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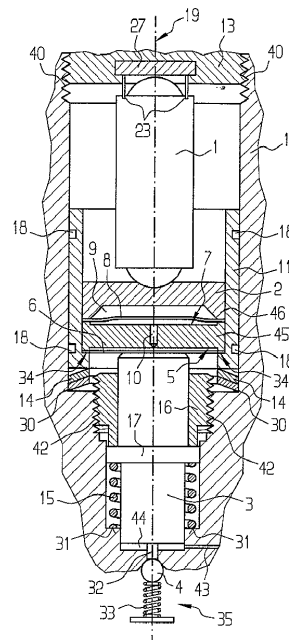
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Examination request pursuant to § 44 PatG [*Patentgesetz* (German Patent Law)] has been submitted

⑤④ Device for transmitting a motion and an injector with a device for transmitting a motion

⑤⑦ A device for transmitting a movement for an injection valve is described, in which a transmission module 2 is arranged between a piezoelectric actuator and a drive piston, which transmission module has at least one pressure chamber 5 which is closed through a first membrane. The pressure chamber 5 is connected via a throttle 10 to a compensation chamber 7 which is also arranged in the transmission module 2.



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The invention relates to a device for transmitting a movement according to the preamble of claim 1 and injectors with a device for transmitting a movement according to the preamble of claims 6 and 7.

A power transmission device is used, for example, in automotive engineering to transmit the movement of a piezoelectric actuator in an injection valve to a control element, the control element opening a servo valve, for example, which in turn controls the opening and closing of an injection valve.

EP 0 477 400 A1 discloses an arrangement for adaptive tolerance compensation for the displacement transformer of a piezoelectric actuator, which acts in the lifting direction, in which the deflection of an actuator 1 is transmitted to a piston 3 via a hydraulic chamber 2. For mechanical tolerance compensation, the hydraulic chamber 2 is connected to a compensation chamber 17 via a channel 16.

The object of the invention is to provide a particularly compact and easy-to-assemble device for transmitting a movement of an actuator.

The object of the invention is achieved by the features of claim 1, by the features of claim 6 and by the features of claim 7.

An essential advantage of the invention is that the pressure chamber and the compensation chamber are incorporated in a compact housing, and that the housing is located between the actuator and the controlling element. This way it allows for a particularly simple manufacture of the device, in particular for an injection valve. The housing with the power transmission device is pre-assembled and is inserted into the housing of the injection valve during manufacture.

Advantageous developments and improvements of the invention are specified in the dependent claims. Furthermore, it is advantageous to provide a pressure medium in the compensation chamber, which applies a specifiable pressure to the transmission medium in the compensation chamber.

The invention is explained in more detail with reference to the figures; showing:

Fig. 1 shows a device for power transmission without stroke translation,

Fig. 2 shows a device for power transmission with a spring as a pressure medium and

Fig. 3 shows a device for power transmission with stroke translation.

Fig. 1 shows schematically part of an injection valve with a piezoelectric actuator 1 and a servo valve 4. The piezoelectric actuator 1 is placed in a housing 12 and arranged between an upper stop 13 and a transmission module 2 in the longitudinal direction of the injection valve. The piezoelectric actuator 1 is connected via control lines 23 to a control means 27 with which the length of the piezoelectric actuator 1 can be adjusted. The piezoelectric actuator 1 preferably consists of a stack of piezoelectric elements, with which a greater deflection is achieved.

The upper stop 13 is connected to the housing 12 via a screw thread 40 and can be positioned in the longitudinal direction of the housing 12 depending on the desired pre-stressing of the piezoelectric actuator 1. The transmission module 2 is essentially cylindrical and has a pressure chamber 5 which is delimited by a first membrane 6. In the transmission module 2 there is a connecting bore 10 which has a throttling effect. The connecting bore 10 connects the first pressure chamber 5 to a compensation chamber 7, which is also introduced into the transmission module 2. The compensating chamber 7 is closed off by a pre-stressed spring plate 8. The pressure chamber 5 is at least partially

filled with a transmission medium, for example a hydraulic fluid, which has low compressibility. The pressure chamber 5 and the compensation chamber 7 are preferably completely filled with the transmission medium. Instead of the spring plate 8, other means can also be provided which specify the pressure of the transmission medium in the compensation chamber 7, such as an elastic membrane. The means are preferably designed in such a way that when transmission medium flows into the compensation chamber 7, the pressure in the compensation chamber 7 is increased.

