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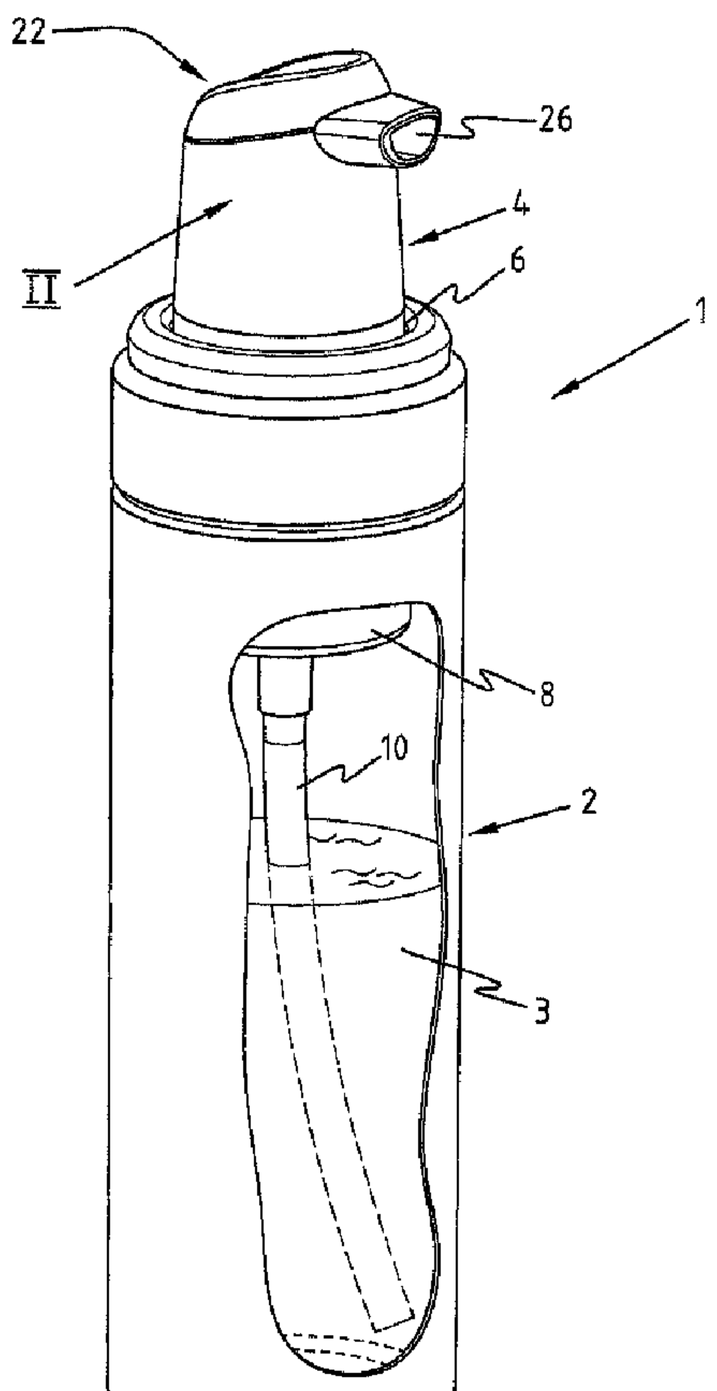
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(54) Title: DISPENSER FOR CONCENTRATED INJECTION



(57) Abrégé/Abstract:
A dispenser, particularly suitable for a liquid container, comprising a liquid pump provided with an inlet having an inlet valve and an outlet having an outlet valve, an air pump provided with an inlet having an inlet valve and an outlet having an outlet valve, a mixing

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(21) 2 542 183

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(57) Abrégé(suite)/Abstract(continued):
chamber which is in communication with the outlet of each pump, and a dispensing part provided with an outflow channel with an outflow opening, wherein the outflow channel is in communication with the mixing chamber, and wherein the outlet valve of the air pump is arranged adjacent to the outlet of the liquid pump.

