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(54) FILTER ASSEMBLY FOR AN INJECTION VALVE, VALVE ASSEMBLY AND INJECTION VALVE

FILTERANORDNUNG FÜR EIN EINSPRITZVENTIL, VENTILANORDNUNG UND EINSPRITZVENTIL

ENSEMBLE FILTRE POUR UNE SOUPAPE D'INJECTION, ENSEMBLE DE SOUPAPES ET SOUPAPE D'INJECTION

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Description

[0001] The present invention relates to a filter assembly for a fluid injection valve, a valve assembly and a fluid injection valve. The fluid injection valve may in particular be an injection valve for injecting fuel into a combustion engine.

[0002] A valve assembly for a fluid injection valve comprises a valve body comprising a cavity with a fluid inlet portion and a fluid outlet portion and a valve needle axially moveable in the cavity. The valve needle prevents a fluid flow through the fluid outlet portion in a closing position and releases the fluid flow through the fluid outlet portion in further positions. The valve needle may be actuated by an electromagnetic actuation unit.

[0003] A filter assembly is provided at the fluid inlet portion of the valve assembly for filtering the fluid to be dosed. Such a filter assembly is shown in EP 2 949 917 A1.

[0004] The valve needle is biased towards a closing position by a preloaded calibration spring. The calibration spring can be preloaded by press-fitting the filter assembly or a adjustment tube located on top of the spring into the housing, the pole piece or another element of the injection valve as disclosed in US 6,997,404 B2, in DE 10 2013 225 820 A1 and in DE 10 2007 049 963 A1. This, however, adds to the length of the injector.

[0005] It is an object of the present invention to provide a space-saving filter assembly for an injection valve, a valve assembly and an injection valve with such a valve assembly.

[0006] These objects are achieved by means of a filter assembly for an injection valve, a valve assembly and an injection valve according to claims 1, 11 and 13.

[0007] Advantageous embodiments and developments are objects of the dependent claims.

[0008] According to a first aspect of the invention, a filter assembly for a fluid injection valve is provided, the filter assembly having a fluid inlet portion and a fluid outlet portion, wherein at least one flow path for fluid flow with a flow direction is formed between the fluid inlet portion and the fluid outlet portion.

[0009] The filter assembly comprises a filter sleeve having a first part and a second part. The first part comprises a filter element. The second part is arranged downstream of the first part with respect to the flow direction and forms a receptacle for an upper part of a calibration spring of the fluid injection valve, wherein a circumferential side wall of the receptacle is arranged to surround the upper part of the calibration spring.

[0010] Hence, the area, where the element preloading the calibration spring and an element of the valve assembly, e.g. the pole piece, are in frictional contact with one another, does not extend upwards from the calibration spring but around its upper part or some distance downwards from the upper part, i.e. some distance towards its lower part. By this, the clamping area of the calibration spring is moved from above the spring to the spring area itself.

[0011] This has the advantage, that the space above the spring is not required for the preloading of the spring. This space can be used differently, particularly for the reduction of pressure waves from the rail. Alternatively or additionally, the overall length of the injector can be reduced.

[0012] The receptacle comprises a ledge for supporting the calibration spring, the ledge protruding from the circumferential side wall and dividing the first part from the second part. The ledge provides support for the calibration spring. The ledge can be formed integrally with the filter sleeve. It protrudes from the circumferential side wall far enough to allow for a stable support of the calibration spring.

[0013] Thus, the ledge makes an annular support for the calibration spring, which is typically a coil spring. The central opening of this annular support makes a passage for fluid flow.

[0014] The second part of the filter sleeve has, on an outer surface of the circumferential side wall, a first fitting area for press-fitting the filter assembly into a fuel injector.

[0015] A fitting area is hereby understood to be a contact area between e.g. two elements, where frictional forces between the two elements make a frictional locking connection between the two elements. To make this frictional locking connection between the filter sleeve and an element of the fuel injector, e.g. the pole piece, the dimensions of the filter sleeve are chosen accordingly. In particular the diameter of the filter sleeve is chosen to make press-fitting the filter sleeve possible.

[0016] The filter sleeve is made in one piece, i.e. the first part and the second part are formed integrally. This simplifies the manufacture of the filter sleeves and saves costs.

[0017] According to one embodiment, a disk having at least one opening is arranged in the filter sleeve dividing the first part from the second part and providing a support for the calibration spring. The disk can be an annular disk with a central opening or with a number of openings making a passage for fluid flow. This has the advantage, that a dampening effect on pressure waves in the fuel is created.

[0018] It has been found that the dampening effect and the passage of fuel through the opening are both satisfactory if the opening (in the case of one central opening) has a diameter of 0,5 millimeters to 1 millimeters, more particularly of 0,7 millimeters to 0,9 millimeters.

[0019] The disk can, in particular, be supported by the ledge. Thus, the outer diameter of the disk is typically chosen to be only slightly smaller than the inner diameter of the filter sleeve but larger than the inner diameter of the ledge.

[0020] According to one embodiment, the second part of the filter sleeve has, on an inner surface of the circumferential side wall, a spring fitting region for fastening a calibration spring within the filter sleeve. The calibration spring may be fixed to the filter sleeve, but the fastening

can also mean a guiding of the calibration spring.

[0021] It is advantageous, if the calibration spring is guided only at its topmost and lowermost part, but not in between. Guidance in between exerts frictional forces on the calibration spring and disturbs its movement.

[0022] According to the described embodiment, the upper part of the calibration spring can be fitted into the receptacle such that the inner surface of the circumferential side wall having the spring fitting region provides guidance for the calibration spring. In order to achieve this, the inner diameter of the receptacle is only slightly larger than the outer diameter of the calibration spring, and the axial length of the receptacle is sufficient to provide reliable guidance.

[0023] According to one embodiment, instead of the disk a cap is arranged in the filter sleeve, the cap having a side wall part arranged coaxially with the circumferential side wall of the second part and a disk shaped part with at least one opening, the disk shaped part dividing the first part of the filter sleeve from the second part and providing a support for the calibration spring.

[0024] According to this embodiment, the receptacle receives the calibration spring and the cap. Preferably, the axial length of the cap is not larger than that of the receptacle so that the cap does not protrude from the receptacle. The cap provides a particularly reliable guidance for the calibration spring.

