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(54) Titre : RECIPIENT COMPORTANT UNE SOURCE DE CO_2 COMPRIME ET UNE SECURITE A ECLATEMENT EN CAS DE SURPRESSION

(54) Title: CONTAINER HAVING CO_2 COMPRESSED GAS SOURCE AND OVERPRESSURE BURST SAFEGUARD

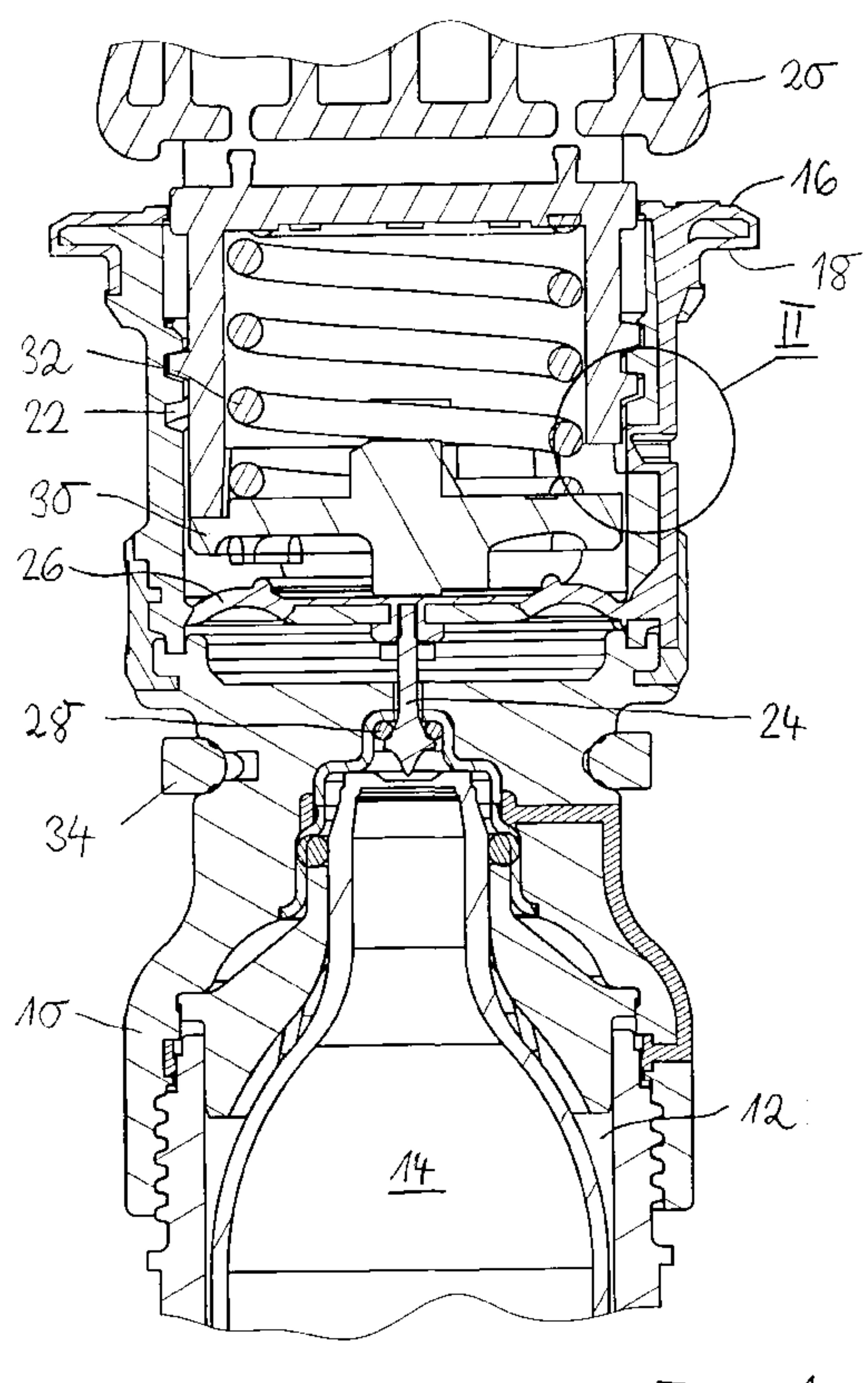

Fig. 1

(57) Abrégé/Abstract:
The invention relates to a container that can be filled with fluid and closed pressure-tight and from which fluid can be removed, having an insert that can be fixed in an opening of the container while sealing the same. The insert has a high-pressure CO_2

