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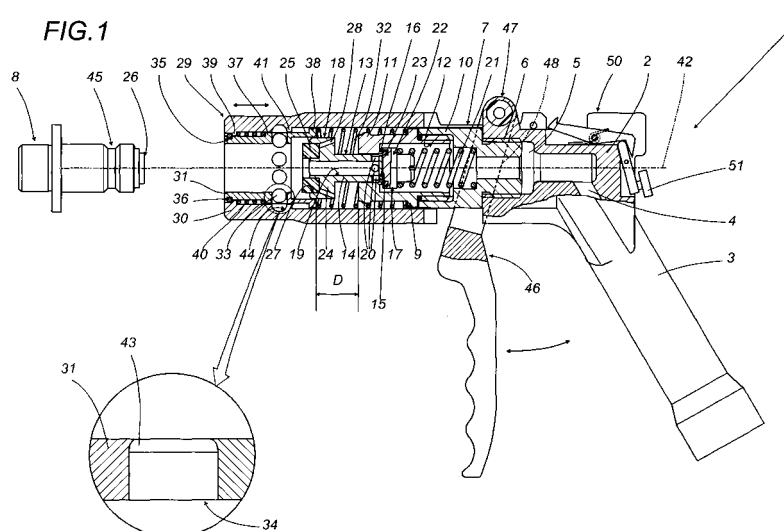
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(54) **Pistol for dispensing gaseous fuel**

(57) Pistol (1; 100) for dispensing gaseous fuel comprising: a body (2); a grip (3) internally provided with a conduit (4) for the passage of gaseous fuel towards a respective tank; a chamber (5) positioned internally to the body (2) communicating with said conduit (4); a dispensing head (7; 70) associated to said body (2), interiorly provided with a cavity (12) communicating with said chamber (5), said head (7; 70) being able to couple with a corresponding filler pipe (8; 80) for the injection of the gaseous fuel; shutter mans (13; 68, 69) movable following the insertion of the pistol (1;100) on the filler pipe (8; 80), between a first position and a second po-

sition; the first position corresponding to an operative condition wherein the fuel is dispensed, and the second position corresponding to an operative condition wherein the dispensing of fuel is impeded; a coupling device (29; 77) to maintain said dispensing head (7; 70) in position on said filler pipe (8; 80), the coupling device (29; 77) comprising a plurality of spheres (33; 72) positioned on a circumference and movable between two positions, so that in one position they allow the free insertion of the filler pipe (8; 80), and in the other position they do not allow the insertion and extraction of the filler pipe (8; 80).



Description

[0001] The present invention relates to a pistol for dispensing gaseous fluid, in particular gaseous fuel for motor vehicles.

[0002] Pistols for dispensing gaseous fuel for motor vehicles are known, provided with conduit for the passage of the fuel, which is dispensed through a dispensing head able to couple with a corresponding filler pipe for the injection of the fuel, provided on the motor vehicle. The dispensing head is provided with a coupling device able to maintain said dispensing head in position on said filler pipe.

[0003] Modifications are presently ongoing on the filler pipes for the inflow of the gaseous fuel which are found on the vehicle, such modifications having the purpose of making the connection safer and of unifying the tank attachment fitting in different Nations. The coupling devices currently available for the new types of unified attachment fitting, however, have rather difficult and inconvenient activation.

[0004] The present invention relates to a fuel dispensing pistol comprising a coupling device for the new filler pipes which is easy and convenient to activate. The dispensing pistol further comprises at its exterior a lever for activating the coupling device and in its interior shutter means which allow to dispense the gaseous fuel when the pistol is coupled to the tank filler pipe.

[0005] The shutter means of the pistol according to the present invention comprise devices and are realised to prevent or in any case minimise the release of the gaseous fuel into the environment during the fuelling operation.

[0006] The coupling device of the pistol comprises a plurality of locking elements, a sleeve associated with the blocking elements, and able to slide between a non operative position, wherein the locking elements are free and allow the insertion of the pistol on the filler pipe, and an operative position wherein said locking elements are locked and do not allow the insertion and extraction of the pistol onto and from said filler pipe.

[0007] The technical features of the invention and its advantages shall be made more readily apparent in the detailed description that follows, made with reference to the accompanying drawings, which represent an embodiment provided purely by way of non limiting example, wherein:

- Figure 1 shows a dispensing pistol constituting the subject of the present invention in section view and a fuel filler pipe of a motor vehicle;
- Figure 2 shows the pistol of Figure 1 in a partial side view;
- Figures 3, 4 and 5 shows an enlarged part of a pistol according to a variation of the one in Figure 1, and the respective filler pipe of a motor vehicle, the pistol being shown in successive phases during the insertion of the dispensing head on the filler pipe;

- Figure 6 shows a dispensing pistol according to another variation of the one in Figure 1, shown in section view, in coupled condition on a respective fuel filler pipe of a motor vehicle; and

- 5 - Figure 7 shows a variation of a detail of the dispensing head of Figure 3. In accordance with the figures of the accompanying drawings, the number 1 indicates a pistol for dispensing gaseous fluid, in particular gaseous fuel for motor vehicles, provided with a body 2 having a grip 3 in whose interior a fuel supply conduit 4 is obtained. The conduit 4 terminates at one of its extremities with a suitable attachment for an inflow pipe from a device for dispensing the gaseous fuel (not shown herein).

