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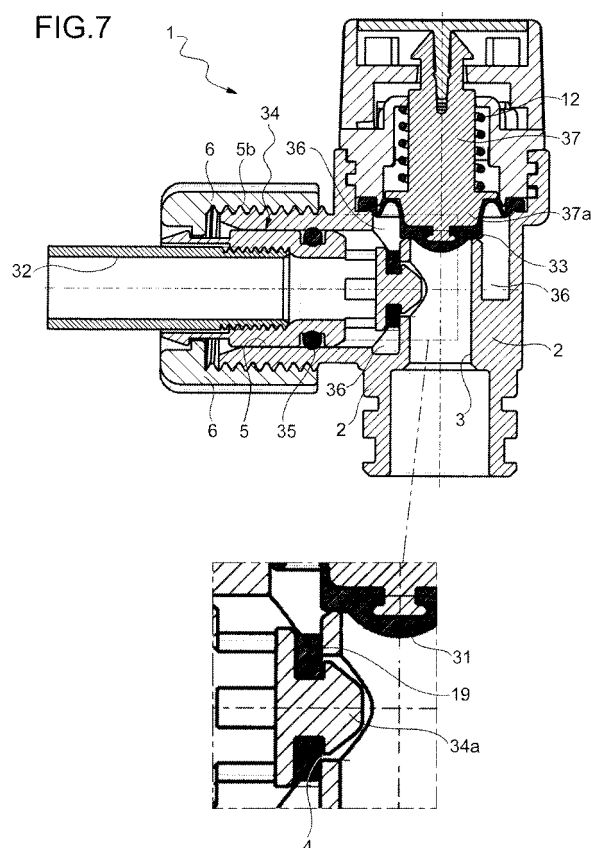
(54) **Drain cock with built-in pressure regulator, particularly for wall-mounted boilers and the like**

(57) The drain cock (1) comprises a body (2) with a pipe (3) that leads to a valve seat (4), a hand-actuated opening and closing member (6) screwed onto a formation (5b) on the body (2), barrier members (15, 16, 19; 15, 16, 27; 19) connected to the opening and closing member (6) and able to act on the valve seat (4), in such a way that when said member (6) is, relative to the body (2), in a closed position and in an open position, respectively, these barrier members shut off and disengage from, respectively, the seat (4), preventing and permitting, respectively, communication between an upstream portion of the installation and a region downstream of the valve seat (4).

The drain cock (1) also comprises a moveable barrier (19; 16; 31) separated from the opening and closing member (6) and stressed by a spring (12) towards a shut-off position in which it is able, when this member (6) is in the closed position, to prevent the passage of liquid between the pipe (3) of the body (2) and a discharge passage (8b; 32).

The arrangement is such that said barrier (19; 16; 31) is able to move from the shutoff position, against the action of the spring (12), when the pressure of the fluid upstream of the seat (4) exceeds a predetermined value, to a position in which it allows fluid to be discharged from the portion of the installation upstream of the seat (4) to the discharge passage (8b; 32).

FIG.7



Description

[0001] The present invention relates to a drain cock for a plumbed installation, particularly a wall-mounted boiler or the like.

[0002] More specifically the invention relates to a drain cock comprising

a body designed to be connected to or built into said installation and having a plumbed pipe that leads to a valve seat;
a hand-actuated opening and closing member connected disconnectably to a matching formation on said body, particularly by a threaded connection, and barrier means connected to said opening and closing member and able to act on said valve seat, in such a way that when said member is, relative to the body, in a closed position and in an open position, respectively, the barrier means shut off and disengage from, respectively, said valve seat, preventing and permitting, respectively, communication between an upstream portion of the installation and a region downstream of said valve seat.

[0003] It is an object of the present invention to provide an improved drain cock.

[0004] These and other objects are achieved according to the invention with a drain cock of the type specified above, characterized in that it comprises a moveable barrier separated from the opening and closing member and stressed by associated elastic means towards a shutoff position in which it is able, when said member is in the closed position, to prevent the passage of liquid between said pipe of the body and a discharge passage; the arrangement being such that the barrier is able to move from said shutoff position, against the action of said elastic means, when the pressure of fluid upstream of the valve seat exceeds a predetermined value, to a position in which it allows fluid to be discharged from the portion of the installation upstream of said valve seat to the aforesaid discharge passage.

[0005] By means of these features, the drain cock according to the invention is also able to perform the function of a true pressure regulator.

[0006] It therefore greatly simplifies the structure and assembly of the plumbed installation in which it is used.

[0007] Other features and advantages of the invention will be made clear by the following detailed description, which is given purely by way of non-restrictive example, with reference to the appended drawings, in which:

Figure 1 is a cross section through a first drain cock according to the present invention;
Figure 2 is a cross section through a variant of part of the drain cock according to Figure 1;
Figure 3 is a cross section through a second embodiment of a drain cock according to the invention;
Figures 4 and 5 are cross sections taken on IV-IV

and V-V, respectively, as marked in Figure 3;

Figure 6 is a cross section through another embodiment of a drain cock according to the invention; and
Figure 7 is a cross section through a variant of the drain cock according to Figure 6.

[0008] With reference to Figure 1, a drain cock 1 for a plumbed installation, particularly a wall-mounted boiler in a domestic heating system, comprises a body 2. This body is designed to be connected, or even built into, the installation in question, or into the body of the boiler to which it is connected.

