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QUANTEX PATENTS LIMITED, GB
(72) Inventeurs/Inventors:
HAYES-PANKHURST, RICHARD PAUL, GB;
FORD, JONATHAN EDWARD, GB
(74) Agent: BERESKIN & PARR LLP/S.E.N.C.R.L.,S.R.L.

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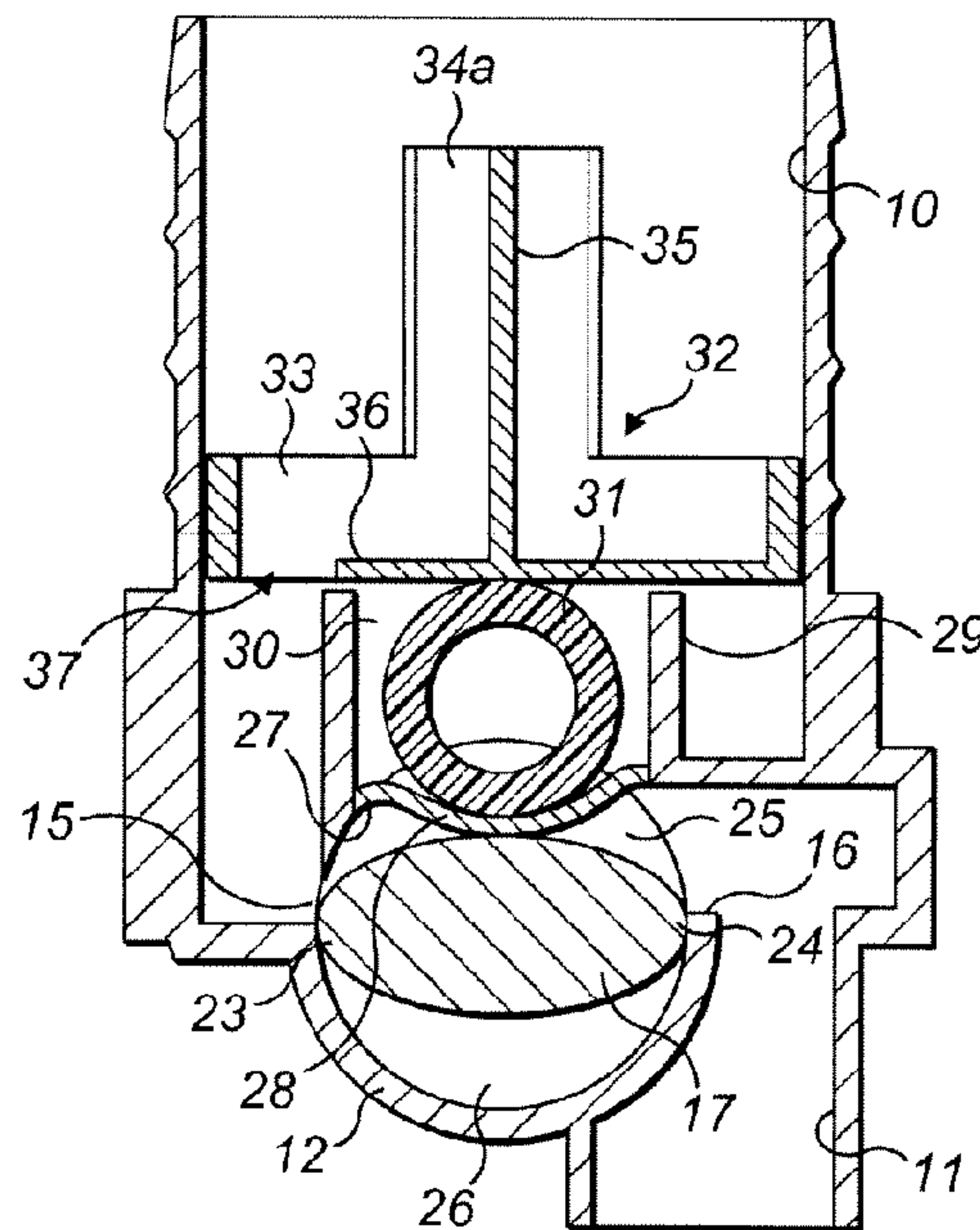


FIG. 5

(57) **Abrégé/Abstract:**

A pump fitting has an inlet adaptor (10) for connection to an outlet (39) of a container (38) of fluid and including an inlet passage (10), an outlet passage (11) for fluid and a pump housing (12) between the inlet passage (10) and the outlet passage (11). The pump housing (12) contains a rotor (17) rotatably received in an interior surface of the housing (12). The rotor (17) includes a housing-engaging surface (23, 24) co-operating with the interior surface of the housing (12) to form a seal therebetween and also including at least one shaped surface (21, 22) radially inwardly of the housing-engaging surface and forming with the interior surface of the housing a chamber (25, 26) for conveying fluid from the inlet passage (10) to the outlet passage (11) on rotation of the rotor (17). A seal (28) is provided between the outlet passage (10) and the inlet passage (11), the seal (28) being urged into engagement with the rotor (17) to prevent fluid passing from the outlet passage (11) to the inlet passage (10) as the shaped surface rotates. The inlet passage (10), the outlet passage (11) and the housing (12) are formed as a one-piece moulding.



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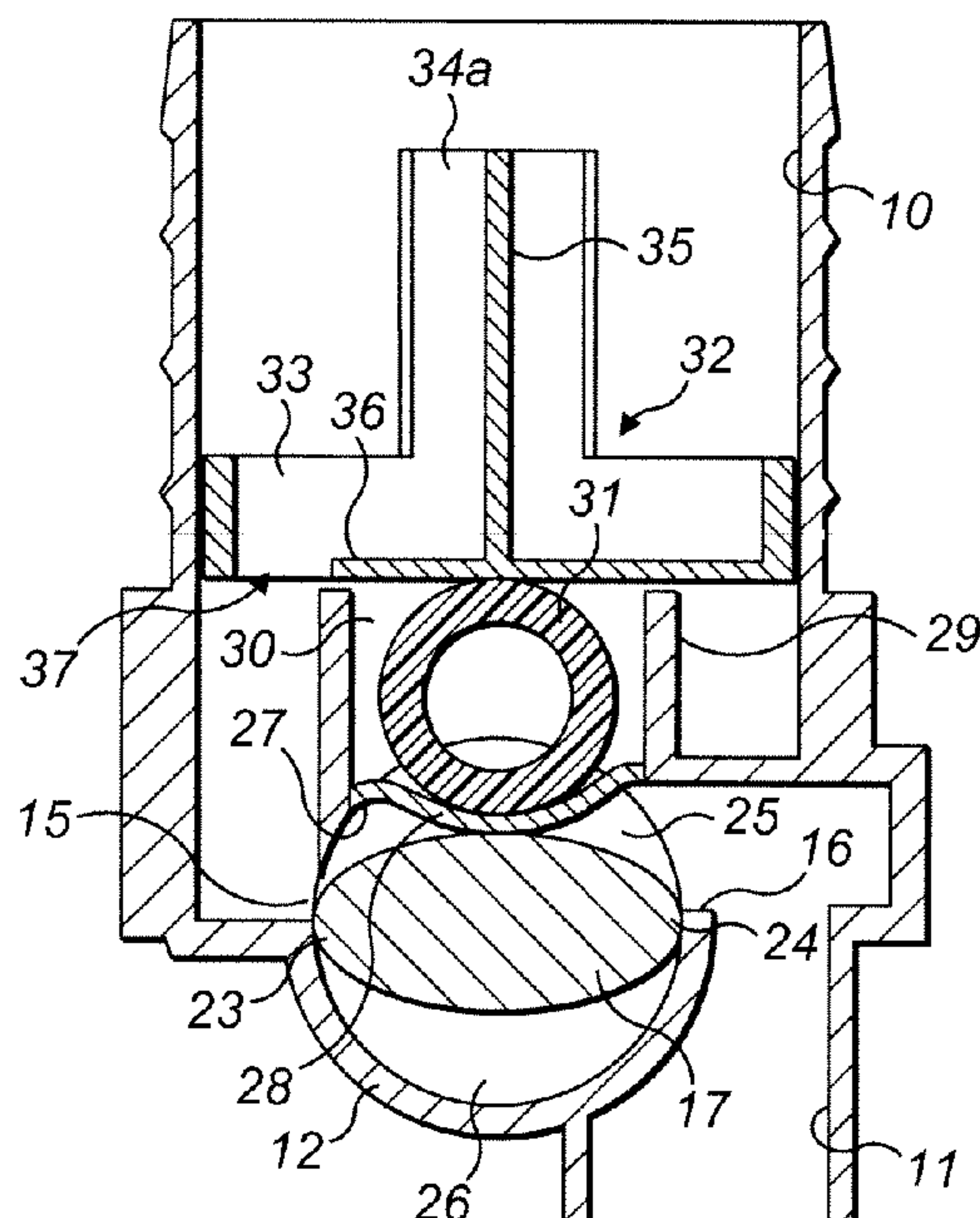
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(71) Applicant: **QUANTEX PATENTS LIMITED** [GB/GB];
85 Richford Street, London W6 7HJ (GB).(72) Inventors: **HAYES-PANKHURST, Richard Paul**; 60A
Crabtree Lane, London SW6 6LW (GB). **FORD, Jonathan Edward**; 128 St Pauls Road, London N1 2LP (GB).(74) Agent: **KNOTT, Stephen**; Mathisen & Macara LLP,
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(54) Title: PUMP FITTINGS AND METHODS FOR THEIR MANUFACTURE

