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Valve for Liquid Gas Bottles

The invention relates to a valve for liquid gas bottles and a method for refilling with liquid gas.

A gas bottle is a pressure vessel, usually made of metal, regularly made of steel, for the transport and storing of gases under pressure. Such a bottle can have a volume of more than 100 liters. The nominal pressure can be several hundred bar.

Liquid gas bottles contain gases such as LPG in liquefied form. Common gases are ethane, propane, butane and mixtures thereof. These gases can be liquefied at room temperature by comparatively low pressure. The liquid gas content of such bottles is usually between 3 and 33 kg. The height of such liquid gas bottles is usually between 420 mm and 1290 mm. The bottle diameter is typically between 200 mm and 318 mm.

Liquid gas bottles are closed with a valve (fitting), to which a suitable hose line can be screwed, usually in connection with a pressure reducer, for controlled withdrawal of their contents. In addition, a safety valve is located in the valve of liquid gas bottles which limits the permissible overpressure in the bottle to, for example, approx. 30 bar to prevent the bottle from bursting.

Typically, a valve of such a liquid gas bottle has a lateral connection piece as a gas tap, which is used for filling as well as for withdrawal. Lines are manually screwed onto this gas tap both in the case of withdrawal and refilling. When the gas tap is open, the lateral connection piece is connected to an opening at the underside of the valve. This underside with the opening is located above the liquid level when a liquid gas bottle is installed. Therefore, when gas is withdrawn, the gas which is above the liquid level in the gaseous state is withdrawn.

Liquid gas bottles are used for the operation of gas consumers such as gas stove, gas cooker, gas grill, gas oven or gas radiant heaters. When the content of a liquid gas bottle is used up, liquid gas bottles are returned by the consumer to the point of sale of liquid gas bottles for refilling. After such a return of the liquid gas bottle, it is transported from the point of sale to a central filling machine or filling station.

In order to facilitate refilling, it is known from publication DE 43 34 182 A1 that in addition to a lateral connection piece or lateral gas tap, a centric filling point can be provided. Filling can then be carried out from above without the need to align a laterally protruding gas tap.

From the publication EP 3021034 A1 a valve is known, which has a gas tap for gas withdrawal and an opening for refilling a liquid gas bottle. The opening for refilling a liquid gas bottle can be connected in a gas conducting manner to a tubular or hose line of the valve by opening a tap, which should extend at least 300 mm, preferably at least 400 mm, into a liquid gas bottle, when the valve is connected to such a gas bottle. This ensures that the line can extend into the liquefied part of the gas, which above all enables very fast emptying by pumping out.

It is the task of the invention to reduce the technical effort for refilling gas bottles.

To solve the task, a valve comprises the features of the first claim. Advantageous embodiments result from the dependent claims.

The valve for a liquid gas bottle according to the invention comprises a gas consumer connection piece. A gas consumer can be connected to the gas consumer connection piece to supply the gas consumer with gas. In particular, the gas consumer connection piece has a thread through which a gas consumer can be connected by means of a screw connection. In particular, the gas consumer connection piece stands out of the valve laterally.

There is a gas inlet opening at an underside of the valve and a gas conducting connection between the gas inlet opening and the gas consumer connection piece. Gas from a gas bottle connected to the valve can pass through the gas inlet opening to the gas consumer connection piece to supply gas to a gas consumer.

The valve comprises a rotary handle that can be rotated to an open position and a closed position. In an open position gas can flow from the gas inlet opening to the gas consumer connection piece. In the closed position, no gas can flow from the gas inlet opening to the gas consumer connection piece.

The valve has a closable opening on its upper side for refilling. Closable opening means that there is an opening and also a closing device that, when closed, prevents gas from flowing through this opening into a gas bottle connected to the valve. In particular, the closable opening is closed by an valve (opening valve) that can be operated from the outside to open the valve. In particular, the valve can be opened by pressure.

There is a gas conducting connection, which connects the closable opening with an opening at the underside of the valve in such a way that a refilling of a connected gas bottle with gas through the closable opening is possible.

In a preferred embodiment, the rotary handle comprises the closable opening through which a gas bottle can be refilled. The edge of the closable opening, also called opening edge, is therefore part of the rotary handle. In particular, the opening enables an automated refilling using a filling station as described in EP 3 021 033 A1. The number of parts required is low, especially in comparison to the prior art as described in publication DE 43 34 182 A1 and publication EP 3 021 034 A1, according to which a separate component is arranged for the provision of an opening on the upper side. The installation space can be kept small.