(57) Abrégé(suite)/Abstract(continued):
cartridge (14), a pressure regulating valve for dispensing CO_2 therefrom, and an actuator accessible from outside, the actuation of which taps the high-pressure CO_2 cartridge (14). An overpressure safeguard provides, upon undesired increases in pressure in the container, a flow path from the head space thereof through the insert to the atmosphere. The overpressure safeguard is designed as a burst safeguard. It bursts after an internal pressure is exceeded at which the container visibly crowns, but before reaching an internal pressure at which the container explodes.

Abstract

The invention relates to a container that can be filled with fluid and closed pressure-tight and from which fluid can be removed, having an insert that can be fixed in an opening of the container while sealing the same. The insert has a high-pressure CO2 cartridge (14), a pressure regulating valve for dispensing CO2 therefrom, and an actuator accessible from outside, the actuation of which taps the high-pressure CO2 cartridge (14). An overpressure safeguard provides, upon undesired increases in pressure in the container, a flow path from the head space thereof through the insert to the atmosphere. The overpressure safeguard is designed as a burst safeguard. It bursts after an internal pressure is exceeded at which the container visibly crowns, but before reaching an internal pressure at which the container explodes.

Container having CO_2 compressed gas source and overpressure burst safeguard

Specification

The invention relates to a container that can be filled with liquid and closed in pressure-tight condition, and from which liquid can be withdrawn. Examples of such containers are drums, small drums (party kegs) or cans, in which CO_2-containing liquids, especially beverages, are filled under pressure. In particular, it relates to party beer kegs.

The prior-art container according to EP 1642861 A1 has an insert, which can be fixed sealingly in an opening of the container and which is provided with a high-pressure CO_2 cartridge, a pressure-regulating valve for discharging CO_2 therefrom and an externally accessible control element, which can be actuated to pierce the high-pressure CO_2 cartridge.

Commercial pierceable CO_2 cartridges in a size suitable for pertinent containers contain approximately 16 g CO_2 under a pressure of approximately 60 bar. The pressure-regulating valve of EP 1642861 A1 ensures reduction and precise regulation of the pressure under which the CO_2 discharged into the top space of the container is maintained. The pressure is typically between 0.7 and 1.3 bar. It is equal to or slightly higher than the partial pressure of the CO_2 dissolved in the liquid.

The present invention addresses the inherently improbable accident that the pressure-regulating valve according to EP 1642861 A1 will ever fail for some reason, since it is possible for a gradual or even very rapid uncontrolled pressure rise to take place in the container. Tests show that a conventional party beer keg withstands an internal pressure of up to approximately 6.5 bar. At approximately 4 bar, the party keg begins to bulge; the top end plate and/or bottom end plate of the party key swell outward. At approximately 6.5 bar the party keg splits, usually because a folded seam joint between the shell and the top end plate or bottom end plate of the party keg comes undone. The remaining CO_2 escapes. The party keg empties out, possibly with a vigorous fountain of beer. This does not pose any danger to persons but may cause property damage, and laborious cleanup work is needed.

From EP 1688813 A1 there is known a container with a built-in pressure system, which is provided with a high-pressure CO_2 cartridge, a pressure-regulating valve for discharging CO_2 therefrom and an externally accessible control element, which can be actuated to pierce the high-pressure CO_2 cartridge. The pressure system is provided with an overpressure safeguard, which in the event of an undesired pressure rise in the container opens a flow path from the top space thereof through the pressure system to the atmosphere.

The overpressure safeguard according to EP 1688813 A1 is composed of an overpressure valve, which has a valve element in the form of an overpressure tubing section and which shuts off or opens a complicated flow path via a plurality of openings, bores and ducts. The structural complexity and the cost prices of such an overpressure safeguard are high.

The object of the invention is to provide a container of the said type with an overpressure safeguard that has simple construction and is functionally reliable, and that in the event of an accident signals the customer that something is not right with the pressure system within the container.

The overpressure safeguard that achieves this object bursts after exceedance of an internal pressure at which the container visibly bulges, but before development of an internal pressure at which the container splits. The bursting part of the overpressure safeguard is a diaphragm on the wall of a housing with which the insert protrudes into the container.