[0025] To achieve this, the cap may, on an inner surface of the side wall part, have a spring fitting region for fastening the calibration spring within the cap. Here, too, "fastening" of the calibration spring may mean securely guiding the calibration spring.

[0026] According to one embodiment, the cap has, on an outer surface of the side wall part, a cap fitting region for joining the cap to the filter sleeve. The cap could be welded to the filter sleeve. Alternatively, the cap could be press-fitted into the filter sleeve. In particular, the outer diameter of the cap and the inner diameter of the filter sleeve are such that a connection between both is possible. This has the advantage, that the cap providing particularly secure guidance of the calibration spring can be inserted into the filter sleeve.

[0027] The filter assembly can be used with different types of filters. According to one embodiment, the filter element comprises a body part which may comprise a plastic material (e.g. Nylon) and is joined to the first part of the filter sleeve, for example by welding or press-fitting. The filter element further comprises a cap part comprising a metal and being joined to a fluid inlet portion of the filter element, for example by welding or press-fitting. The cap part may have one or more openings to make a passage for fluid flow. The diameter of the openings may be relatively small to provide a dampening effect on pressure waves.

[0028] Alternatively, the filter assembly can comprise a different type of filter element. According to this embodiment, the filter element is formed by the first part of the filter sleeve comprising a number of through-holes forming the fluid inlet portion of the filter assembly. According to this embodiment, the first part of the filter sleeve is closed at its upper end and provided with through holes, which may e.g. be laser-drilled, electron beam-drilled or drilled mechanically. Thus, the first part of the filter sleeve constitutes the filter element.

[0029] According to one embodiment, the filter sleeve and/or the cap comprise steel, particularly stainless steel, and/or a copper alloy. These materials have the necessary corrosion resistance and provide the suitable mechanical properties for a tight press-fit. The filter sleeve and/or the cap can be manufactured by a deep-drawing process.

[0030] According to one aspect of the invention, a valve assembly for an injection valve is provided, comprising a valve body comprising a cavity with a fluid inlet portion and a fluid outlet portion, a valve needle axially moveable in the cavity, the valve needle preventing a fluid flow through the fluid outlet portion in a closing position and releasing the fluid flow through the fluid outlet portion in further positions. The valve assembly further comprises the described filter assembly and a preloaded calibration spring for biasing the valve needle, the calibration spring having a lower part which is allocated near one end of the valve needle and an upper part which is allocated at a distance from the needle, the upper part being received by the receptacle.

[0031] Thus, the circumferential side wall of the receptacle encloses a plurality of turns of the calibration spring which represent the upper part of the calibration spring.

[0032] The pole piece of the valve assembly provides a rigid element suitable to receive the filter assembly. The pole piece typically has a central opening receiving the calibration spring. Into this central opening the spring with the filter assembly may be press-fitted. Thus, the first fitting area of the second part of the filter sleeve is in contact with the pole piece.

[0033] Frictional forces between the fitting area of the second part of the filter sleeve and the inner surface of the pole piece make a stable frictional locking connection between the two press-fitted parts.

[0034] According to one aspect of the invention, a fluid injection valve with the described valve assembly is provided. The injection valve has the advantages described above in connection with the filter assembly.

[0035] Further advantages, advantageous embodiments and developments of the filter assembly, the valve assembly for an injection valve and the fluid injection valve will become apparent from the exemplary embodiments which are described below in association with schematic figures.

Figure 1 shows a cross sectional overview of an injection valve according to one embodiment of the invention;

Figure 2 shows a detail of an injection valve according to a first embodiment of the invention,

Figure 3 shows a detail of an injection valve according to a second embodiment of the invention,

Figure 4 shows a detail of figures 2 and 3,

Figure 5 shows a detail of an injection valve according to a third embodiment of the invention,

Figure 6 shows a detail of an injection valve according to a fourth embodiment of the invention,

Figure 7 shows a detail of figures 5 and 6,

Figure 8 shows a detail of an injection valve according to a fifth embodiment of the invention,

Figure 9 shows a detail of an injection valve according to a sixth embodiment of the invention and

Figure 10 shows a detail of figures 8 and 9.

[0036] Elements of the same design and function that appear in different illustrations are identified by the same reference character.

[0037] The fluid injection valve 1 shown in figures 1 to 10 is in particular suitable for dosing fuel to an internal combustion engine. However, the invention could be used in other types of injection valves, too.

[0038] The injection valve 1 comprises a valve assembly 3. The valve assembly 3 comprises a valve body 5 with a central longitudinal axis. The valve body 5 comprises a cavity 7. The cavity 7 has a fluid outlet portion 11. The fluid outlet portion 11 communicates with a fluid inlet portion 9 which is provided in the valve body 5. The fluid inlet portion 9 and the fluid outlet portion 11 are in particular positioned at opposite axial ends of the valve body 5.

[0039] The cavity 7 takes in a valve needle 13. The valve needle 13 comprises a needle shaft 12 and a sealing ball 14 welded to the tip of the needle shaft 12.

[0040] The injection valve 1 comprises an electromagnetic actuator unit 17 for the valve needle 13. The actuator unit 17 comprises a solenoid 19, an armature 21 and a pole piece 27. The armature 21 is axially movable in the cavity 7. The armature 21 is separate from the valve needle 13 and is axially movable relative to the valve needle 13 and to the valve body 5. A lower retainer 23 and an upper retainer 25 are fixed to the valve needle 13.

[0041] This type of injector is sometimes called "free-lift" injector, because the armature travels upwards some distance (the free-lift gap) before engaging the needle. However, the invention can be used with different types of injectors, where the armature is fixed to the needle, for example.

[0042] The valve needle 13 is preloaded by a calibration spring 15 which is arranged in the cavity 7 at the end of the valve needle 13 facing the fluid inlet portion 9. A lower part 29 of the calibration spring 27 is supported by the upper retainer 25. It could be supported by the valve needle 13 itself, too.

[0043] An upper part 31 of the calibration spring 27 is received by the receptacle 35 of a filter assembly 33, which is press-fitted with the pole piece 27. The receptacle 35 is formed by a circumferential side wall 45 of the filter assembly 33. This is explained in more detail with reference to figures 2 to 10. The embodiment shown in figure 1 is also shown in figure 8.