The transmission module 2 is surrounded by a guide sleeve 11 which is introduced into the injection valve housing 12 and which is pre-stressed against the housing 12 in the longitudinal direction of the injection valve with a disk spring 14. The transmission module 2 rests in a circular edge area on an annular bearing surface 34 of the guide sleeve 11. The disk spring 14 is supported against a ring-shaped peripheral first stop 30 which is introduced into the housing 12. The transmission module 2 and the guide sleeve 11 are arranged to be movable against the disk spring 14 in the longitudinal direction of the injection valve.

The transmission module 2 is preferably divided into two separate components. The first component is a base plate 45 into which the connecting bore 10 is introduced and to which the first membrane 6 and the spring plate 8 are connected. A cover plate 46 is provided as the second component, which is arranged over the spring plate 8 and bears against the piezoelectric actuator 1. A recess designed to correspond to the end section of the piezoelectric actuator 1 is preferably made in the cover plate, in which the end section of the piezoelectric actuator 1 is inserted. The cover plate 46 preferably rests on a circumferential annular surface on the base plate 45 and has a recess 9 which provides space for the spring plate 8 to bulge.

The first membrane 6 is associated with a drive piston 3 which is biased by a spring 15 against a lower stop 16. The lower stop 16 is connected to the housing 12 via a screw connection 42 and is thus arranged so that it can be adjusted in the longitudinal direction. The lower stop 16 has the shape of a hollow cylinder, in the cylindrical recess of which the drive piston 3 is guided adequately. Below the lower stop 16, the drive piston 3 has an check ring 17 which has a larger diameter than the hollow cylinder of the lower stop 16. In addition, the spring 15, which is designed as a cylindrical spring and encloses the drive piston 3 in the lower section, is clamped between a stop surface 31 and the check ring 17. This presses the check ring 17 against the lower stop 16. This way, the lower stop 16 specifies the rest position of the drive piston 3.

At its lower end, the drive piston 3 merges into a control needle 32, which extends through a relief chamber 44 to a valve seat 35 of a servo valve. The relief chamber 44 is connected to a relief line 43 introduced in the housing 12.

A ball 4 is provided as the closing element and is pressed against the valve seat by a valve spring 33. The servo valve is used to control an injection needle, which controls the injection of an internal combustion engine.

During the production of the injection valve, the piezoelectric actuator 1, the transmission module 2 and the drive piston 3 are pre-adjusted via the upper stop 13 and the lower stop 16. The piezoelectric actuator 1, the transmission module 2 and the drive piston 3 are adjusted in such a way that the servo valve 4 is closed when the piezoelectric actuator 1 is not activated and the piezoelectric actuator 1 is in contact with the transmission module 2 with a predetermined pretension and the drive piston 3 is in contact with the first membrane 6.

The functioning of Fig. 1 is explained in more detail below: In the rest state, the piezoelectric actuator 1 is not controlled and the closing element 4 is seated on the valve seat 35. Furthermore, the piezoelectric actuator 1 and the drive piston 3 rest on opposite sides of the transmission module 2, with the drive piston 3 placed on the first membrane 6. In the rest position, the piezoelectric actuator 1 is pre-stressed against the upper stop 13 by the disk spring 14 via the guide sleeve 11 and the transmission module 2. The drive piston 3 is pressed by the spring 15 against the lower stop 16, which is adjusted in such a way that the drive piston 3 bears against the first membrane 6.

If the piezoelectric actuator 1 is now controlled, the piezoelectric actuator 1 presses the entire transmission module 2 against the spring force of the disk spring 14 in the direction of the drive piston 3, so that pressure is exerted on the drive piston 3 via the first membrane 6 and the transmission medium located in the pressure chamber 5 is exercised.

This moves the drive piston 3 against the spring force of the tension spring 15 in the direction of the closing element 4 so that the closing element 4 is lifted off the valve seat 35 by the control needle 32. As a result, a pressure chamber which applies high pressure to the injection needle of the injection valve is connected to the relief chamber 44 and the relief line 42, so that the pressure in the pressure chamber drops and the injection needle lifts off the assigned valve seat and injection begins.

If the activation of the piezoelectric actuator 1 ends, the piezoelectric actuator 1 is shortened and the transmission module 2 and the guide sleeve 11 are pushed by the disk spring 14 in the direction of the piezoelectric actuator 1. The drive piston 3 is pushed away from the closing element 4 by the spring 15, so that the closing element 4 is pushed by the valve spring 33 back onto the assigned valve seat 35. This disconnects the connection between the pressure chamber and the relief line 43 and high pressure is again applied to the valve needle, so that the valve needle is pushed onto the assigned valve seat and this ends the injection.

