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(54) **Safety electromagnetic valve with internal spring**

(57) Electromagnetic flame safety gas valve of the type that is incorporated into a housing (6) of a domestic gas supply tap, that comprises an electromagnet (2) with a core (3) and a movable armature (4) attracted by the core (3) of the electromagnet (2) when it is switched on thereby opening a valve seat (20), a valve sealing member (9) connected to said movable armature (4) in order to move it, a protective casing (10) that houses the electromagnet (2) by enclosing it and a return spring (8) of the sealing member (9) in a rest position when the valve seat is closed. The protective casing (10) is extendable axially and comprises at least one moving element (12) that is moved in conjunction with the sealing member (9) and the movable armature (4), and the return spring (8) is housed in said protective casing (10).

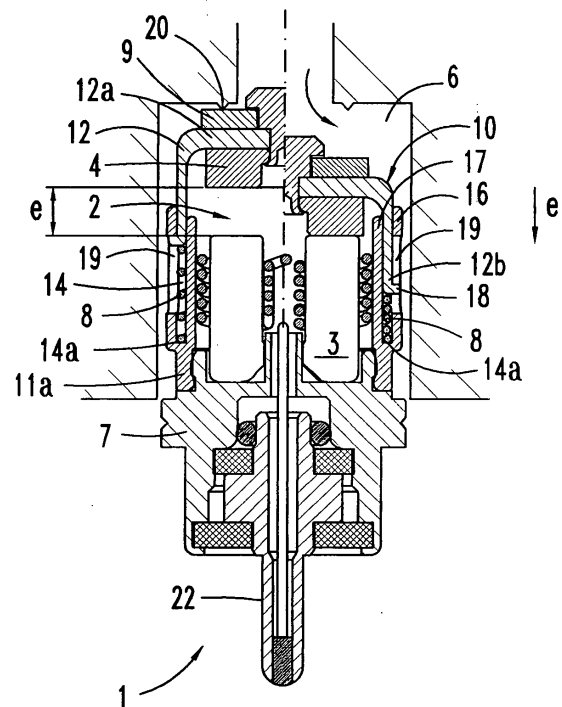


FIG. 1

Description

TECHNICAL FIELD

[0001] The present invention relates to an electromagnetic flame safety valve that is incorporated into a housing of a domestic gas tap supplying a burner.

PRIOR ART

[0002] There are known flame safety gas valves of this type that are activated by a magnetic unit supplied by a thermocouple or an external DC voltage.

[0003] EP 1036987 A (ES 2155016 A) discloses a flame safety gas valve that is incorporated into a cylindrical housing of a domestic gas supply tap that comprises an electromagnet with a core and a movable armature, a protective casing inside which is housed the electromagnet, a shaft and a valve sealing member, wherein the sealing member is fixed to the end of the shaft, both extending outside the casing, a coaxial seat supporting the core of the electromagnet onto which is fixed the protective casing and a helicoidal return spring of the sealing member surrounding the valve shaft, the closed end of the casing having a guide hole adjusted for the axial movement of the shaft. In this valve, the return spring is extended between the sealing member and the protective casing supported on the end of the casing and outside it, as a result of which the valve shaft is required to have a certain length for guiding the spring. A safety valve of this type occupies a housing in the tap of an equivalent length, which increases the volume of the body of the tap and, as a consequence, the weight of the alloy employed in the manufacture of the gas tap.

DISCLOSURE OF THE INVENTION

[0004] The object of the invention is to provide a safety gas valve adapted in its length to be housed in a gas tap body that comprises an electromagnet with a core and with a movable armature, a valve sealing member connected directly to the movable armature, a protective casing that houses the electromagnet in its interior, and a return spring housed in the protective casing for the closure of the sealing member when the electromagnet is switched off.

[0005] The objective of this invention is to reduce the length of the safety valve of the prior art in order to reduce the volume of its housing in the tap body and thus, achieve a smaller tap body volume. The safety valve according to the invention houses the return spring in the protective casing, instead of the spring being disposed between said protective casing and the sealing member as in known safety valves, and does not require, therefore, a valve shaft connecting the sealing member to the movable armature to guide the spring when said frame is moving.