[0044] During the manufacturing process of the injection valve 1, the filter assembly 33 can be moved axially in the valve body 5 in order to preload the calibration spring 15 in a desired manner. By this the calibration spring 15 exerts the desired force on the valve needle 13 towards a fluid outlet portion 11 of the injection valve 1. In the closing position of the valve needle 13, a fluid flow through the fluid outlet portion 11 is prevented.

[0045] To move the valve needle 13 in an opening position, the solenoid 19 is energized, the magnetic force on the armature 21 overcomes the force exerted by the calibration spring 15 and the armature 21 moves upwards, taking with it the valve needle 13 by means of the upper retainer 25. The fluid outlet portion 11 is opened.

[0046] When the solenoid 19 is de-energized, the calibration spring 15 forces the valve needle 13 downwards towards the fluid outlet portion 11, until the fluid outlet portion 11 is closed by the ball 14.

[0047] As can be seen in figure 1, there is a space above the filter assembly 33, where according to the state of the art there would be an adjustment tube preloading the calibration spring 15. The filter assembly 33 only reaches a little way above the pole piece 27. Therefore, the space above the filter assembly 33 can be used to dissipate pressure waves. Alternatively, the injection valve 1 could be made shorter.

[0048] Figure 2 shows details of the injection valve 1 according to a first embodiment of the invention. The filter assembly 33 comprises a filter sleeve 37, which may be a cylindrical tube and which has a first part 39 near the fluid inlet portion 11 and a second part 41 further away from the fluid inlet portion 11. Thus, the second part 41 is arranged downstream from the first part 39. A ledge 47 formed by a protrusion of the sleeve 37 divides the first part 39 from the second part 41.

[0049] The first part 39 comprises a filter element 43, which in this embodiment is formed of the upper part of the filter sleeve 37 being perforated by a number of laser-drilled through-holes. In this embodiment, the upper end of the filter sleeve 37 is closed.

[0050] The second part 41 has a circumferential side wall 45, which forms a receptacle 35 for the upper part 31 of the calibration spring 15.

[0051] The filter sleeve 37 is press-fitted into a central opening in the pole piece 27. When mounted, the outside of the second part 41 is in frictional contact with the inner surface of the pole piece 27. The area on the outside of

the second part 41, where there is contact between the filter sleeve 37 and the pole piece 27, is the first fitting area 49. Frictional forces operating across this area 49 make a frictional locking connection between the filter assembly 33 and the pole piece 27.

[0052] When the filter assembly 33 is inserted into the central opening in the pole piece 27, the calibration spring 15 is compressed and thereby preloaded. The calibration spring 15 is supported by the ledge 47 and received in and guided by the receptacle 35. Thus, the circumferential side wall 45 functions as a guide for the calibration spring 15.

[0053] Figure 3 shows details of the injection valve 1 according to a second embodiment of the invention. This embodiment differs from the first one only in the kind of filter element 43 used. According to the second embodiment, the filter element 43 has a body part 51 made of a plastic material and being press-fitted onto a fluid inlet portion of the filter element 43. The filter element 43 further comprises a cap part 53 made of a metal and being press-fitted onto the first part 39 of the filter sleeve 37.

[0054] Figure 4 shows details of the filter sleeve 37 according to the first and second embodiments . According to these embodiments, the filter sleeve 37 comprises a circumferential ledge 47 which protrudes from the circumferential side wall 45 and forms a support for the calibration spring 15.

[0055] A part of an inner surface of the circumferential side wall 45 serves as a guide for the calibration spring 15. This surface area, where the calibration spring 15 may be in contact with the circumferential side wall 45, is called the spring fitting region.

[0056] Figure 5 shows details of an injection valve 1 according to a third embodiment of the invention. This embodiment differs from the first one shown in figure 2 in that an additional disk 55 is arranged below the ledge 47, covering essentially the entire cross-section of the filter sleeve 37 and providing a stable support for the calibration spring 15. The disk 55 has a central opening which can be better seen from figure 7. The disk has the advantage that it functions as a throttle for passing fluid, reducing pressure waves.

[0057] Figure 6 shows details of an injection valve 1 according to a fourth embodiment of the invention. This embodiment differs from the third only in the kind of filter element 43 used. According to the fourth embodiment, a filter element 43 as described above with reference to figure 3 is used.

[0058] Figure 7 shows a detailed view of the filter sleeve 37 with the disk 55 according to the third and fourth embodiments. The diameter of the central opening 59 in the disk can be chosen according to the desired throttle effect. Instead of a single central opening, a number of openings could be used.

[0059] Figure 8 shows details of an injection valve 1 according to a fifth embodiment of the invention. This embodiment differs from the first and third one shown in figures 2 and 5 in that a cap 57 is arranged below the ledge 47.

[0060] The cap 57 has a disk shaped part 61 which can be seen in more detail in figure 10 and which essentially corresponds to the disk 55 of the third and fourth embodiment. The disk shaped part 61 has at least one opening. It may have one central opening 63 as shown in figure 10. The disk shaped part 61 divides the first part 39 of the filter sleeve 37 from the second part 41 and provides a support for the calibration spring 15.

[0061] The cap 57 further comprises a side wall part 65 arranged coaxially with the circumferential side wall 45 of the second part 41. On an inner surface 69 of the side wall part 65, the cap 57 has a spring fitting region 67 for fastening the calibration spring 15 within the cap 57.

[0062] On an outer surface 71 of the side wall part 65, a cap fitting region 73 for press-fitting the cap 57 into the filter sleeve 37 is defined as the area where frictional forces operate to form a frictional locking connection between the cap 57 and the filter sleeve 37, when the cap 57 is press-fitted into the filter sleeve 37. Alternatively, the cap 57 could be welded to the filter sleeve 37.

[0063] Figure 9 shows details of an injection valve 1 according to a sixth embodiment of the invention. This embodiment differs from the fifth only in the kind of filter element 43 used. According to the sixth embodiment, a filter element 43 as described above with reference to figures 3 and 6 is used.