In order to be able to refill a gas bottle in an automated manner with little technical effort, the closable opening provided for refilling is located on the upper side of the valve. In particular, this keeps the effort for positioning a gas bottle in the filling station low. If the rotary handle is now also located on the upper side, then a filling station can not only refill a gas bottle connected to the valve from above with little centering effort, but can also open and close the rotary handle in an automated manner from above without the need for additional effort for positioning a gas bottle. In addition, a valve can be built with less technical effort compared to the valve known from EP 3 021 034 A1. Nevertheless, the rotary handle can be closed in an automated manner in a technically simple manner if necessary when a gas bottle is to be refilled.

The rotary handle advantageously comprises an inner cylinder which forms an upper portion of the gas conducting connection connecting the closable opening on the upper side with the opening at the underside. This contributes to the fact that the valve can be manufactured with a small number of components as well as with little installation space.

The rotary handle comprises in particular a cap which is connected to the cylinder in one piece. Thus, the rotary handle can consist of metal, wherein the cap and cylinder are manufactured in one piece by machining a metal block. The rotary handle is therefore not composed of several parts that were initially manufactured individually. This also reduces the number of parts required for production.

In the inner cylinder, preferably, a closing device is provided with which the closable opening can be closed. The closing device is formed in particular by a valve (closing valve) which can be moved from the outside by pressure against the force of a spring, thereby opening the opening. This facilitates automated refilling. The lower end of the valve is in particular supported against the housing of the valve. The upper end of the valve is for example clamped to the closing device or the valve of the closing device. A part of the closing device reaches into a spring which is spiral,

for example, which is held by the upper region of the spring, e.g. in a form-fit manner and/or clamping.

In an advantageous embodiment, the inner cylinder separates an inner channel from an outer channel in a gastight manner when the rotary handle is in its closed position. Gas can flow from the inner channel into the outer channel when the rotary handle is in its open position. Gas can then flow from the gas inlet opening on the underside along a gas supply channel into the inner channel. Gas can also flow from the outer channel to the gas consumer connection piece. This embodiment allows the valve to be manufactured with a small number of components in a small installation space.

The inner channel and the outer channel run preferably annularly around the gas conducting connection, which connects the closable opening on the upper side with the opening at the underside. The available installation space is thus used particularly well to bring gas from a connected bottle to a consumer. In particular, outer channel and inner channel are located on the same plane. The inner channel is preferably located inside the outer channel. Also these embodiments contribute to being able to manufacture with a small number of components and with little installation space.

Lifting movements of the inner cylinder are preferably performed by a rod, bolt or retaining ring that extends into a recess. The recess is wider than the rod, bolt or retaining ring such that the rod, bolt or retaining ring can be moved along the recess. The rod, bolt or retaining ring can consist of metal or plastic. The retaining ring can be a sealing ring by which desired gas-tight connections which can prevent unplanned gas leakage can advantageously be ensured in an improved manner.

The gas supply channel is preferably provided with a pressure relief valve, through which gas can escape from the valve in event of excessive gas pressure. A connected gas bottle is thus protected from an excessive overpressure.

Preferably the pressure relief valve is arranged on a side of the valve opposite the gas consumer connection piece. This arrangement allows the valve to be manufactured compactly in a small space.

Advantageously, a riser connection piece protrudes with respect to the underside. Gas can flow through the riser connection piece to the closable opening. A riser or hose can be easily attached to the riser connection piece. It is thus possible to select a riser or a hose that reaches to the bottom of a connected gas bottle. This facilitates and accelerates the emptying of a gas bottle during an automatic refill.

The underside is preferably bordered by an interior space in which an external filling protection is present. The external filling protection preferably runs at least partially at an angle inside the interior space. The external filling protection prevents the filling of the gas bottle through the gas consumer connection piece. It functions like a check valve. Gas can flow from the interior space to the gas consumer connection piece when the rotary handle is opened.

Between the inner cylinder and the housing of the valve which is inwardly and/or outwardly adjacent to the inner cylinder there are advantageously one or more sealing rings, which for example are held in recesses. The one or more sealing rings are pressed in a gas-tight manner against the inner cylinder. The sealing rings consist in particular of an elastomer or another resilient plastic.

The valve housing is preferably made of metal. A sufficiently stable valve housing can be manufactured with little technical effort.

The valve housing is preferably made of one piece. The number of components can thus be kept low. Also the effort for the production is low, because it is not necessary to produce several parts individually first and to join them together to a valve housing afterwards. Instead, the valve housing can be machined from a block, for example by milling and/or drilling. Such one-piece production also avoids tightness problems.