[0006] For the housing of the return spring in the pro-

TECTIVE casing, in a first embodiment of the invention, the protective casing is formed by a tubular fixed element that comprises a housing for the spring and a tubular moving element that is supported on an internal end of the return spring, and may thus compress the return spring when the movable armature is attracted towards the core in the opened-valve position, or alternatively, said moving element of the casing is moved in the closed-valve direction by the effect of the force of the spring when the electromagnet is switched off. In a second embodiment, the protective casing is formed by a tubular moving element and a tubular fixed element of a flexible material, such as elastomer, which has a central part reinforced internally by the return spring, with a bag-type geometry adapted to said spring. The tubular fixed element is connected at its free end to the tubular moving element so that said tubular moving element may compress the return spring and the tubular flexible central part when the movable armature is attracted towards the core in the opened-valve position, or alternatively, said moving element of the casing is moved in the closed-valve direction by the effect of the force of the spring, when the electromagnet is switched off.

[0007] In a third embodiment, the protective casing is formed by a tubular fixed element that corresponds with a tubular wall of the metallic casing that houses in its exterior the core and a tubular moving element that is supported on an internal end of the return spring and may thus compress the return spring when the movable armature is attracted towards the core in the opened-valve position, or alternatively, said moving element of the casing is moved in the closed-valve direction by the effect of the force of the spring, when the electromagnet is switched off.

DESCRIPTION OF THE DRAWINGS

[0008]

Figure 1 is a cross-sectional view of a first embodiment of the electromagnetic safety gas valve, shown in two longitudinal halves in the two opened and closed positions of the valve.

Figure 2 is a front view of the safety gas valve of Figure 1 in the closed-valve position.

Figure 3 is a cross-sectional view of a second embodiment of the electromagnetic safety gas valve, shown in two longitudinal halves in the two opened and closed positions of the valve.

Figure 4 is a front view of the safety gas valve of Figure 3 in the closed-valve position.

Figure 5 is a cross-sectional view of a third embodiment of the electromagnetic safety gas valve, shown in two longitudinal halves in the two opened and

closed positions of the valve.

Figure 5a is a view of a detail of the electromagnetic safety gas valve of Fig. 5.

Figure 6 is a front view of the safety gas valve of Figure 5 in the closed-valve position.

DETAILED DISCLOSURE OF THE INVENTION

[0009] With reference to Figures 1-6, the electromagnetic safety valve 1 according to the invention, which is adapted to a gas tap body, comprises an electromagnet 2 with a U-shaped core 3 and a movable armature 4 attracted by the core, a sealing member 9 fixed directly to the movable armature 4 that effects a stroke "e" equivalent to the air gap of the electromagnet 2 when it is switched on to open the valve seat 20, a metallic casing 7 providing an electrical connection to the mass supporting the core 3, a protective casing 10 with a tubular shape that houses the electromagnet 2 by surrounding it, a helical-type return spring 8 for the sealing member 9, which is housed in the protective casing 10, and an electrical connector 22 that supplies the electromagnet, wherein the safety valve 1 is incorporated in a housing 6 of the tap body.

[0010] The tubular protective casing 10 comprises at least one moving element, such as a moving hood 12, and a tubular fixed element 11 surrounding the core 3. The tubular moving hood 12, made, for example, of plastic, has a free end closed by means of a closing wall 12a of the casing, this acting as a support fixed to the movable armature 4 and the sealing member 9 and moving with them in one or other axial direction.

[0011] Between them the tubular fixed element 11 and the moving hood 12 form the casing 10 that remains closed in all its positions relative to both parts 11 and 12, thereby ensuring the hermetic closure of the protective casing 10.

[0012] In a first embodiment, shown in figures 1 and 2, the tubular fixed element 11 is opened at both ends, the free end of which has a collar 11a to allow it to be fixed to the metallic casing 7.

[0013] The fixed element 11 forms a concentric circular channel 14 delimited by a cylindrical interior wall 17 and a cylindrical exterior wall 16, through which the return spring 8 is guided and supported on. The end of the moving hood 12b is connected to the fixed element 11 of the casing 10 in the hole between the exterior wall 16 and the interior wall 17 so that it slides on them easily when the movable armature 4 is attracted towards the core 3.