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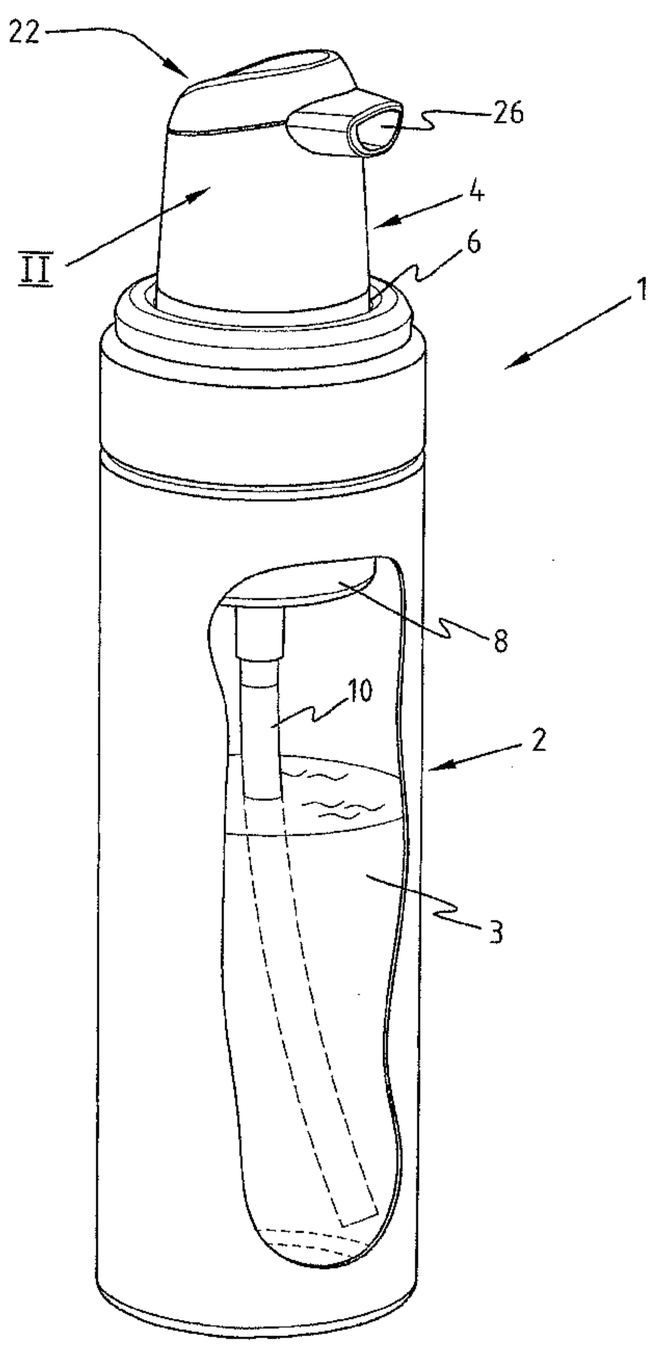
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(54) Title: DISPENSER FOR CONCENTRATED INJECTION



(57) Abstract: A dispenser, particularly suitable for a liquid container, comprising a liquid pump provided with an inlet having an inlet valve and an outlet having an outlet valve, an air pump provided with an inlet having an inlet valve and an outlet having an outlet valve, a mixing chamber which is in communication with the outlet of each pump, and a dispensing part provided with an outflow channel with an outflow opening, wherein the outflow channel is in communication with the mixing chamber, and wherein the outlet valve of the air pump is arranged adjacent to the outlet of the liquid pump.

WO 2005/028121 A1

WO 2005/028121 A1

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DISPENSER FOR CONCENTRATED INJECTION

The invention relates to a dispenser, particularly suitable for a liquid container, comprising a liquid pump provided with an inlet having an inlet valve and an outlet having an outlet valve, an air pump provided with an inlet having an inlet valve and an outlet having an outlet valve, a mixing chamber which is in communication with the outlet of each pump, and a dispensing part provided with an outflow channel with an outflow opening, wherein the outflow channel is in communication with the mixing chamber.

Such a dispenser can be used to dispense a spray or a foam. Such a dispenser preferably produces a spray or foam of the highest possible quality, which entails the air bubbles in the spray or the foam being distributed as finely and uniformly as possible.

A dispenser of the present type is known from EP 0 618 147. The outlet valve of the air pump is adjacent to the outlet of the liquid pump.

The object of the present invention is to improve known dispensers.

The present invention provides for this purpose a dispenser which is characterized in that the outlet valve for air, which is adjacent to an outlet for the liquid pump, is formed by a flexible wall. Although a minimal leakage need not affect the functioning of the dispenser, the flexible wall seals. In the case of some liquids a sudden opening of the air valve to generate an "explosion" of air is found to be necessary to obtain a good foam or spray. Such an outlet valve for air can be manufactured in relatively simple and inexpensive manner.

The air in the air pump is compressed, and the pressure therefore increases. When a determined pressure

difference is reached over the air valve, it will open. The resistance which must be overcome is here the valve resistance and the underlying liquid pressure of liquid flowing past the valve. The air can hereby be injected under great pressure directly into the liquid. Experiments have shown that a spray or foam of improved quality can hereby be obtained. The flexible wall is movable in the liquid flow.

The outlet valve of the air pump is preferably positioned relative to the outlet of the liquid pump such that when the valve is opened the air is introduced almost transversely of the liquid flow. Experiments have once again shown that this enhances the quality of the spray or the foam.

In a further embodiment according to the invention the outlet of the liquid pump comprises a liquid chamber which, as seen in flow direction, is situated after the outlet valve of the liquid pump and which is provided with a central opening which debouches in the mixing chamber. During compression of the air in the air pump the liquid chamber is filled with liquid from the liquid container. Via the central opening in the liquid chamber the liquid flows into the mixing chamber where, after sufficient build-up of pressure, air is introduced into the liquid.

The mixing chamber preferably comprises a central outlet opening which debouches in the outflow channel of the dispensing part. The air-liquid mixture is thus forced to leave the mixing chamber through a relatively small opening. This also enhances the quality of the foam or the spray.

In a preferred embodiment a flexible wall is arranged between the liquid chamber and the mixing chamber. In the static situation the valve seals around the central outlet opening of the mixing chamber.

The central opening of the liquid chamber is preferably in open communication with the outflow channel of the dispensing part. Liquid leaves the liquid chamber through the central opening in the direction of the outflow channel.

The dispenser according to the invention is particularly intended as foam dispenser, wherein a foam-forming element is arranged in the outflow channel.

The foam-forming element is preferably arranged in the outflow channel such that the foam flowing through the outflow channel passes through the foam-forming element at least twice. A finer and more uniform foam is hereby found to result which is unsurpassed by any known foam-forming unit. The production process is furthermore simpler since only one foam-forming element is arranged for two passages, which has the effect of saving costs.