[0009] The body 2 contains an internal liquid-carrying pipe 3 that leads to a valve seat marked 4.

[0010] The drain cock 1 also comprises a hand-actuated opening and closing member 6 that is connected disconnectably to a matching formation of the body 2.

[0011] In the embodiment shown in Figure 1, downstream of the valve seat 4, there is defined in the body 2 a passage 5 having a smooth-walled upper portion 5a and a lower portion 5b whose wall is threaded. This portion 5b of the passage 5 opens at the bottom outside the body 2.

[0012] The opening and closing member 6 is connected disconnectably to the body 2. In the embodiment depicted, the member 6 is of essentially tubular shape and includes an intermediate portion 6a which is externally threaded and is screwed into the correspondingly threaded portion 5b of the passage 5 of the body 2.

[0013] The actuating member 6 has a bottom end portion 6b, likewise essentially tubular, of enlarged diameter. The periphery of this portion 6b of the member 6 is preferably provided with a plurality of ridges 7 to facilitate grasping it and turning it by hand.

[0014] Connected to the bottom portion 6b of the actuating member 6 by for example a snap fastening, is a tubular fitting 8. In the embodiment illustrated, this fitting 8 has a top axial portion 8a of relatively larger diameter inserted into the portion 6b of the actuating member 6 with an interposed sealing ring 9.

[0015] The fitting 8 has a reduced-diameter bottom portion 8b onto which a drain tube 10 can be engaged. This may for example be a flexible tube.

[0016] The opening and closing member 6 and the associated fitting 8 may conveniently each be made as a separate single plastic moulding.

[0017] In the embodiment illustrated, the fitting 8 includes an integral cross-shaped configuration 11 which, without obstructing the passage of fluid through this fitting, acts as a lower reaction element for a helical spring marked 12.

[0018] The opening and closing member 6 has a top axial portion 6c in which an external annular groove 13 is made to house an O-ring seal 14 which presses against the smooth wall of the portion 5a of the passage 5 of the body 2.

[0019] Inside the opening and closing member 6, at the junction between its bottom portion 6b and its inter-

mediate portion 6a, an annular stop ridge marked 6d is defined.

[0020] Reference 15 in Figure 1 is a general reference for a barrier assembly which in the embodiment illustrated comprises an essentially tubular body 16 mounted so as to be axially moveable in the internal passage 6e defined inside the intermediate portion 6a and inside the top end portion 6c of the opening and closing member 6.

[0021] The tubular body 16 ends at the top in the form of a head 17 which supports, around a mushroom-shaped configuration 18, an annular seal 19, of elastomeric material for example, designed to operate as the actual barrier by acting on the valve seat 4 of the body 2.

[0022] Beneath the head 17, a plurality of openings 20 are formed in the wall of the tubular body 16 through which the region located in the portion 5a of the passage 5, above the sealing ring 14, communicates with the axial passage 16a of the aforesaid body 16.

[0023] The helical spring 12 extends partially into the tubular element 16 of the barrier assembly 15 and reacts at its top end against an internal shoulder of this tubular element.

[0024] Reference 21 is an external ring mounted on the lower end of the tubular element 16 to face the annular stop configuration 6d on the opening and closing member 6.

[0025] The arrangement described above is such that when the system comprising the opening and closing member 6, the barrier assembly 15 and the fitting 8 is disconnected from the body 2, the spring 12 keeps the barrier assembly 15 in the condition of maximum retraction from the end 6c of the member 6. In this condition the ring 21 of the barrier assembly 15 is pressed against the annular stop configuration 6d of the member 6.

[0026] When the system defined above is connected to the body 2 by screwing the member 6 into the threaded portion 5b of the passage 5 and is screwed almost all the way home, the barrier 19 contacts the valve seat 4. Continued screwing of the member 6 causes the assembly to arrive at the condition illustrated in Figure 1, in which the ring 21 of the barrier assembly 15 is off the annular stop configuration 6d, and the helical spring 12 is slightly compressed.

[0027] In operation, in order to discharge the plumbed installation to which the cock 1 is fitted, all that is required is to unscrew the member 6: initially the barrier 19 remains in contact with the valve seat 4, until the ring 21 reaches the annular configuration 6d of the member 6; after which, as the member 6 continues to be unscrewed, the latter draws the barrier 19 away from the valve seat 4. The liquid can then flow from the pipe 3 to the passage 5, then through the openings 20 into the internal passage 16a of the barrier assembly, and finally through the fitting 8 into the drain tube 10.

[0028] In normal operation of the plumbed installation to which the drain cock 1 is fitted, the latter is also able to perform the pressure regulating function: if the pressure of the fluid upstream of the valve seat 4 exceeds a

predetermined threshold, whose value depends on the characteristics of the spring 12, the entire barrier assembly 15 moves translationally downwards against the action of said spring, allowing a partial drainage of fluid from the pipe 3 to the drain tube 10.

[0029] As soon as the pressure upstream of the valve seat 4 drops to a predetermined level, the barrier assembly 15 is returned to the condition shown in Figure 1 by action of the spring 12.

[0030] Figure 2 shows a variant of the fitting 8. In this variant the bottom portion 8b of this fitting is inserted into a tubular extender 22. This extender has a top portion 22a slid leaktightly into the bottom portion of the fitting 8, and a bottom portion 22b or nipple onto which the drain tube 10 can be force fitted.