[0008] At the other extremity, the conduit 4 communicates with a chamber 5 obtained internally to the body 2 and provided with a threaded seat 6, wherein is screwed a dispensing head 7, destined to be coupled with a filler pipe 8 provided on the motor vehicle (not shown herein) to be supplied with the gaseous fuel.

[0009] The head 7 comprises a body 9, realised in two parts: a first part 10 and a second part 11. The body 9 internally comprises a cavity 12, which communicates, at an extremity of the body 9, with the chamber 5. In the opposite extremity, where the second part 11 is located, shutter means 13 are present, essentially constituted by a piston element 14, which allow the gaseous fuel to be dispensed when the pistol is coupled to the filler pipe 8.

[0010] The second part 11 presents a hole 15 surrounded by an annular ledge 16; within the hole 15 slides with little play the piston element 14. The body 9 is divided into the two parts 10 and 11 in such a way as to allow the insertion of the piston element 14 into the cavity 12.

[0011] The piston element 14 presents a first extremity 17 inserted in the body 9 inside the cavity 12, and a second extremity 18, projecting from the body 9, destined to be coupled to the filler pipe 8, which in turn is connected with a conduit for the injection of the fuel in the tank (not shown herein) of the motor vehicle. The element 14 further presents a blind axial hole 19 and a plurality of radial holes 20 (for instance four) located in the first extremity 17 and communicating with the axial hole 19.

[0012] The piston element 14 can slide in the hole 15 between two extreme positions: a first position wherein it is extracted with respect to the second part 11 of the body 9, and a second position wherein it is retracted. A spring 21 tends to maintain the piston element 14 in the first extracted position.

[0013] When the piston element 14 is retracted, the radial holes 20 are in communication with the cavity 12 and allow the passage of the gas from the cavity 12, and hence also from the chamber 5, through the axial hole 19 to the filler pipe 8. When instead the piston element 14 is extracted, the radial holes 20 are shut by the wall

of the hole 15 not allowing the passage of the gas.

[0014] The first extremity 17 of the piston element 14 comprises a first mushroom head 22, which can be separable and, for instance, is connected by means of a threaded coupling to the central part of the piston element 14 in such a way as to allow the insertion of the piston element 14 into the hole 15.

[0015] The mushroom head 22 co-operates, for preventing the release of the gaseous fuel, with the annular ledge 16 that surrounds the hole 15, and for this purpose it is provided with a sealing gasket 23 oriented towards the annular ledge 16. The head 22 has a tendency to be thrust against the annular ledge 16 by the spring 21, so that the gasket 23, which is relatively yielding, by deforming on the annular ledge 16, and in part also around it, guarantees the perfect seal, thereby preventing the gaseous fuel from leaking out when the piston 1 is in non operative conditions. Also the pressure of the gaseous fuel present in the cavity 12 favours the maintenance of the head 22 against the annular ledge 16.

[0016] The second extremity 18 of the element 14 comprises a second mushroom head 24 which can be realised in a single piece with the central part of the element 14. The second mushroom head 24 is provided with a gasket 25, also relatively yielding, able to guarantee a hermetically sealed coupling between the element 14 and the filler pipe 8 of the motor vehicle tank. In particular, the gasket is destined to co-operate with an annular ledge 26 with which the filler pipe 8 is provided. The gasket 25 presents an inner diameter that is substantially similar to the inner diameter of the annular ledge 26 and a greater annular width than that of the annular ledge 26. Hence, the gasket 25, being compressed on a smaller annular surface, is deformed in such a way as to encompass the ledge 26 also laterally. Thus, gas tightness is assured even if the filler pipe 8 is not aligned with the head 7.

[0017] The gasket 25 is housed in a seat 27, obtained in the second mushroom head 24. Some holes 28 are positioned on the bottom wall of the seat 27, i.e. in contact with the side of the gasket 25 opposite to the one destined to bear down on the filler pipe 8. The function of the holes 28 shall be clarified subsequently in the course of the explanation of the operation of the pistol and of the fuel dispensing phases.

[0018] The pistol 1 is also provided with a coupling device 29 to maintain the pistol 1, and in particular the head 7, coupled to the filler pipe 8. The coupling device 29 comprises a sleeve 30 inserted to slide on tubular element 31 and on the head 7. The tubular element 31 is on the same axis as the head 7 and is separated therefrom for a segment D. The tubular element 31 is maintained away from the head 7 by a spring 32.

[0019] The tubular element 31 presents in the inner surface a series of spheres 33 positioned in appropriate seats 34 along a circumference of the inner lateral surface of the tubular element 31. The spheres 33 serve to lock the piston 1 on the filler pipe 8, when the piston 1

is inserted for dispensing the gaseous fuel.