[0014] The moving hood 12 is supported and presses on one end of the spring 8 when it is driven by the movable armature 4 attracted towards the core 3, thereby compressing said spring 8. In the opposite direction, the spring 8 is extended to drive the moving hood 12 in order to close the sealing member 9. The moving hood 12 comprises on its opened end 12b a plurality of projecting ra-

dial flanges 18 that are inserted into corresponding windows 19 opened on said exterior wall 16 of the casing.

[0015] With reference to Figure 1, when the electromagnet 2 is switched off and the spring 8 extended, the sealing member 9 closes the valve seat 20. The spring 8 is guided on said circular channel 14, prestressed against the bottom of the circular channel 14 in the fixed casing element 11 by the radial flanges 18 of the moving hood 12. In this rest position the movable armature 4 is separated from the core 3 of the electromagnet 2 leaving an air gap "e". The moving hood 12 occupies an extended rest position with the radial flanges 18 abutting against the windows 19 in the tubular fixed element 11, so that in said rest position, the valve seat 20 remains closed.

[0016] Also shown in Figure 1, with the electromagnet 2 being switched on when the valve is opened, the movable armature 4 is attracted towards the core 3 of the electromagnet 2, thereby overcoming the resistance of the return spring 8, so that the moving casing 12 is moved towards the core 3 by a stroke "e" through the circular channel 14 of the casing, thereby compressing the return spring 8. In a specific embodiment of the electromagnetic safety valve 1, said stroke "e" is approximately 1 mm.

[0017] In a second embodiment, shown in Figures 3 and 4, the tubular fixed element 11 is made of a material such as elastomer, and has a bag-type flexible central part 30, reinforced internally by the return spring 8 and with a geometry adapted to said spring 8. The tubular fixed element 11 of the casing 10 is opened at both ends, the free end 15 of which has a collar 11a allowing it to be fixed to the metallic casing 7, and the other end comprises an interior radial flange 33. The moving hood 12 comprises on the exterior wall of the opened end 12b a radial groove 31 in which the interior radial flange 33 is inserted so that the fixed element 11 and the mobile element 12 integrated into the protective casing 10 are solidly connected. When the electromagnet 2 is switched off and the spring 8 extended, the sealing member 9 closes the valve seat 20, the movable armature 4 is separated from the core 3 of the electromagnet 2 leaving an air gap "e", and the protective casing 10 occupies an extended rest position. When the electromagnet 2 is switched on in the opened-valve position, the movable armature 4 is attracted towards the core 3 of the electromagnet 2, thereby overcoming the resistance of the spring 8, so that the moving hood 12 is moved towards the core 3 by a stroke "e", while the spring 8 and the flexible central part 30 of the fixed element 11 are compressed. In a specific embodiment of the electromagnetic safety valve 1, said stroke "e" is approximately 1 mm.

[0018] In a third embodiment, shown in Figures 5, 5a and 6, the protective casing 10 comprises the moving hood 12, the free end 12b of which has an interior radial flange 43, and a fixed element 11 that corresponds with a tubular wall of the casing 7, which houses and encloses the electromagnet 2, surrounding it. The metallic casing 7 comprises a ring-shaped base 41 upon which is supported one of the ends of the spring 8, said tubular wall