[0031] A clip 23 or split pin prevents the extender 22 being pulled out of the fitting 8. The extender is however able to execute a limited axial translational stroke relative to the fitting 8.

[0032] A spring 24 is inserted between the portion 22a of the extender 22 and an internal shoulder of the portion 8b of the fitting 8. The action of this spring is to tend to keep the extender 22 in the position illustrated in Figure 2, where its top portion 22a is pressed against the clip 23.

[0033] Conveniently but not necessarily the extender 22 has a projecting intermediate configuration 22c of for example hexagonal shape for operation by a spanner or the like when the extender 22 and the tube 10 connected to it are to be turned.

[0034] Figures 3 to 5 show a variant of a drain cock with built-in pressure regulator according to the present invention. In these figures, parts and components corresponding functionally to parts and components already described are given the same reference numbers as before.

[0035] In the embodiment shown in Figures 3 to 5 the drain cock 1 comprises a body 2 which is essentially of "male" type, and has an externally threaded intermediate portion 5b.

[0036] Correspondingly, the hand-actuated opening and closing member 6 is of "female" type and has an internally threaded end portion 6a for screwing onto the portion 5b of the body 2.

[0037] The opening and closing member 6 has a bottom portion 6b, connected to the bottom end of which is an extender 8 onto which the drain tube 10 is pushed.

[0038] Figure 3 also shows, at 14, an O-ring seal inserted between the body 2 and the opening and closing member 6. In the embodiment shown in Figures 3 to 5 this ring 14 is however placed in an annular groove in the bottom part of the body 2.

[0039] As can be seen in Figures 3 and 4, beneath the valve seat 4 the portion 6b of the member 6 forms an annular transverse shoulder 25, which defines a central opening or passage 26. Around the edge of this opening 26 is an annular seal 27, made for example of an elastomeric material, which looks essentially C-shaped in transverse section.

[0040] As can be seen in Figure 3, in the operating condition of the cock 1 the top portion 27a of sealing ring 27 presses against the valve seat 4 of the body 2.

[0041] A plurality of through openings 28 which are radially external to the sealing ring 27 are defined in the annular shoulder 25 of the member 6. The function of the openings 28 will be described below.

[0042] In the embodiment shown in Figures 3 to 5 a barrier assembly 15 is mounted moveably inside the opening and closing member 6 and consists, in the example illustrated, of a simple cup-shaped member 16 held in place by the helical spring 12 in engagement with the bottom portion or underside 27b of the sealing ring 27.

[0043] As seen in Figures 3 and 5, a plurality of longitudinal ribs 29 are conveniently formed in the portion 6b of the member 6, beneath the annular shoulder 25, to guide the axial movement of the body 16.

[0044] In the condition of use the cock 1 described above is in the condition shown in Figure 3. If the pressure in the installation to which the cock 1 is fitted rises too high, this cock can act as a pressure regulator. What happens is that the pressure of the fluid acts on the top surface of the barrier member 16, pushing it away from the sealing ring 27, in opposition to the reaction of the spring 12, which is correspondingly compressed. A quantity of liquid can then be drained out through the passages 30 defined between the side skirt of the barrier member 16 and the guide ribs 29 (Figure 5).

[0045] When used as a drain cock, the member 6 is unscrewed manually from the body 2 in such a way that the sealing ring 27 comes away from the valve seat 4. Consequently, although the barrier member 16 remains in engagement with the underside of the sealing ring 27, a quantity of liquid can flow from the pipe 3 to the drain tube 10, passing through the openings 28 in the shoulder 25 and the passages 30 defined between the guide ribs 29 of the member 6.

[0046] The version described above with reference to Figures 3 to 5 has the advantage that the pressure threshold at which the cock 1 acts as a pressure regulator does not depend on how tightly the member 6 is screwed onto the body 2.

[0047] Also in the version shown in Figure 3 the fitting member 8 may be modified to the version shown in Figure 2.

[0048] Figure 6 shows another variant of a drain cock according to the present invention. In this figure, once again, certain parts or components corresponding to parts and components already described have again been given the same reference numbers as before.

[0049] In the embodiment shown in Figure 6 the drain cock 1 comprises a body 2 designed to be connected to or even built into the use installation, or into the body of the boiler to which it is fitted.

[0050] Defined within the body 2 is a pipe 3 which leads to a first valve seat 4, shown by the edge of an opening formed in a side wall of the pipe 3. This pipe also leads to another valve seat, marked 33.

[0051] The cock 1 in Figure 6 again includes a hand-actuated opening and closing member 6 connected disconnectably to a matching configuration of the body 2. In particular, the body 2 forms a tubular projection in which is defined a passage 5, downstream of the valve seat 4. This tubular portion of the body 2 has an external thread 5b on which the internally threaded opening and closing member 6 is screwed.

[0052] An essentially cylindrical rod 34 with a peripheral sealing ring 35 which engages with the surface of the passage 5 is coaxially fixed to the member 6. The distal end 34a of the rod 34 carries an annular sealing ring which forms the barrier 19 acting on the valve seat 4.

[0053] The passage 5 communicates with a chamber 36 formed in the body 2 around the valve seat 33. On the opposite side from the passage 5, the chamber 36 communicates with the drain pipe 32 formed in a tubular projection of the body 2.