[0020] The outer lateral surface of the tubular element 31 presents a seat 35, whereinto is inserted an elastic ring 36, a first ledge 37 and a second ledge 38. The elastic ring 36 serves as a first limit stop for the sleeve 30, which presents in correspondence and internally a first annular rib 39. The latter and the first ledge 37 constitute the bearing extremities for a spring 40, inserted between the tubular element 31 and the sleeve 30. The spring 40 acts in such a way as to maintain the sleeve 30, with its rib 39, set against the elastic ring 36.

[0021] The second ledge 38 co-operates with a second annular rib 41 positioned internally to the sleeve 30, constituting a second limit stop for the sleeve 30. The sleeve 30 is therefore movable in the axial direction between a first ledge, constituted by the elastic ring 36, and the second ledge 38.

[0022] As shown in Figures 1 and from 3 to 5, the seats 34 traverse the wall of the tubular element 31 and are realised in such a way as to allow the spheres 33 to project with respect to the inner surface of the tubular element 31 for a certain segment in radial direction towards the axis 42. In the part 43, oriented towards the axis 42, the seats 34 present a slightly lesser diameter than the diameter of the spheres 33, so that the spheres 33 cannot exit the seat 34, in the direction towards the interior of the tubular element 31, while they can exit in the other direction to allow their introduction in the seats 34.

[0023] Preferably, as shown in the detail of Figure 1, the part 43 is shaped as a spherical sector with decreasing diameter. With respect to the truncated cone shape, this shape presents the advantage of not having the tendency to block the spheres 33 in the seats 34 when the spheres are completely encased in the seat 34, i.e. projecting towards the axis 42.

[0024] The sleeve 30, on its own inner surface and in correspondence with the spheres 33, presents an annular slot 44. As Figure 4 shows, during the insertion of the pistol 1 on the filler pipe 8, the spheres 33 enter the seats 34 to allow the passage of the filler pipe 8 inside the tubular element 31. The filler pipe 8 has a diameter that is only slightly lesser than the inner diameter of the tubular pipe 31. The spheres 33, having a greater diameter than the thickness of the tubular element 31, in part also enter the annular slot 44.

[0025] The filler pipe 8 presents an outer annular seat 45, within which the spheres 33 can be inserted, when the pistol 1 must be locked onto the filler pipe 8 itself. The annular seat 45 is so positioned as to face the spheres 33 when the filler pipe 8 is set against the tubular element 31. By axially moving the sleeve 30, the spheres 33 can no longer enter the annular slot 44.

[0026] The spheres 33 not being aligned with the annular slot 44 itself, are held in the annular seat 45 of the filler pipe 8, thereby locking the latter with the pistol 1.

[0027] As shown in Figure 2, the sleeve 30 can be axially displaced by a lever 46 able to rotate about a hinge

47 obtained in the body 2. The lever 46 is provided with a fork 48 which co-operates with appropriate seats 49 obtained in the outer part of the sleeve 30.

[0028] Hence the sleeve 30 is able to slide with respect to the tubular element 31, between a non operative positions (Figures 1 and 3), wherein the spheres 33 can freely enter the annular slot 44 and an operative position (Figure 5) wherein said spheres 33 are locked on a lesser diameter by the inner wall of the sleeve 30.

[0029] In the non operative position of Figure 3, the sleeve 30 is set against the elastic ring 36, and in the operative position of Figure 5 the sleeve 30 bears on the second ledge 38. In this latter operative condition, the tubular element 31 is approached to the head 7, so that the spring 32 is compressed.

[0030] The pistol 1 is further provided with locking and unlocking means 50 for stabilising the sleeve 31 in the operative position and subsequently allowing its release by means of the release push-button 51. The locking and unlocking means 50 are of a known type and therefore are not described in detail herein.

[0031] In use, with reference to Figures 1 and from 3 to 5, when the pistol 1 is inserted on the filler pipe 8, the sleeve 30 is in the aforesaid non operative position, wherein the spheres 33 are able to enter the seats 34 and allow the passage of the filler pipe 8 within the tubular sleeve 31, the piston element 14 being thrust by the spring 21 to bear on the ledge 16.

[0032] After the pistol 1 is inserted on the filler pipe 8, and the sleeve 30 is brought to bear against it, the spheres 33 are aligned with the annular seat 45 of the filler pipe 8 (see Figure 4).

[0033] Subsequently when the lever 46 is moved towards the grip 3, the fork 48 starts to move the sleeve 30 towards the grip 2 so that the spheres 33 are forced to enter into the seat 45 of the filler pipe 8 and remain therein, preventing any further movement of the tubular element 31 with respect to the filler pipe 8.

[0034] When the lever 46 continues to be moved towards the grip 3, the head 7 slides forward (i.e. leftwards with reference to Figures 3-5), with respect to the tubular element 31 and to the piston element 14.