After bursting of the overpressure safeguard, the remaining CO_2 is blown off from the top space of the container via a well-defined flow path. Thus liquid or foam does not escape, or at least does not do so to a noteworthy extent. If any impairments at all occur as a result, they remain within limits. The visibly bulging container signals to the customer that something is not right with the pressure system within the container.

In a preferred embodiment, the flow path for blowing off the CO_2 leads through an unsealed zone of the control element. For this purpose it is possible to take advantage of existing unsealed zones, such as those of the control element on the insert according to EP 1642861 A1, only slight modifications in the structural design thereof being needed.

In a preferred embodiment, the overpressure safeguard is inactive before the high-pressure CO_2 cartridge is pierced. The overpressure safeguard is activated by the piercing of the high-pressure CO_2 cartridge. In this way it is ensured that the overpressure safeguard functions only if it is actually used, specifically in the event of failure of the pressure-regulating valve.

In a preferred embodiment, the overpressure safeguard bursts at an internal pressure of between 4.0 bar and 9.0 bar, preferably 4.5 bar and 7.0 bar, more preferably 5.0 and 6.0 bar.

In a preferred embodiment, the diaphragm is braced against the control element before the high-pressure CO_2 cartridge is pierced. As soon as the high-pressure CO_2 cartridge is pierced, the diaphragm is released from the control element.

In a preferred embodiment, the diaphragm is countersunk into the insert. In this way it is protected from damage.

In a preferred embodiment, the diaphragm is composed of elastic plastic. In the event of an uncontrolled rise of the internal pressure, the diaphragm undergoes increasing elastic deformation, until it bursts.

The invention will be explained in more detail hereinafter on the basis of an exemplary embodiment illustrated in the drawing, wherein:

Fig. 1 shows a CO_2 compressed gas source in longitudinal section; and

Fig. 2 shows the elastic plastic component of a detail II of Fig. 1.

The CO_2 compressed gas source is constructed as an insert, which fits in the bunghole of a container, extends into the container and tightly closes the bunghole. The container is filled under pressure with CO_2-containing liquid through the bunghole, which is usually disposed at the middle of its top end plate. Thereafter the bunghole is closed with the insert.

To withdraw the liquid, there can be used an integrated outlet tap, which is disposed on the side wall of the container at the height of the bottom end plate thereof. The liquid flows out under the action of internal pressure and gravity, until a reduced pressure is reached in the top space of the container above the liquid surface therein. To adjust this correctly and maintain it in controlled manner, the CO_2 compressed gas source is activated. The CO_2 compressed gas source injects CO_2 into the top space of the container under a pressure that corresponds to the partial pressure of the CO_2 dissolved in the liquid or that slightly exceeds this partial pressure. Thereby steady emptying of the container is ensured. No air is admitted into the top space of the container. The CO_2 content of the liquid remains constant.

The insert has slender elongated shape, and for the most part is radially symmetric relative to a central axis. It is made largely of plastic. The two-component plastic injection-molding technique can be used for manufacture.

When the insert is in installed condition, closing the bunghole of the container, it projects with a housing 10 into the container.

At its inside end housing 10 has a chamber 12 for receiving a high-pressure CO_2 cartridge 14 in a snug fit. The head of cartridge 14, at the end face of which it can be pierced, is proximal to the bunghole.

Housing 10 is supported externally with a circumferential collar 16 on the beaded rim of the bunghole. On collar 16 there is molded a seal 18, with which the insert seals the bunghole.

A rotary knob 20 countersunk in housing 10 protrudes outwardly beyond collar 16, and can be actuated to pierce CO_2 cartridge 14. Rotary knob 20 has a steep male thread 22, with which it is screwed into a complementary female thread of housing 10.

To pierce CO_2 cartridge 14 there is used a piercing needle 24, which is structurally combined with the valve member of a pressure-regulating valve. The valve member is mounted together with an elastic diaphragm 26 at the center of the axis of housing 10. The tip of piercing needle 24 is disposed only a short distance from the end face of CO_2 cartridge 14.

During axial positioning movement of piercing needle 24 on CO_2 cartridge 14, the valve member lifts from a valve seat 28 of the pressure-regulating valve. Valve seat 28 is made from elastic sealing material and molded onto housing 10.