**FIG. 5**

(57) Abstract: A pump fitting has an inlet adaptor (10) for connection to an outlet (39) of a container (38) of fluid and including an inlet passage (10), an outlet passage (11) for fluid and a pump housing (12) between the inlet passage (10) and the outlet passage (11). The pump housing (12) contains a rotor (17) rotatably received in an interior surface of the housing (12). The rotor (17) includes a housing-engaging surface (23, 24) co-operating with the interior surface of the housing (12) to form a seal therebetween and also including at least one shaped surface (21, 22) radially inwardly of the housing-engaging surface and forming with the interior surface of the housing a chamber (25, 26) for conveying fluid from the inlet passage (10) to the outlet passage (11) on rotation of the rotor (17). A seal (28) is provided between the outlet passage (10) and the inlet passage (11), the seal (28) being urged into engagement with the rotor (17) to prevent fluid passing from the outlet passage (11) to the inlet passage (10) as the shaped surface rotates. The inlet passage (10), the outlet passage (11) and the housing (12) are formed as a one-piece moulding.

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PUMP FITTINGS AND METHODS FOR THEIR MANUFACTURE

The invention relates to pump fittings and methods for their manufacture.

5

It is known to dispense liquids from a container using a pump or tap. Where, for example, the liquid is wine, the container may include a manually operated tap for this purpose. Such taps are not capable of dispensing accurate quantities nor is the flow rate consistent
10 although they are cheap and can be disposed of with the container. Alternatively, the container is connected to a dispenser that includes a peristaltic or diaphragm or other rotary pump that draws liquid from the container for delivery. These are capable of delivering more accurate quantities of liquid but are expensive to provide and require frequent cleaning for hygiene purposes and periodic maintenance.

15

According to a first aspect of the invention, there is provided, a pump fitting for a container of fluid comprising an inlet adaptor for connection to an outlet of a container of fluid and including an inlet passage, an outlet passage for fluid and a pump housing between the inlet passage and the outlet passage, the pump housing containing a rotor rotatably
20 received in an interior surface of the housing, the rotor including a housing-engaging surface co-operating with the interior surface of the housing to form a seal therebetween and also including at least one shaped surface radially inwardly of the housing-engaging surface and forming with the interior surface of the housing a chamber for conveying fluid from the inlet to the outlet on rotation of the rotor, a seal being provided between the outlet
25 passage and the inlet passage, the seal being urged into engagement with the rotor to prevent fluid passing from the outlet passage to the inlet passage as the shaped surface rotates, the inlet passage, the outlet passage, the seal and the housing being formed as a one-piece moulding.

30 Such a pump fitting is easy and cheap to produce, can deliver accurate quantities of liquid and may be disposed of with the container.

According to a second aspect of the invention, there is provided a liquid delivery system comprising a pump fitting according to the first aspect of the invention and a container of liquid connected to the inlet passage of the pump fitting.

5

According to a third aspect of the invention, there is provided a method of manufacturing a pump fitting according to the first aspect of the invention and in which the seal is a flexible diaphragm located in a aperture in the housing and comprising the step of forming the inlet passage, the outlet passage, and the housing as a single moulding and then moulding the diaphragm *in situ* in one-piece with the inlet passage, the outlet passage and the housing.

10

The following is a more detailed description of some embodiments of the invention, by way of example, reference being made to the accompanying drawings in which:-

Figure 1 is a perspective view of a pump fitting for a container of fluid;

15

Figure 2 is a plan view from above of the pump fitting of Figure 1;

Figure 3 is a section on the line III-III of Figure 2 with a rotor of the pump fitting in a first position;

Figure 4 is a similar view to Figure 3 but with the rotor in a second position;

Figure 5 is a section on the line V-V of Figure 2 with the rotor in the first position of

20

Figure 3;

Figure 6 is a similar view to Figure 5 but with the rotor in the second position of Figure 4;

Figure 7 is a similar view to Figure 1 but with the pump fitting partly broken away and with the rotor in the first position of Figures 3 and 5;

Figure 8 is a similar view of Figure 7 but with the rotor in the second position of Figures 4 and 6;

25

Figure 9 is a similar view to Figure 6 but showing the pump fitting positioned to connect to a container of liquid,

Figure 10 is a similar view to Figure 4 but showing the pump fitting positioned to connect to a container of fluid,

30

Figure 11 is a schematic cross-sectional view of part of a mould tool to be used in a moulding machine for moulding the pump fitting of Figures 1 to 10, and showing a one-

piece moulding and first, second third and fourth cores moved to form a mould for a diaphragm seal of the fitting, and

Figure 12 is an underneath plan view of the mould tool of Figure 11.

5 Referring first to Figures 1 to 6, the pump fitting comprises an inlet passage 10, an outlet passage 11 and a pump housing 12 between the inlet passage 10 and the outlet passage 11. The inlet passage 10, the outlet passage 11 and the pump housing 12 may be formed in one piece by a single moulding process from any suitable material. This will be described in more detail below.

10

As seen in Figures 1 to 6, the inlet passage 10 is generally cylindrical with an outer surface 13 formed with a plurality of axially spaced circumferentially extending ribs 14. The pump housing 12 is generally cylindrical and of smaller diameter than the diameter of the inlet passage 10. The pump housing 12 is carried at a lower end of the inlet passage 10 with its
15 axis normal to the axis of the inlet passage 10. This is best seen in Figures 3, 4, 5 and 6. The pump housing 12 is provided with an inlet opening 15 (see Figures 5 and 6) that provides fluid communication between the inlet passage 10 and the interior of the pump housing 12. The outlet opening 16 (see figures 5 and 6) provides a fluid connection between the interior of the pump housing 12 and the outlet passage 11. In addition, as seen
20 in Figures 3 and 4, the housing 12 has a closed end 42 and an open end 43.

The outlet passage 11 is generally cylindrical and has an axis that is parallel to the axis of the inlet passage 10. As seen in Figures 5 and 6, the axis of the outlet passage 11 is spaced from the axis of the inlet passage 10.

25

A rotor 17 is rotatably received in an interior surface 18 of the pump housing 12. As seen in Figures 3 and 4, the rotor 17 has first and second generally cylindrical ends 19, 20. These ends 19, 20 are a close fit with the interior surface 18 (see Figures 3 and 4) of the pump housing 12 to support the rotor 17 for rotation and to prevent the leakage of fluid
30 between the rotor 17 and the interior surface 18. An end face 44 at the second end 20 of the rotor 17 bears against the closed end 42 of the housing 12 to provide a thrust bearing wall

for the rotor 17. An end face 45 at the first end 19 of the rotor is exposed for connecting the rotor 17 to a drive, as described below.

5 The rotor 17 is formed with two shaped surfaces 21, 22. As seen in Figures 5 and 6, the surfaces 21, 22 are shaped so that the rotor is generally elliptical in cross section at the centre of the rotor 17 (see Figures 5 and 6) but substantially circular in cross section adjacent the cylindrical ends 19, 20.

10 The rotor 17 is formed with first and second housing engaging surfaces 23, 24 (see Figures 5 and 6) that extend between the shaped surfaces 21, 22 and seal against the interior surface 18 of a pump housing 12 to prevent the passage of fluid around the rotor 17.

15 The first and second shaped surfaces 21, 22 form with the interior surface 18 of the pump housing 12 respective first and second chambers 25, 26. The function of these chambers 25, 26 will be described below in connection with the operation of the pump fitting.

20 The pump housing 12 is formed, between the outlet opening 16 and the inlet opening 15, with an aperture closed by a flexible diaphragm seal 28. The aperture 27 is surrounded by a wall 29 extending away from the rotor 17 in a direction normal to the axis of the pump housing 12 and projecting into the inlet passage 10. The wall 29 forms a chamber 30 containing a flexible hollow tube 31. As seen in Figure 3, the tube 31, in its substantially uncompressed state, has a minimum diameter at its first and second ends and a maximum diameter intermediate the ends. The tube 31 is pressed into contact with the diaphragm 28 which in turn is pressed into contact with the rotor 17 by a cap 32.

25

As seen in Figures 5, 6, 7 and 8, the cap 32 includes an annular outer wall 33 that is a sliding fit within the inlet passage 10. Two diametrically opposed part-cylindrical guide surfaces 34a, 34b project upwardly from the outer wall 33 and are also in sliding engagement with the interior surface of the inlet passage 10. A central rib 35 extends 30 between the guide surfaces 34a, 34b. The lower end of the outer wall 33 is closed by a disc 36. As seen in Figures 5 and 6, this disc 36 bears against the tube 31 to force the tube 31 into contact with a diaphragm seal 28. As seen in fig 10, the free ends of the guide surfaces

34a, 34b include respective lugs 6046a, 6046b that engage in holes 6147a, 6147b in the inlet passage 10 to locate the cap 32 relative to the inlet passage 10. On assembly, the circular inlet passage 10 is momentarily distorted into an oval to allow the lugs 6046a, 6046b on the cap 32 to pass into the passage 10..