The rotary handle is in particular connected to the valve housing by a threaded connection. A lower portion of the gas conducting connection which connects the closable opening on the upper side with the opening at the underside, is formed by the valve housing. This also contributes to the fact that the valve can be manufactured from only a few parts.

The valve housing preferably comprises the underside to further reduce the number of parts needed.

The gas consumer connection piece, the pressure relief valve piece and/or the riser connection piece are preferably also part of the valve housing to keep the number of parts low.

Preferably, the rotary handle comprises a cap with a funnel-like hollow. The closable opening is located in the bottom of the cavity. This facilitates automatic refilling of a gas bottle. The hollow is in particular formed by ridges that extend from one edge of the cap towards the closable opening. A space remains between the ridges into which a tool can reach. This makes it easier to operate the rotary handle in an automated manner. Also the ridges are advantageously connected to the cap in one piece. The cap is thus machined from one piece to further reduce the number of parts.

Reducing the number of parts allows to keep production costs low.

The pictures show:

Figur 1: sectional view of a valve;

Figur 2: further sectional view of the valve;

Figur 3: side view of the valve.

Figure 1 shows a sectional view of a valve 1 for a gas bottle. The valve 1 comprises a gas consumer connection piece 2 of common design. The gas consumer connection piece 2 is provided with a thread 3. A gas consumer such as a gas burner

or a gas heater can be connected to the gas consumer connection piece 2. Gas from a gas bottle connected to the valve 1 can be fed to the gas consumer via the gas consumer connection piece 2 when a gas consumer is connected.

On the upper side of the valve 1 there is a rotary handle in the form of a rotating hand wheel 4. By opening or turning hand wheel 4 by rotation around the axis 5, the valve 1 can be opened or closed. When the valve 1 is open, gas from a gas bottle connected to the valve 1 can flow through one or more gas inlet openings 6 at the underside 7 to a gas consumer connected to the gas consumer connection piece 2. When the valve 1 is closed, no gas from a gas bottle connected to valve 1 can flow through the valve 1 to a gas consumer connected to the gas consumer connection piece 2.

On the upper side of the valve there is a closure composed of two components 8 and 9, which in the unloaded state is pressed by the force of a pretensioned spring 10 against an opening edge 11, i.e. the edge of an opening, on the upper side of valve 1 in a gas-tight manner. Component 8 is a circumferential sealing body, which preferably consists of an elastomer. The circumferential sealing body 8 is held in a form-fit manner by a mandrel of component 9, which consists of metal, for example. The circumferential sealing body 8 also rests with its underside on component 9. Component 9 also extends into the spiral spring 10 and is thus held in place in a clamping manner by the spring 10. If the closure 8, 9 is pressed down against the force of the pretensioned spring 10, the opening is opened. This opening is connected to a riser connection piece 12 located on the underside by a filling channel 13, 14 in a gas-conducting manner. The filling channel comprises an upper portion 13, which is widened with respect to a lower portion 14. The pretensioned spring 10 is located in the widened portion 13 of the filling channel. The lower end of the spring 10 is supported by the bottom of the portion 13. The upper end of the spring 10 is supported against a widened portion 9.

Gas can flow through the opening edge 11 towards the riser connection piece 12 and out of riser connection piece 12 when the closure 8, 9 has been pushed down

to an open position. Conversely, gas can then also be pumped out of a gas bottle connected to valve 1 through riser connection piece 12 when closure 8, 9 is open. Gas can therefore be pumped out through the opening on the upper side of valve 1 in the opened state of closure 8, 9, to empty a gas bottle connected to valve 1.

The riser connection piece 12 is designed and configured to connect a riser pipe or hose which reaches to the bottom of a connected gas bottle. The riser connection piece 12 protrudes downward from the gas-inlet underside 7. In order to be able to reliably connect a riser or a hose to riser connection piece 12, the outer circumference of riser connection piece 12 has a circular bulge 15 arranged annularly around riser connection piece 12, which bulge is in section in the shape of a partial circle.