[0035] The latter, bearing with the mushroom head 24 and the gasket 25 on the edge 26 of the filler pipe 8, cannot move, thus the head 7 (or more precisely the part 11 of the body 9) progressively opens the holes 20 of the piston element 14 placing the conduit 4 for supplying the gaseous fuel in communication with the tank of the motor vehicle to be refuelled, through the chamber 5 of the body 2, the cavity 12 of the head 7, the radial holes 20 and the axial hole 19 of the piston element 14 (see Figure 5).

[0036] When the lever 46 reaches the stop, the means 50 lock the sleeve 30 in the operative position.

[0037] To extract the pistol 1 from the filler pipe 8, it is sufficient to exert a modest pressure on the release push-button 51, disengaging the means 50 and thereby freeing the sleeve 30. The latter is returned by the spring

32 to the non operative position, allowing the spheres 33 to return into the annular slot 44, and allowing the extraction of the pistol 1 from the filler pipe 8 itself.

[0038] During the operation of extracting the pistol, especially if it is performed with a rapid movement, the gasket 25 is temporarily unloaded by the pressing action of the piston element 14. Hence it is possible that gasket 25, remaining adherent to the annular ledge 26 of the filler pipe 8, becomes detached from its seat 27. The detachment action is favoured by the pressure of the gaseous fuel which seeps between the seat 27 and the gasket 25 thereby realising an ejection action of the gasket 25 itself. To prevent this drawback, some holes 28 are provided on the bottom of the seat 27. The holes 28 allow to unload the pressure of the gaseous fuel which may have seeped behind the gasket 25.

[0039] It should be noted that the sequence of operations for inserting the pistol 1 on the filler pipe 8 is such as to minimise the release of the gaseous fuel into the environment.

[0040] At first the pistol 1 is locked on the filler pipe 8 and only afterwards does the head 7, moving relatively to the piston element 14, allow the passage of the gaseous fuel.

[0041] Moreover, before the opening phase of the passage for the gaseous fuel, the gasket 25 is already bearing on the annular ledge of the filler pipe 8, being pressed by the spring 21, and therefore the gaseous fuel cannot be released into the environment, but only enter the tank to be filled.

[0042] In the embodiment illustrated in Figure 1, the filler pipe 8 is provided with a valve, not shown because it is of a known type, which opens automatically with the difference between the pressure of the tank to be filled and the pressure of the device for dispensing the gaseous fuel.

[0043] According to an alternative embodiment, illustrated in Figures 3 through 5, the second mushroom head 24 comprises means 52 for opening a valve 53 with which the filler pipe 8 can be provided. In this filler pipe 8, the valve 53 is not automatic, but must be opened in a "positive" manner by appropriate means (namely, the means 52), the difference in pressure between the tank and the dispensing device not being sufficient.

[0044] The means 52 comprise a thrust pivot pin 54 positioned along the axis 42. The pin 54 is connected to a disk 55 which is inserted, for instance by means of a threaded coupling 56, in the part of the head 24 oriented towards the filler pipe 8. The disk 55 presents holes 57 for allowing the passage of the gaseous fuel.

[0045] The pivot pin 54 is made in such a manner as to open the valve 53 when the pistol 1 is inserted on the filler pipe 8. The valve 53 comprises a sphere 58 pressed by a spring 59 in such a way as to close the passage of the filler pipe 8. The spring 59 develops a force, lesser than that developed by the spring 21, so that the pivot pin 54 presses on the valve 53 and opens it.

[0046] According to another embodiment illustrated in Figure 7, the pivot pin 54 is able to slide with respect to the disk 55, which for this purpose presents a seat 60. The pivot pin 54 in turn comprises a mushroom valve 61, fitted with a disk 62 pressed by a spring 63. The disk 62 presents a truncated cone shaped surface 64 which couples with a corresponding truncated cone shaped seat 65. The spring 63 develops a force whose intensity is comparable to that of the spring 59, so that the spring 53 and the mushroom valve 61 open nearly simultaneously.

[0047] The mushroom valve 61 therefore guarantees a further safety to prevent the release of the gaseous fuel into the environment.

[0048] Figure 6 shows a pistol 100, variation of the pistol 1 of the previous embodiments, and a filler pipe 80 slightly modified with respect to the filler pipe 8 of the previous embodiments.

[0049] In this case, the pistol 100 is fitted with a head 70, which is in turn fitted with shutter means 66 comprising a ball valve 67. The ball valve 67 is similar to the valve 53 and comprises a ball 68 and a spring 69.

[0050] Also in accordance with this embodiment, the spring 69 develops a force whose intensity is comparable to that of the spring 59, so that the valve 53 on the filler pipe 80 and the ball valve 66 open nearly simultaneously, preventing any release of gaseous fuel into the environment. The head 70 comprises a section 71 able to couple with the filler pipe 80 and a series of spheres 72 housed in seats 73 positioned according to a circumference. The seats 73 are identical to the seats 34 of the embodiment of Figure 1.

[0051] On the outer part of the seats 73 is present a sleeve 74 which is activated by the lever 46 as shown in the embodiment of Figure 2. The sleeve 74, the section 71, the spheres 72 and the related seats constitute the coupling device 77 for the pistol 100 on the filler pipe 80.