11 being concentric to the ring-shaped base 41. The tubular wall 11 guides the spring 8 internally and has on its free end an exterior radial flange 42. The exterior radial flange 42 is inserted into the interior radial flange 43, said interior radial flange 43 being locked in place by its complementary exterior flange 42. In this way the tubular wall 11 of the casing 7 and the moving hood 12 are connected together to form the protective casing 10 that remains closed in all its positions relative to both parts 11 and 12, thereby ensuring the hermetic closure of the protective casing 10. The interior radial flange 43 has a ring-shaped exterior surface 43a that is supported on the spring 8. The spring 8 is housed on the exterior of the tubular wall 11 of the casing 7, prestressed against the ring-shaped base 41 of said casing 7 and with one of its ends positioned in a housing 45 delimited by the tubular wall 11, the ring-shaped surface 43a of the moving hood 12 and a peripheral radial tab 44 formed on the end 12b of said moving hood 12. When the electromagnet 2 is switched off and the spring 8 extended, the sealing member 9 closes the valve seat 20. The spring 8 is guided on the tubular wall 11 of the casing 7, prestressed against the ring-shaped base 41 of the casing 7. In this rest position, the movable armature 4 is separated from the core 3 of the electromagnet 2 leaving an air gap "e". The moving hood 12 occupies an extended rest position with the exterior radial flanges 42 of the tubular wall 11 abutting against the interior radial flanges 43 of the moving hood 12, so that in said rest position, the valve seat 20 remains closed. When the electromagnet 2 is switched on in the opened-valve position, the movable armature 4 is attracted towards the core 3 of the electromagnet 2, thereby overcoming the resistance of the spring 8, so that the moving hood 12 is moved towards the core 3 by a stroke "e", thereby compressing the spring 8.

[0019] Other embodiments of the protective casing are covered by the invention, although they are not shown in the drawings, all of them of an electromagnetic safety valve such as the one described here, wherein the sealing member 9 and the movable armature 4 of the electromagnet are directly connected together, without the use of an intermediate shaft as a guide for the return spring 8, which is disposed, therefore, in the protective casing 10, for the purposes of reducing the total length of the magnetic unit 2, 7, 9, 10.

Claims

1. Electromagnetic flame safety gas valve of the type that is incorporated into a housing (6) of a domestic gas supply tap, which comprises an electromagnet (2) with a core (3) and a movable armature (4) attracted by the core (3) of the electromagnet (2) when it is switched on, thereby opening a valve seat (20), a valve sealing member (9) connected to said movable armature (4) in order to move it, a protective casing (10) that houses the electromagnet (2) by en-

closing it, and a return spring (8) for returning the sealing member (9) to a rest position when the valve seat is closed, **characterised in that** the protective casing (10) is extendable axially and comprises at least one moving element (12) that is moved in conjunction with the sealing member (9) and the movable armature (4), the return spring (8) being housed in said protective casing (10).

2. Safety gas valve according to claim 1, wherein the spring (8) is of the helicoidal-compression type, the protective casing (10) comprises a tubular fixed element (11), and the moving element (12), which is hood-shaped, comprises a closing wall (12a) that directly connects the sealing member (9) with the movable armature (4), said moving element (12) exerting pressure on the spring (8) in order to move it in conjunction with the sealing member (9) when the electromagnet (2) is switched on.
3. Safety gas valve according to claim 2, wherein the tubular fixed element (11) and the moving element (12) are connected together to form the protective casing (10) that remains closed in all its positions relative to both parts (11, 12).
4. Safety gas valve according to claims 2 or 3, wherein the moving element (12) of the protective casing (10) effects a movement equivalent to the air gap "e" of the movable armature (4) in order to open the valve.
5. Safety gas valve according to any of claims 2 to 4, wherein the tubular fixed element (11) comprises a circular guide channel (14) in which the spring (8) is housed, and the moving element (12) is supported on the spring (8) in order to move it in conjunction with the sealing member (9) to compress the spring (8) when the electromagnet (2) is switched on.
6. Safety gas valve according to claim 5, wherein said concentric circular channel (14) is formed between a cylindrical exterior wall (16) and a cylindrical interior wall (17), both of them concentric, of the tubular fixed element (11) of the casing, and have a support base (14a) on the end of the spring (8).
7. Safety gas valve according to claim 6, wherein the moving element (12) is guided by the exterior wall (16) and the interior wall (17) of the casing that forms said circular channel (14), the cylindrical exterior wall (16) has a plurality of open windows (19) for guidance and the movement abutment of the moving element (12) in its stroke "e", and the moving element (12) has a plurality of radial flanges (18) on its open end (12a) inserted into the guide and abutment windows (19).
8. Safety gas valve according to any of claims 2 to 4,

wherein the tubular fixed element (11) is flexible and has a central part (30) reinforced internally by the spring (8), and which has a bag-type geometry adapted to said spring (8) .

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9. Safety gas valve according to claim 8, wherein at least the central part (30) is made of an elastomer.