For a further improvement in the foam quality, a further foam-forming element can be arranged, as seen in the flow direction, before or after the foam-forming element that is passed through twice. In a particularly advantageous embodiment according to the invention, the final foam-forming element, as seen in the flow direction, is preferably arranged in the outflow opening. The foam-forming element forms resistance at the outer end of the dispensing part, so that the foam does not spurt out of the outflow channel, and thereby remains more stable.

Finally, the invention relates to a dispenser assembly consisting of a liquid container and a dispenser according to the invention.

The invention will be further elucidated hereinbelow with reference to the accompanying drawings. In the drawings:

Figure 1 shows a perspective, partly cut-away dispenser assembly according to the invention;

Figure 2 shows a perspective view in cross-section of a detail of a foam dispenser according to a first embodiment;

Figure 3 shows a perspective view in cross-section of a detail of a foam dispenser according to a second embodiment;

Figures 4A and 4B are partly cross-sectional views of the dispenser shown in figures 2 and 3 with respectively closed and open outlet valve for air.

A dispenser assembly 1 according to the present invention comprises a cylindrical liquid container 2 which has therein a liquid 3 for atomizing or foaming and on which is arranged a dispenser 4 (figure 1). Dispenser 4 comprises a pump 6 for air and a pump 8 for liquid, which are each provided with an inlet and an outlet. Air pump 6 is in communication with the environment via opening 9 (figure 2), while liquid pump 8 is in communication with the content 3 of liquid container 2 via hose 10. Dispenser 4 further comprises a mixing chamber 14 which is in communication with both the air pump 6 and the liquid pump 8. The outlet of mixing chamber 14 is formed by a central outlet opening 15 in wall 20. The outlet of liquid pump 8 comprises an outlet valve 16 and a liquid chamber 12 which is located thereabove and provided with a central opening 13 debouching in mixing chamber 14. An outlet valve 18 for air is located in the outlet of air pump 6 (figure 2).

The top part of the assembly comprises a dispensing part 22, comprising an outflow channel 24 with an outflow opening 26. Outflow channel 24 runs from mixing chamber 14 to outflow opening 26. In this channel 24 are arranged one (figure 2) or two (figure 3) foam-forming elements, in the shown preferred embodiment in

the form of relatively fine-mesh screens 28,30. Reference is made in respect of these screens, and in particular in respect of specific dimensioning thereof, to patent application NL 1022633, the content of which is incorporated herein.

The opening 9 for admitting air into air pump 6 is provided in dispensing part 22. The inlet of air pump 6 further comprises an air chamber 32. The air inlet is bounded by inlet valve 34. A compression chamber 36 for air is arranged between inlet valve 34 and outlet valve 18 for air.

The outlet valve 18 for air is formed by a flexible wall which forms a wall for both liquid chamber 12 and mixing chamber 14. In the static situation the flexible wall 18 seals round the central outlet opening 15 of mixing chamber 14. The flexible wall is provided with central opening 13 which forms the outlet of liquid chamber 12. This central opening 13 is in open communication with outflow channel 24 of dispensing part 22 via mixing chamber 14 and the central outlet opening 15 of mixing chamber 14.

On the underside of flexible wall 18 there are provided stop means 38 with which the outlet valve 16 for liquid comes into contact in the maximum opened position. Stop means 38 serve to prevent the outlet valve 16 for liquid influencing the operation of outlet valve 18 for air. These stops also ensure that the outlet valve 16 for liquid does not close off the liquid flow. During the downward stroke of dispenser 4 the outlet valve 16 is lifted by the liquid flow. These ribs 38 are arranged to prevent the valve 16 sealing the outflow opening 13.

The manner in which dispenser 4 and assembly 1 are further constructed is described and shown in

international patent application WO 02/42005 of applicant. The content hereof is likewise incorporated.

The operation of assembly 1 will be elucidated with reference to figures 4A and 4B. In figure 4A the outlet valve 18 for air is shown in the static situation. In the static situation the valve 18 seals round outlet opening 15 of mixing chamber 14. Air is situated in compression space 36 and owing to the sealing cannot displace to mixing chamber 14. Liquid is situated in liquid chamber 12. Via central opening 13 of liquid chamber 12 and the central outlet opening 15 of mixing chamber 14 the liquid chamber 12 is in open communication with outflow channel 24. The pressure in the liquid chamber is therefore equal to atmospheric pressure. In this situation the user presses on dispensing part 22. Dispensing part 22 is hereby moved downward relative to container 12 while co-displacing the pistons (not shown) of air pump 6 and liquid pump 8. During a downward stroke of dispensing part 22 the air in compression space 36 is compressed. The pressure will hereby increase. When the pressure in compression space 36 has reached a predetermined value, the resistance of air valve 18 can be overcome, and flexible wall 18 can bend downward, whereby an open connection is created between compression space 36 and mixing chamber 14. At that moment the air under pressure will be injected with great force into the liquid flow which comes from liquid chamber 12 through central opening 13, mixing chamber 14 and the central outlet opening 15 of mixing chamber 14. Because the outlet valve 18 of the air pump is positioned relative to the outlet of liquid pump 8, the air is introduced practically transversely of the liquid flow when valve 18 is opened. The position with opened air valve 18 is shown in figure 4B. Because air escapes from compression space 36, the pressure will fall until

eventually the resistance of valve 18 is no longer overcome. Valve 18 will then close (figure 4A). Reference is made to WO 02/42005 for the further operation of dispenser assembly 1.