Piercing needle 24 is urged by a slide 30, which is disposed between rotary knob 20 and piercing needle 24. Slide 30 is guided in longitudinal sliding relationship in housing 10. Upon actuation, rotary knob 20 is screwed forward against slide 30, which is axially adjusted in the process.

A helical compression spring 32 is clamped between rotary knob 20 and slide 30. Helical compression spring 32 braces slide 30 against piercing needle 24.

Diaphragm 26 bounds a working space downstream from valve seat 28 of the pressure-regulating valve. The working space has a lateral outlet opening, in front of which there is disposed an elastic O-ring 34. O-Ring 34 has the function of a non-return valve. It prevents liquid from entering the insert.

To pierce CO_2 cartridge 14, rotary knob 20 is turned by approximately 90°. Slide 30 is moved axially inward by the screwing thrust of rotary knob 20. Piercing needle 24 is driven axially inward under elastic deformation of diaphragm 26. The valve member lifts from valve seat 28. After piercing, a very small valve space upstream from the head of CO_2 cartridge 14 fills with CO_2 under high pressure.

After rotary knob 20 has turned a complete 90° or more, slide 30 springs axially back outward under the force of helical compression spring 32. For this purpose it is actuated by piercing needle 24, which is retracted axially by the elastic return deformation of diaphragm 26. Helical compression spring 32 is compressed. The pressure-regulating valve is closed and a small amount of CO_2 under high pressure is admitted into the working space. The compressive forces of the CO_2 on diaphragm 26 contribute to the spring-back of slide 30 actuated by the piercing needle.

Further opening and closing of the pressure-regulating valve is determined by an equilibrium of forces across diaphragm 26, established by the elastic properties of diaphragm 26, the spring constant of helical compression spring 32 and the CO_2 pressure in the working space. The determining factor for the pressure of the discharged CO_2 is the spring constant of helical compression spring 32.

Usually the user will activate the CO_2 compressed gas source when the internal pressure in the container has dropped so much that the stream of liquid emerging through the outlet tap is too weak. However, the CO_2 compressed gas source can already be activated beforehand without difficulty even if the internal pressure in the container is still high, very likely even when the user first attempts to operate the container at all. Introduction of CO_2 into the top space of the container does not take place as long as the high internal pressure is acting on O-ring 34 in front of the outlet opening.

The CO_2 compressed gas source is equipped with an overpressure safeguard, which becomes active if the pressure-regulating valve fails and CO_2 enters the top space of the container at uncontrolled high pressure.

The overpressure safeguard is made by injection-molding thermoplastic elastomer (TPE) onto the wall of housing 10 just in front of the bunghole, such that its part having the smallest material thickness forms diaphragm 36 countersunk in the wall.

Diaphragm 36 is in flush contact with the outer shell of rotary knob 20, which has not yet been activated to pierce CO_2 cartridge 14. For this purpose it is placed on rotary knob 20 between two adjacent thread flights of male thread 22.

When rotary knob 20 is turned by 90° to pierce CO_2 cartridge 14, a window in the shell of rotary knob 20 becomes positioned opposite diaphragm 36. In the event of an uncontrolled rise of the internal pressure, diaphragm 36 is able to expand elastically into this window, until it bursts at the location of smallest material thickness at approximately 5.7 bar. Thereby a flow path is opened from the top space of the container at the shell of rotary knob 20; this path is not absolutely leaktight relative to collar 16, and so the CO_2 is able to flow out of the top space of the container to the atmosphere.

List of reference numerals

10	Housing
12	Chamber
14	High-pressure CO_2 cartridge
16	Collar
18	Seal
20	Rotary knob
22	Male thread
24	Piercing needle
26	Diaphragm
28	Valve seat
30	Slide
32	Helical compression spring
34	O-ring
36	Diaphragm

Claims

1. A container that can be filled with liquid and closed in pressure-tight condition, and from which liquid can be withdrawn, which container has an insert that can be fixed in sealed manner in an opening of the container and a high-pressure CO_2 cartridge (14), a pressure-regulating valve for discharging CO_2 therefrom and a control element that is accessible from the outside and that can be actuated to pierce the high-pressure CO_2 cartridge (14), and which has an overpressure safeguard, which in the event of an undesired pressure rise in the container opens a flow path from the top space thereof through the insert to the atmosphere, characterized in that the overpressure safeguard bursts after exceedance of an internal pressure at which the container visibly bulges, but before development of an internal pressure at which the container splits, and in that the bursting part of the overpressure safeguard is a diaphragm (36) on the wall of a housing (10) with which the insert protrudes into the container.