[0052] Unlike the previous embodiments, the pistol 100 is in an uncoupled condition, with the possibility of its insertion on the filler pipe 80, when the lever 46 is pulled and the sleeve 74 presents an annular slot 75 aligned with the spheres 72. Subsequently, when the lever 46 is released the sleeve 74 advances towards the filler pipe 80 actuated by a spring 76. The annular slot 75 is therefore no longer aligned with the spheres 72, which thus lock the pistol 100 on the filler pipe 80. The pistol 100 therefore does not include the locking and unlocking means 50.

[0053] The sphere 58 of the filler pipe 80 and the sphere 68 of the pistol 100 are in equilibrium under the action of the respective springs 59 and 69 and thus allow the passage and dispensing of the fuel.

ing: a body (2), a grip (3) internally provided with a conduit (4) for the passage of gaseous fuel towards a respective tank; a chamber (5) positioned internally to the body (2) communicating with said conduit (4); a dispensing head (7; 70) associated to said body (2), internally provided with a cavity (12) communicating with said chamber (5), said head (7; 70) being able to couple with a corresponding filler pipe (8; 80) for injecting the gaseous fuel; a coupling device (29; 77) to maintain said dispensing head (7; 70) in position on said filler pipe (8; 80), said coupling device (29; 77) being movable between a first non operative position and a second operative position, a lever (46) being provided and able to move the coupling device (29; 77) at least from said non operative position to said operative position, locking and unlocking means (50) being provided and able to stabilise said coupling device (29; 77) in said operative position, characterised in that the coupling device (29; 77) comprises a plurality of locking elements (33; 72), a sleeve (30; 74) associated to the locking elements (33; 72) and able to slide between a non operative position, wherein the locking elements (33; 72) are free and allow the insertion of the pistol (1; 100) on the filler pipe (8; 80), and an operative position wherein said locking element (33; 72) are locked and do not allow the insertion and the extraction of the pistol (1; 100) on and from said filler pipe (8; 80).

2. Pistol according to claim 1, characterised in that the head (7; 70) comprises shutter means (13; 68, 69) which allow to dispense the gaseous fuel when the coupling device (29; 77) is in operative condition, and prevent the dispensing of the gaseous fuel when the coupling device (29; 77) is in non operative condition.
3. Pistol according to claim 2, characterised in that the shutter means (13; 68, 69) comprise an element (14; 68) able to move, following the insertion of the pistol (1; 100) on the filler pipe (8; 80), between a first position and a second position; the first position corresponding to said operative condition for dispensing the fuel, and the second position corresponding to said operative condition wherein the dispensing of the fuel is impeded.
4. Pistol according to claims 2 or 3, characterised in that the shutter means (13; 68, 69) are positioned at an extremity of the head (7; 70) and comprise a shutter (14; 68) able to open a passage (19, 20; 68, 70), in said extremity, to place the chamber (5) and the cavity (12) in communication with the filler pipe (8; 80).
5. Pistol according to claim 1, characterised in that the coupling device (29) comprises a tubular element

Claims

1. Pistol (1; 100) for dispensing gaseous fuel compris-

(31; 74) able to receive the filler pipe (8; 80) and provided with seats (34; 73) positioned along a circumference of its own inner lateral surface and in that the locking elements of the coupling device (29; 77) are spheres (33; 72) housed in said seats (34; 73). 5

6. Pistol according to claim 5, characterised in that the sleeve (30; 74) associated to the locking elements (33; 72) comprises an annular slot (44; 75) able radially to move the locking elements (33; 72) following an axial displacement of said sleeve (30; 74). 10

7. Pistol according to claim 5, characterised in that the seats (34; 73) comprise a part (43) in the form of spherical sector in proximity to the inner lateral surface of the tubular element (31; 74). 15

8. Pistol according to one of the claims from 2 to 4, characterised in that the shutter is a piston element (14) comprising a first and a second mushroom head (22, 24) fitted with gaskets (23, 25) and in that the second mushroom head (24) comprises a seat (27) for the gasket (25) provided with through holes (28). 20 25

9. Pistol according to one of the claims 2, 3, 4 or 8, characterised in that the piston element (14) comprises holes (19, 20) for allowing the passage of the gaseous fuel during the dispensing operation and in that said piston element (14) is maintained in position wherein it closes said holes (19, 20) by thrusting elements (21). 30

10. Pistol according to one of the claims 2, 3, 4, 8 or 9, characterised in that the piston element (14) comprises a pivot pin (54) able to open a valve (53) which may be positioned in the filler pipe (8), when the pistol is in dispensing condition. 35 40

11. Pistol according to claim 10, characterised in that the piston element (14) comprises a valve (61) associated to the pivot pin (54) and able to open, following the insertion movement of the pistol (1) on the filler pipe (8) simultaneously with the valve (53). 45