Claims

1. Filter assembly (33) for a fluid injection valve (1), the filter assembly (33) having a fluid inlet portion and a fluid outlet portion, wherein at least one flow path for fluid flow with a flow direction is formed between the fluid inlet portion and the fluid outlet portion, the filter assembly (33) comprising a filter sleeve (37) having a first part (39) and a second part (41), the first part (39) comprising a filter element (43) and the second part (41) being arranged downstream of the first part (39) with respect to the flow direction and forming a receptacle (35) for an upper part (31) of a calibration spring (15) of the fluid injection valve (1), wherein a circumferential side wall (45) of the receptacle (35) is arranged to surround the upper part (31) of the calibration spring (15)

characterized in that

the filter sleeve (37) is made in one piece and has a protrusion forming a ledge (47) for supporting the calibration spring (15), the ledge (47) protruding from the circumferential side wall (45) and dividing the first part (39) from the second part (41)

- the second part (41) of the filter sleeve (37) has, on an outer surface of the circumferential side wall (45), a first fitting area (49) for press-fitting the filter assembly (33) into a fuel injector

(1).

2. Filter assembly (33) according to claim 1, wherein a disk (55) having at least one opening (59) is arranged in the filter sleeve (37) dividing the first part (39) from the second part (41) and providing a support for the calibration spring (15).

3. Filter assembly (33) according to claim 1, wherein the central opening (59) has a diameter of 0.5 millimeters to 1 millimeter, in particular of 0.7 millimeters to 0.9 millimeters

4. Filter assembly (33) according to any of claims 1 to 3, wherein the second part (41) of the filter sleeve (37) has, on an inner surface of the circumferential side wall (45), a spring fitting region for fastening the calibration spring (15) within the filter sleeve (37).

5. Filter assembly (33) according to claim 1, wherein a cap is arranged in the filter sleeve (37), the cap (57) having

- a side wall part (65) arranged coaxially with the circumferential side wall of the second part (41) and
- a disk shaped part (61) with at least one opening (63), the disk shaped part (61) dividing the first part (39) of the filter sleeve (37) from the second part (41) and providing a support for the calibration spring (15).

6. Filter assembly (33) according to claim 5, wherein the cap (57) has, on an inner surface (69) of the side wall part (65), a spring fitting region (67) for fastening a calibration spring (15) within the cap (57).

7. Filter assembly (33) according to claim 5 or 6, wherein the cap (57) has, on an outer surface (71) of the side wall part (65), a cap fitting region (73) for joining the cap (57) to the filter sleeve (37).

8. Filter assembly (33) according to any of claims 1 to 7, wherein the filter element (43) comprises

- a body part (51) being joined to the first part (39) of the filter sleeve (37) and
- a cap part (53) comprising a metal and being joined to a fluid inlet portion of the filter element (43).

9. Filter assembly (33) according to any of claims 1 to 7, wherein the filter element (43) is formed by the first part (39) of the filter sleeve (37) comprising a number of through-holes forming the fluid inlet portion of the filter assembly (33).

10. Filter assembly (33) according to any of claims 1 to 8, wherein the filter sleeve (37) and/or the cap (57) comprises steel and/or a copper alloy and is made by deep-drawing.

11. Valve assembly (3) for an injection valve (1), comprising

- a valve body (5) comprising a cavity (7) with a fluid inlet portion (9) and a fluid outlet portion (11),
- a valve needle (13) axially moveable in the cavity (7), the valve needle (13) preventing a fluid flow through the fluid outlet portion (11) in a closing position and releasing the fluid flow through the fluid outlet (11) portion in further positions,

the valve assembly (3) further comprising

- a filter assembly (33) according to any of claims 1 to 10 and
- a preloaded calibration spring (15) for biasing the valve needle (13), the calibration spring (15) having a lower part (29) which is allocated near one end of the valve needle (13) and an upper part (31) which is allocated at a distance from the needle (13), the upper part (31) being received by the receptacle (35).

12. Valve assembly (3) according to claim 11, wherein the filter assembly (33) is press-fitted into a central opening of a pole piece (27) of the valve assembly (3), the first fitting area (49) of the second part (41) of the filter sleeve (37) being in contact with the pole piece (27) .

13. Fluid injection valve (1) with a valve assembly (3) according to claim 11 or 12.

Patentansprüche

1. Filteranordnung (33) für ein Fluideinspritzventil (1), wobei die Filteranordnung (33) einen Fluideinlassabschnitt und einen Fluidauslassabschnitt aufweist, wobei wenigstens ein Strömungsweg für einen Fluidstrom mit einer Strömungsrichtung zwischen dem Fluideinlassabschnitt und dem Fluidauslassabschnitt ausgebildet ist, wobei die Filteranordnung (33) einen Filterschlauch (37) aufweist, der einen ersten Teil (39) und einen zweiten Teil (41) aufweist, wobei der erste Teil (39) ein Filterelement (43) aufweist und der zweite Teil (41) in Bezug auf die Strömungsrichtung stromabwärts von dem ersten Teil (39) angeordnet ist und eine Aufnahme (35) für einen oberen Teil (31) einer Kalibrierfeder (15) des Fluideinspritzventils (1) bildet, wobei eine umlaufende Seitenwand (45) der Aufnahme (35) so angeordnet

ist, dass sie den oberen Teil (31) der Kalibrierfeder (15) umgibt,
dadurch gekennzeichnet, dass
der Filterschlauch (37) in einem Stück hergestellt ist und einen Vorsprung aufweist, der einen Absatz (47) zum Halten der Kalibrierfeder (15) bildet, wobei der Absatz (47) von der umlaufenden Seitenwand (45) vorsteht und den ersten Teil (39) von dem zweiten Teil (41) teilt,

- der zweite Teil (41) des Filterschlauchs (37) auf einer Außenfläche der umlaufenden Seitenwand (45) einen ersten Einsetzbereich (49) zum Einpressen der Filteranordnung (33) in eine Einspritzdüse (1) aufweist.

2. Filteranordnung (33) nach Anspruch 1,
wobei eine Scheibe (55), die wenigstens eine Öffnung (59) aufweist, in dem Filterschlauch (37) angeordnet ist, die den ersten Teil (39) von dem zweiten Teil (41) teilt und eine Halterung für die Kalibrierfeder (15) bereitstellt.

3. Filteranordnung (33) nach Anspruch 1,
wobei die mittlere Öffnung (59) einen Durchmesser von 0,5 Millimeter bis 1 Millimeter, insbesondere von 0,7 Millimeter bis 0,9 Millimeter, aufweist.