[0054] Reference 31 in Figure 6 is a diaphragm barrier, its perimeter being clamped between the body 2 and an associated body 2' which is screwed onto the latter. The diaphragm barrier 31 is connected to an end portion or head 37a of a moveable body marked by the general reference 37. A spring 12 tends to push the body 37 down in such a way as to keep the central portion of the diaphragm barrier 31 engaged on the valve seat 33. In this condition the inlet passage 3 is disconnected from the drain passage 32 because of the closure of the valve seat 4 by the barrier 19 and because of the closure of the valve seat 33 by the diaphragm barrier 31.

[0055] In use, when the member 6 is manually unscrewed from the body 2, the passage 3 is able to communicate with the drain pipe 32 through the chamber 36 due to the separation of the barrier 19 from the opening or valve seat 4. In this condition, however, the diaphragm barrier 31 remains engaged on the valve seat 33.

[0056] However, when the cock 6 is screwed onto the body 2, as shown in Figure 6, if the pressure of the liquid in the inlet passage 3 rises above a predetermined threshold, the barrier 31 moves off the seat 33, against the action of the spring 12, allowing communication between the inlet passage 3 and the drain pipe 32. The barrier 31 moves back onto the seat 33 as soon as the pressure of the liquid in the inlet passage 3 drops back below a predetermined level.

[0057] The embodiments shown in Figure 3 and 6 have the advantage that the drain cock function and the pressure regulating function are performed using separate liquid seals. Consequently, when the boiler or installation is drained following unscrewing of the opening and closing member 6, the seal which performs the pressure regulating function is not handled and this makes it possible to keep it clean because it is not contaminated with impurities carried by the liquid drained from the installation. The sealing action of the pressure regulating part is therefore reliably maintained.

[0058] In the embodiment shown in Figure 6 there is no need to adopt a solution of the type illustrated in Figure

2, because the fitting in which the drain pipe 32 is formed is fixed.

[0059] Figure 7 shows a variant of the drain cock of Figure 6. Nonetheless, the same reference numbers are used in Figure 7 as before to define parts/components identical or substantially equivalent to parts/components already described.

[0060] Summarizing very briefly, in the variant shown in Figure 7 the drain pipe 32 has been made coaxially through the opening and closing knob 6. The body 2 is correspondingly simplified by the elimination of a fitting.

[0061] Clearly, without affecting the principle of the innovation, the specific embodiments may be considerably varied with respect to those described and illustrated purely by way of non-restrictive example, without thereby departing from the scope of the invention as defined in the accompanying claims.

Claims

1. Drain cock (1) for a plumbed installation, particularly a wall-mounted boiler, comprising

a body (2) designed to be connected to or built into said installation and having a pipe (3) that leads to a valve seat (4),
a hand-actuated opening and closing member (6) connected disconnectably to a matching formation (5b) on said body (2), particularly by a threaded connection,
barrier means (15, 16, 19; 15, 16, 27; 19) connected to said opening and closing member (6) and able to act on said valve seat (4), in such a way that when said member (6) is, relative to the body (2), in a closed position and in an open position, respectively, said barrier means shut off and disengage from, respectively, said seat (4), preventing and permitting, respectively, communication between an upstream portion of the installation and a region downstream of said valve seat (4);

characterized in that

it comprises a moveable barrier (19; 16; 31) separated from the opening and closing member (6) and stressed by associated elastic means (12) towards a shutoff position in which it is able, when said member (6) is in the closed position, to prevent the passage of liquid between the pipe (3) of the body (2) and a discharge passage (8b; 32);
the arrangement being such that said barrier (19; 16; 31) is able to move from said shutoff position, against the action of the elastic means (12), when the pressure of the fluid upstream of said seat (4) exceeds a predetermined value, to

a position in which it allows fluid to be discharged from the portion of the installation upstream of said seat (4) to the aforesaid discharge passage (8b; 32).

2. Drain cock (1) according to Claim 1, characterized in that

the opening and closing member (6) defines in its interior, downstream of said valve seat (4), at least one passage (16a; 30) for a flow of liquid, and said barrier means comprise a barrier (19; 16) which is moveable inside the opening and closing member (6) and stressed by associated elastic means (12) towards a shutoff position in which it is able, when said member (6) is in the closed position, to shut off the communication between the pipe (3) of the body (2) and the internal passage (16a; 30) of said member (6); the arrangement being such that said barrier (19; 16) is able to move from said shutoff position, against the action of the elastic means (12), when the pressure of the fluid upstream of said seat (4) exceeds a predetermined value, to a position in which it allows fluid to be discharged from the portion of the installation upstream of said seat (4) to the aforesaid region downstream of the seat (4).

3. Drain cock according to Claim 2, in which the barrier (16, 19) extends partially outside of the opening and closing member (6) and has a seal (19) able to act on said valve seat (4).

4. Drain cock according to Claim 3, in which the opening and closing member (6) is of male general configuration, and is mounted removably in a female seat (5b) in said body (2).