The central outlet opening 15 of mixing chamber 14 preferably has a diameter of between about 0.5 and 4 mm, more preferably a diameter of between about 1 and 2 mm. The highly concentrated injection of air into the liquid channel creates an intensive mixing. It has been shown experimentally that this produces a higher quality of foam. It is possible, owing to pressure differences over air valve 18 during injection, that there occurs high-frequency opening and closing of valve 18.

Instead of opening 9 in the side wall of dispenser 4, it is also possible to connect air pump 6 to the environment via a gap (not shown) arranged between cap 40 and side wall 42. Situated under cap 40 is a tube which serves as chimney and allows the air from the gap through to air chamber 32. This construction is shown in figure 3 of NL 1022633.

Although the invention in the drawings is elucidated for the purpose of making foam, the invention is not limited to foam. The concentrated injection of air by means of an outlet valve located adjacently of the outlet for liquid can also be applied for the purpose of making a spray.

CLAIMS

1. Dispenser, particularly suitable for a liquid container, comprising:

- a liquid pump provided with an inlet having an inlet valve and an outlet having an outlet valve,
- an air pump provided with an inlet having an inlet valve and an outlet having an outlet valve,
- a mixing chamber which is in communication with the outlet of each pump, and
- a dispensing part provided with an outflow channel with an outflow opening, wherein the outflow channel is in communication with the mixing chamber, **characterized in that** the outlet valve of the air pump, which is adjacent to the outlet of the liquid pump, is formed by a flexible wall.

2. Dispenser as claimed in claim 1, wherein the outlet valve of the air pump is positioned relative to the outlet of the liquid pump such that when the valve is opened the air is introduced almost transversely of the liquid flow.

3. Dispenser as claimed in claim 1 or 2, wherein the outlet of the liquid pump comprises a liquid chamber which, as seen in flow direction, is situated after the outlet valve of the liquid pump and is provided with a central opening which debouches in the mixing chamber.

4. Dispenser as claimed in any of the foregoing claims, wherein the mixing chamber comprises a central outlet opening which debouches in the outflow channel of the dispensing part.

5. Dispenser as claimed in any of the foregoing claims, wherein the flexible wall is arranged between the liquid chamber and the mixing chamber.

6. Dispenser as claimed in claim 5, wherein in the static situation the flexible wall seals around the central outlet opening of the mixing chamber.

7. Dispenser as claimed in any of the claims 3-6, wherein the central opening of the liquid chamber is in open communication with the outflow channel of the dispensing part.

8. Foam dispenser as claimed in any of the foregoing claims, further comprising a foam-forming element arranged in the outflow channel.

9. Foam dispenser as claimed in claim 8, wherein the foam-forming element is arranged in the outflow channel such that the foam flowing through the outflow channel passes through the foam-forming element at least twice.

10. Foam dispenser as claimed in claim 8 or 9, wherein a further foam-forming element is arranged, as seen in the flow direction, before the foam-forming element in the outflow channel.

11. Foam dispenser as claimed in any of the claims 8-10, wherein a further foam-forming element is arranged, as seen in the flow direction, after the foam-forming element or the foam-forming elements in the outflow channel.

12. Foam dispenser as claimed in claim 11, wherein the final foam-forming element as seen in the flow direction is arranged in the outflow opening.

13. Dispenser assembly consisting of a liquid container and a dispenser, wherein the dispenser is formed by a dispenser as claimed in any of the claims 1-12.