Opposite the gas consumer connection piece 2 there is a pressure relief valve piece 16. Valve 1 has an annular inner channel 17 which allows gas to flow from a right-hand gas supply channel 18 to the left-hand gas consumer connection piece when the handwheel 4 is in an opened position. However, two gas supply channels 18 can also be provided, for example. The gas supply channel 18 leads from the one or more gas inlet openings 6 to the right-hand region of the annular inner channel 17. An annular outer channel 19 runs parallel to the annular inner channel 17 and around the outside of the annular inner channel 17. The annular outer channel 19 is separated from the annular inner channel 17 by an annular wall 20. The annular wall 20 therefore forms the outer wall of the annular inner channel 17 and also the inner wall of the annular outer channel 19. On the left side the annular outer channel 19 is connected to the gas consumer connection piece 2 in a gas conducting manner so that gas from the annular outer channel 19 can flow through the gas consumer connection piece 2 and then on to a gas consumer connected to the gas consumer connection piece 2.

A sealing ring 21 with a flat underside is located in a recess on the underside of handwheel 4. When the handwheel 4 is in its closed position as shown in figure 1, the flat underside of the sealing ring 21 rests gastight on the upper side of the

annular wall 20. The upper side of the annular wall 20 is rounded to reliably ensure a gas-tight connection. Because the sealing ring 21 has a flat underside and the upper side of the annular wall 20 is rounded, the thickness of the annular wall 20 can be advantageously small. This allows installation space advantages to be achieved.

Gas cannot pass from the annular inner channel 17 into the annular outer channel 19 if the underside of the sealing ring 21 rests on the upper side of the annular wall 20 in a gas-tight manner. This prevents gas from flowing from a gas bottle connected to the valve 1 to the gas consumer connection piece 2 when the handwheel 4 is closed.

When the handwheel 4 is opened, the sealing ring 21 is lifted off the annular wall 20, i.e. moved away upwards. Subsequently, gas can flow from the annular inner channel 17 into the annular outer channel 19 and from here further into the gas consumer connection piece 2.

The handwheel 4 is sealed in a gas-tight manner by one or preferably several further outer sealing rings 22, preferably of round cross-section, in such a way that gas cannot escape from the annular outer channel 19 upwards out of the valve. Several sealing rings 22 are preferable, since no gas should escape in an unplanned manner, in order to avoid unplanned emptying of a gas bottle. The handwheel 4 is sealed in a gas-tight manner by a further inner sealing ring 23, preferably of round cross-section, in such a way that gas cannot flow upwards from the annular inner channel 17 into the upper portion 13 of the filling channel. As a rule, one sealing ring 23 is sufficient, as it may be undesirable for gas to flow into the filling channel due to a leaking sealing ring 23, but this does not lead to an unplanned emptying of a gas bottle.

The handwheel 4 comprises an inner cylinder 24, which has an external thread 25 in an upper region. The aforementioned sealing rings 22 and 23 adjoin this inner cylinder 24 in a gas-tight manner on the inside and outside, respectively. The inner

cylinder 24 has, for example, one or more circumferential recesses on its outside, in which one or more sealing rings 22 are held. The external thread 25 of the inner cylinder 24 is screwed into an internal thread 26 of a valve housing 27. A retaining ring 28 is held by an inner circumferential recess in the valve housing 27, which extends inwardly into a recess 29. The recess 29 is provided circumferentially on the outer circumference of the inner cylinder 24. The recess 29 is wider than the width of the retaining ring 28, so that the retaining ring 28 can be moved along the width of the recess 29 in the form of a relative movement. This limits movement of the handwheel 4 both in the direction of the closed position and in the direction of the open position. The retaining ring thus prevents the valve 1 from being unscrewed. The path for opening the valve is limited.

The valve housing 27 is made of metal in one piece, namely machined from a metal block, for example by drilling and milling. The valve housing therefore consists of a single piece. Thus, several parts were not first manufactured and subsequently joined together in such a way that they form the valve housing 27.

The lower portion 14 of the gas conducting connection 13, 14, which connects the closable opening on the upper side with the opening at the underside 7, is formed by the valve housing 27. Thus, the valve housing 27 comprises a tube forming the lower portion 14. The valve housing 27 comprises the underside 7 of the valve. The gas consumer connection piece 2, the pressure relief valve piece 16 and the riser connection piece 12 are also part of the valve housing 27.

In the pressure relief valve piece 16, there is a valve which opens in the event of an excessively high overpressure. The valve comprises a circular valve seal 30 which is held in place by a valve cover 31. The circular valve seal 30 may consist of an elastomer to effect a good sealing effect. The valve cover 31 is pressed by a preloaded valve spring 32 in the direction of an annular opening edge 33. The opening with the annular opening edge 33 is thus sealed gas-tight by the valve seal 30 when there is no excessively high overpressure. In the event of excessively high overpressure, the valve cover 31 is lifted off the opening edge 32 together with the

valve seal 30 in such a way that gas can escape to the outside. The outer end of the valve spring 32 is held by a cover 35 provided with recesses 34. The cover 35 is attached to the pressure relief valve piece 16, for example by a screw connection. The cover 35 has recesses 34 to allow gas to escape through the cover 35 in the event of an excessively high overpressure.

