread engaging an outer sleeve. Jointly with damping
25 means, the stem nut is adapted to ensure a springy and damping stop function at the end of the movement of the stem.

Furthermore, US 4,488,704 discloses a valve of the type stated in the introduction provided with an actuator device comprising a nut member having an external thread interengaging a mounting member connected to the valve housing. Moreover, the actuator device comprises a stem, at which lower end a shut-off member is arranged, said stem being provided with an external thread engaging an internal thread of the nut member. The nut member as well as the stem is provided with an operating handle. In the shown embodiment, the external thread of the nut member is more fine than its internal thread engaging the stem. As a result, a rapid movement of the shut-off member is obtained, when the handle of the stem is operated and a more slow and accurate movement of the shut-off member is obtained, when the handle of the nut member is operated. Owing to consideration of space and control, however, this valve is not particularly advantageous in that two operating means or handles are required.

Brief Description of the Invention

- 15 The object of the present invention is to provide a shut-off valve of the type stated in the introduction, whereby a reliable sealing in the closed position at a lower closing torque than at known shut-off valves and still in keeping with the norms for the maximum number of rotations from open to closed position and without the drawbacks stated above.
- 20 The shut-off valve according to the invention is characterised in that first coating stop means are provided between the two members interengaged by means of the thread with the largest pitch (i.e. either between the inner stem member and the outer stem member or between the outer stem member and the nut member), said stop means adapted to engage each other at the end of the closing movement to
- 25 ensure a joint turning of the two members in relation to the third member during the final part of the closing movement (i.e. either a joint turning of the inner stem member and the outer stem member relative to the nut member or a turning of the inner stem member relative to the outer stem member and the nut member). As a result, the initial and the major part of the closing movement of the shut-off member

takes place between the members interengaged by means of the threads with the large pitch, while the final part of the closing movement necessarily takes place by a movement between the two members interengaged by means of the thread having a small pitch and thus at a lower torque, when the stop means engage each other.

5 Consequently, the closing torque necessary for obtaining sealing when the resilient sealing areas are compressed, is substantially reduced, which is particularly important in large valves. This is an economic advantage in motor-driven shut-off valves, as the motor usually is dimensioned relative to the necessary maximum torque for the compression in the closing phase. A shut-off valve according to the invention

10 may be provided with a smaller and thus less expensive motor than known valves. Correspondingly, according to the invention, hand-operated valves may be operated by means of substantially simpler and cheaper operation equipment than hitherto.

According to the invention, the first stop means comprises two mutually facing stop faces on the two members interengaged by means of the threads with the largest

15 pitch.

Moreover, according to the invention, the inner stem member, the outer stem member and the nut member may comprise second coacting stop means adapted to be brought into engagement with each other during the opening movement to bring all of the members into a predetermined initial position. The closing movement of

20 the shut-off valve is thereby more accurately controlled.

According to the invention, for ensuring a joint turning of the two members, interengaged by means of the threads with the smallest pitch, relative to the third member during the initial part of the closing movement, a releasable locking means may be arranged between said two members, said locking means being released

25 when the two first stop means engage each other. As a result, it is ensured that the turning in the small thread is not effected before the final part of the closing movement.

According to an embodiment of the invention, which in practice has proved particu-

larly advantageous, the pitch of the coacting threads between the inner stem member and the outer stem member is larger than the pitch of the coacting threads between the outer stem member and the nut member.

Moreover, in connection with the above advantageous embodiment, the second stop
5 means may comprise mutually facing stop faces on a radial projection on the inner stem member and on an upper end of the outer stem member, respectively.

Furthermore, according to the invention, the locking means may be formed of a flexible member being secured to the nut member or to the outer stem member and being in friction engagement with the other member in the locking position.

10 The releasable locking means may advantageously be formed of a flexible ring being received in opposite grooves in mutually facing faces of the outer stem member and the nut member.

According to a second advantageous embodiment of the invention, the pitch of the coacting threads between the nut member and the outer stem member is larger than
15 the pitch of the coacting threads between the inner stem member and the outer stem member.

The second advantageous embodiment of the invention may further comprise a sleeve circumscribing the inner stem member and the upper end of the outer stem member to allow a displacement of the two members relative to each other and
20 having an engagement means to prevent disengagement of the two stem members. The use of such a sleeve ensures a more accurate operation of the shut-off member, as the risk of the outer stem member disengaging the inner stem member and falling off with the shut-off member inside the valve housing no longer exists.

25 The engagement means of the sleeve may be formed of an inwardly projecting flange coacting with a shoulder on the outer stem member to limit the displacement of the outer stem member.

In the second advantageous embodiment, the releasable locking means may be formed of a flexible member secured to the inner stem member or the outer stem member and being in friction engagement with the other of said members in the locking position.

- 5 The releasable locking means may also be formed of a flexible member fixed to the outer stem member or the sleeve and being in friction engagement with the other of said members in the locking position.

The releasable locking means may thus be formed of a flexible ring being received by opposite grooves in mutually facing surfaces of the inner stem member and the
10 outer stem member or of the outer stem member and the sleeve in the locking position.

Moreover, the releasable locking means may be formed of a flexible member, such as a disk spring, arranged between the outer stem member and a ledge on the inner stem member. As a result, a very simple structure is obtained, wherein opposite
15 grooves in mutually facing surfaces of the members forming part thereof need not be provided. Furthermore, by using a disk spring, it is possible to preload the thread with the small pitch.