5. Drain cock according to Claim 2, in which said barrier means (15, 16, 27) comprise a sealing ring (27) fixed to the opening and closing member (6) and able to push against said valve seat (4) when this member (6) is in the closed position, and a barrier body (16) which is moveable in said member (6), on the opposite side of said sealing ring (27) from the seat (4), under the action of the elastic means (12) which tend to push it against said sealing ring (27); in which opening and closing body (6) is defined at least one passage (28) that bypasses said sealing ring (27) to allow fluid to be discharged from the pipe (3) of the body (2) when the opening and closing member (6) is moved to an open position.

6. Drain cock according to Claim 5, in which the opening and closing member (6) is of female general configuration and is mounted removably on a male configuration (5b) of the aforesaid body (2).

7. Drain cock according to any one of the preceding claims, in which there is connected to the opening and closing member (6) a fitting (8) to which a drain tube (10) may be rotatably connected (Figure 2). 5
8. Drain cock according to Claim 1 or 5, comprising first and second liquidtight sealing means (27a, 27b; 19, 31) capable of engaging with corresponding valve elements (4, 16; 4, 33) for controlling, independently of each other, communication between said pipe (3) of the body (2) and the discharge passage (8b; 32). 10
9. Drain cock according to Claim 8, in which the first (19) and second liquidtight sealing means (31) engage with corresponding openings or valve seats (4, 33) that are separate from each other and located between said pipe (3) and the discharge passage (32). 15
10. Drain cock according to Claim 9, in which the discharge passage (32) is formed through the opening and closing member (6). 20

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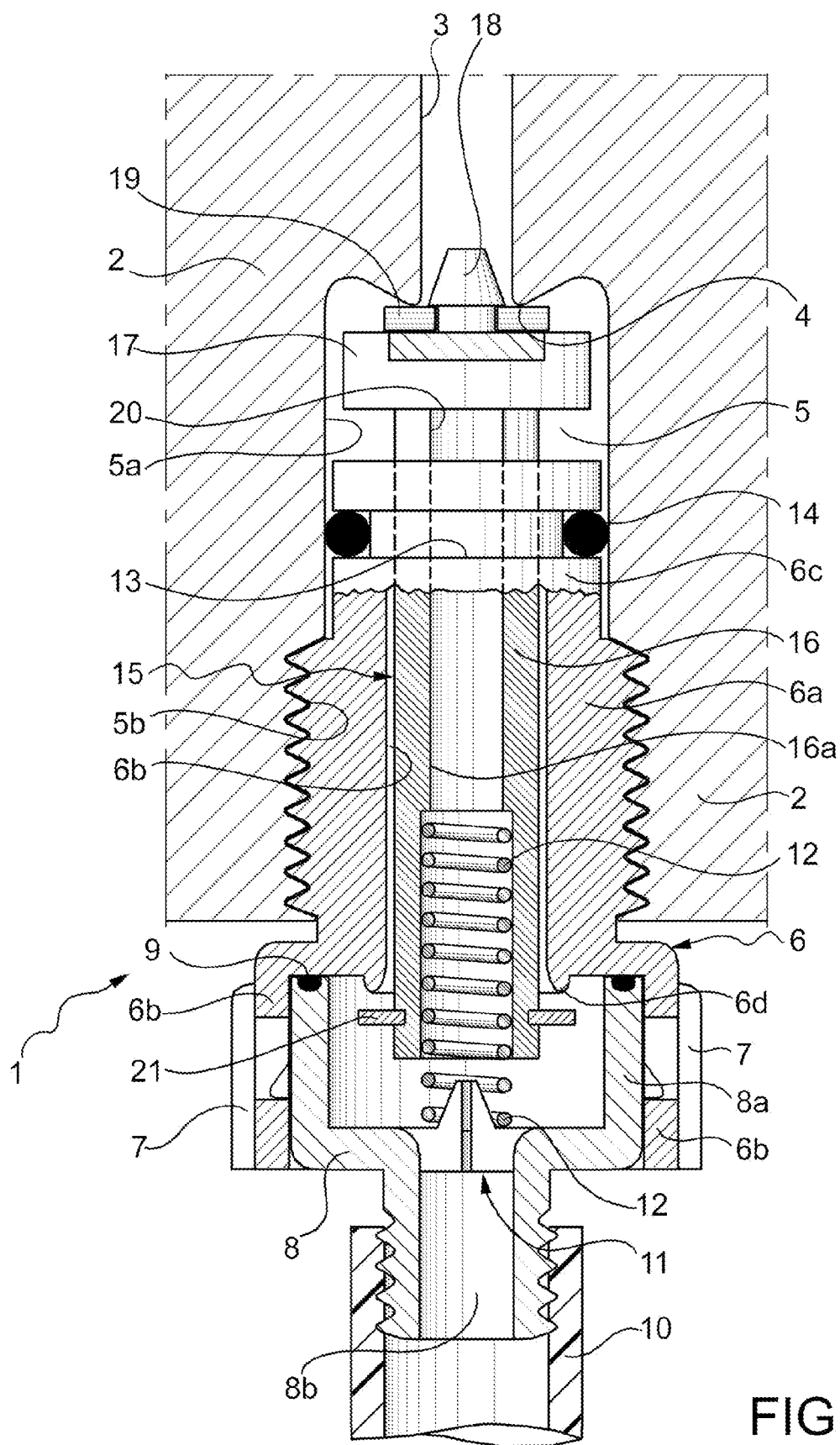