The adjustment of the piezoelectric actuator 1, the transmission module 2 and the drive piston 3 is carried out with a new injection valve and at a specified temperature. If, due to wear or a change in temperature, the adjustment no longer fits, the transmission module 2 achieves an automatic adjustment.

For this purpose, both the pressure chamber 5 and the compensation chamber 7 are preferably completely filled with the transmission medium and the drive piston 3 is pre-stressed against the first membrane 6 when the piezoelectric actuator 1 is in the rest position, so that the transmission medium in the pressure chamber 5 and in the compensation chamber 7 is at a specified pressure.

If the piezoelectric actuator 1 shortens in the rest position without being actuated due to thermal influences or signs of aging in relation to the housing 12, the spring plate 8 pushes the transmission medium from the compensation chamber 7 via the throttle 10 into the pressure chamber 5, so that the first membrane 6 is moved in the direction of the drive

piston 3 and, as a result, the drive piston 3 bears against the first membrane 6 despite the shortening of the piezoelectric actuator 1.

However, if the distance between the piezoelectric actuator 1 and the drive piston 3 is reduced, the first membrane 6 is pushed in by the drive piston 3 so that the transmission medium is pressed through the throttle 10 into the compensation chamber 7 against the spring force of the spring plate 8. As a result, the drive piston 3 is always in contact with the first membrane 6 in this case as well.

The throttle 10 should preferably be dimensioned in relation to the transmission medium such that during normal activation of the drive piston 3 only so little of the transmission medium flows into the compensation chamber 7 that the activation of the drive piston is not impaired. For example, the drive piston 3 controls a servo valve of an injection valve or a nozzle needle of an injection valve. In these examples, the throttle 10 must be dimensioned in such a way that only an insignificant amount of transmission medium flows into the compensating chamber 7 during the actuation times for the servo valve or during the actuation times for the nozzle needle. The actuation times are in the range of milliseconds, preferably between 0 ms and 10 ms. Fast actuation times are around 0.1 to 1 ms.

However, if there are long-lasting pressure differences between the pressure chamber 5 and the compensation chamber 7 lasting from one second to minutes, the transmission medium is exchanged between the compensation chamber 7 and the pressure chamber 5 via the throttle 10. This is especially the case in terms of thermal expansion differences and gradual wear.

Fig. 2 shows additional embodiment of the invention which corresponds essentially to the injection valve of Fig. 1, but in which a second membrane 20 is provided instead of the spring plate 8 to delimit the compensation chamber 7. The second diaphragm 20 has a plunger 21 which is tensioned against the transmission module 2, in particular, against the cover plate 46, via a compression spring 22. In this way, the deflection of the second membrane 20 from its rest position is counteracted by the spring force of the compression spring 22. The pressure of the transmission medium prevailing in the pressure chamber 5 and in the compensation chamber 7 is thus adjusted by the spring force of the compression spring 22. This also achieves an adjustment compensation through the compression spring 22 and the throttle 10 in that the pressure chamber 5 is filled with a transmission medium, which has a corresponding pressure, ensuring that the first membrane 6 is always in contact with the drive piston 3. In this way, according to Fig. 1, it achieves an automatic adjustment.

Fig. 3 also shows part of an injection valve with a piezoelectric actuator 1, which acts on a transmission module 2 and a drive piston 3 via a die 29. The injection valve shown in Fig. 3 differs from the injection valves of Fig. 2 and 1 in the type of power transmission from the piezoelectric actuator 1 to the drive piston 3. For this purpose, a die 29 is provided in the housing 12 adjacent to the piezoelectric actuator 1 and is mounted so that it is movable in the longitudinal direction of the housing 12 against a disk spring 14. The disk spring 14 pre-stresses the piezoelectric actuator 1 via the die 29 against the upper stop 13, which is connected to the housing 12 via a screw connection allowing it can be adjusted in the longitudinal direction. The disk spring 14 is supported against the transmission module 2, which rests on a lower stop 16, which is adjustable in the longitudinal direction of the housing 12.

The lower stop **16** is connected to the housing **12** via a screw connection **42**. The lower stop **16** has a cylindrical recess in the middle, in which the drive piston **3** is movably mounted in the longitudinal direction. The drive piston **3** is pre-stressed against the lower stop **16** by a coil spring **15**, which rests against a check ring **17** of the drive piston **3** one side and against the housing **12**, while on the other side the coil spring **15** encloses the drive piston **3**.