10. Safety gas valve according to any of claims 8 or 9, wherein the tubular fixed element (11) comprises on a free end, an interior radial flange (33) that is inserted into a radial groove (31) on the open end (12b) of the moving element (12) of the casing (10).

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11. Safety gas valve according to any of claims 2 to 4, wherein the fixed element (11) is a tubular wall of the metallic casing (7), which houses and encloses the electromagnet (2) and guides the spring (8) internally.

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12. Safety gas valve according to claim 11, wherein the tubular wall (11) of the casing (7) has an exterior radial flange (42) on its free end that is inserted into an interior radial flange (43) of the moving element (12), both radial flanges (42,43) being complementary.

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13. Safety gas valve according to claim 12, wherein the spring (8) is housed on the exterior of the tubular wall (11) of the casing (7), prestressed against a ring-shaped base (41) of said casing (7) and a housing (45) delimited by the tubular wall (11), a ring-shaped exterior surface (43a) of the interior radial flange (43), and a peripheral radial tab (44) formed on the end (12b) of the moving element (12).

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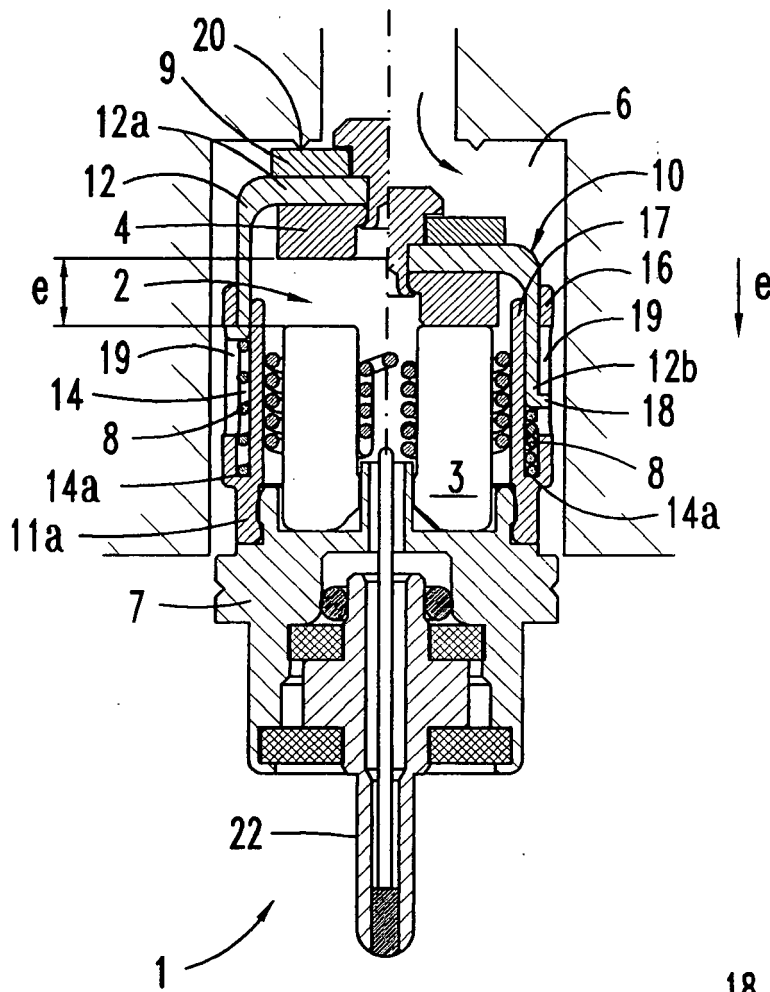