5

The disc 36 is provided with an aperture 37 to allow the flow of fluid along the inlet passage 10 to the rotor 17.

10 The pump fitting described above with reference to the drawings is for connection to a container of liquid 38, part of which is shown schematically in Figures 9 and 10. The container 38 may hold any suitable liquid to be pumped such as, for example, wine. The term “liquid” is to be taken, however, to encompass liquids such as soups and paints.

15 The container 38 includes an outlet passage 39 that is cylindrical in shape and which is a mating fit with the inlet passage 10 of the pump fitting. The inlet passage 10 is inserted into the outlet passage 39, with the ribs 35 securing the parts together and providing a seal. This engagement prevents the tube 10 distorting and so the lugs 6046a, 6046b cannot disengage from the tube 10 so ensuring that the cap 32 is locked to the tube 10.

20 The exposed end face 45 of the rotor 17 is connected to a drive (not shown), which may be in the form of an electric motor. The drive itself may be controlled by a control system (not shown). The motor rotates the rotor 17 in an anti-clockwise direction as seen in Figures 5 and 6. Starting from the position shown in Figure 5, rotation of the rotor 17 rotates the first chamber 25 around the housing 12 to communicate the first chamber 25 with the outlet
25 passage 11. At the same time, the second chamber 26 communicates with the inlet passage 10 to receive liquid from the container 38. Further rotation of the rotor 17 conveys the liquid in the second chamber 2 around to the outlet passage 11 at the same time squeezing the liquid from the first chamber 25 through the outlet passage 11.

30 During this rotation, the diaphragm seal 28 and the tube 31 work together to prevent the passage of liquid from the outlet passage 11 to the inlet passage 10. As seen in Figures 3, 4, 5 and 6, the tube 31 urges the diaphragm seal 28 into contact with the surface of the

rotor 17 throughout the rotation of the rotor 17 – contacting alternately the housing engaging surfaces 23, 24 of the rotor and the shape surfaces 21, 22 of the rotor. As seen in Figures 3 and 4, the shape of the tube ensures that an even pressure is applied to the diaphragm seal 28 along its axial extent.

5

As will be seen in Figures 5 and 6, the diaphragm seal 28 and the tube 31 are located at an end of the inlet passage 11. This saves space so making the pump fitting compact. In addition, and as also seen in Figures 5 and 6, the chamber 30 receives liquid from the inlet passage 10 and the pressure of this liquid is applied to the under surface of the diaphragm seal 28. This increases the force urging the diaphragm seal 28 against the rotor 17. If the pressure of fluid in the container 38 is increased, by, for example, the container 38 being crushed, the pressure urging the diaphragm seal 28 against the rotor 17 will be increased, so reducing or preventing the leakage of liquid past the rotor as a result of the pressure increase.

15

The control system can be used to control the drive so that the rotor delivers a predetermined volume of liquid at a predetermined flow rate through the outlet passage 11.

The arrangement of the pump housing 12 and the rotor 17 need not be as described above. It could be of any of the types described in PCT/GB2005/003300 and PCT/GB2010/000798.

It will be appreciated that the pump fitting provides a simple and inexpensive way of delivering liquid from the container 38. The inlet passage 10 and the outlet passage 11 provide a direct path out of the container 38 interrupted only by the rotor and diaphragm. The pump fitting has few moving parts and so is reliable in operation. In addition, the pump fitting is capable of delivering a measured quantity of liquid with great accuracy so making it suitable for delivering measured quantities of potable liquids such as wine and concentrated liquids. Since the pump fitting is inexpensive to manufacture, it may be provided as a part of the container 38 and disposed of with the container 38 when the container 38 is empty. The rigid outlet passage 39 may be part of a container 38 that is collapsible. It is desirable to evacuate as much of such a container as possible. It is

difficult to evacuate any liquid left in this rigid part so incorporating as much of the pump into this volume as possible reduces the dead volume and so improves the utilisation of liquid.

- 5 As mentioned above, the inlet passage 10, the outlet passage 11, the diaphragm seal 28 and the pump housing 12 are formed as a one piece moulding in the same moulding process as follows and referring to Figures 11 and 12.

10 With reference to fig 11 and 12, the moulding process for moulding in one-piece the inlet passage 10, the outlet passage 11 and the pump housing 12 utilises a mould tool with first, second, third and fourth cores 47, 48, 49 and 50. The first core 47 defines the interior of the inlet passage 10 and co-operates with the second core 48 to define the aperture 27 in the pump housing 12. In addition, the first core 47 defines a slot 51 that forms the one-piece moulding with a wall 52 adjacent an edge of the aperture 27. The third core 49 defines a
15 sprue 56 extending from the pump housing 12 and the fourth core 50 engages the third core 49 to form a feed point 55.

Once this part of the moulding has been formed, the first core 47 is retracted as seen in Figure 11 to space it from the second core 48 by the required thickness of the diaphragm
20 seal 28 to form a mould chamber 53. The third core 49 and fourth core 50 are also retracted to form a passage 54 leading from the feed point 55 to the mould chamber 53 forming a diaphragm seal mould cavity. A molten material suitable to form the diaphragm seal 27 is injected through the feed point 55, through the passage 54 and into the mould chamber 53 to form the diaphragm seal 28 in one-piece with the remaining components.

25

In this way, whole of the pump fitting can be manufactured as a one-piece moulding using the same cavity in the tool using a twin screw moulding machine for each of the housing and diaphragm materials. This reduces size of the tool and reduces the time for production thereby reducing the cost of the pump fitting.

30

CLAIMS

1. A pump fitting for a container of fluid comprising an inlet adaptor for connection to an outlet (39) of a container (38) of fluid and including an inlet passage (10), an outlet
5 passage (11) for fluid and a pump housing (12) between the inlet passage and the outlet passage, the pump housing (12) containing a rotor (17) rotatably received in an interior surface (18) of the housing (12), the rotor (17) including a housing-engaging surface (23, 24) co-operating with the interior surface (18) of the housing to form a seal therebetween and also including at least one shaped surface (21,22) radially inwardly of the housing-
10 engaging surface (23,24) and forming with the interior surface (18) of the housing (12) a chamber (25,26) for conveying fluid from the inlet passage (10) to the outlet passage (11) on rotation of the rotor, a seal (28) being provided between the outlet passage (11) and the inlet passage (10), the seal (28) being urged into engagement with the rotor (17) to prevent fluid passing from the outlet passage (11) to the inlet passage (10) as the shaped surface
15 (21,22) rotates, the inlet passage (10), the outlet passage (11), the seal (28) and the housing (12) being formed as a one-piece moulding.
2. A pump fitting according to claim 1 wherein the inlet passage (10) is generally cylindrical about an axis, the inlet passage axis being normal to the axis of rotation of the
20 rotor (17).
3. A pump fitting according to claim 2 wherein the outlet passage (11) is generally cylindrical about an axis, the outlet passage axis being parallel to the inlet passage axis.
- 25 4. A pump fitting according to claim 3 wherein the outlet passage axis is offset from the inlet passage axis.
5. A pump fitting according to any one of claims 2 to 4 wherein the housing (12) and the rotor (17) are generally cylindrical, the diameter of the housing (12) being smaller than
30 the diameter of the inlet passage (10).

6. A pump fitting according to any one of claims 1 to 6 wherein the inlet passage (10) terminates in an inlet opening (15) in the housing (12), an outlet opening (16) in the housing leading to the outlet passage (11).
- 5 7. A pump fitting according to claim 6 when dependent on claim 2 wherein the inlet and outlet openings (15,16) are normal to the axis of the inlet passage.
8. A pump fitting according to any one of claims 1 to 7 wherein the one-piece moulding forms a chamber (30) provided by a surrounding wall (29) extending in a
10 direction normal to the axis of the housing (12), one end of the wall being closed by the seal (28) and the opposite end of the wall (29) being closed by a cap (32), , a tube or tubes (31) being within said chamber (30) and acting between the cap (32) and the seal (28) to urge the seal (28) towards the rotor (17).
- 15 9. A pump fitting according to claim 8 wherein the surrounding wall (29) projects into the inlet passage (10), the cap (31) including a disc- shaped member (36) that is a sliding fit in the inlet passage (10), a face of the disc (36) engaging providing said cap.
10. A pump fitting according to claim 9 wherein the disc-shaped member (36) includes
20 an aperture (37) to allow the passage of fluid along the inlet passage (10).
11. A pump fitting according to any one of claims 1 to 10 wherein the housing (12) is closed at one end by an end wall (44) providing a thrust bearing for an associated end of the rotor (17), an opposite end of the housing (12) being open to expose an opposite end of
25 the rotor for connection to a drive for rotating the rotor (17) to pump fluid from the inlet passage (10) to the outlet passage (11).
- .
- 30 12. A liquid delivery system comprising a pump fitting according to any one of claims 1 to 11 and a container of liquid connected to the inlet passage of the pump fitting.