In comparison to the transmission modules of Fig. **1** and **2**, the transmission module **2** now has a second pressure chamber **28** which is assigned to the die **29** and which is closed by a third membrane **26**, the third membrane **26** being assigned to the die **29**. The second pressure chamber **28** is connected to the first pressure chamber **5** via two lines **25**. One or more lines **25** can also be provided. In a simple embodiment, one line **25** suffices. The pressure chamber **5** is closed off by a first membrane **6**, which is assigned to the drive piston **3**. The lines **25** are each provided in the edge region of the transmission module **2** and are designed in such a way that the transmission medium located in the pressure chamber **5** and the second pressure chamber **28** can be exchanged between the second pressure chamber **28** and the pressure chamber **5** with almost no pressure loss.

Preferably, both the second pressure chamber **28**, the lines **25**, the first pressure chamber **5** and the compensation chamber **7** are completely filled with the transmission medium. In a simpler, less advantageous embodiment, the second pressure chamber **28**, the pressure chamber **5** and the compensation chamber **7** are only partially filled with the transmission medium.

The pressure chamber **5** is connected to the compensating chamber **7** via a connecting bore **10** which is designed as a throttle. The compensating chamber **7** is closed off by a membrane with a spring action, in this case a spring plate **8**. Instead of the spring plate **8**, another means can also be used, as shown in Fig. **2**, with which the pressure in the compensation chamber and the volume of the compensation chamber can be adjusted to specified values.

The arrangement according to Fig. **3** works as follows: In the rest position, the piezoelectric actuator **1** is pre-stressed against the upper stop **13** by the disk spring **14** via the die **29**. The disk spring **14** is supported against the housing **12** via the transmission module **2'** and the lower stop **16**.

The transmission module **2** rests with the third membrane **26** on the circular pressure surface of the die **29**. In addition, the transmission module **2** rests on the ring-shaped support surface **36** of the lower stop **16**. The drive piston **3** is pushed with its circular piston surface **37** against the first membrane **6** and the closing element **4** is pressed by the valve spring **33** onto the assigned valve seat **35**.

If the piezoelectric actuator **1** is now controlled by the control means **27** via the control lines **23**, the piezoelectric actuator **1** lengthens, so that as a result the die **29** is deflected against the spring force of the disk spring **14** in the direction of the transmission module **2**. However, the transmission module **2** is fixed in position by the lower stop **16** preventing it from following the longitudinal movement of the die **29**. As a result, the third membrane **26** is pushed downwards by the die **29** with the circular plunger surface **38** causing the transmission medium located in the second pressure chamber **28** to be pushed into the pressure chamber **5** via the lines **25**. This deflects first membrane **6** in the direction of the drive piston **3** and the drive piston **3** is thus moved against the spring force of the spring **15** in the direction of the closing element **4**. As a result of this, the closing element **4** is lifted off the valve seat **35** by the actuating needle **32** against the force of the valve spring **33**.

Although there is a connection between the pressure chamber **5** and the compensation chamber **7** via the connecting bore **10**, this is designed as a throttle causing brief pressure increases in the pressure chamber **5** to only a very small outflow of transmission medium into the compensation chamber **7**. At least the throttle **10** and the transmission medium are matched to one another in such a way that only a small amount of transmission medium flows into the compensation chamber **7** for the times in which the piezoelectric actuator **1** is actuated to actuate the closing element **4**, so that the actuation of the closing element is not affected.

After switching off the control of the piezoelectric actuator **1**, the piezoelectric actuator **1** is shortened, so that the die **29** is moved by the disk spring **14** in the direction of the piezoelectric actuator **1**. As a result of the force of spring **15** acting on membrane **6** via drive piston **3**, transmission medium flows from the first pressure chamber **5** through lines **25** into the second pressure chamber **28**, so that first and third membranes **6**, **26** return to their initial position.

As a result of the movement of the drive piston **3** in the direction of the transmission module **2**, the valve spring **33** pushes the closing element **4** back onto the assigned valve seat **35**. The transmission medium that flowed into the compensation chamber **7** during the activation of the piezoelectric actuator **1** is pushed back into the pressure chamber **5** by the spring plate **8** via the throttle **10**. In this way, the specified rest position is reached again.

If, due to different thermal expansion coefficients or signs of wear, the piezoelectric actuator **1**, the die **29**, the transmission module **2**, or the drive piston **3** change with respect to the preset adjustment, this maladjustment is automatically compensated for by the transmission module **2**. For example, if the piezoelectric actuator **1** and the die **29** are moved from the preset position in the direction of the drive piston **3**, the result is that the third membrane **26** is continuously arched, so that the transmission medium is pressed from the second pressure chamber **28** into the pressure chamber **5**. The first membrane **6** of the pressure chamber **5** is prevented from bending towards the drive piston **3** by the drive piston **3** through the spring force of the spring **15**. As a result of the high pressure in the pressure chamber **5**, the transmission medium flows into the compensation chamber **7** against the spring force of the spring plate **8**. This way, even with the present maladjustment, it achieves that the drive piston **3** remains in its specified position and the closing element **4** is not lifted off the valve seat **35**.