FIG. 1

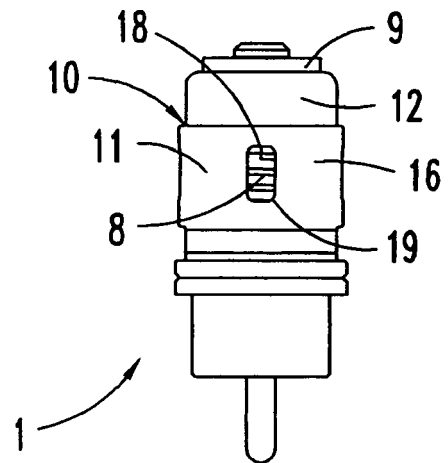


FIG. 2

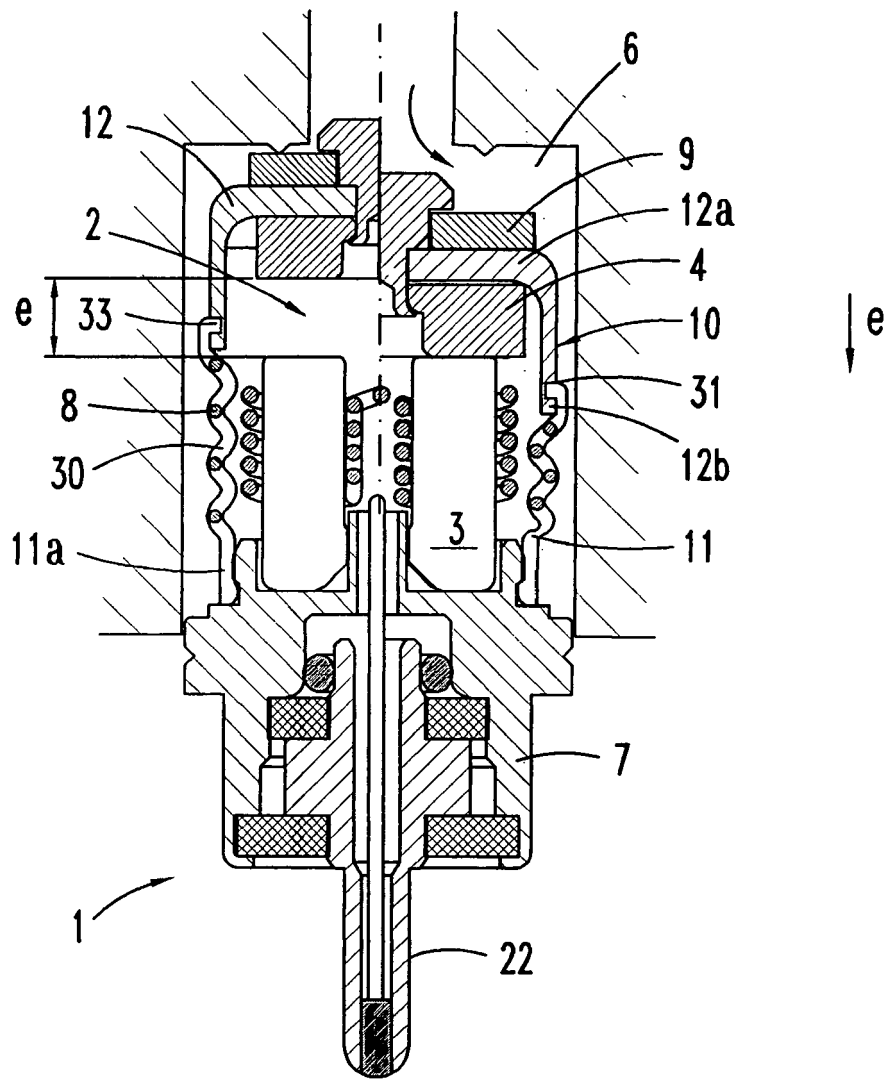


FIG. 3

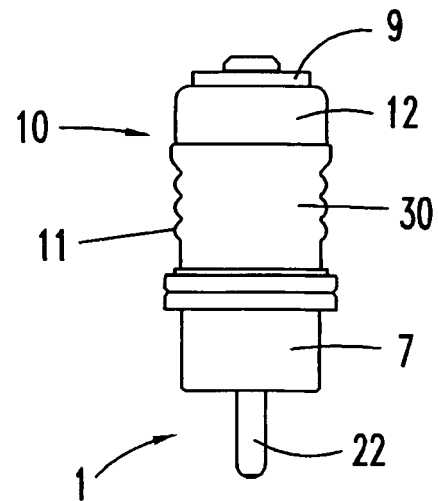


FIG. 4

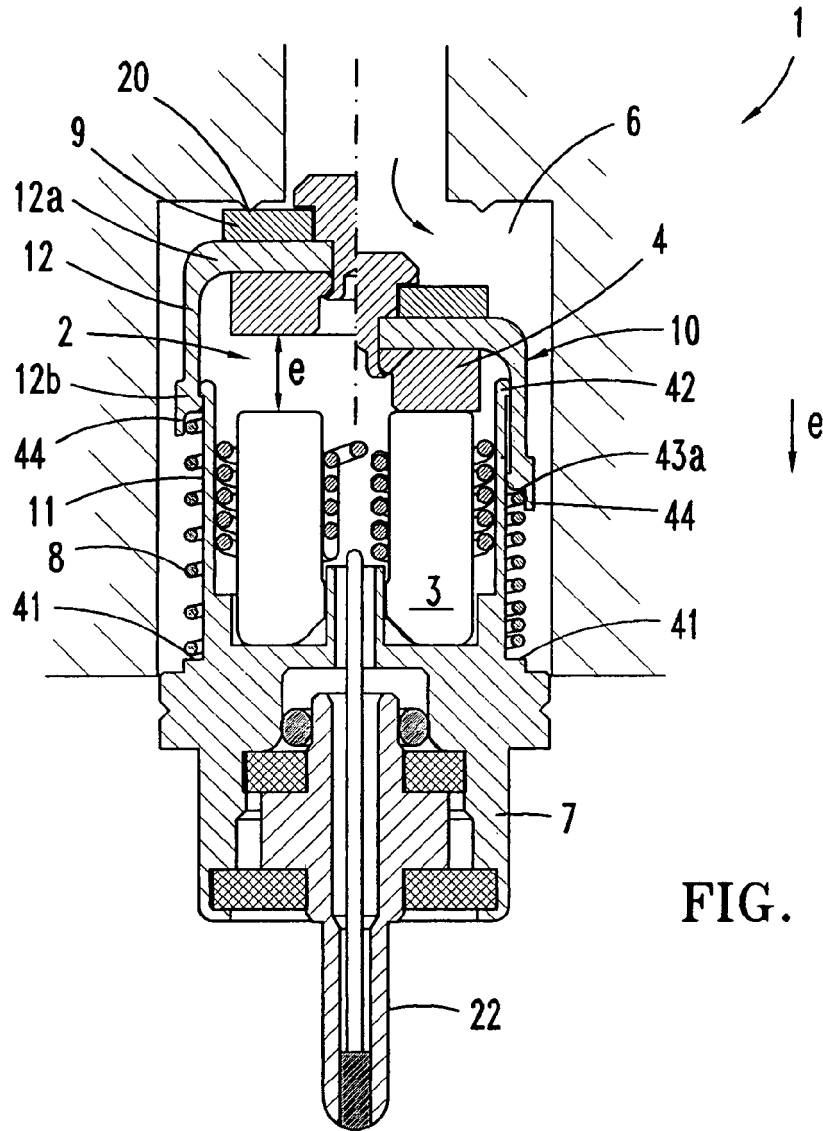


FIG. 5

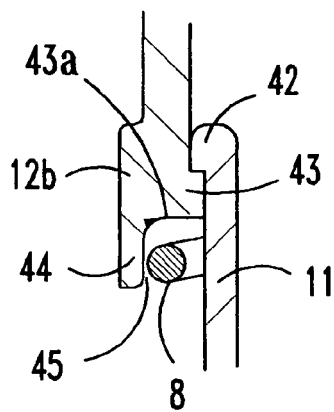


FIG. 5a

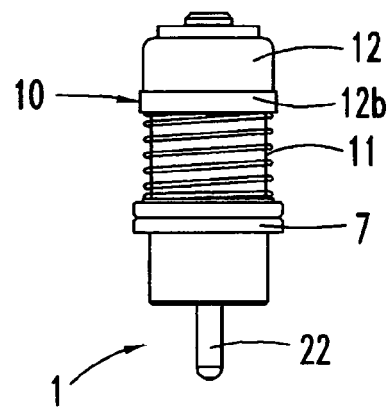


FIG. 6

REFERENCES CITED IN THE DESCRIPTION

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