13. A system according to claim 13 wherein the container includes an outlet (39), the inlet passage (10) of the pump fitting being a push-fit connection with said outlet (39).

14. A system according to claim 13 or claim 14 and further including a drive connected
5 to the rotor (17) to rotate the rotor and pump liquid from the container to the pump fitting outlet passage (11).

15. A system according to claim 15 and further including a control system for
controlling the drive to deliver a predetermined volume of liquid at a predetermined flow
10 rate from the container (38) to the pump fitting outlet passage (11).

16. A method of manufacturing a pump fitting according to any one of claims 1 to 11
and in which the seal (28) is a flexible diaphragm located in an aperture in the housing and
15 comprising the step of forming the inlet passage (10), the outlet passage (11), and the
housing (12) as a single moulding and then moulding the seal (28) *in situ* in one-piece
with the inlet passage (10), the outlet passage (11) and the housing (12).

17. A method according to claim 16 wherein forming the one-piece moulding includes
20 locating first and second mould parts (47, 48) to form said aperture (27) in the housing
(12), adjusting the relative positions of the first and second mould parts (47, 48) to form a
mould cavity and then injecting into said cavity material that forms the seal (28) in one-
piece with the housing.

25 18. A method according to claim 19 wherein the first mould part (47) defines the inlet
passage (10), the first mould (47) part being moved relative to the second mould part (48)
to form the seal mould cavity.

19. A method according to claim 19 wherein the first mould part (47) is a core located
30 in and guided by the inlet passage (10) of the one-piece moulding when moving to form
the seal mould cavity.

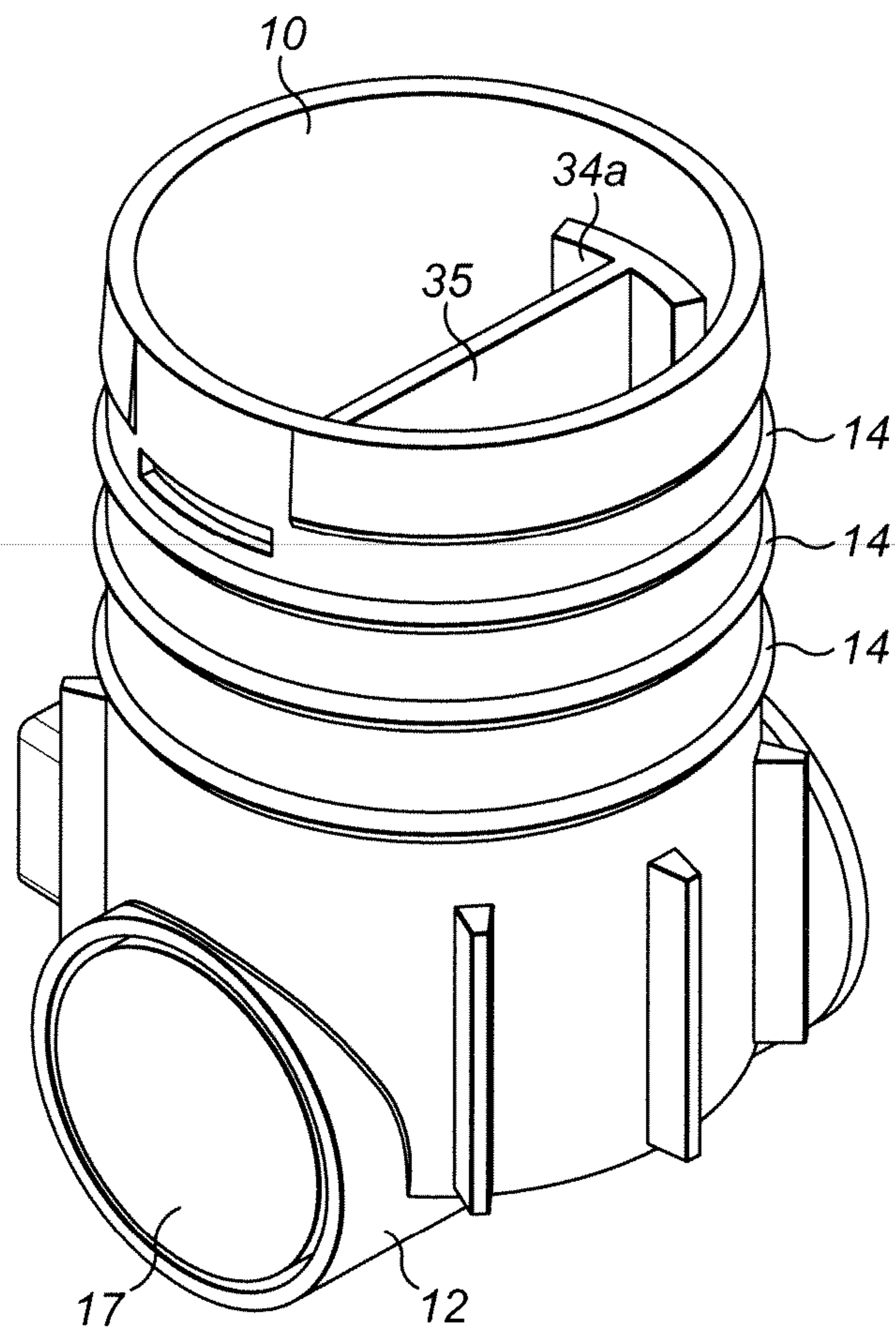
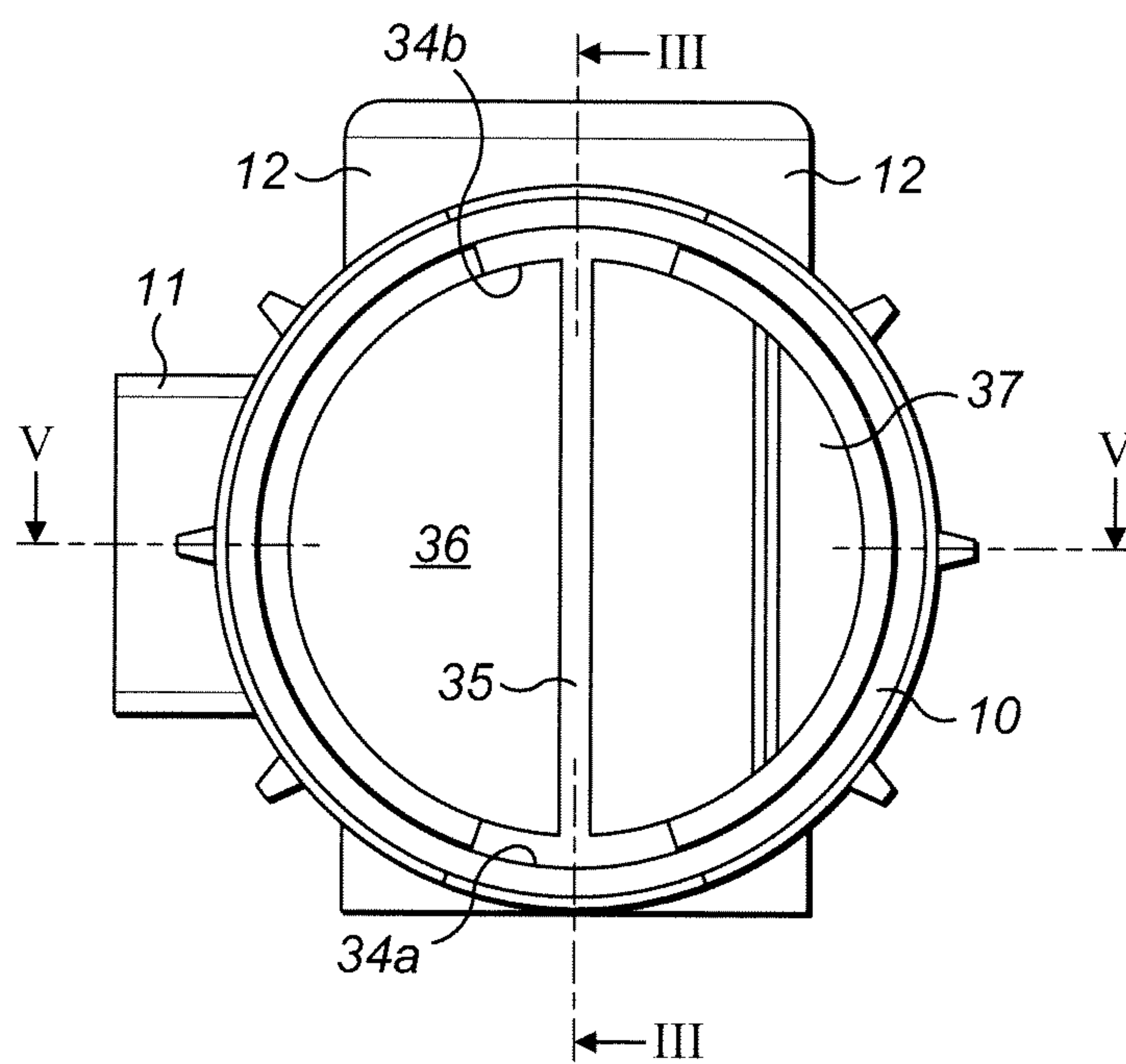
20. A method according to claim 18 or claim 19 wherein the one-piece moulding includes a passage (54) for injection of the diaphragm material into the diaphragm mould cavity.