If the predetermined distance between the die **29** and the drive piston **3** is increased, there is a risk that either the die **29** and/or the drive piston **3** will no longer rest on the third membrane **26** or on the first membrane **6**. However, this is prevented by the fact that transmission medium flows out of the compensation chamber **7** through the connecting bore **10** into the pressure chamber **5** and via the lines **25** into the second pressure chamber **28**. This way, even with this misalignment, it is ensured that the die **29** and the drive piston **3** are in operative connection with one another directly via the transmission medium.

The spring force of the spring plate 8, the spring force of the first membrane 6 and the third membrane 26, as well as the cross section of the connecting bore 10, i.e., also the transmission medium and the filling level of the pressure chamber 5, the lines 25, the second pressure chamber 28 and the compensation chamber 7 must be adjusted according to the circumstances so that an automatic adjustment is achieved.

The die surface 38 with which the die 29 bears against the third membrane 26 is advantageously larger than the piston surface 37 with which the drive piston 3 bears against the first membrane 6. This way, it achieves a stroke ratio between the deflection of the piezoelectric actuator 1 and the deflection of the drive piston 3. In addition, it is advantageous if the surface of the third membrane 26 is larger than the surface of the first membrane 6, so that over the different sized surfaces of the first membrane 6 and the third membrane 26 a stroke transmission is already achieved between the deflection of the piezoelectric actuator 1 and the deflection of the drive piston 3.

The transmission module 2 has sealing rings 18 in the edge area, which seal off the piezoelectric actuator 1 in regards to the drive piston 3 and the closing element 4 in a tight manner.

The arrangement of Fig. 3 offers the advantage that when the deflection of the piezoelectric actuator 1 is transmitted to the drive piston 3, the transmission module is not moved, but the deflection is transmitted directly via the first and the third membrane 6, 26 and the transmission medium. This allows to only move small masses, making a rapid transfer of movement possible, in particular, for the control of an injection valve.

The parts of the injection valves shown in Fig. 1 to 3 are rotationally symmetrical to the axis of symmetry 19.

An advantageous adjustment of an injection valve according to Fig. 1 or 3 is achieved in that the upper stop 13 is adjusted in the direction of the drive piston 3 and consequently increasing the pressure of the piezoelectric actuator 1 via the transmission module 2 on the drive piston 3. At the same time, the piezoelectric actuator 1 is controlled alternately by the control means 27, so that the piezoelectric actuator 1 is alternately lengthened and shortened. At the same time, the opening characteristic of the servo valve 35, 4 is measured and the screwing in of the upper stop 13 is stopped when the control characteristic is optimal. The adjustment primarily offers advantages with flexible membranes 6, 8, 26, which have a progressive characteristic curve of the spring force in relation to the spring deflection. Systems with corresponding membranes are generally difficult to adjust. However, the method described allows for easy and precise adjustment. Preferably, both the screwing in and the control of the piezoelectric actuator 1 and the measurement of the opening characteristic of the servo valve 35, 4 take place automatically via a correspondingly designed testing device.

In a continuation of the invention, instead of the opening characteristic of the servo valve 35, 5, the injection characteristic of the injection valve controlled by the servo valve is measured. This is preferably done by measuring the amount of fuel delivered by the injection valve during an injection process. Optimum adjustment of the injection valve is achieved in a simple manner in this way.

Claims

1. Device for transmitting a movement comprising a pressure chamber (5) which is at least partially filled with a transmission medium and which is at least partially delimited by a first flexible element (6), with a

compensation chamber (7) connected via a connection (10) is connected to the pressure chamber (5), the connection (10) and the transmission medium being designed in such a way that there are hardly any short-term pressure differences between the pressure in the pressure chamber (5) and the pressure in the compensation chamber (7) and long-term pressure differences almost be completely compensated, characterized in that

the pressure chamber (5) and the compensation chamber (7) are incorporated into a transmission module (2), and that the compensation chamber (7) is operatively connected to means (8; 20, 21, 22), which specify the pressure in the compensation chamber (7) and the volume of the compensation chamber (7).

2. Device according to claim 1, characterized in that a second pressure chamber (28) is provided in the transmission module (2), which is filled at least partially, with the transmission medium, that the second pressure chamber (28) is connected to the first pressure chamber (5),

that the second pressure chamber (28) is delimited by a second, at least partially, flexible element (26).