FIG.1

FIG.2

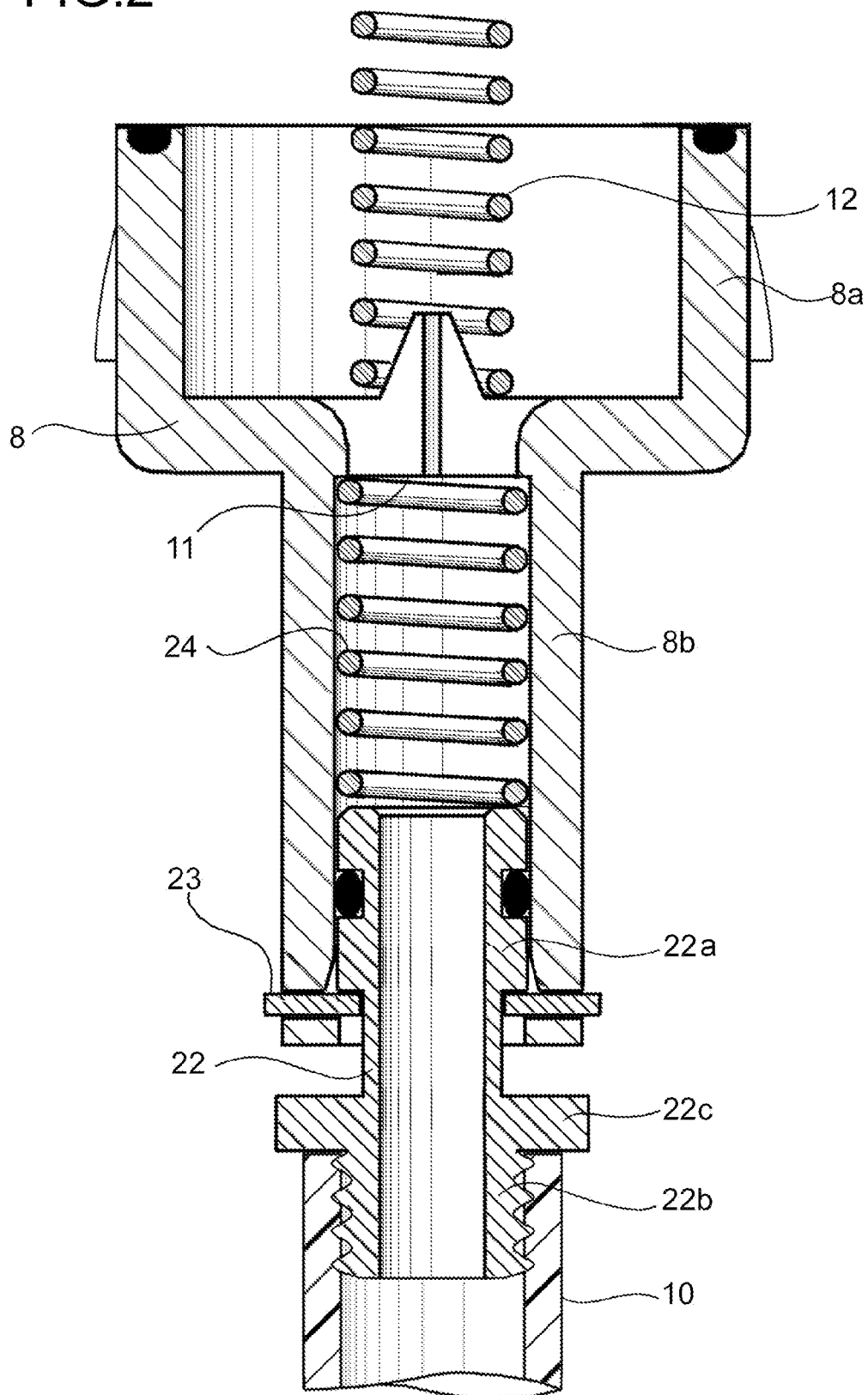


FIG.3

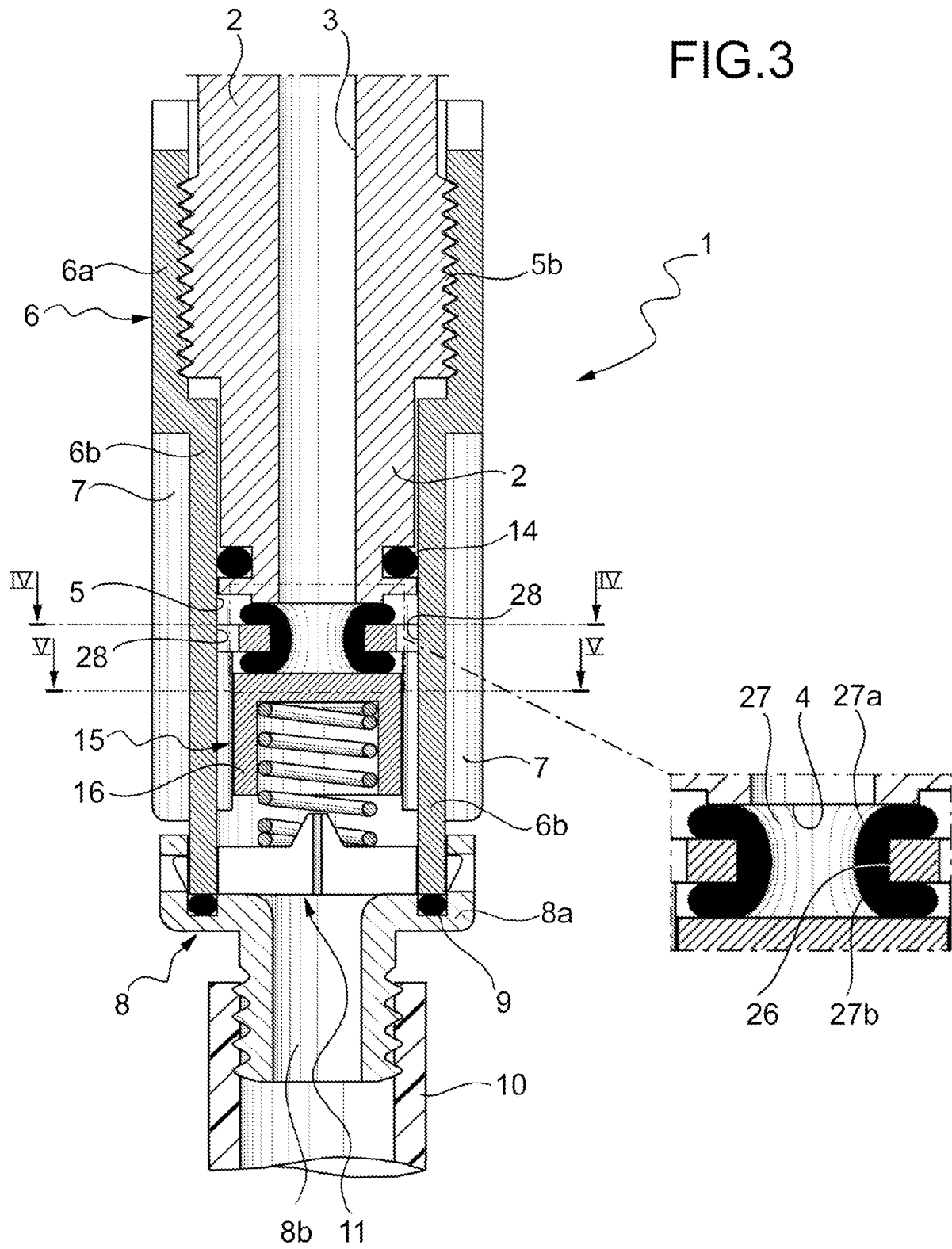