The inner cylinder 24 of the handwheel 4 opens into a cap 36 on the upper side. The cap 36 has on its upper side a recess formed by ridges 37 to make it easier for a tool to open or close the handweel 4 by rotation in an automated manner. It also facilitates automated refilling, since a filling head of a filling station can be more easily connected to the valve.

Adjacent to the underside 7 is an interior space 38, which is formed around the lower portion 18 of the filling channel. An external filling protection is located in the interior space. The external filling protection 39 prevents the gas bottle from being filled through the gas consumer connection piece 2. The external filling protection 39 functions like a check valve.

Figure 2 shows a section through valve 1 rotated by 90° about axis 5 compared to figure 1. Figure 3 shows a side view of valve 1. There are two lateral box-shaped extensions 40. These make it easier to attach a valve 1 to a gas bottle by means of tools.

Patentkrav

1. Armatur til en flaskegasflaske med en gasforbruger-tilslutningsstuds (2), med en gasindgangsåbning (6) på undersiden (7), med en gasledende forbindelse (17, 18, 19) mellem gasindgangsåbningen (6) og gasforbruger-tilslutningsstudsen (2), med et drejegreb (4), der kan drejes til en åbningsstilling og en lukkestilling, hvor der i åbningsstillingen kan strømme gas fra gasindgangsåbningen (6) til gasforbruger-tilslutningsstudsen (2) og i lukkestillingen ikke kan strømme gas fra gasindgangsåbningen (6) til gasforbruger-tilslutningsstudsen (2), med en åbning, der kan lukkes, på armaturets overside, og med en gasledende forbindelse (13, 14), der forbinder den åbning, der kan lukkes, på oversiden med en åbning ved undersiden (7), således at det er muligt at genopfylde en tilsluttet gasflaske med gas gennem undersiden (7) og gennem den åbning, der kan lukkes, **kendetegnet ved, at** randen (11) på den åbning, der kan lukkes, udgør en del af drejegrebet (4).

2. Armatur ifølge krav 1, **kendetegnet ved, at** drejegrebet (4) omfatter en indre cylinder (24), der danner et afsnit (13) af den gasledende forbindelse (13, 14) bildet, som forbinder den åbning, der kan lukkes, på oversiden med åbningen ved undersiden (7), idet der i den indre cylinder (24) findes en lukkeindretning (8, 9, 10), med hvilken den åbning, der kan lukkes, kan låses.

3. Armatur ifølge det foregående krav, **kendetegnet ved, at** den indre cylinder (24) adskiller en indre kanal (17) gastæt fra en ydre kanal (19), når drejegrebet (4) befinder sig i sin lukkestilling, idet gas fra den indre kanal (17) kan strømme ud i den ydre kanal (19), når drejegrebet (4) befinder sig i sin åbningsstilling, idet gas kan strømme fra gasindgangsåbningen (6) langs en gastilførselskanal (18) ind i den indre kanal (17), og idet gas kan strømme fra den ydre kanal (19) til gasforbruger-tilslutningsstudsen (2).

4. Armatur ifølge det foregående krav, **kendetegnet ved, at** den indre kanal (17) og den ydre kanal (19) forløber ringformigt omkring den gasledende forbindelse (13, 14), som forbinder den åbning, der kan lukkes, på oversiden med

åbningen ved undersiden (7).

5. Armatur ifølge et af de tre foregående krav, **kendetegnet ved, at** en løftebevægelse af den indre cylinder (25) begrænses af en tætningsring (28), som når ind i en udsparing (29), der er bredere end tætningsringen (28), således at tætningsringen (28) kan bevæges langs udsparingen (28).

6. Armatur ifølge et af de tre foregående krav, **kendetegnet ved, at** gastilførselskanalen (18) er forsynet med en overtryksventil (30, 31, 32), gennem hvilken gas kan undvige ved et overdrevent højt gastryk fra armaturet (1).

7. Armatur ifølge det foregående krav, **kendetegnet ved, at** overtryksventilen (30, 31, 32) er anbragt på en side af armaturet (1), som ligger over for gasforbruger-tilslutningsstudsen (2).

8. Armatur ifølge et af de foregående krav, **kendetegnet ved, at** en stigrørtilslutningsstuds (12) springer frem fra undersiden (7), og gas kan strømme gennem stigrørtilslutningsstudsen (12) til den åbning, der kan lukkes.