3. Device according to claim 2, characterized in that the area with which the first flexible element (6) delimits the first pressure chamber (5) is different from the area with which the second flexible element (26) delimits the second pressure chamber (28).

4. Device according to claim 1, characterized in that a flexible membrane (8) is provided as a means which at least partially delimits the compensation chamber (7) and which adjusts the pressure in the compensation chamber (7) and the volume of the compensation chamber (7).

5. Device according to claim 1, characterized in that an at least partially flexible membrane (20) is provided as the means, which delimits the compensation chamber (7), that spring means (22) are provided which are in operative connection with the membrane (20), and which counteract a deflection of the membrane (20).

6. Injection valve with an actuator (1) and a control element (3), which are operatively connected to one another by a transmission module (2), with the following features:

the transmission module (2) has a pressure chamber (5), which is filled with a transmission medium and is delimited by a first flexible membrane (6);

the transmission module (2) has a compensation chamber (7) which is connected to the pressure chamber (5) via a connection (10);

the connection (10) and the transmission medium are designed in such a way that short-term pressure differences between the pressure in the pressure chamber (5) and the pressure in the compensation chamber (7) are hardly compensated and long-lasting pressure differences are almost completely compensated;

the actuator (1) is assigned to an upper side of the transmission module (2);

the control element (3) is assigned to the first flexible element (6) on the lower side of the transmission module (2);

the transmission module (2) is movably arranged in the housing (12) of the injection valve, so that when the actuator (1) moves in the direction of the transmission module (2), the transmission module (2) in the housing (12) in the direction of the control element (3) is moved and the movement of the actuator (1) is at least partially transmitted to the control element (3) via a movement of the transmission module (2).

7. Injection valve with an actuator (1) and a control element (3), which are operatively connected to one another by a transmission module (2), with the following features: 5
the transmission module (2) has a pressure chamber (5), which is filled with a transmission medium and is delimited by a first flexible membrane (6);
the transmission module (2) has a compensation chamber (7) which is connected to the pressure chamber (5) via a connection (10); 10
the connection (10) and the transmission medium are designed in such a way that short-term pressure differences between the pressure in the pressure chamber (5) and the pressure in the compensation chamber (7) are hardly compensated and long-lasting pressure differences are almost completely compensated; 15
the transmission module (2) has a second pressure chamber (28) delimited by a second flexible element (26);
the first and the second pressure chamber (5,28) are connected to one another via a line (25); 20
the actuator (1) is associated with the second flexible element (26);
the control element (3) is assigned to the first flexible element (6); 25
the transmission module (2) is fixed in the direction of movement of the actuator (1), so that when the actuator (1) moves in the direction of the transmission module (2), the transmission module (2) is fixed in the housing (12) and the movement of the actuator (1) is transmitted to the control element (3) via the first flexible element (6), the transmission medium and the second flexible element (26). 30
8. Device according to claim 6, characterized in that the transmission module (2) is connected to the housing (12) by means with spring action (14). 35
9. Method for adjusting an actuator (1) and a control element (3) and a transmission module (2) in an injection valve according to claim 6 or 7, in which the control element (3) is operatively connected to a closing element (4) of a valve, characterized in that 40
- the actuator (1) is controlled intermittently,
- at the same time the position of the actuator (1) in the direction of the transmission module (2) is changed via adjustment means (13, 40), 45
- depending on the controlling of the actuator (1), the opening characteristic of the valve is checked, and
- the adjustment is complete when the valve has a predetermined opening and closing characteristic. 50