FIG.4

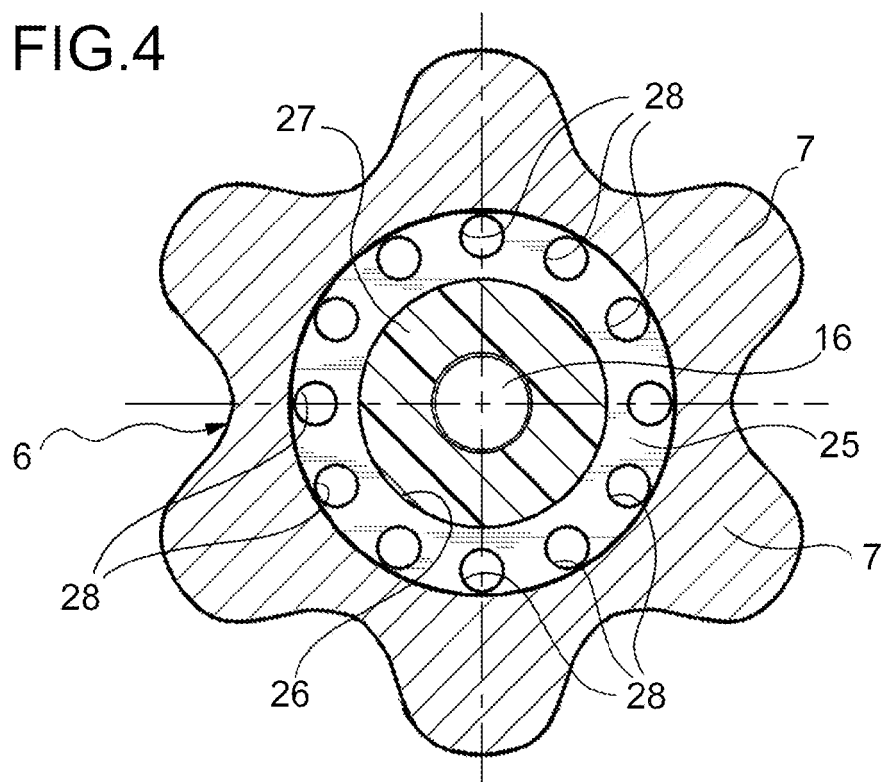


FIG.5