4. Filteranordnung (33) nach einem der Ansprüche 1 bis 3, wobei der zweite Teil (41) des Filterschlauchs (37) auf einer Innenfläche der umlaufenden Seitenwand (45) einen Federeinsetzbereich zum Befestigen der Kalibrierfeder (15) in dem Filterschlauch (37) aufweist.

5. Filteranordnung (33) nach Anspruch 1,
wobei ein Deckel in dem Filterschlauch (37) angeordnet ist, wobei der Deckel (57) aufweist

- einen Seitenwandteil (65), der koaxial mit der umlaufenden Seitenwand des zweiten Teils (41) angeordnet ist, und
- einen scheibenförmigen Teil (61) mit wenigstens einer Öffnung (63), wobei der scheibenförmige Teil (61) den ersten Teil (39) des Filterschlauchs (37) von dem zweiten Teil (41) teilt und eine Halterung für die Kalibrierfeder (15) bereitstellt.

6. Filteranordnung (33) nach Anspruch 5,
wobei der Deckel (57) auf einer Innenfläche (69) des Seitenwandteils (65) einen Federeinsetzbereich (67) zum Befestigen einer Kalibrierfeder (15) in dem Deckel (57) aufweist.

7. Filteranordnung (33) nach Anspruch 5 oder 6,
wobei der Deckel (57) auf einer Außenfläche (71) des Seitenwandteils (65) einen Deckeleinsetzbereich (73) zum Verbinden des Deckels (57) mit dem Filterschlauch (37) aufweist.

8. Filteranordnung (33) nach einem der Ansprüche 1 bis 7, wobei das Filterelement (43) aufweist

- einen Körperteil (51), der mit dem ersten Teil (39) des Filterschlauchs (37) verbunden ist, und
- einen Deckelteil (53), der ein Metall aufweist und mit einem Fluideinlassabschnitt des Filterelements (43) verbunden ist.

9. Filteranordnung (33) nach einem der Ansprüche 1 bis 7,
wobei das Filterelement (43) dadurch ausgebildet ist, dass der erste Teil (39) des Filterschlauchs (37) eine Anzahl von Durchgangsbohrungen aufweist, die den Fluideinlassabschnitt der Filteranordnung (33) bilden.

10. Filteranordnung (33) nach einem der Ansprüche 1 bis 8,
wobei der Filterschlauch (37) und/oder der Deckel (57) Stahl und/oder eine Kupferlegierung aufweist bzw. aufweisen und durch Tiefziehen hergestellt ist bzw. sind.

11. Ventilanordnung (3) für ein Einspritzventil (1), aufweisend:

- einen Ventilkörper (5), der einen Hohlraum (7) mit einem Fluideinlassabschnitt (9) und einem Fluidauslassabschnitt (11) aufweist,
- eine Ventilnadel (13), die in dem Hohlraum (7) axial bewegbar ist, wobei die Ventilnadel (13) in einer Schließstellung einen Fluidstrom durch den Fluidauslassabschnitt (11) verhindert und in weiteren Stellungen den Fluidstrom durch den Fluidauslassabschnitt (11) freigibt,

wobei die Ventilanordnung (3) ferner aufweist

- eine Filteranordnung (33) nach einem der Ansprüche 1 bis 10 und
- eine vorbelastete Kalibrierfeder (15) zum Vorspannen der Ventilnadel (13), wobei die Kalibrierfeder (15) einen unteren Teil (29), der nahe einem Ende der Ventilnadel (13) platziert ist, und einen oberen Teil (31), der in einem Abstand von der Nadel (13) platziert ist, aufweist, wobei der obere Teil (31) von der Aufnahme (35) aufgenommen ist.

12. Ventilanordnung (3) nach Anspruch 11,
wobei die Filteranordnung (33) in eine mittlere Öffnung eines Polstücks (27) der Ventilanordnung (3) eingepresst ist, wobei sich der erste Einsetzbereich (49) des zweiten Teils (41) des Filterschlauchs (37)

in Kontakt mit dem Polstück (27) befindet.

13. Fluideinspritzventil (1) mit einer Ventilanordnung (3) nach Anspruch 11 oder 12.

Revendications

1. Ensemble filtre (33) pour une soupape d'injection de fluide (1), l'ensemble filtre (33) ayant une partie d'entrée de fluide et une partie de sortie de fluide, au moins un chemin d'écoulement pour un écoulement de fluide avec une direction d'écoulement étant formé entre la partie d'entrée de fluide et la partie de sortie de fluide, l'ensemble filtre (33) comprenant un manchon de filtre (37) ayant une première partie (39) et une seconde partie (41), la première partie (39) comprenant un élément filtre (43) et la seconde partie (41) étant disposée en aval de la première partie (39) par rapport à la direction d'écoulement et formant un réceptacle (35) pour une partie supérieure (31) d'un ressort de calibrage (15) de la soupape d'injection de fluide (1), une paroi latérale circonférentielle (45) du réceptacle (35) étant disposée pour entourer la partie supérieure (31) du ressort de calibrage (15)
caractérisé en ce que
le manchon de filtre (37) est réalisé d'une seule pièce et a une saillie formant un rebord (47) pour supporter le ressort de calibrage (15), le rebord (47) faisant saillie de la paroi latérale circonférentielle (45) et séparant la première partie (39) de la seconde partie (41)
la seconde partie (41) du manchon de filtre (37) a, sur une surface extérieure de la paroi latérale circonférentielle (45), une première zone de montage (49) pour ajuster avec serrage l'ensemble filtre (33) dans un injecteur de carburant (1).

2. Ensemble filtre (33) selon la revendication 1,
un disque (55) ayant au moins une ouverture (59) étant disposé dans le manchon de filtre (37) séparant la première partie (39) de la seconde partie (41) et fournissant un support pour le ressort de calibrage (15).

3. Ensemble filtre (33) selon la revendication 1,
l'ouverture centrale (59) ayant un diamètre de 0,5 millimètre à 1 millimètre, en particulier de 0,7 millimètre à 0,9 millimètre.

4. Ensemble filtre (33) selon l'une quelconque des revendications 1 à 3,
la seconde partie (41) du manchon de filtre (37) ayant, sur une surface intérieure de la paroi latérale circonférentielle (45), une zone de montage de ressort pour la fixation du ressort de calibrage (15) dans le manchon de filtre (37).