Finally, according to the invention, the ratio between the fine pitch and the coarse pitch may be >2 , preferably between 3 and 10.

20 Brief Description of the Drawings.

The invention is explained in details below with reference to the drawings, in which

Fig. 1 is a partial, sectional view of a first embodiment of the shut-off valve according to the invention,

Fig. 2 is a detailed view of an actuator device of the valve according to Fig. 1 in

the closed position thereof.

Fig. 3 is a detailed view of the actuator device in the open position of the valve,

Fig. 4 shows a second embodiment of a valve according to the invention,

Fig. 5 is a detailed view of an actuator device of the valve according to Fig. 4 in
5 the closed position thereof,

Fig. 6 is a detailed view of the actuator device in the open position of the valve and,

Fig. 7 is a detailed view of the actuator device, in which the locking means between
the two stem members comprises disk springs.

Best Mode for Carrying Out the Invention

10 The shut-off valve or gate valve 1 according to the invention shown in Fig. 1-3
comprises an essentially T-shaped valve housing 2 comprising a flow passageway
3 provided with an inlet portion 3' and an outlet portion 3'' being aligned with one
another and a branch portion 4 perpendicular thereto. In the longitudinal direction
of the branch portion, a shut-off member or valve gate 22 is arranged in the housing
15 2, said shut-off member being displaceable between a closed position (Fig. 2), in
which it closes the flow passageway, and an open position (Fig. 3), in which it
opens said passageway. On its outer face, the shut-off member 22 is coated with a
resilient material 23 to sealingly abut the seat faces 24 of the valve housing 2. The
displacement of the shut-off member 22 is provided by means of an actuator device
20 comprising an inner stem member 6 being rotatably arranged in a cap 5 secured to
the branch portion 4 by bolts. By means of a ring 7, the inner stem member 6 is
prevented from axial displacement and further provided with a sealing ring to
prevent impurities from entering the valve and fluid from flowing out of the valve.
The upper end of the stem member 6 extends beyond the cap 5 and may be actuated
25 by a means 10 (not shown), such as a motor for turning the stem member 6.

Moreover, the inner stem member 6 is provided with an external threaded area 11 having a thread 12 for instance a trapezoidal thread. At the top, the threaded area 11 is defined by a first ledge 13 and at the bottom defined by a second ledge 14.

The actuator device 15 further comprises an outer stem member 17 and a nut member 20. The outer stem member 17 has an internal coarse thread 18 coaxing with the coarse thread 12 of the inner stem member 6. Moreover, the outer stem member 17 has an external, fine thread 19 coaxing with an internal, fine thread 21 on the nut member 20. The nut member 20 is secured to the upper end of the shut-off member 22. The shut-off member 22 is provided with a cavity allowing for displacement thereof and of the nut member 20 relative to the stem members during the closing and opening movement.

Between the nut member 20 and the outer stem member 17, a releasable locking means 25 is arranged in form of a flexible ring, in the example shown a spring ring of a circular cross section, received in an outer annular groove 35 close to the upper end of the outer stem member. In the locking position, the spring ring 25 is received in an inner annular groove 36 close to the upper end of the nut member and ensures a joint movement of the outer stem member 17 and the nut member 20 relative to the inner stem member 6.

The releasable locking means may optionally be formed of a flexible member of a resilient material, such as rubber, secured to the nut member or to the outer stem member and in the locking position being in friction engagement with the other of said members. Thus, the spring ring 25 may be replaced by a ring of a resilient material and fixed in the groove 35, said ring being in friction engagement with the opposite inner face of the nut member in the locking position. The locking means may optionally comprise the edge face 37 of the portion of the resilient coating of the valve gate protruding above the nut member and the peripheral face of a ledge projecting at the upper end of the outer stem member.

As shown in Fig. 3, in the initial position of the closing movement of the shut-off

valve, i.e. the fully open position, the first or upper end face 26 of the outer stem member 17 abuts the stop face 27 of the first ledge 13, said face facing the nut member. Further, the outer stem member 17 is joined with the nut member 20 by means of the releasable locking means 25. When closing the shut-off member by turning the inner stem member 6, the initial and major part of the movement takes place in the coarse threads 12,18 between the inner and outer stem member 6,17, the nut member 20 being fixed to the outer stem member 17 by means of the releasable locking means 25. The lower end face 28 of the outer stem member 17 abuts the stop face 29 of the lower stem ledge 14 immediately before the valve is closed, whereby a continued turning in the coarse thread between the inner stem member and the outer member is prevented.

When turning is continued, the locking means 25 is released, the spring ring 25 disengaging the annular groove 36 in the nut member 20, whereby the movement may continue in the fine thread 19,21, until the shut-off member 22 abuts the seat faces 24 in the valve housing 2, while being compressed. This closed position is shown in Fig. 2.

When the shut-off member 22 reverts to its fully open position shown in Fig. 3, by turning the inner stem member in the opposite direction, the movement partly takes place in the fine threads 19,21 and partly in the coarse threads 12, 18, until the first end face 26 of the outer stem member 17 abuts the stop face 27 of the first ledge 13, and the outer stem member and the nut member are in the position, in which the releasable locking means 25 joins said member, (cf. Fig. 3).