2. A container according to claim 1, characterized in that the flow path leads through an unsealed zone of the control element.

3. A container according to claim 1 or 2, characterized in that the overpressure safeguard is inactive before the high-pressure CO_2 cartridge (14) is pierced, and in that it can be activated by the piercing of the high-pressure CO_2 cartridge (14).

4. A container according to one of claims 1 to 3, characterized in that the overpressure safeguard bursts at an internal pressure of 4.0 to 9.0 bar, preferably 4.5 to 7.0 bar, more preferably 5.0 to 6.0 bar.

5. A container according to one of claims 1 to 4, characterized in that the diaphragm is braced against the control element before the high-pressure CO_2 cartridge (14) is pierced and is released from the control element as soon as the high-pressure CO_2 cartridge (14) is pierced.

6. A container according to one of claims 1 to 5, characterized in that the diaphragm (36) is countersunk into the insert.

7. A container according to one of claims 1 to 6, characterized in that the diaphragm (36) is composed of elastic plastic.

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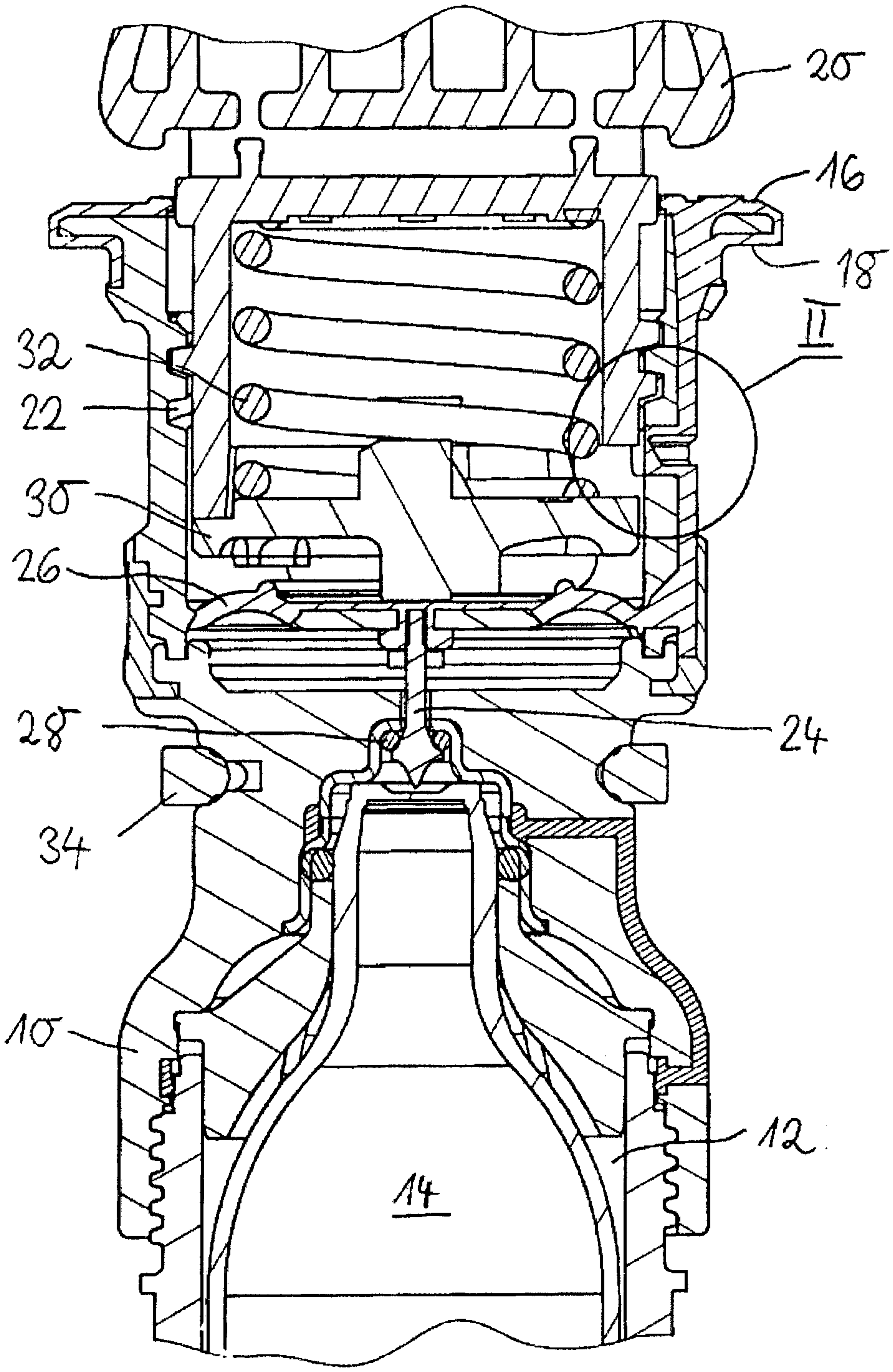