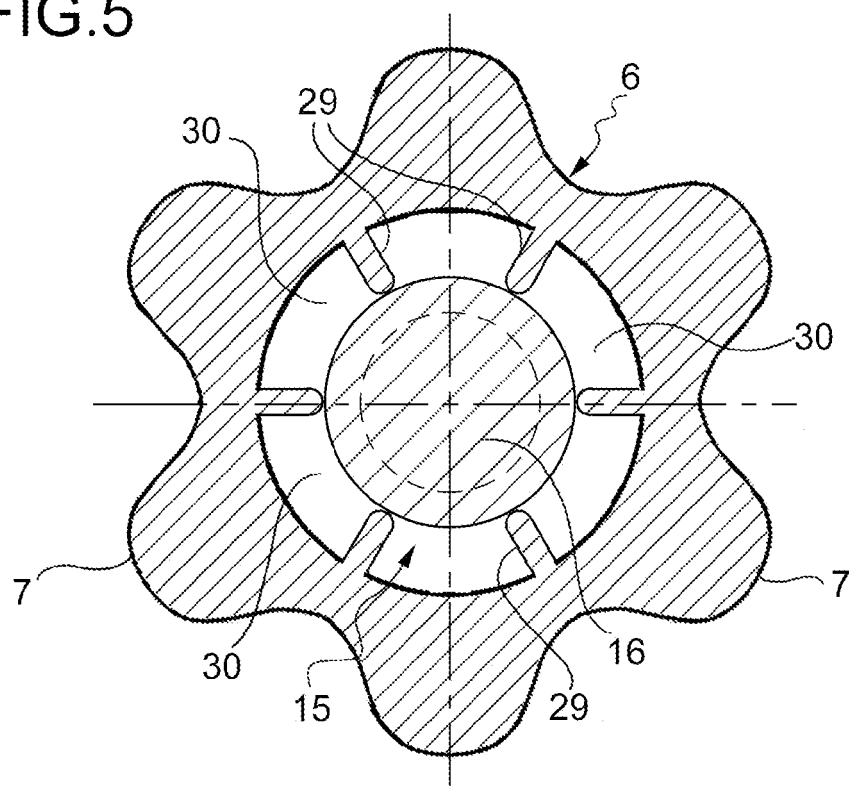


FIG.6

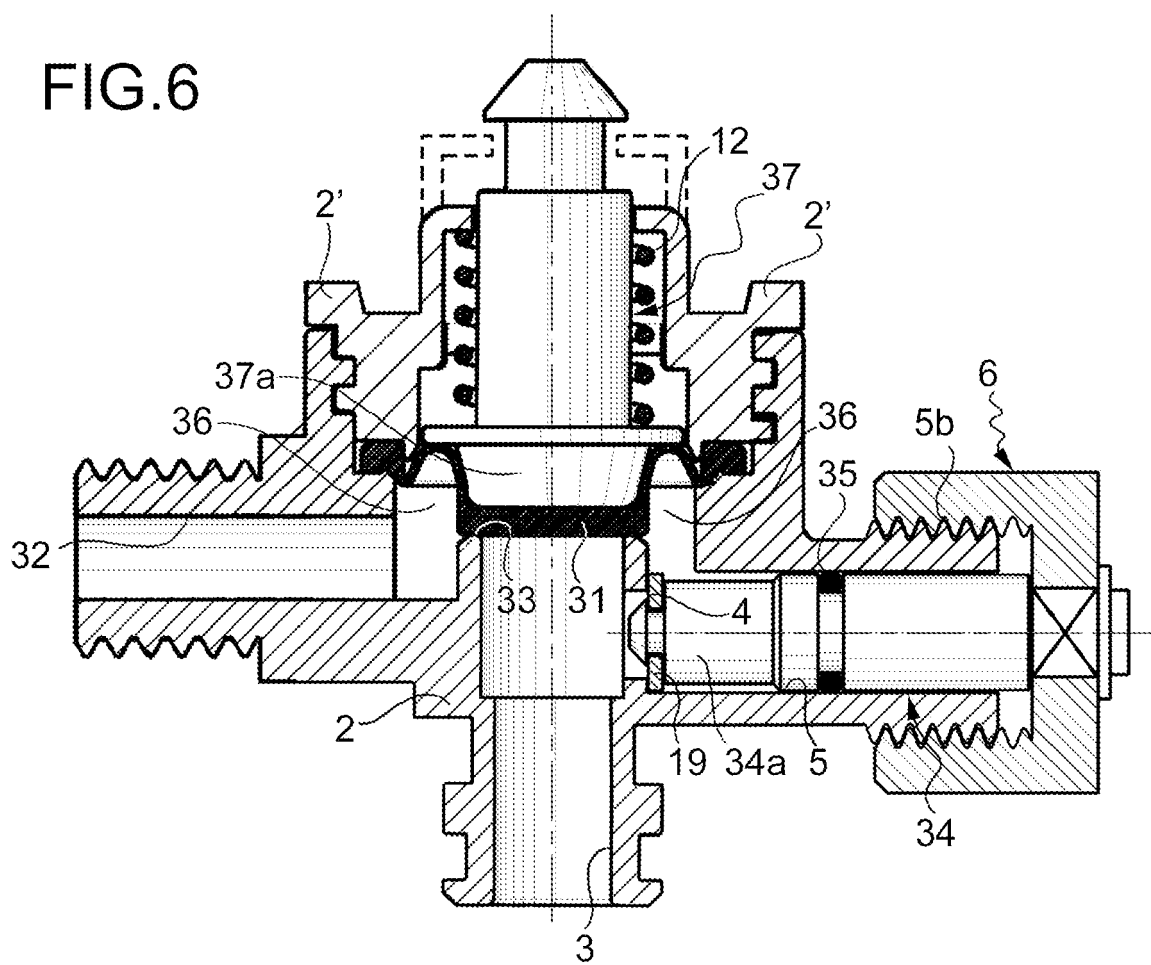


FIG.7