5. Ensemble filtre (33) selon la revendication 1,
un capuchon étant disposé dans le manchon de filtre (37), le capuchon (57) ayant
une partie de paroi latérale (65) disposée coaxialement à la paroi latérale circonférentielle de la seconde partie (41) et
une pièce en forme de disque (61) avec au moins une ouverture (63), la pièce en forme de disque (61) séparant la première partie (39) du manchon de filtre (37) de la seconde partie (41) et fournissant un support pour le ressort de calibrage (15).

6. Ensemble filtre (33) selon la revendication 5,
le capuchon (57) ayant, sur une surface intérieure (69) de la partie de paroi latérale (65), une zone de montage de ressort (67) pour fixer un ressort de calibrage (15) dans le capuchon (57) .

7. Ensemble filtre (33) selon la revendication 5 ou 6,
le capuchon (57) ayant, sur une surface extérieure (71) de la partie de paroi latérale (65), une zone de fixation de capuchon (73) pour relier le capuchon (57) au manchon de filtre (37) .

8. Ensemble filtre (33) selon l'une quelconque des revendications 1 à 7,
l'élément filtre (43) comprenant
une partie corps (51) reliée à la première partie (39) du manchon de filtre (37) et
une partie capuchon (53) comprenant un métal et étant reliée à une partie d'entrée de fluide de l'élément filtre (43).

9. Ensemble filtre (33) selon l'une quelconque des revendications 1 à 7,
l'élément filtre (43) étant formé par la première partie (39) du manchon de filtre (37) comprenant un certain nombre de trous traversants formant la partie d'entrée de fluide de l'ensemble filtre (33).

10. Ensemble filtre (33) selon l'une quelconque des revendications 1 à 8,
le manchon de filtre (37) et/ou le capuchon (57) comprenant de l'acier et/ou un alliage de cuivre et étant fabriqué par emboutissage profond.

11. Ensemble de soupapes (3) pour une soupape d'injection (1), comprenant
un corps de soupape (5) comprenant une cavité (7) avec une partie d'entrée de fluide (9) et une partie de sortie de fluide (11),
une aiguille de soupape (13) mobile axialement dans la cavité (7), l'aiguille de soupape (13) empêchant un écoulement de fluide à travers la partie de sortie de fluide (11) dans une position de fermeture et libérant l'écoulement de fluide à travers la partie de sortie de fluide (11) dans d'autres positions,
l'ensemble de soupapes (3) comprenant en outre

un ensemble filtre (33) selon l'une quelconque des revendications 1 à 10, et
un ressort de calibrage précontraint (15) pour solliciter l'aiguille de soupape (13), le ressort de calibrage (15) ayant une partie inférieure (29) qui est associée à proximité d'une extrémité de l'aiguille de soupape (13) et une partie supérieure (31) qui est associée à une distance de l'aiguille de soupape (13), la partie supérieure (31) étant reçue par le réceptacle (35).

12. Ensemble de soupapes (3) selon la revendication 11,
l'ensemble filtre (33) étant ajusté avec serrage dans une ouverture centrale d'une pièce polaire (27) de l'ensemble de soupapes (3), la première zone de montage (49) de la seconde partie (41) du manchon de filtre (37) étant en contact avec la pièce polaire (27).