5 21. A pump fitting according to any one of claims 1 to 20 wherein, in use, liquid from the inlet passage (10) is applied to the seal (28) to urge the seal against the rotor (17).

22. A pump fitting for a container of fluid comprising an inlet adaptor for connection to an outlet (39) of a container (38) of fluid and including an inlet passage (10), an outlet
10 passage (11) for fluid and a pump housing (12) between the inlet passage and the outlet passage, the pump housing (12) containing a rotor (17) rotatably received in an interior surface (18) of the housing (12), the rotor (17) including a housing-engaging surface (23, 24) co-operating with the interior surface (18) of the housing to form a seal therebetween and also including at least one shaped surface (21,22) radially inwardly of the housing-
15 engaging surface (23,24) and forming with the interior surface (18) of the housing (12) a chamber (25,26) for conveying fluid from the inlet passage (10) to the outlet passage (11) on rotation of the rotor, a seal (28) being provided between the outlet passage (11) and the inlet passage (10), means (31, 32) being provided for urging the seal (28) into engagement with the rotor (17) by to prevent fluid passing from the outlet passage (11) to the inlet
20 passage (10) as the shaped surface (21,22) rotates, the means (31, 32) being located at an end of the inlet passage (10).

23. A pump according to claim 22 wherein, in use, the liquid from the inlet passage (10) is applied to the seal (28) to urge the seal (28) against the rotor (17)

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**FIG. 1****FIG. 2**

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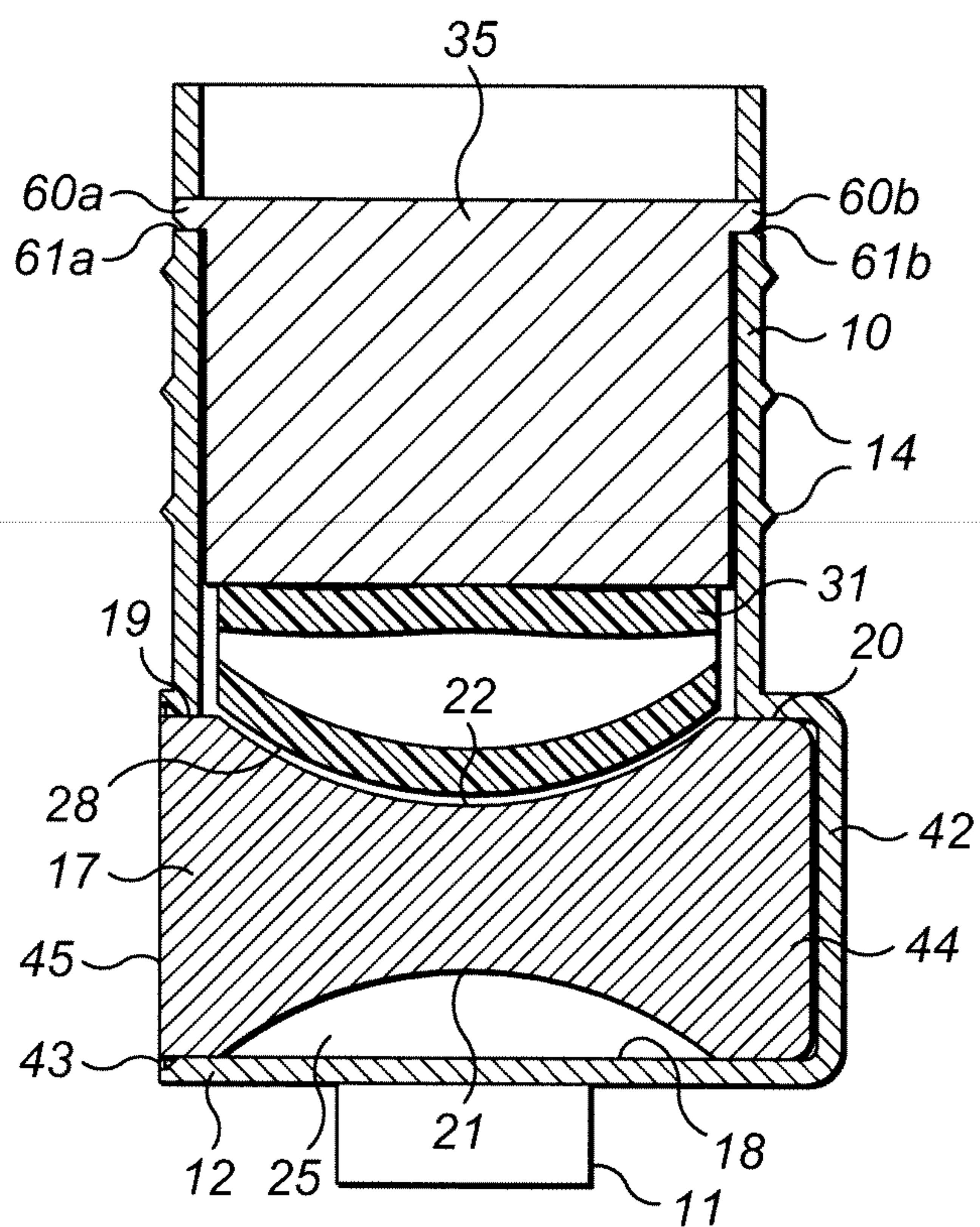