9. Armatur ifølge et af de foregående krav, **kendetegnet ved, at** der til undersiden (7) grænser et indre rum (38), i hvilket der findes en gasvendeplade (39).

10. Armatur ifølge et af de ni foregående krav, **kendetegnet ved, at** der mellem den indre cylinder (24) og det til den indre cylinder (24) indvendigt og/eller udvendigt grænsende armaturhus (27) findes en eller flere tætningsringe (22, 23), der holdes i udsparinger, idet tætningsringene (22, 23) er presset gastæt mod den indre cylinder (24).

11. Armatur ifølge et af de foregående krav, **kendetegnet ved, at** armaturhuset (27) er fremstillet af metal i et stykke.

12. Armatur ifølge det foregående krav, **kendetegnet ved, at** drejegrebet (4) er forbundet drejeligt med armaturhuset (27) gennem en gevindforbindelse (25, 26), og et nedre afsnit (14) af den gasledende forbindelse (13, 14), der forbinder den

åbning, der kan lukkes, på oversiden med åbningen ved undersiden (7), dannes af armaturhuset (27).

13. Armatur ifølge et af de to foregående krav, **kendetegnet ved, at** armaturhuset (27) omfatter undersiden (7).

14. Armatur ifølge et af de to foregående krav, **kendetegnet ved, at** gasforbruger-tilslutningsstudsen (2), overtryks-ventilstudsen (16) og/eller stigrørtilslutningsstudsen (12) er bestanddele af armaturhuset (27).

15. Armatur ifølge et af de foregående krav, **kendetegnet ved, at** drejegrebet (4) er en kappe med en tragtagtig fordybning (37), og den åbning, der kan lukkes, findes i fordybningens (37) bund.

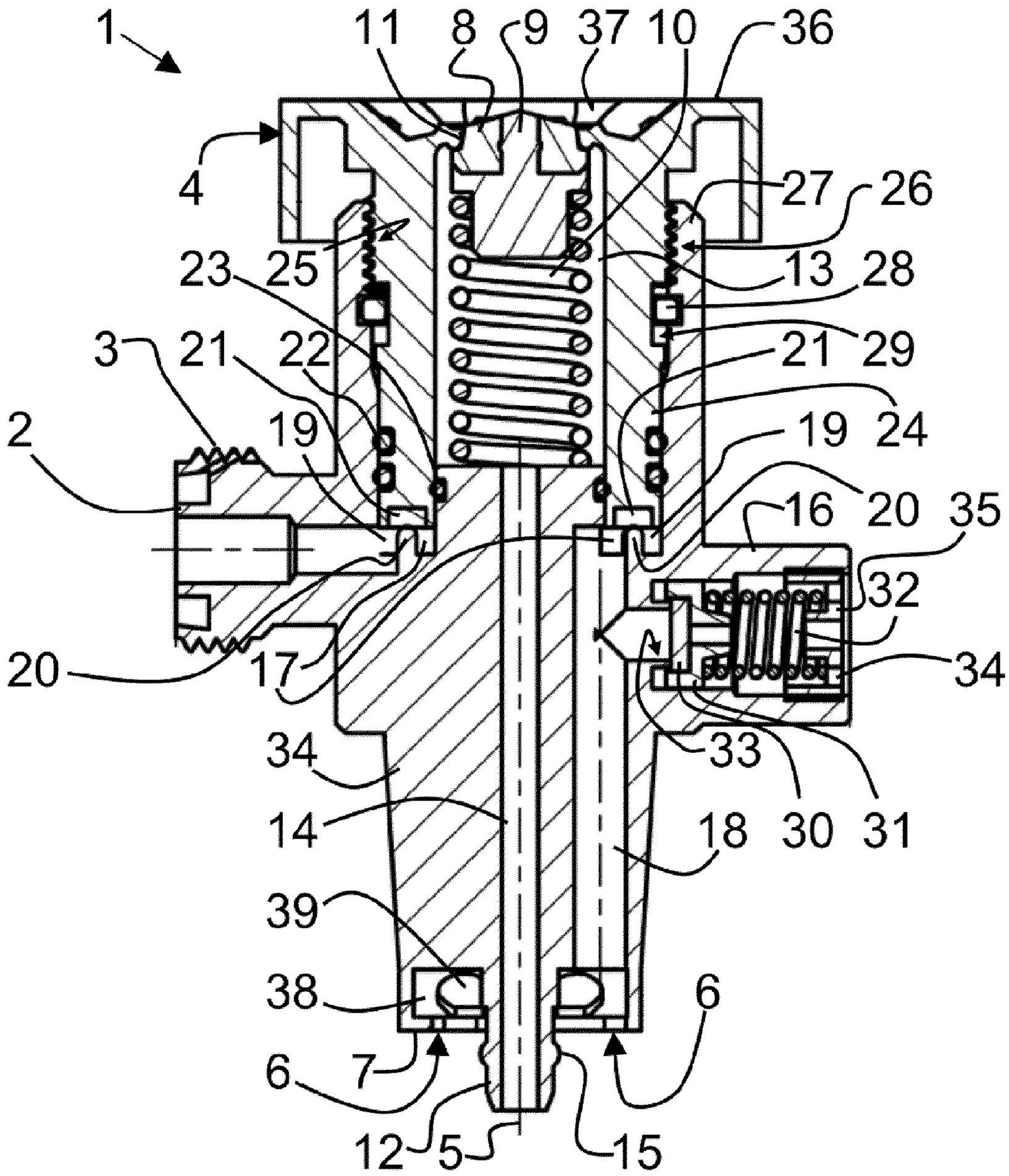
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FIG. 1