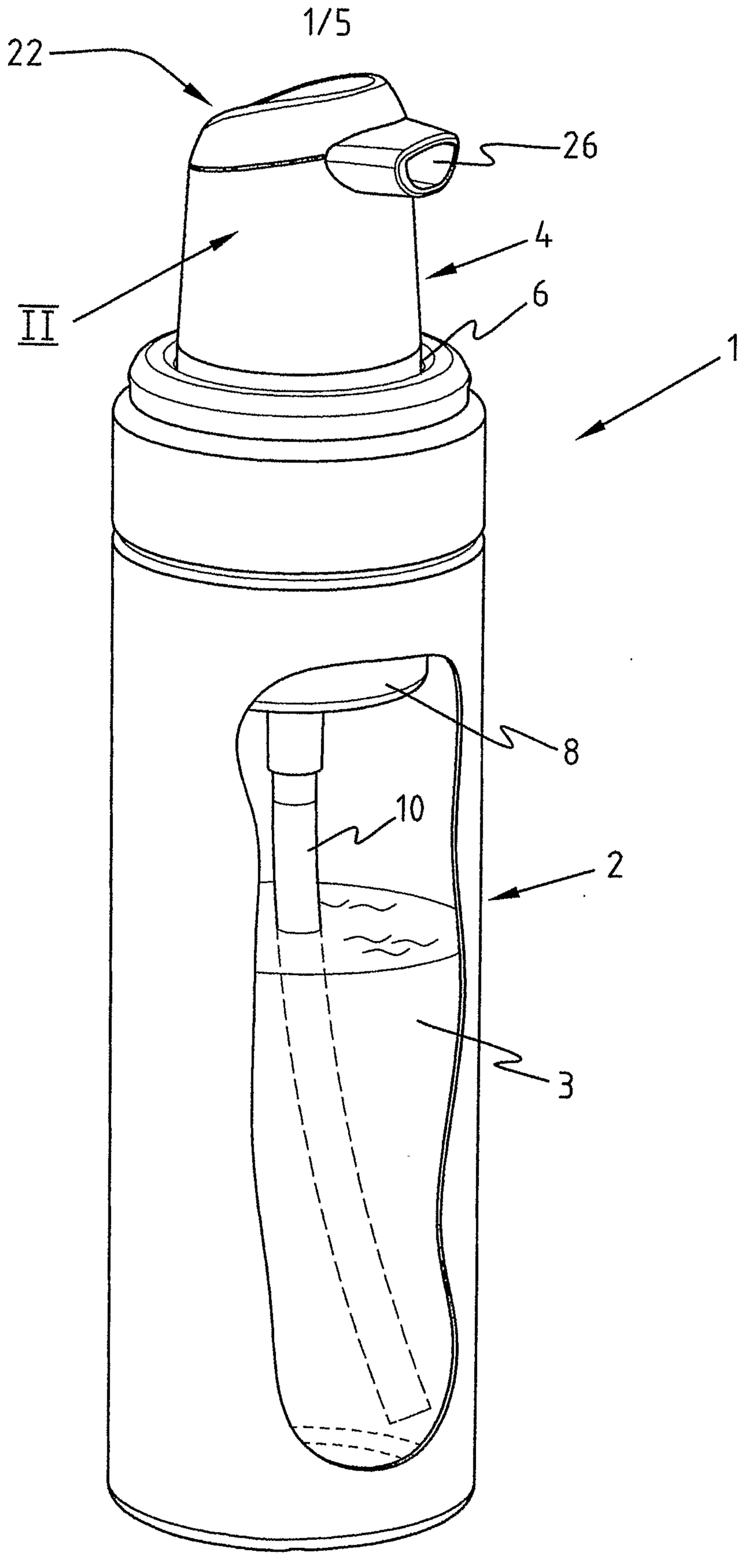


FIG. 1

FIG. 2