Fig. 1

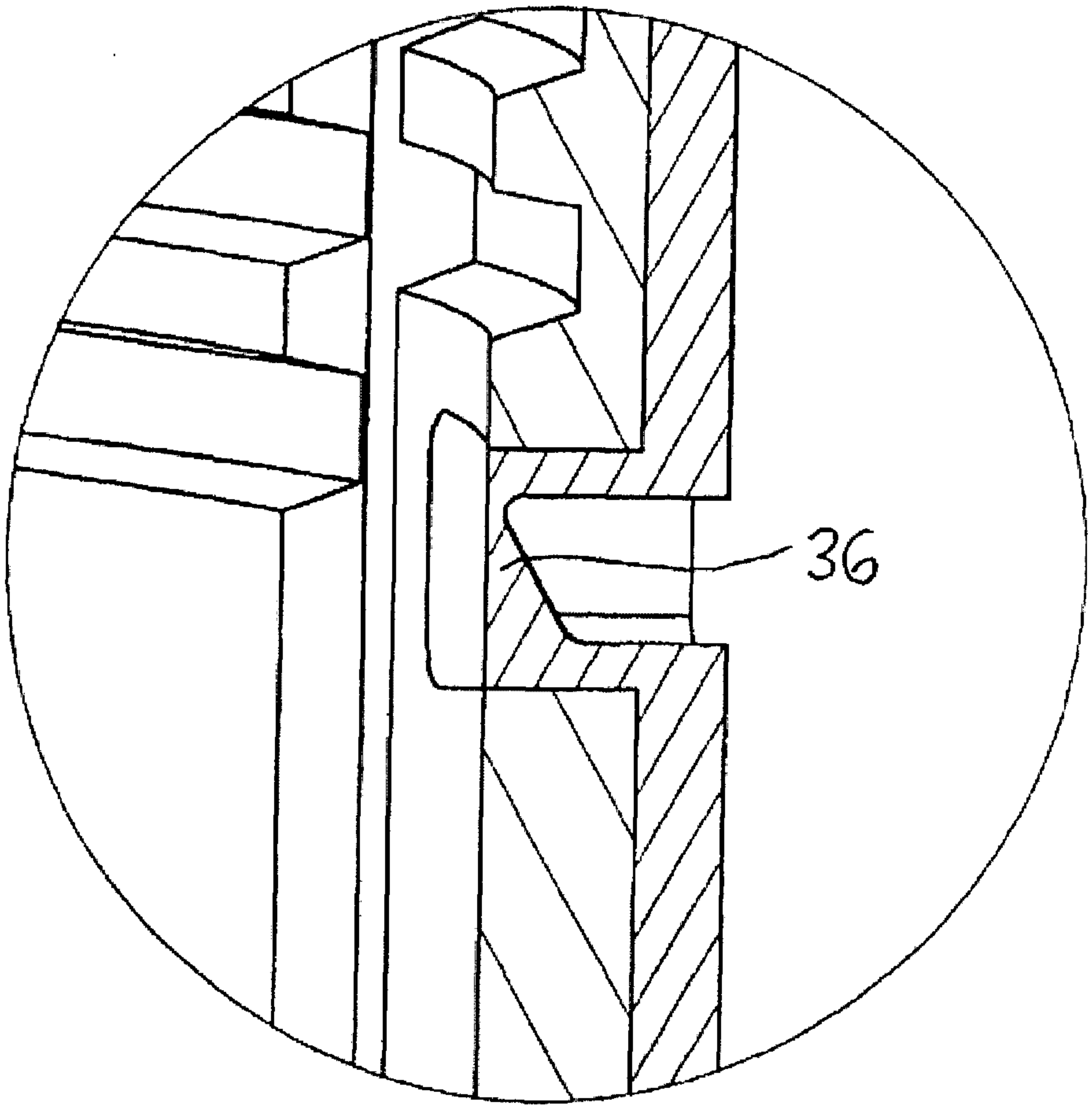