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FIG 1

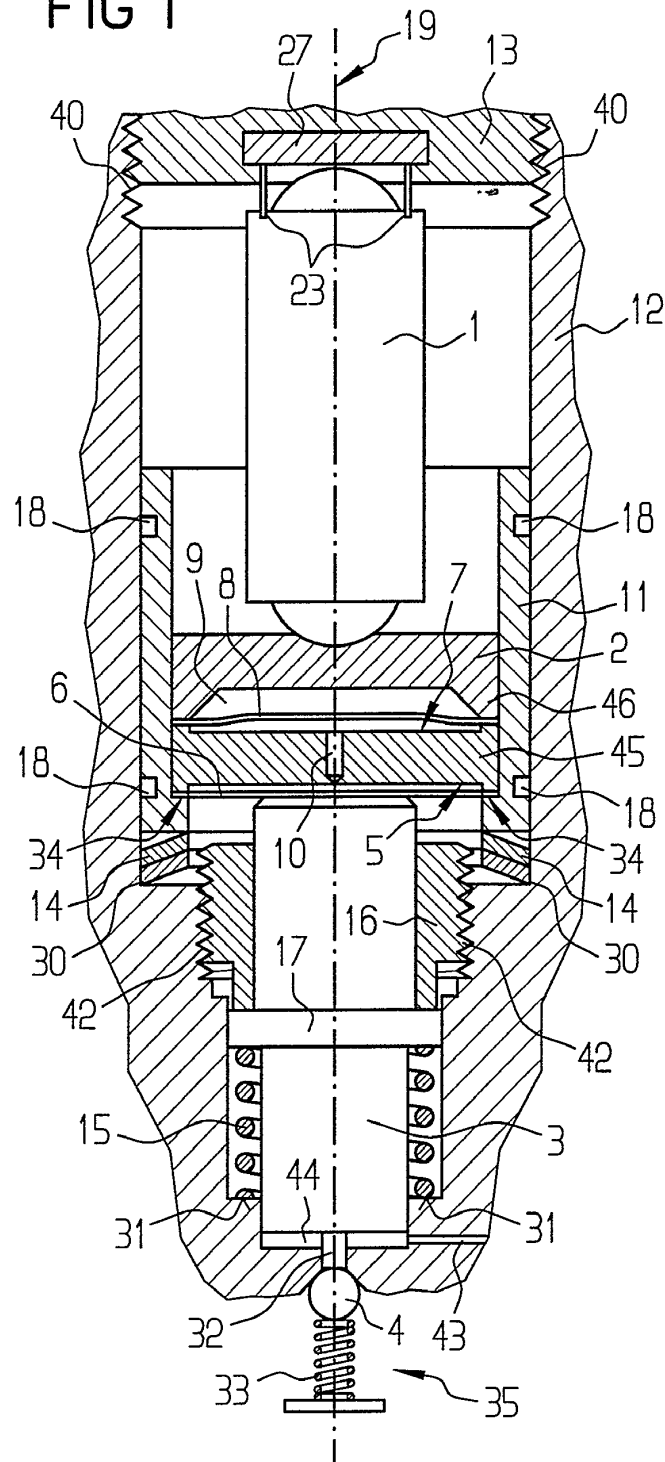


FIG 2

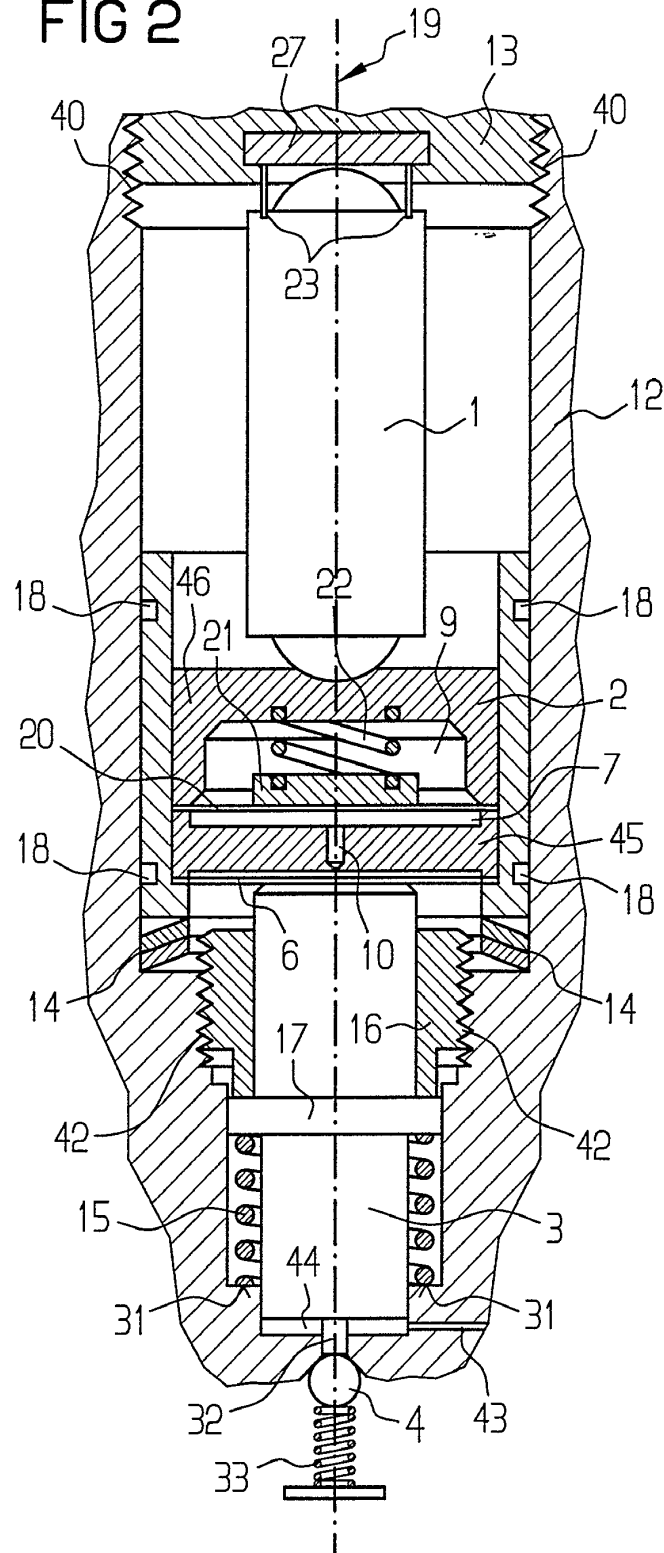
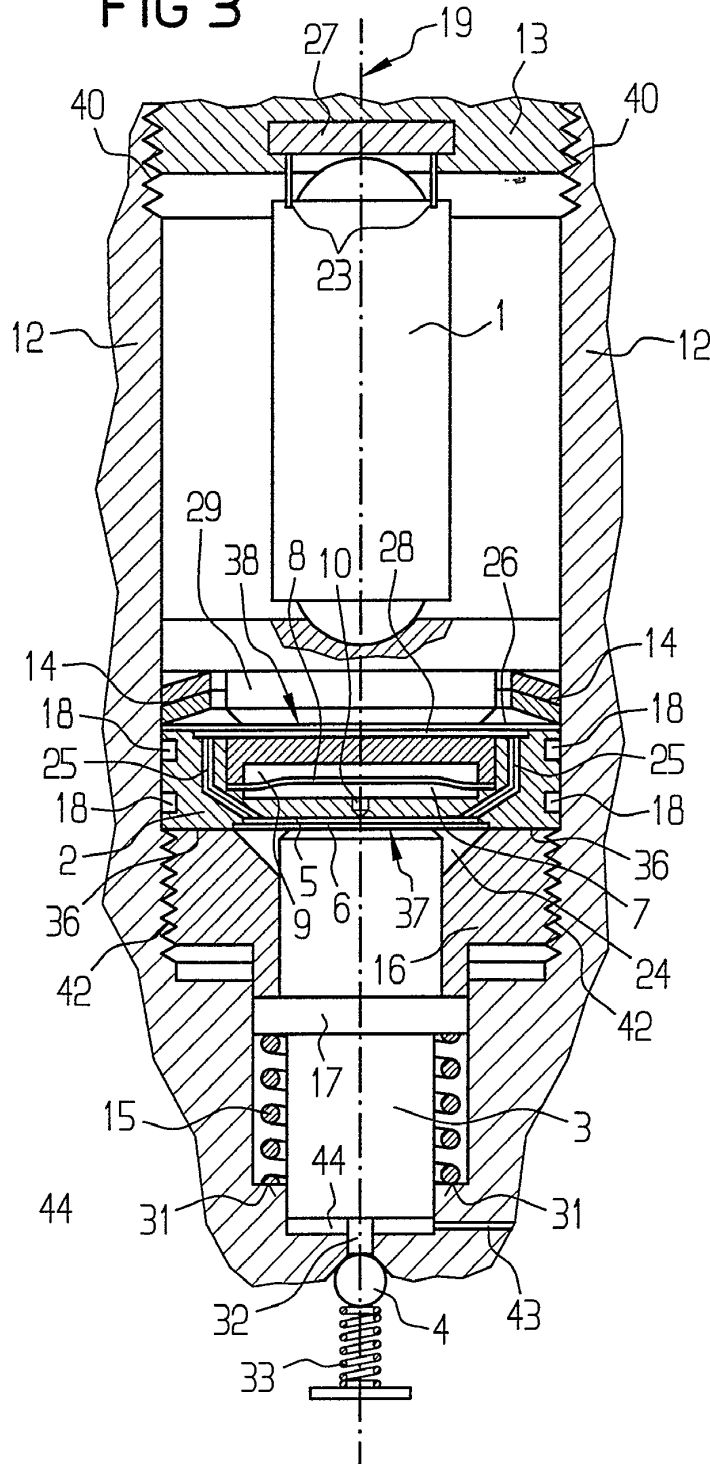


FIG 3





Wednesday, October 5, 2022

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DE 197 08 304 A1 (Klügl, Wendelin)

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