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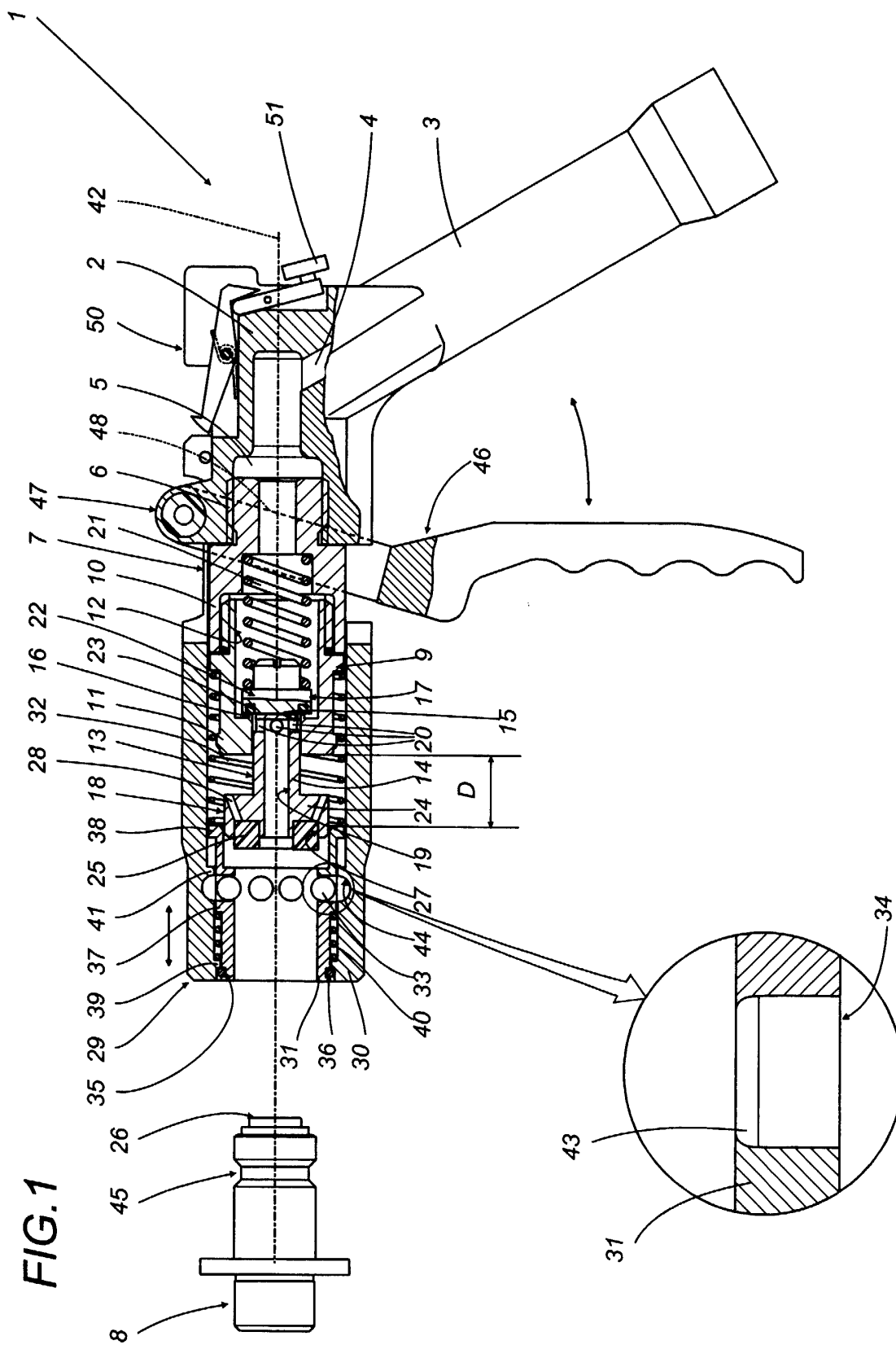