In Fig. 4, 5, 6 and 7, a second embodiment of the shut-off valve 101 according to the invention is shown. This shut-off valve comprises an essentially T-shaped valve housing comprising a flow passageway 103 provided with an inlet portion 103' and an outlet portion 103'' aligned with one another, and a branch portion 104 perpendicular thereto. In the longitudinal direction of the branch portion, a shut-off member or valve gate 122 is arranged in the housing 102, said shut-off member being displaceable between a closed position (Fig. 5), in which it closes the flow passage-

way, and an open position (Fig. 6), in which it opens said passageway. On its outer face, the shut-off member 122 is coated with a resilient material 123 to sealingly abut the seat faces 124 of the valve housing 102. The displacement of the shut-off member 122 is provided by means of an actuator device comprising an inner stem member 106 being rotatably arranged in a cap 105 secured to the branch portion 104 by bolts. The inner stem member 106 is prevented from axial displacement and further provided with a sealing ring 109 to prevent impurities from entering the valve and fluid from flowing out of the valve. The upper end of the stem member 106 extends beyond the cap 105 and may be actuated by a means (not shown), such as a motor for turning the stem member 106. Moreover, the inner stem member 106 is provided with a lower threaded area having a comparatively fine thread 112. The threaded area is at the top defined by a first ledge 113 provided with an annular groove 139 to receive a sealing ring 140.

The actuator device 115, further, comprises an outer stem member 117 and a nut member 120. The outer stem member 117 has an internal fine thread 118 coacting with an external fine thread 112 of the inner stem member 106. Moreover, the outer stem member 117 has an external coarse thread 119 coacting an internal coarse thread 121 of the nut member 120. The nut member 120 is secured to the upper end of the shut-off member 122. The shut-off member 122 is provided with a cavity allowing for displacement thereof and of the nut member 120 relative to the stem members during the closing and opening movement.

The actuator device 115 further comprises a sleeve 108 circumscribing the inner stem member 106 and the upper end of the outer stem member 117. The sleeve 108 acts to prevent the two stem members from disengaging. The sleeve is axially divided into two halves, for instance joined by means of bolts 132 and at its upper end provided with an inwardly projecting flange 148 overlapping a first ledge 113 of the inner stem member 106. Furthermore, at its lower end, the sleeve 108 is provided with a second flange 130 projecting inwardly and coacting with a shoulder 131 provided on the outer stem member to form a stop. The shoulder 131 is shown as a separate part secured to the remaining portion of the outer stem member 117

by means of a lock ring 133. However, said two parts may be integrally formed.

A releasable locking means 125 in form of a flexible ring 125 (in the example shown a spring ring of circular cross-section) is arranged between the sleeve 108 and outer stem member 117 in an outer annular groove 135 close to the upper end
5 of the outer stem member. In the locking position, the spring ring 125 is received in an inner annular groove 136 close to the upper end of the sleeve and ensures a joint movement of the outer stem member 117 and the inner stem member 106 relative to the nut member 120. As indicated by means of a broken line in Fig. 5, the locking means may also be formed of a spring ring 145 arranged in an inner
10 annular groove 138 on the outer stem member 117 and engaging an outer annular groove 137 on the inner stem member 106. The spring ring 125,145 may be replaced a ring of a resilient material retained in the groove 135,138, said ring being in friction engagement with the opposite inner face of the sleeve or the opposite inner face of the inner stem member in the locking position.

15 Finally, as shown in Fig. 7, the locking means may comprise a spring member, comprising two disk springs 144 arranged between the upper face of the outer stem member 117 and the first ledge 113 provided on the inner stem member 106. The disk springs 144 preload the fine thread 112,118 slightly with a view to avoiding that the starting torque of the motor causes an unwanted movement of the outer stem
20 member 117 relative to the inner stem member 106, when the motor is activated.

The closing movement of the shut-off member takes place as follows. As shown in Fig. 6, in the fully open initial position of the valve, the end face 126 of the outer stem member abuts the stop face 127 of the first ledge 113, the outer stem member 117 and the sleeve 108 being joined by means of the releasable locking means 125.
25 When closing the shut-off valve by turning the inner stem member 106, the initial and major part of the closing movement takes place in the coarse thread 119,121. By a joint turning of the inner stem member 106 and the outer stem member 117 relative to the nut member 120, the nut member 120, and thus the shut-off member 122, is moved downwardly in the branch portion 104 and into the passageway 103.

At the end of the closing movement, the lower face 128 of the nut member 120 abuts the stop face 129 of a second ledge 114 on the outer stem member 117 and thus prevents a continued displacement between the two members.

At a sustained turning of the inner stem member 106, the locking means 125 is released and the inner stem member 106 rotates relative to the outer stem member 117, the movement thus continuing in the fine thread 112,118, whereby the outer stem member 117 and consequently the shut-off member 122 are moved downwards, until the latter abuts the seat faces 124 in the valve housing 102, while being compressed. This closed position is shown in Fig. 5.

10 When the shut-off member 122 reverts to its fully open position, the movement partly takes place in the fine threads 112,118 and partly in the coarse threads 119, 121, until the upper face 146 of the nut member 120 abuts the lower face 147 of the shoulder 131 of the outer stem member 117, and the latter is in locking engagement with the sleeve 108, cf. Fig. 6.

15 In the embodiment shown in Fig. 7, in which the locking means comprises disk springs, the opening movement is continued, until the outer stem member 117 abuts the spring disks 144 by its stop face and compresses said disks.

The invention is not limited to the described embodiments and may be varied within the scope of the attached claims. As an example, the sleeve may be omitted in 20 embodiments, as it is superfluous, if the thread is formed in such a manner that the resistance to turning in the small thread exceeds the resistance to turning in the large thread. Furthermore, the shut-off valve may be provided with rising stem.