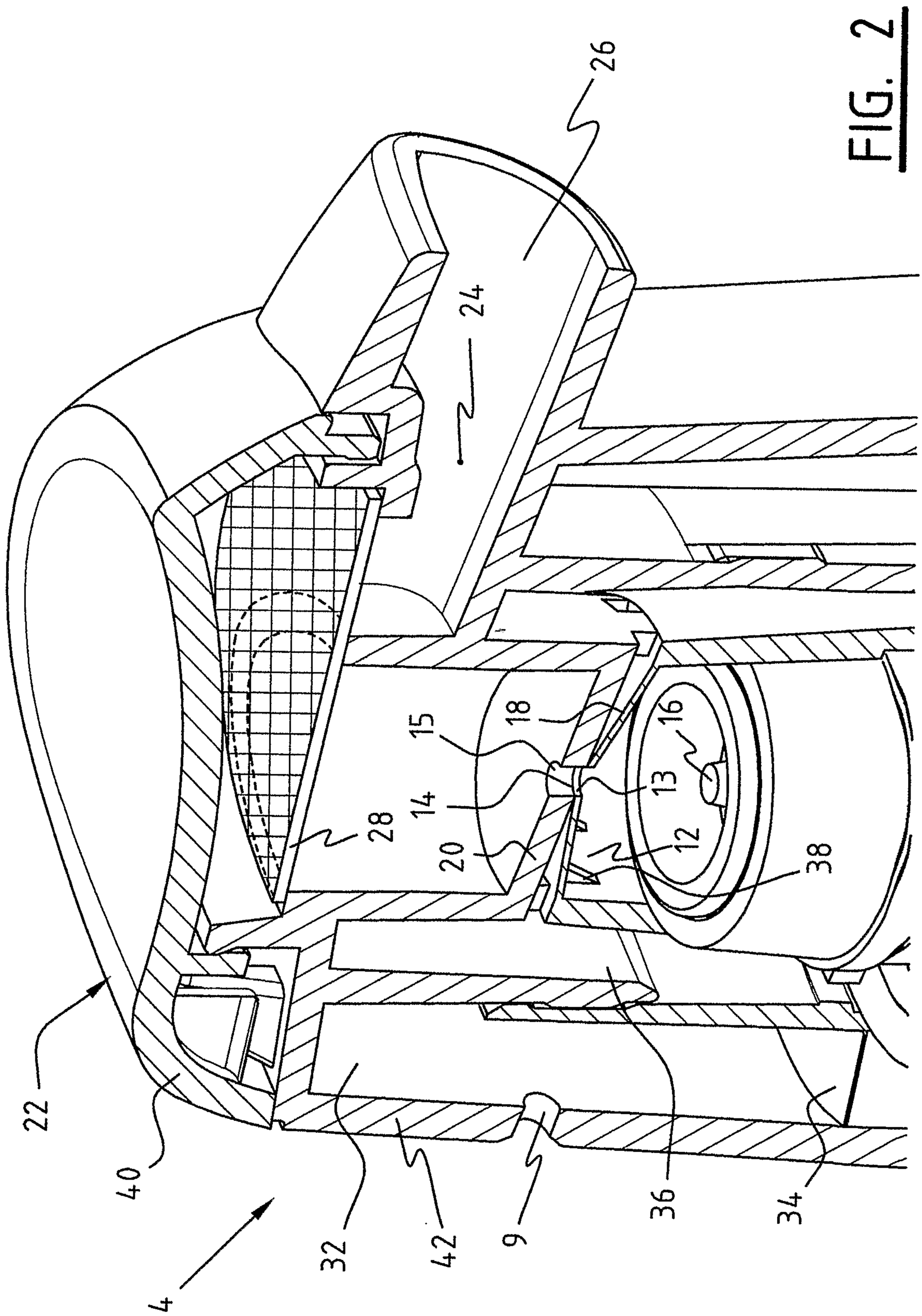
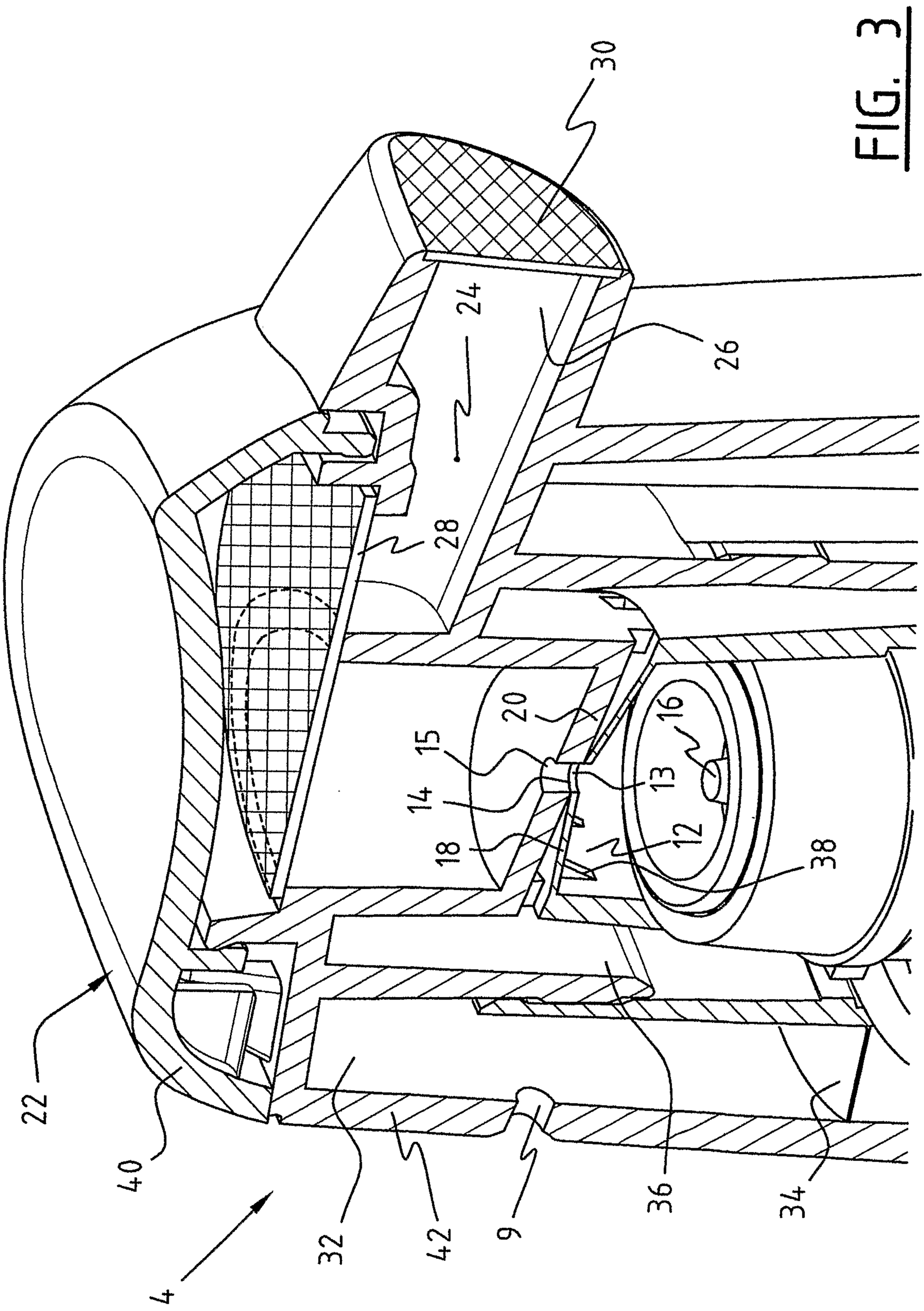