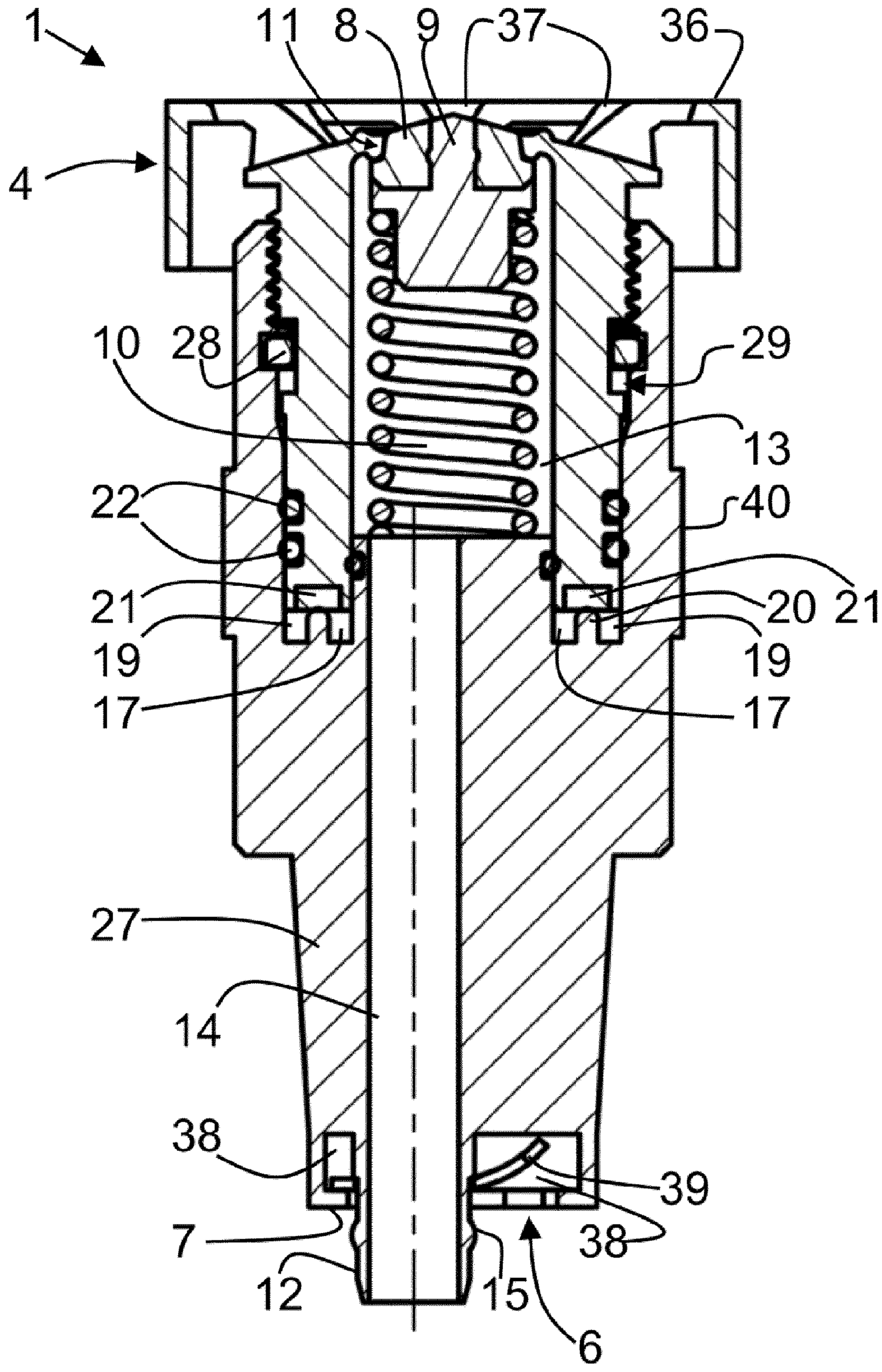
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FIG. 2