Claims

1. A shut-off valve (1,101) comprising a valve housing (1,102) provided with a flow passageway (3,103) and a shut-off member (22,122) arranged in said housing and displaceable by means of an actuator device (15,155) of the stem/nut type
5 between a position, in which the flow passageway is open and a position, in which it is closed, said actuator device comprising a nut member (20, 120) provided with an internal thread (21, 121) with a first pitch, and an outer stem member (17,117) provided with an external thread (19, 119) engaging the internal thread (21,121) of the nut member, and having an internal thread (18,118) with a second pitch differing
10 from the first pitch and engaging a corresponding external thread (12,112) on an inner stem member (6,106), and wherein the threads coacting during the major part of the closing movement of the shut-off member (22,122) are provided with larger pitch than those coacting during the final part of the closing movement,
c h a r a c t e r i s e d in that first coacting stop means (28,29;128,129) are
15 provided between the two members interengaged by means of the thread with the largest pitch (i.e. either between the inner stem member (6) and the outer stem member (17) or between the outer stem member (117) and the nut member (120)), said stop means adapted to engage each other at the end of the closing movement to ensure a joint turning of the two members in relation to the third member during
20 the final part of the closing movement (i.e. either a joint turning of the inner stem member (6) and the outer stem member (17) relative to the nut member (20) or a turning of the inner stem member (106) relative to the outer stem member (117) and the nut member (120)).

2. A shut-off valve (1, 101) as claimed claim 1, c h a r a c t e r i s e d in that
25 the first stop means comprises mutually facing stop faces (28, 29, 128, 129) on the two members being interengaged by means of the threads with the largest pitch.

3. A shut-off valve (1, 101) as claimed in 1 and 2, c h a r a c t e r i s e d in that the inner stem member (6,106), the outer stem member (17,117) and the nut
30 member (20,120) comprise second coacting stop means (26, 27; 126, 127; 146, 147)

adapted to be brought into engagement with each other during the opening movement to bring all of the members (6, 106; 17, 117; 20, 120) into a predetermined initial position.

4. A shut-off valve (1, 101) as claimed in one or more of the claims 1 to 3, characterised by a releasable locking means (25, 125, 225) acting between the two members interengaged by means of the threads with the smallest pitch, said locking means being adapted to ensure a joint turning of said two members relative to the third member during the initial part of the closing movement, and to be released, when the two first stop means (28, 29; 128, 129) engages each other.

10 5. A shut-off valve (1) as claimed in one or more of the claims 1 to 4, characterised in that the pitch of the coacting threads (12,18) between the inner stem member (6) and the outer stem member (17) is larger than the pitch of the coacting threads (19,21) between the outer stem member (17) and the nut member (20).

15 6. A shut-off valve (1) as claimed in claim 3 and 5, characterised in that the second stop means comprises mutually facing stop faces (26, 27) of a radial projection (13) on the inner stem member (6) and on an upper end of the outer stem member (17), respectively.

7. A shut-off valve (1) as claimed in claim 4 and 5, characterised in that the locking means (25) is formed of a flexible member secured to the nut member (20) or the outer stem member (17) and being in friction engagement with the other of said members in the locking position.

8. A shut-off valve (1) as claimed in claim 7, characterised in that the releasable locking means (25) is formed of a flexible ring received in opposite 25 grooves (35,36) formed in mutually facing faces of the outer stem member (17) and the nut member (20) in the locking position.

9. A shut-off valve (101) as claimed in one of more of the claims 1 to 4, characterised in that the pitch of the coacting thread (19, 121) between the nut member (120) and the outer stem member (117) is larger than the pitch of the coacting thread (112,118) between the inner stem member (106) and the outer stem member (117).

10. A shut-off valve (101) as claimed in claim 9, characterised in that it further comprises a sleeve (108) circumscribing the inner stem member (106) and the upper end of the outer stem member (117) to allow a mutual displacement of the two members and having an engagement means (130) to prevent disengagement of the two stem members (106,117).

11. A shut-off valve (101) as claimed in claim 10, characterised in that the engagement means of the sleeve (108) is formed of an inwardly projecting flange (130) coacting with a shoulder (131) on the outer stem member (117) to limit the displacement of the outer stem member.

12. A shut-off valve (101) as claimed in claim 3 and 9, characterised in that the releasable locking means (145) is formed of a flexible member fixed to the inner stem member (106) or the outer stem member (117) and being in friction engagement with the other of said member in the locking position.

13. A shut-off valve (101) as claimed in claim 3, 9, and 10, characterised in that the releasable locking means (125) is formed of a flexible member fixed to the outer stem member (117) or the sleeve (120) and being in friction engagement with the other of said member in the locking position.

14. A shut-off valve (101) as claimed in claim 12 or 13, characterised in that the releasable locking means (125,145) is formed of a flexible ring received in opposite grooves (135,136,137,138) in mutually facing faces of the inner stem member (106) and the outer stem member (117) or of the outer stem member (117) and the sleeve (108) in the locking position.

15. A shut-off valve (101) as claimed in claims 3, 9 and 10, characterised in that the releasable locking means (145) is formed of a flexible member, such as a disk spring (144) arranged between the outer stem member (117) and a ledge (113) on the inner stem member (106).
- 5 16. A shut-off valve (1,101) as claimed in claim 1, characterised in that the ratio between the pitch of the fine thread and the pitch of the coarse thread is > 2 , preferably between 3-10.