FIG. 3



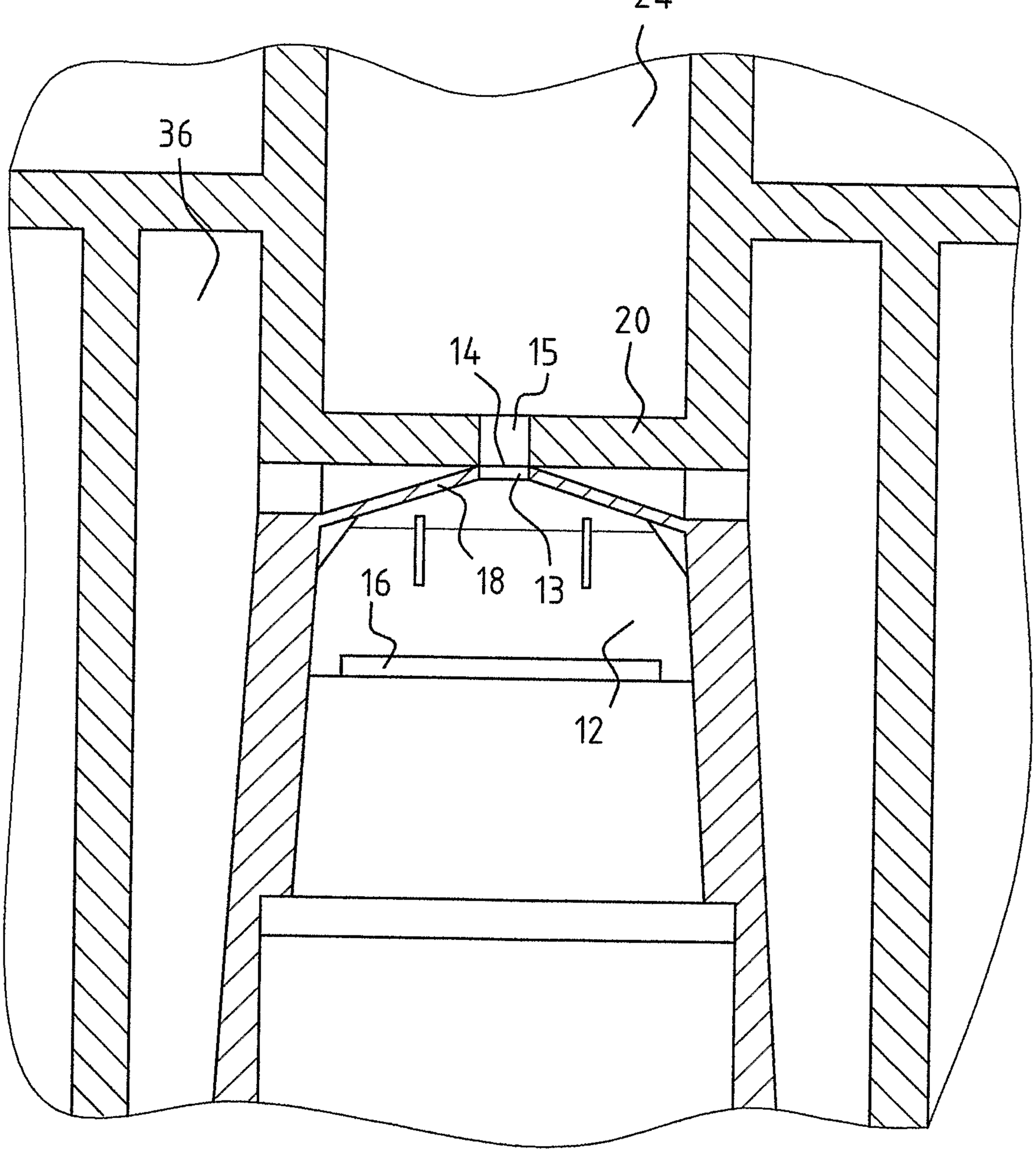


FIG. 4A

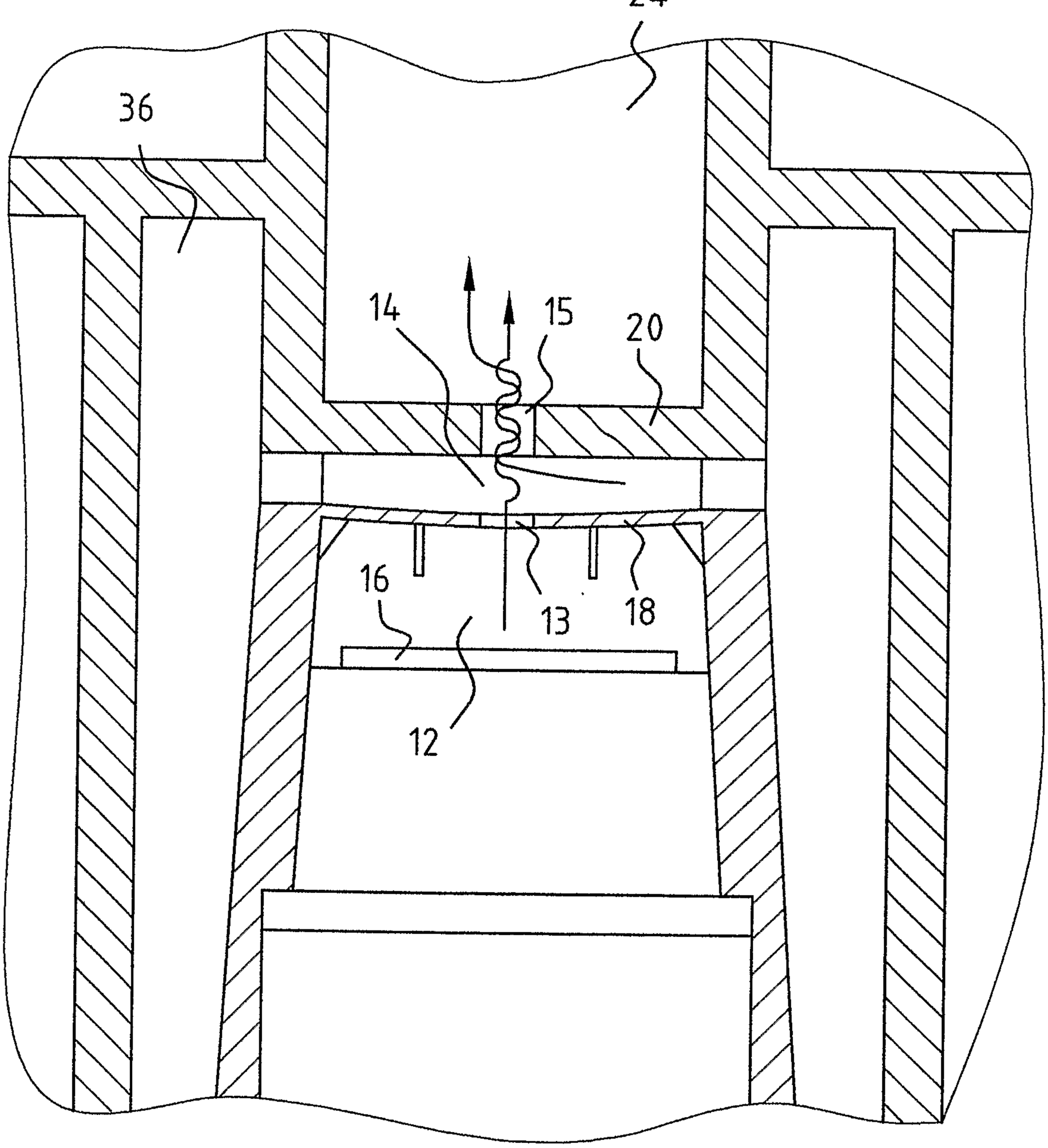