FIG. 3

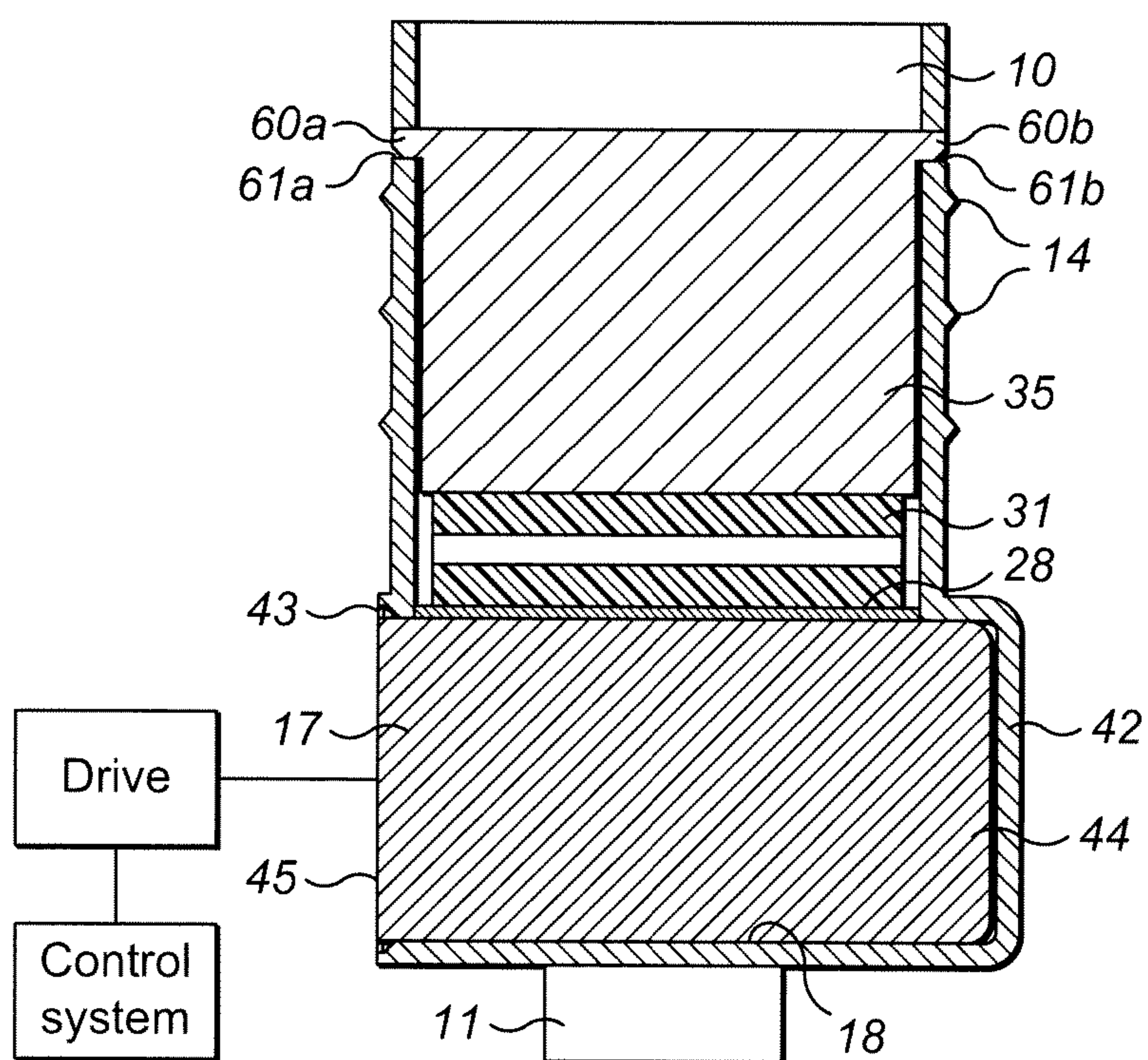
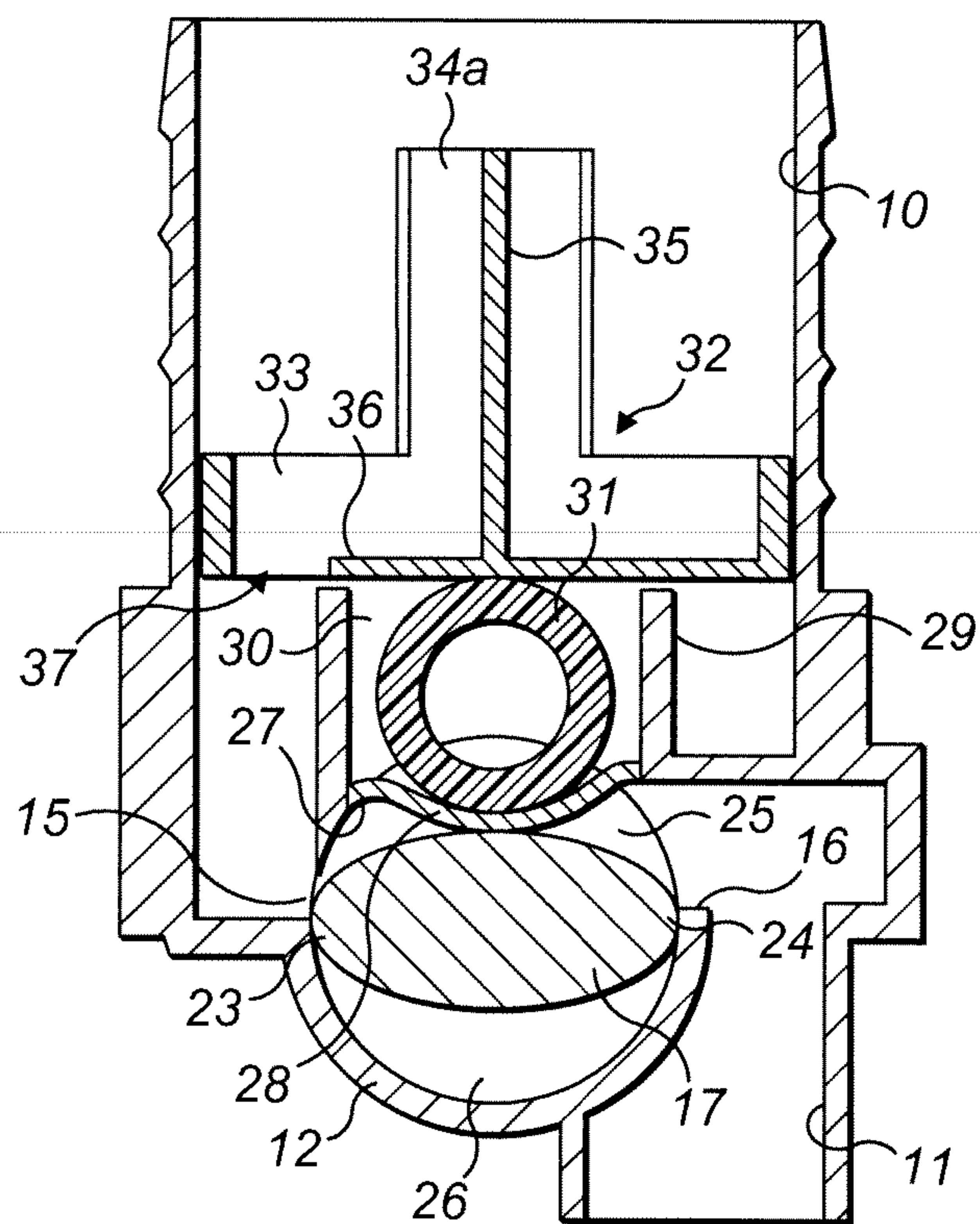
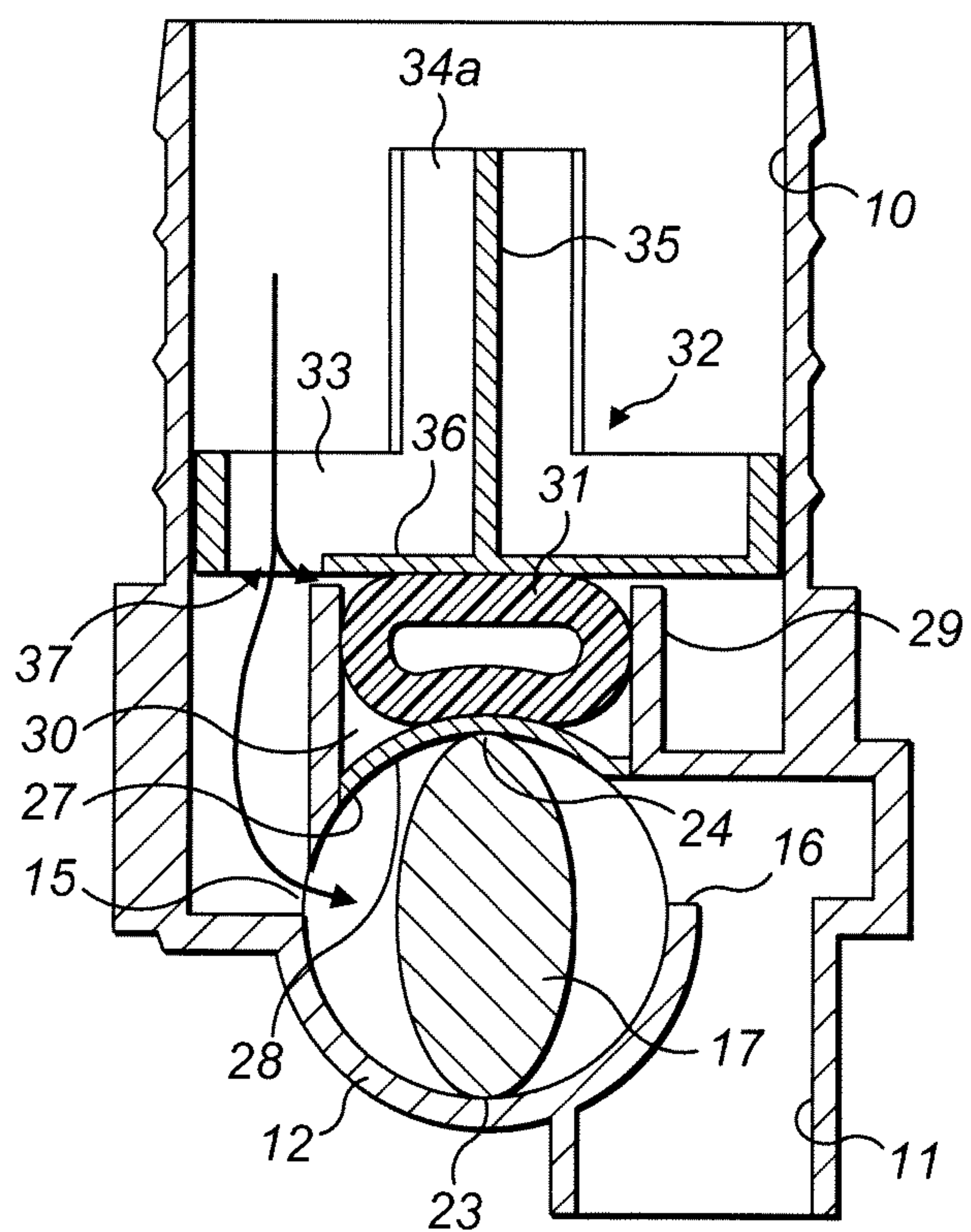
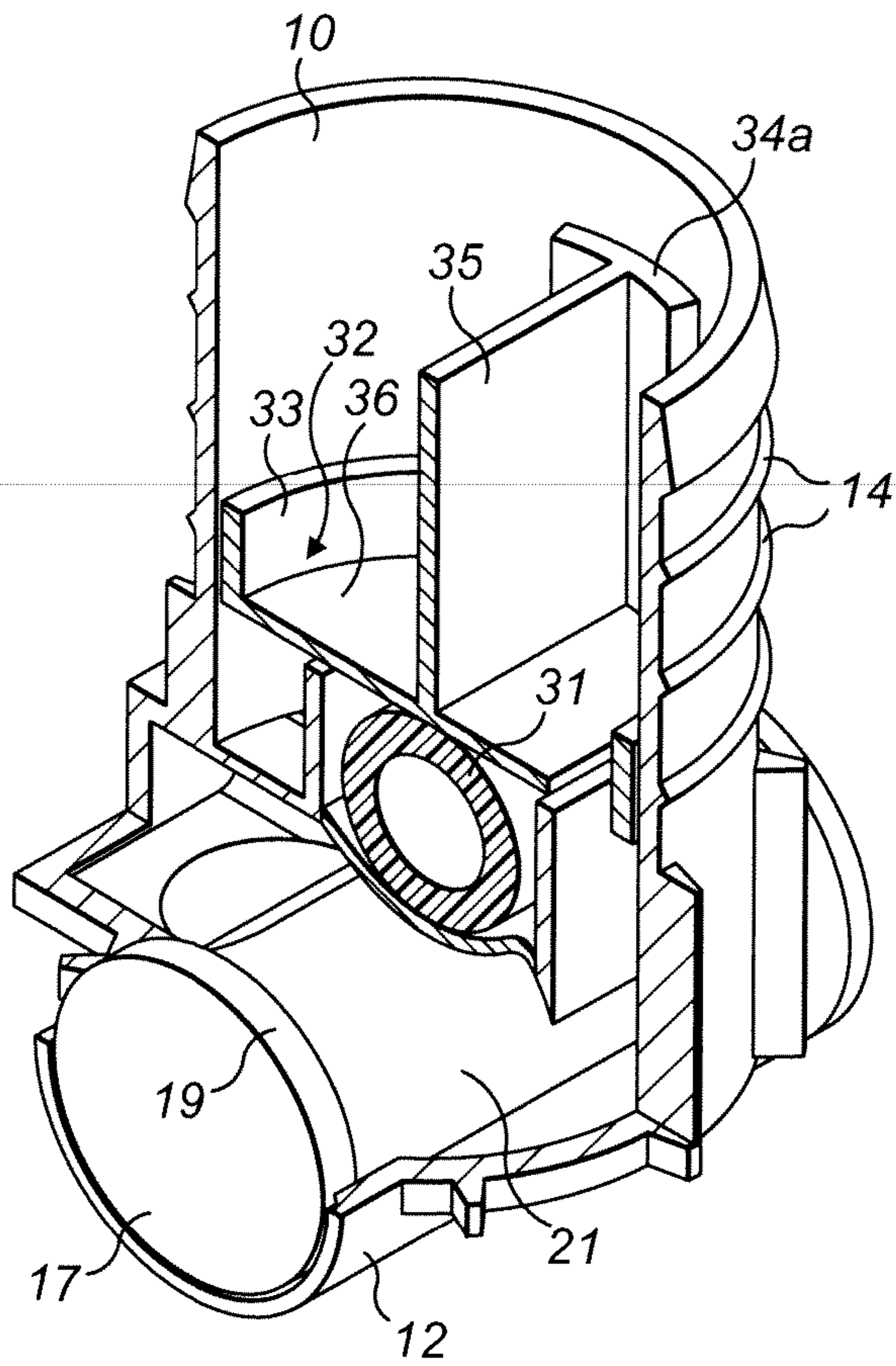
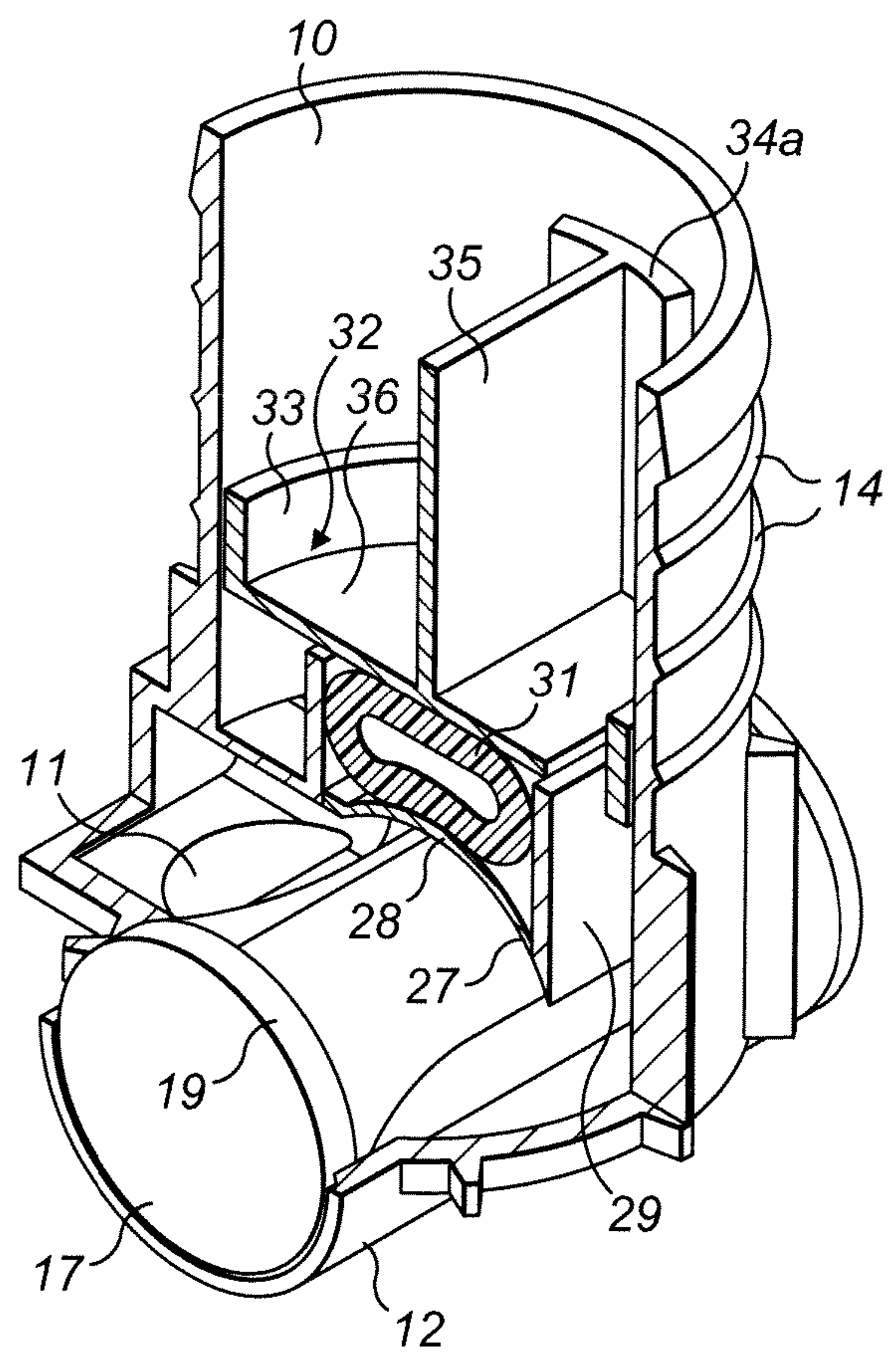