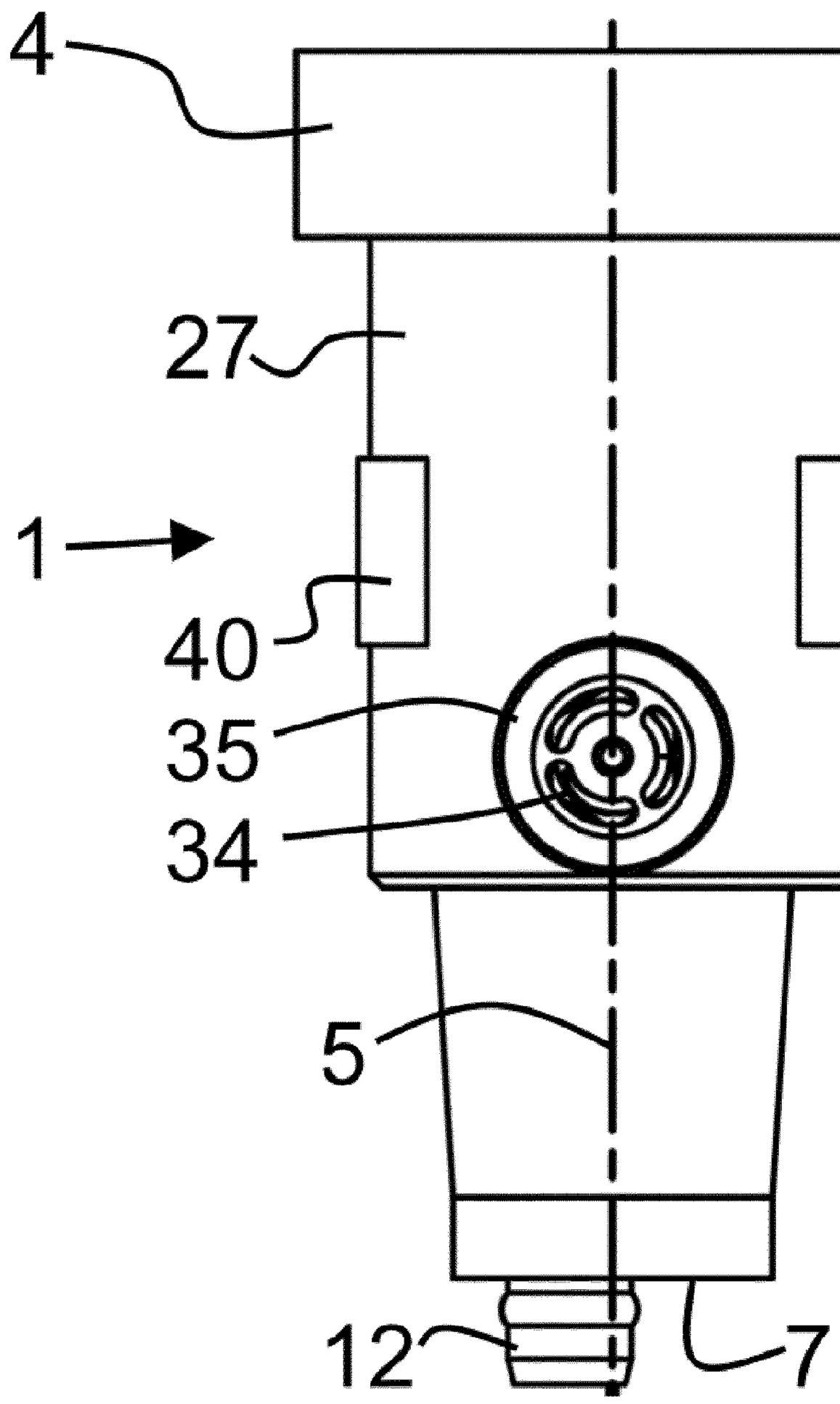

FIG. 3