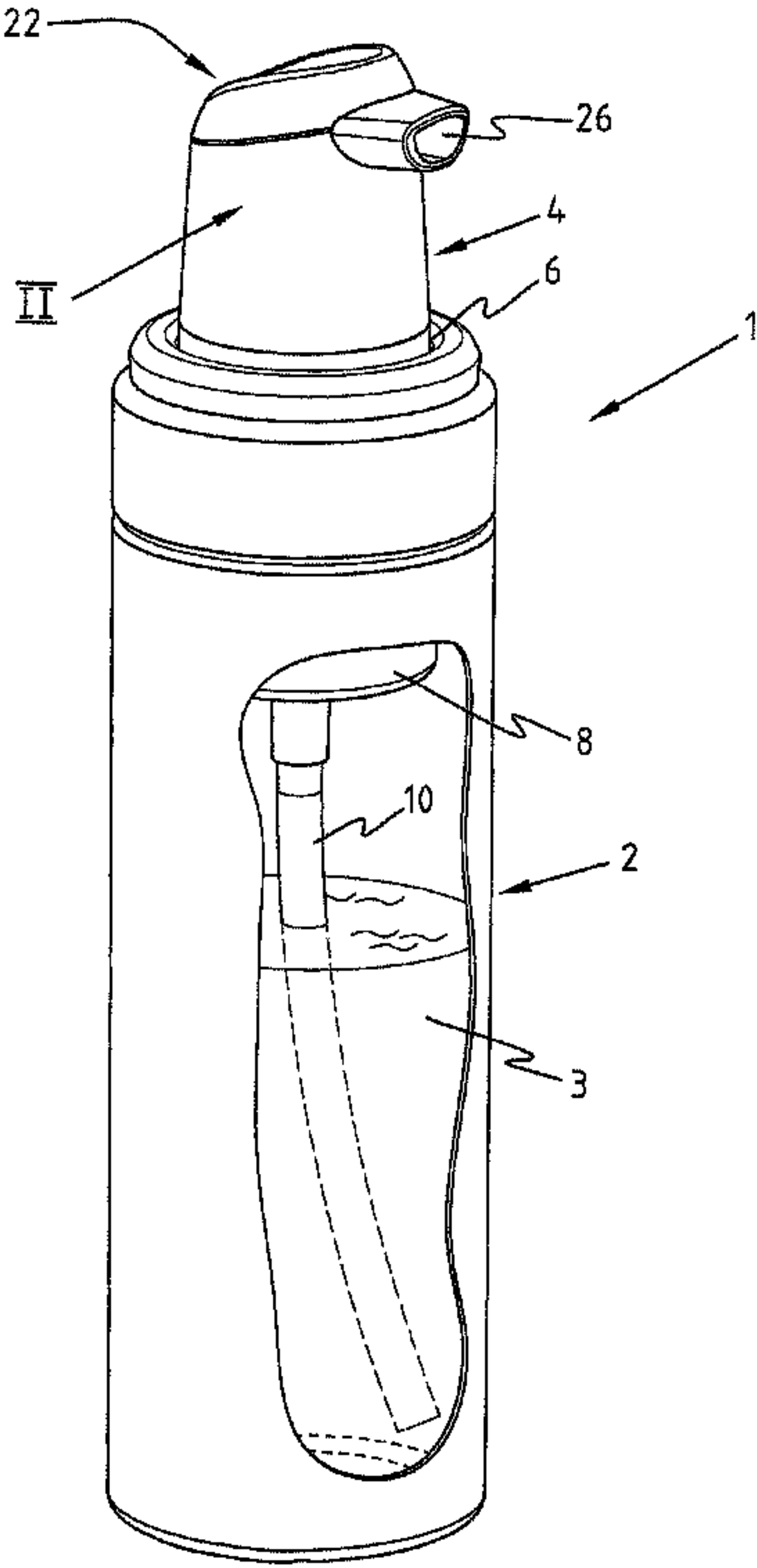


FIG. 4B


22
26
4
II
6
1
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10
2
3