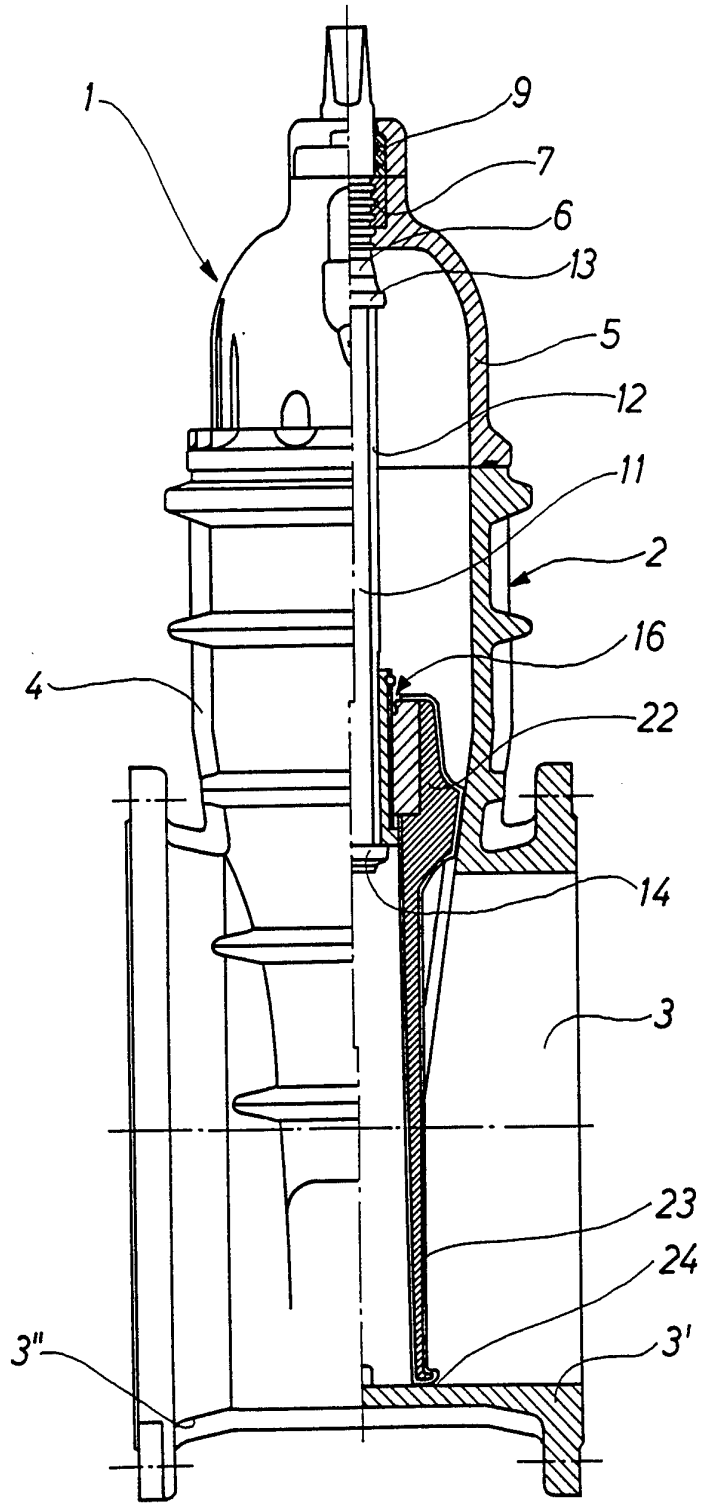


Fig. 1

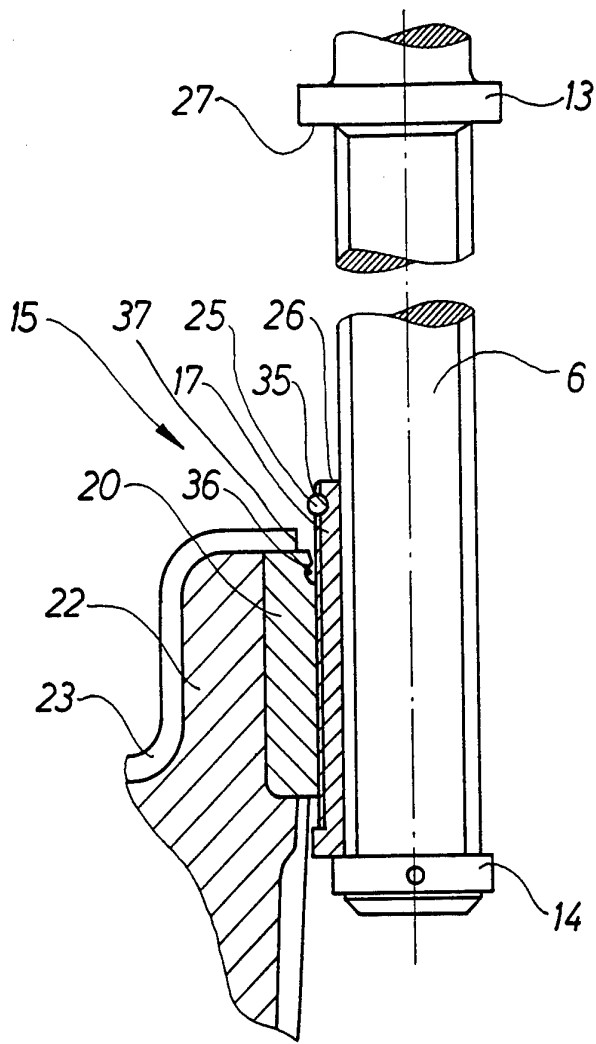


Fig. 2

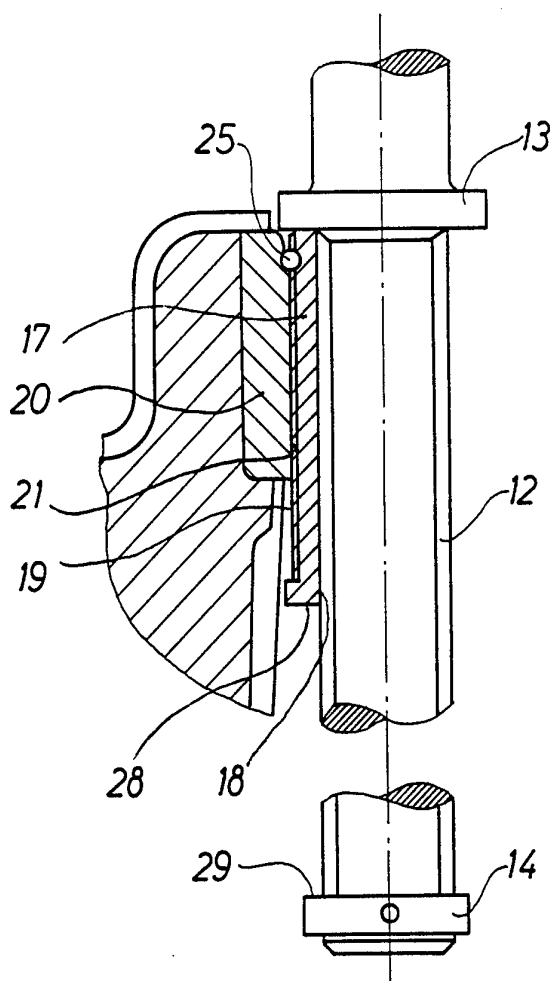


Fig. 3

3/6

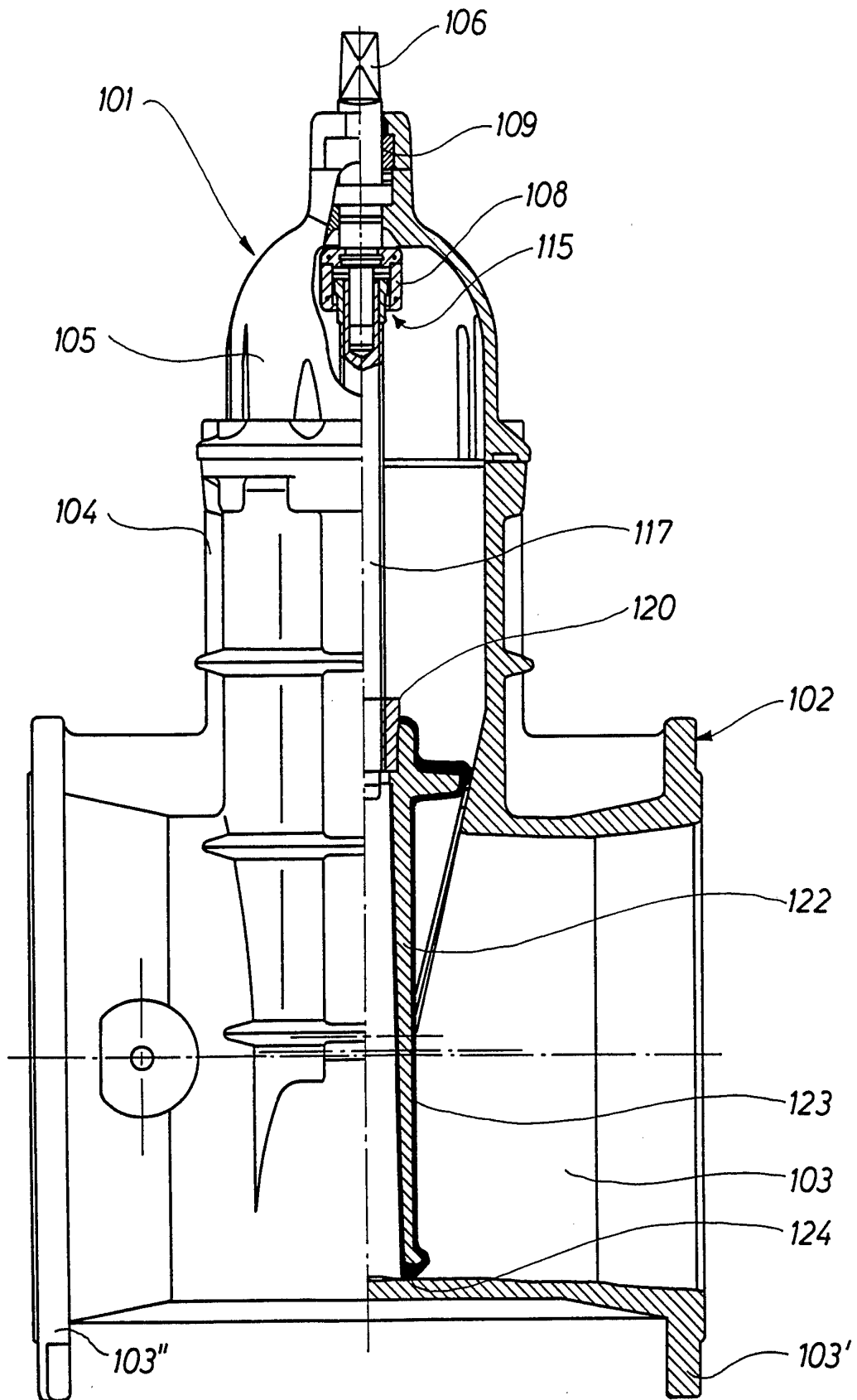


Fig. 4
SUBSTITUTE SHEET

4/6

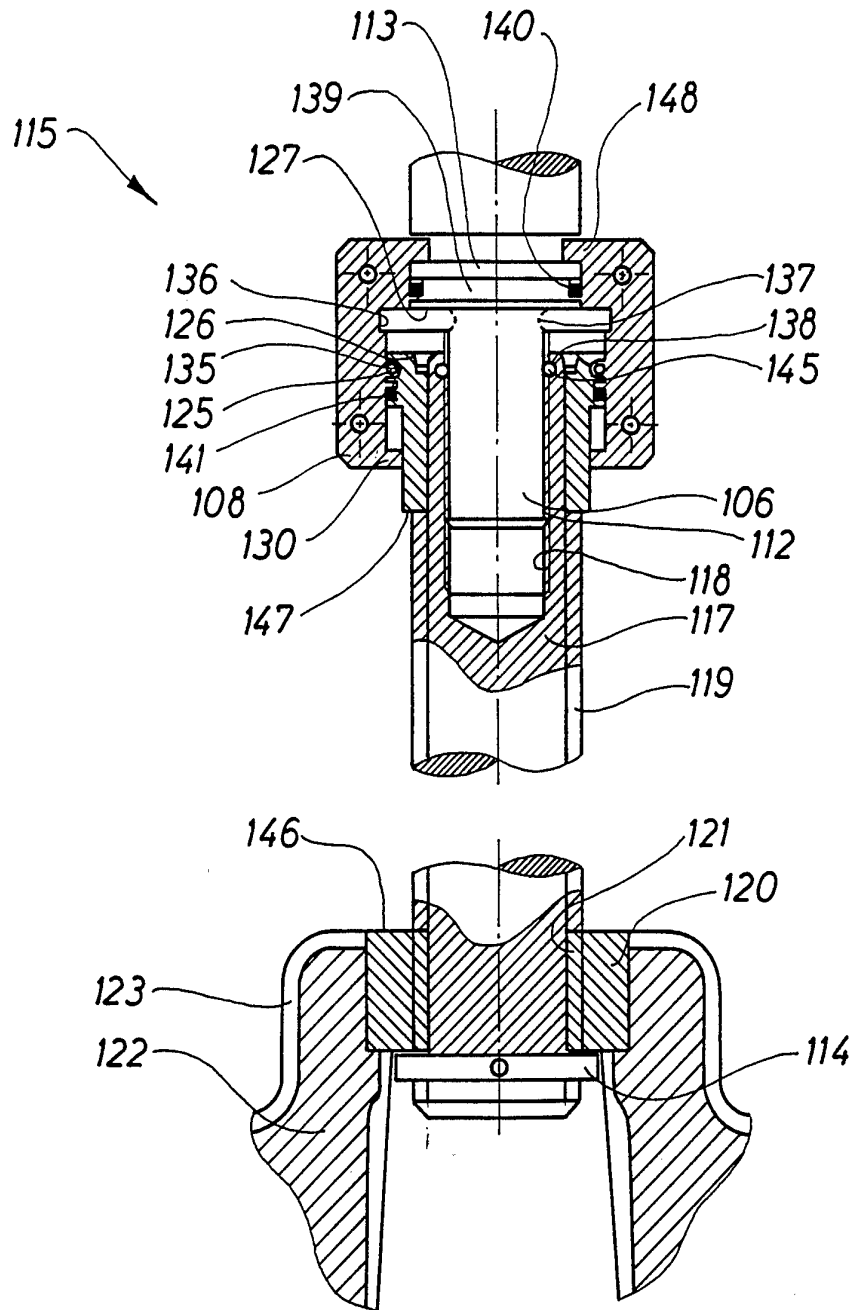


Fig. 5

5/6

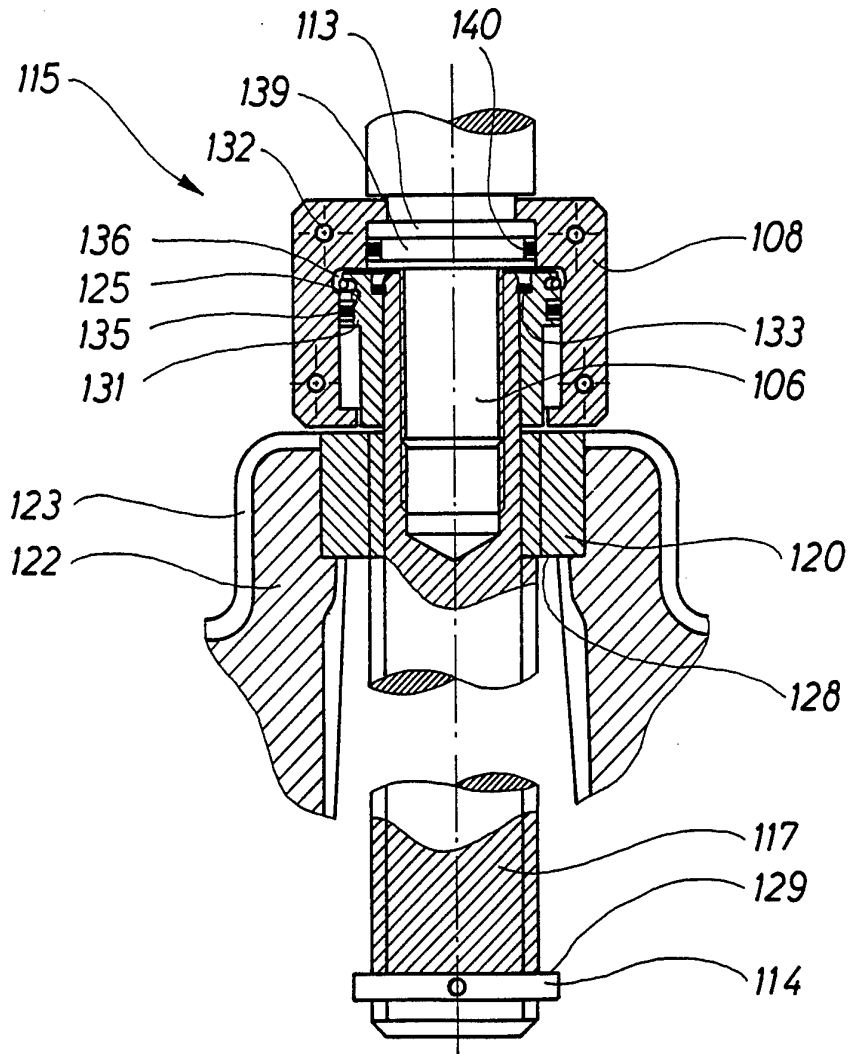


Fig. 6

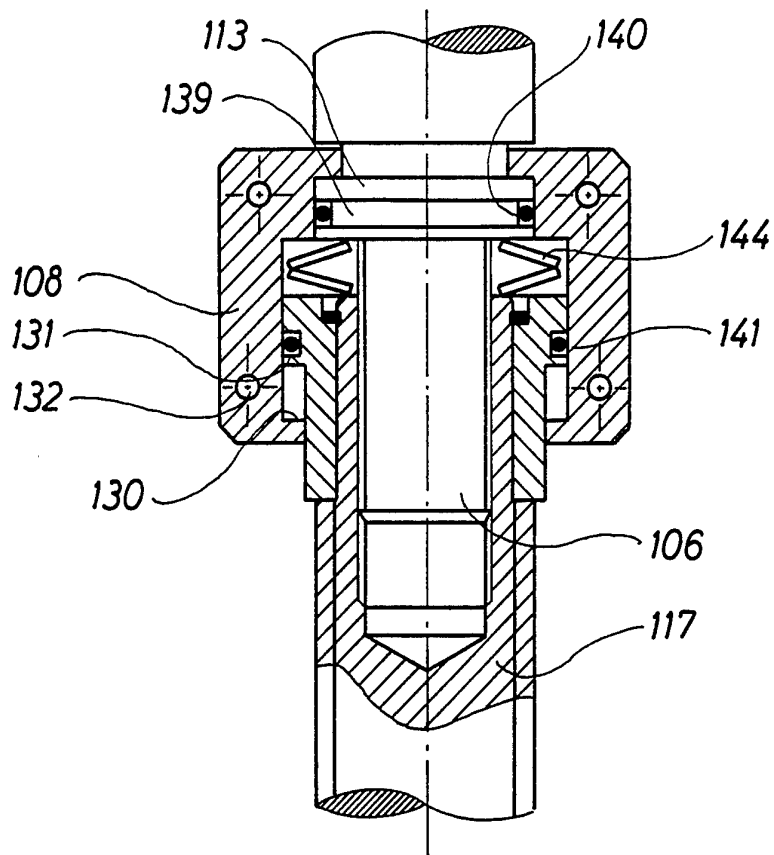


Fig. 7

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 95/00290