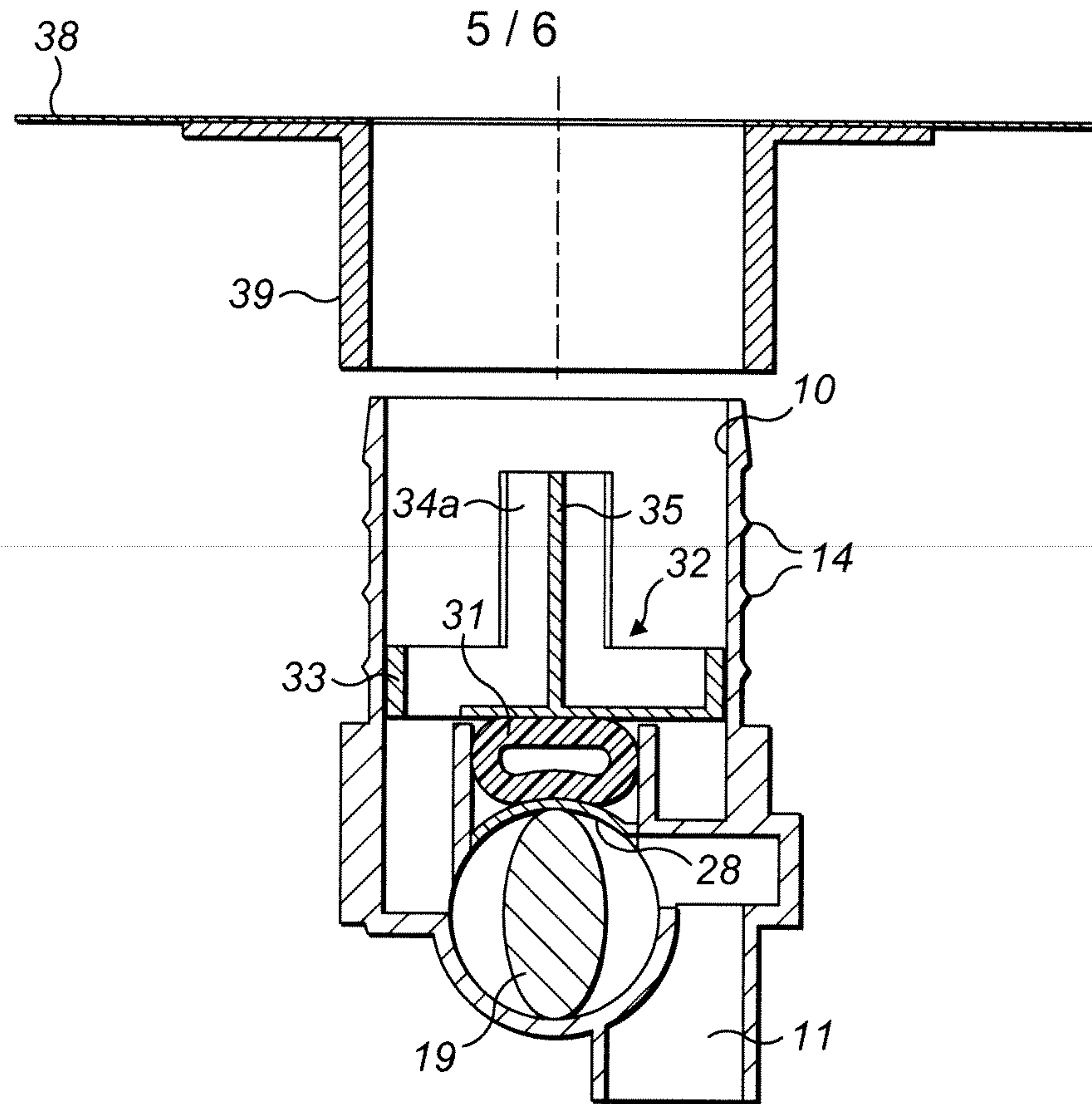
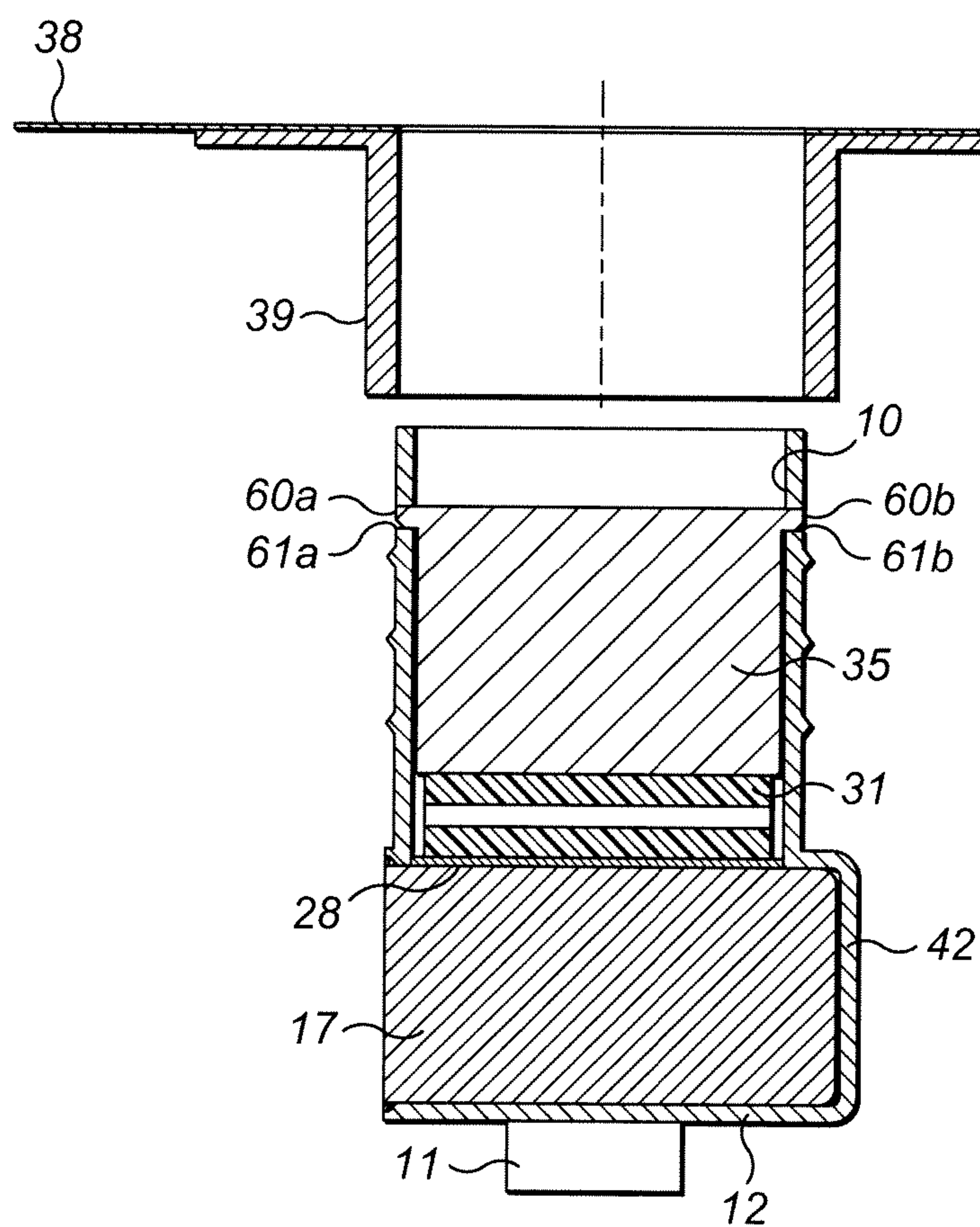
FIG. 4