FIG.2

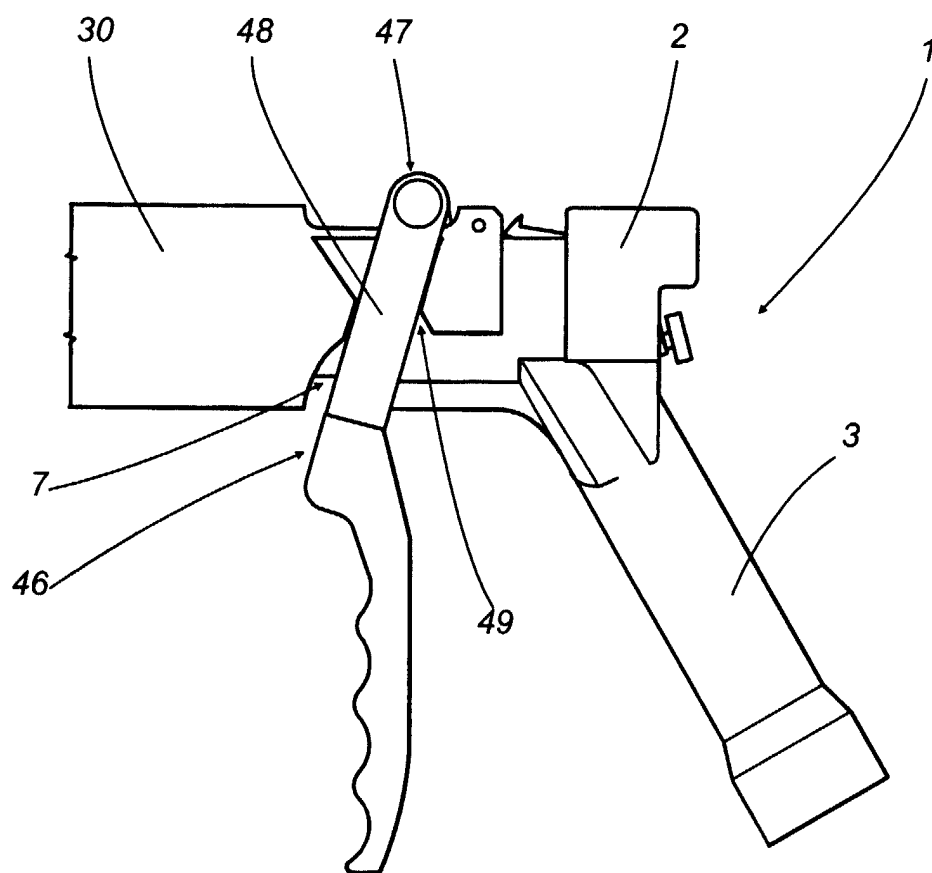


FIG.3

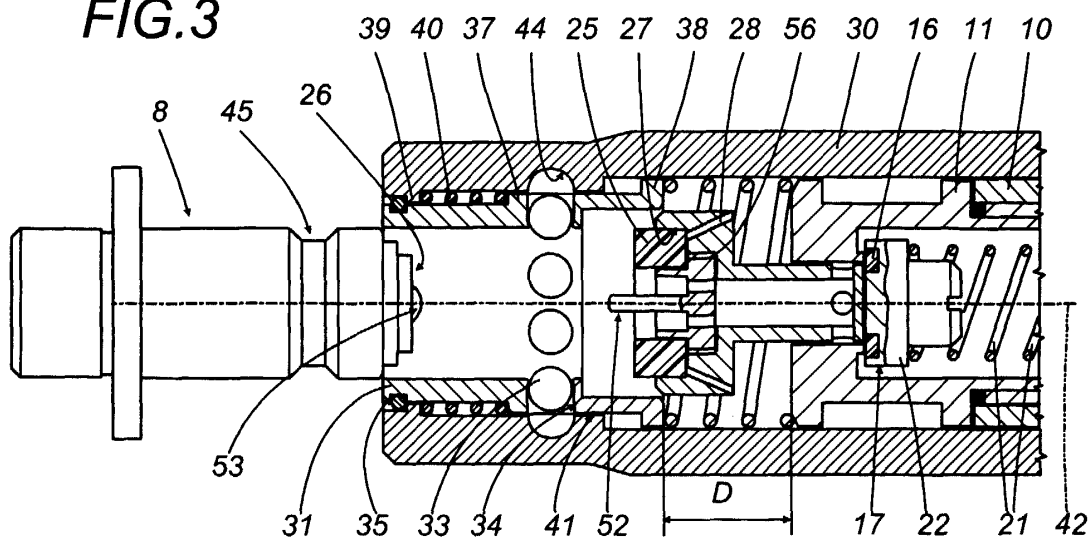


FIG.4

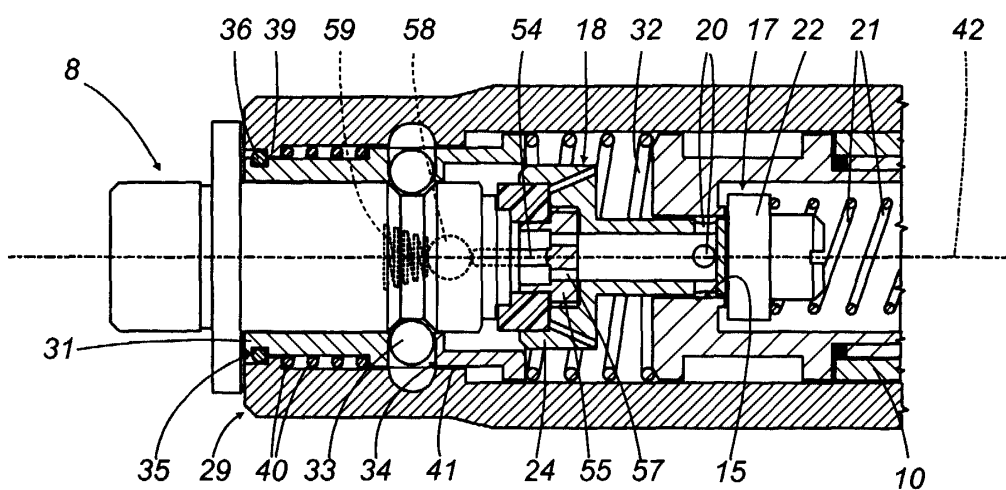