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: F16K 31/50, F16K 3/18

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: F16K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 4101075 A1 (HAAS, HARTMUT), 1 August 1991 (01.08.91), figures 1-3, claims 1-3	1,2,5,6,9
Y	--	3
Y	SE 459115 B (CCE GAS CONTROL EQUIPMENT AB), 5 June 1989 (05.06.89), figures 1-3, abstract	3,4
Y	US 4483512 A (DRAPEAU), 20 November 1984 (20.11.84), figure 3, abstract	3,4,10
	--	



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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Date of the actual completion of the international search

4 October 1995

Date of mailing of the international search report

21 -10- 1995

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK 95/00290

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 1600813 A (HERION, ERICH), 6 May 1970 (06.05.70) --	
A	US 5188338 A (ITOI), 23 February 1993 (23.02.93), figure 1, abstract -- -----	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

28/08/95

International application No.

PCT/DK 95/00290

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-A1- 4101075	01/08/91	DE-U- 9000861	29/03/90
SE-B- 459115	05/06/89	DE-C- 3890870	07/04/94
		EP-A- 0419466	03/04/91
		GB-A- 2217436	25/10/89
		NL-A- 8820742	01/09/89
		SE-A- 8703888	09/04/89
		WO-A- 8903492	20/04/89
US-A- 4483512	20/11/84	NONE	
DE-A- 1600813	06/05/70	NONE	
US-A- 5188338	23/02/93	CA-A- 2059082	12/07/92
		EP-A, A, A 0494511	15/07/92
		KR-B- 9410774	11/11/94