13. Soupape d'injection de fluide (1) avec un ensemble de soupapes (3) selon la revendication 11 ou 12.

Fig. 1

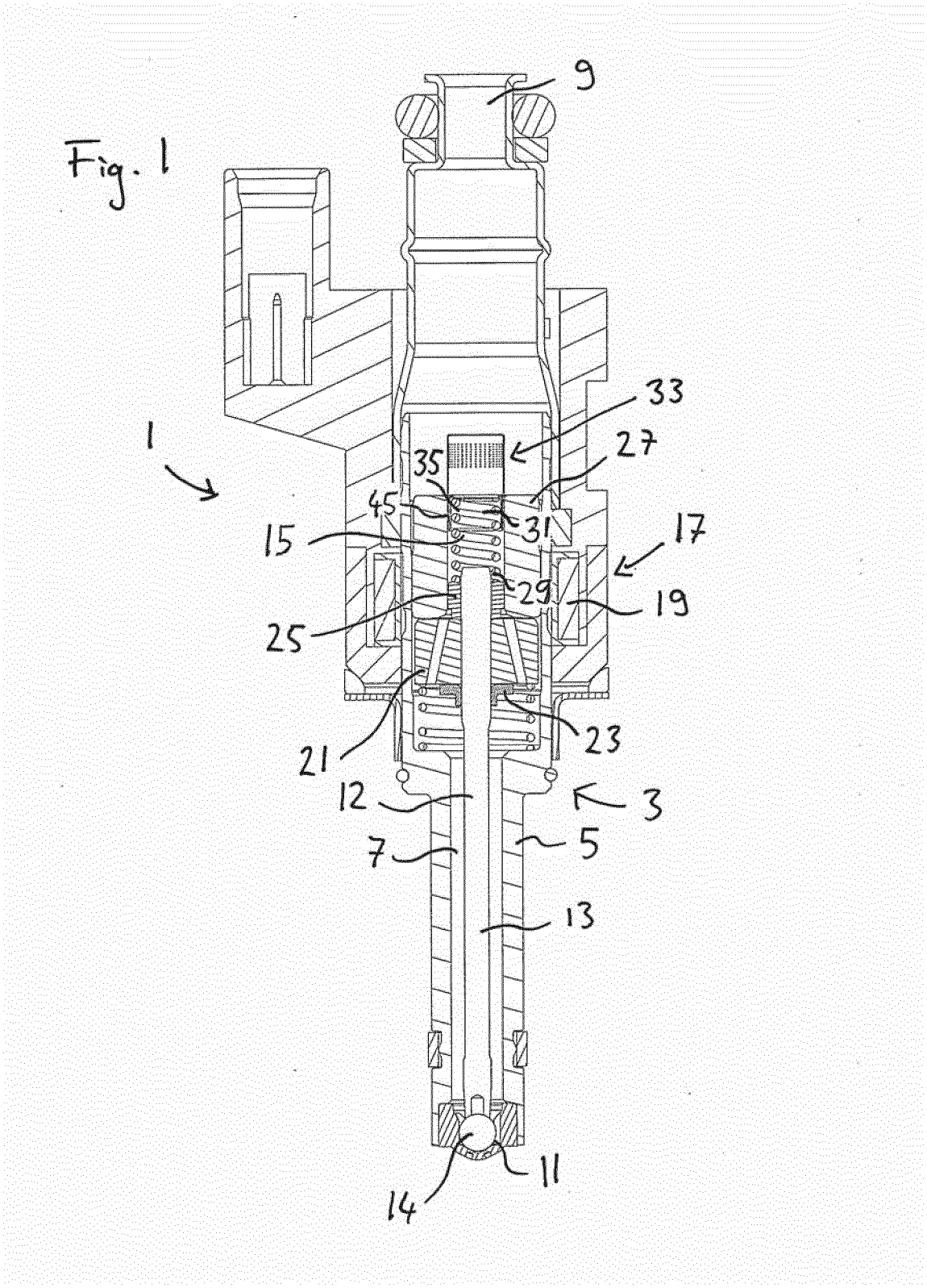


Fig. 2

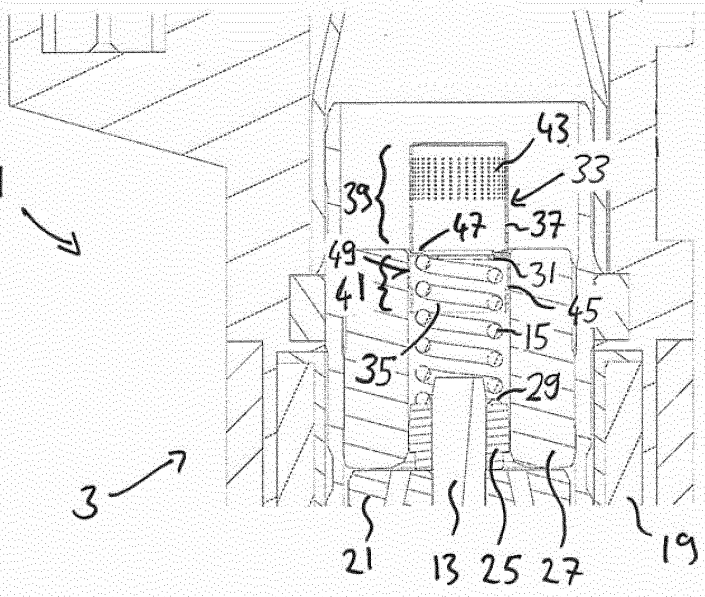


Fig. 3

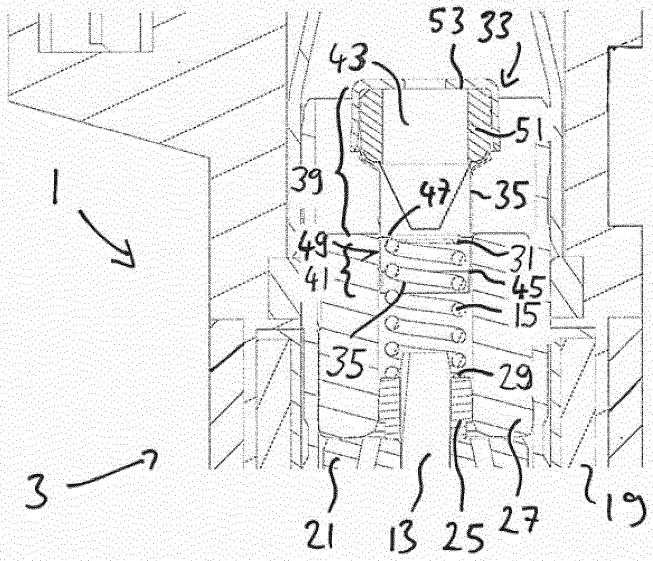


Fig. 4

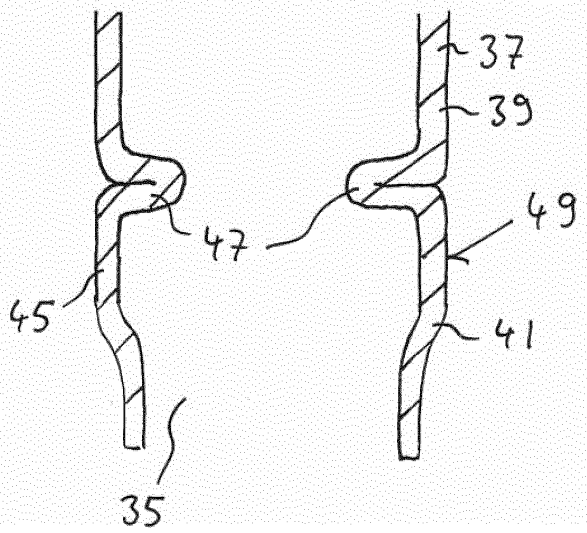


Fig 5