Fig. 2

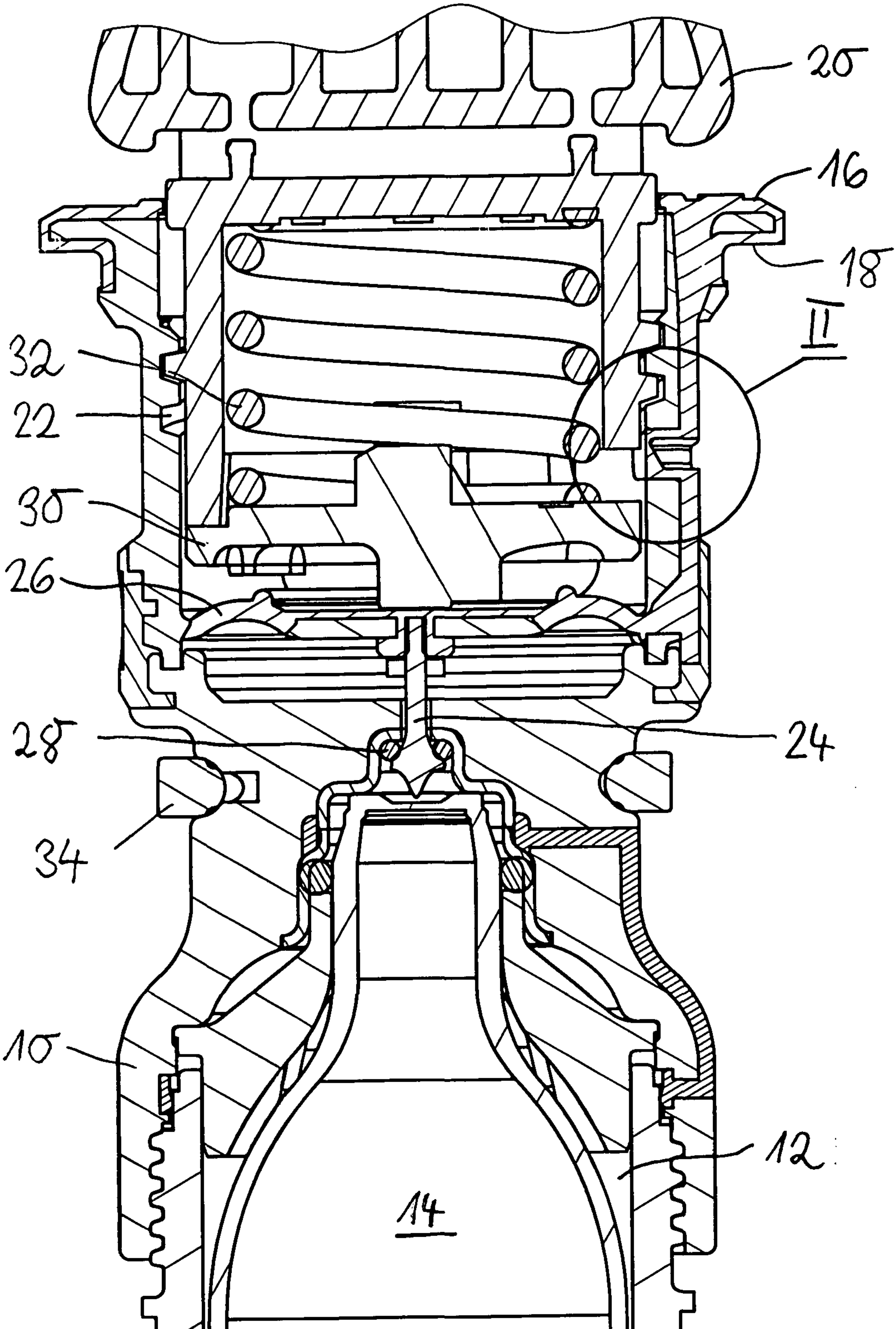

Fig. 1