FIG.5

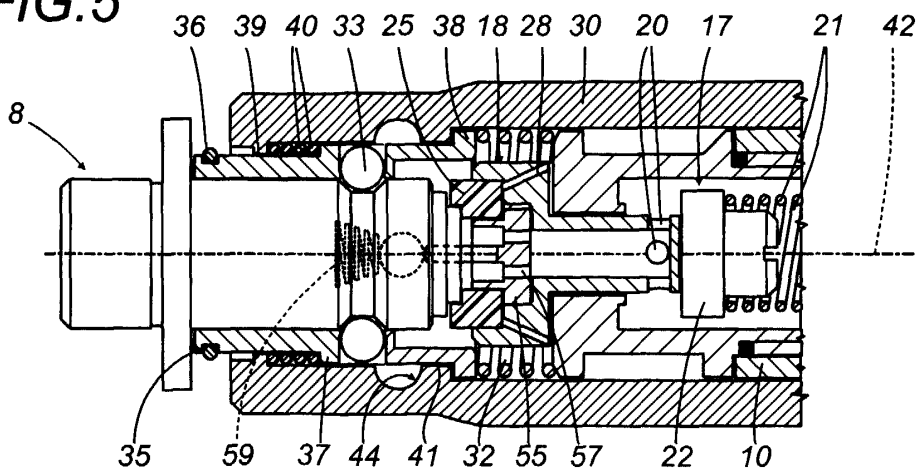


FIG.6

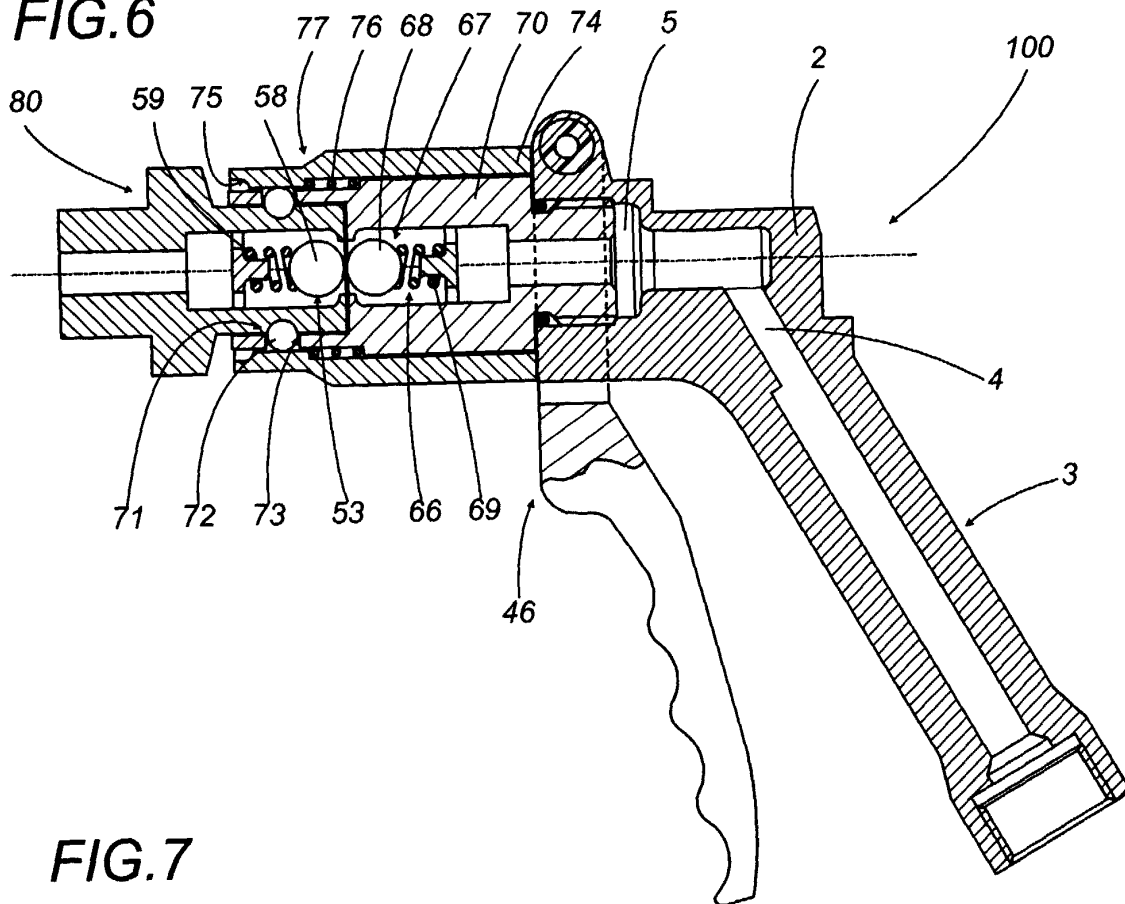


FIG.7