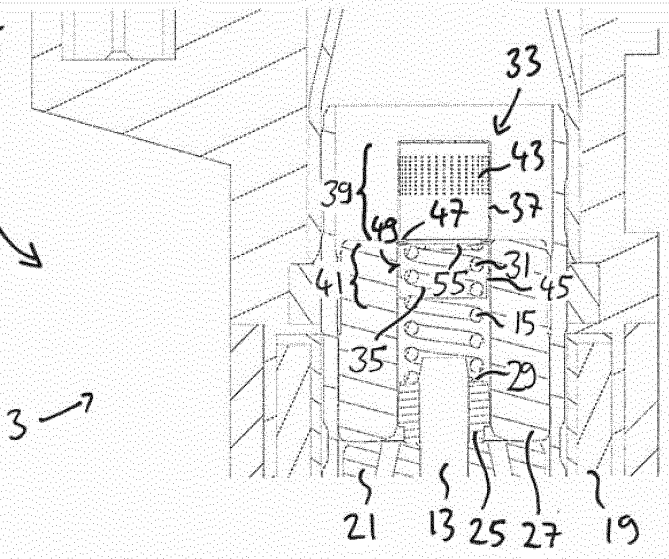


Fig 6

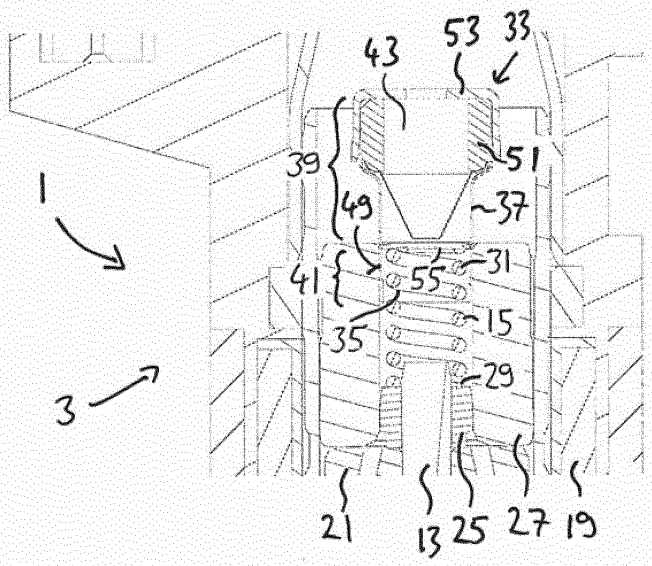


Fig. 7

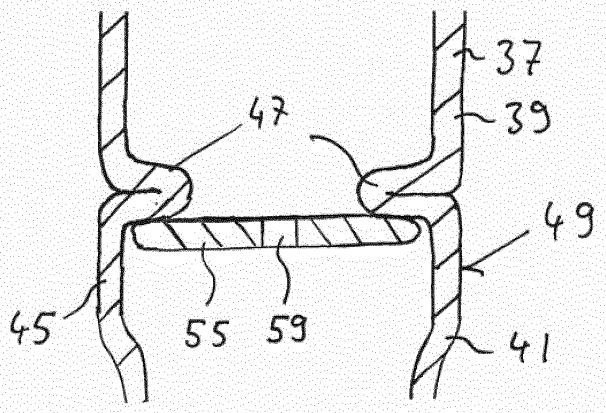


Fig 8

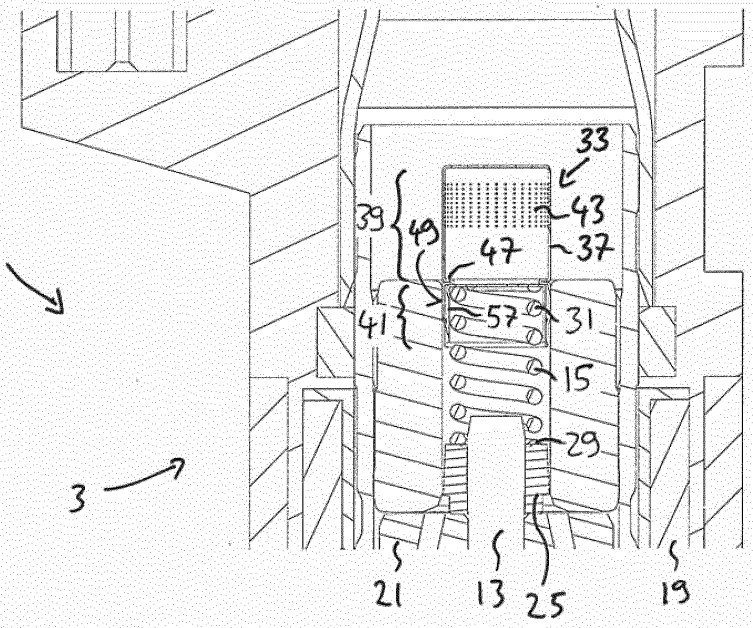


Fig 9

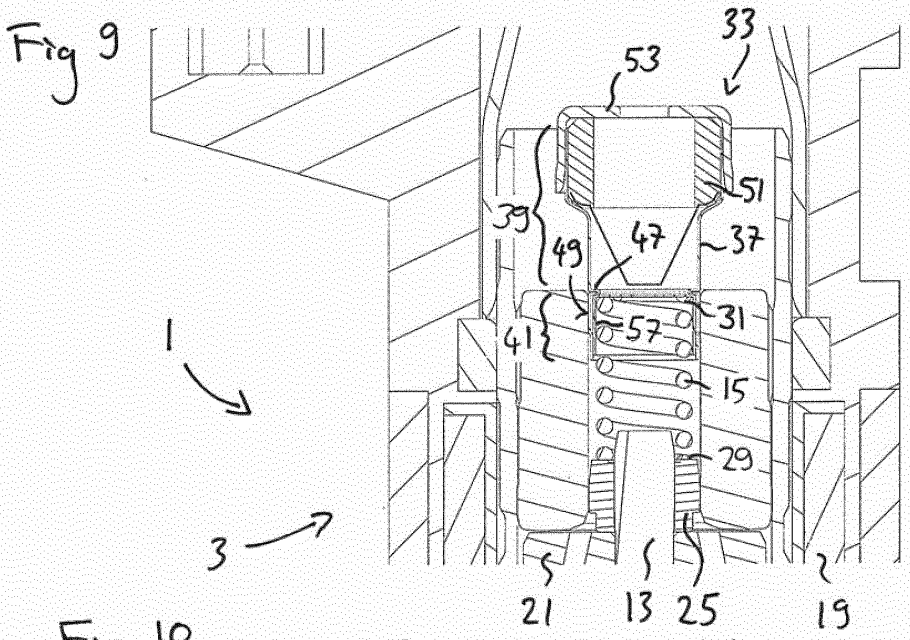
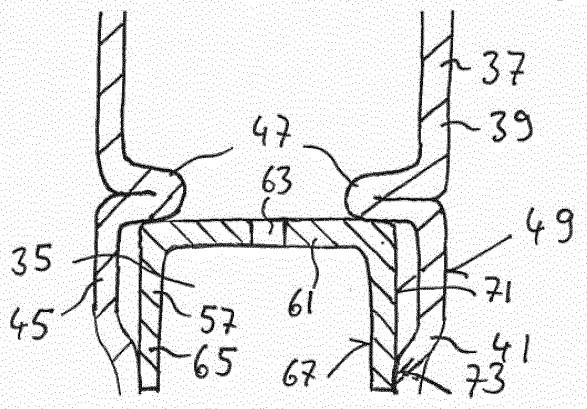


Fig. 10



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