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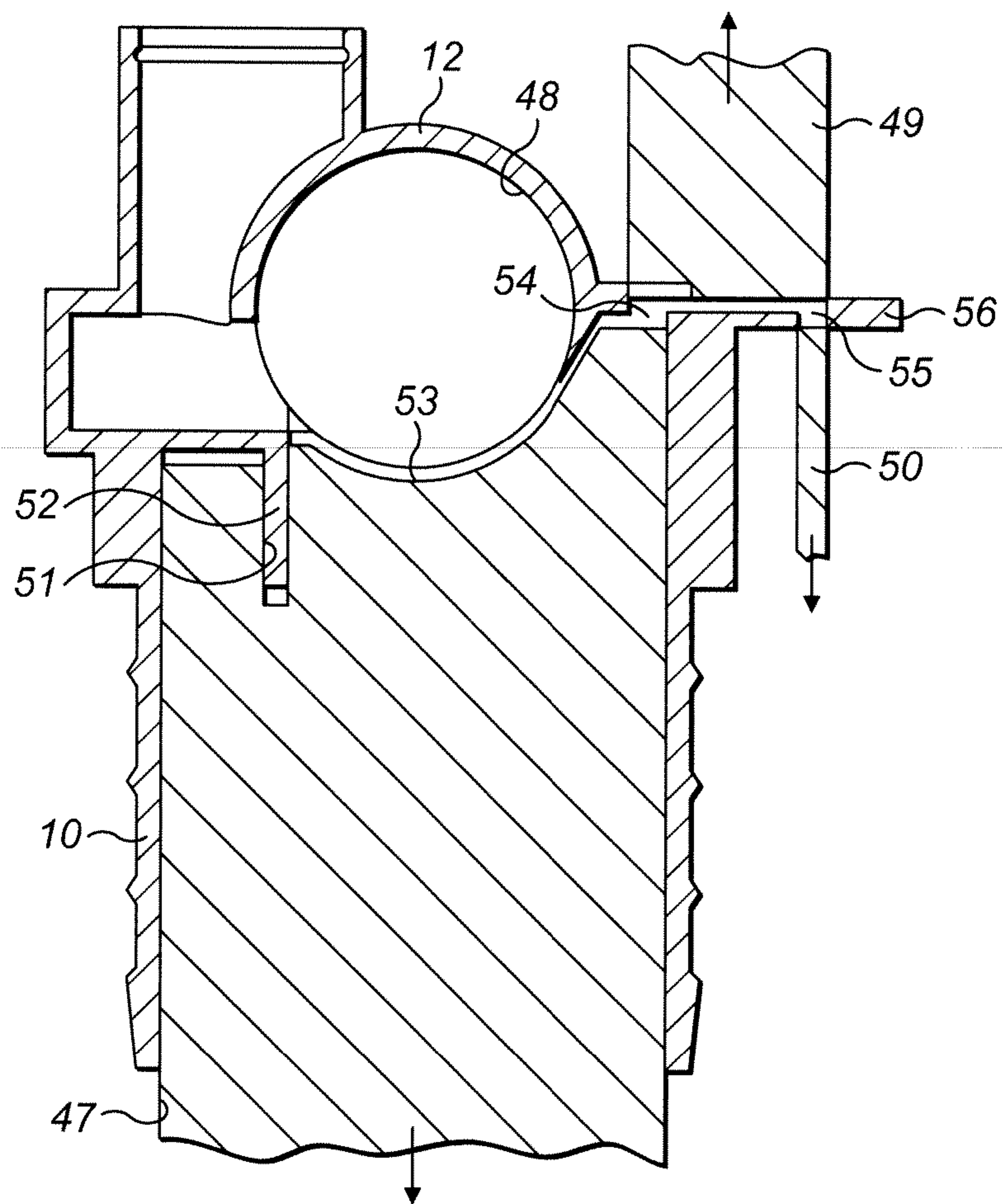
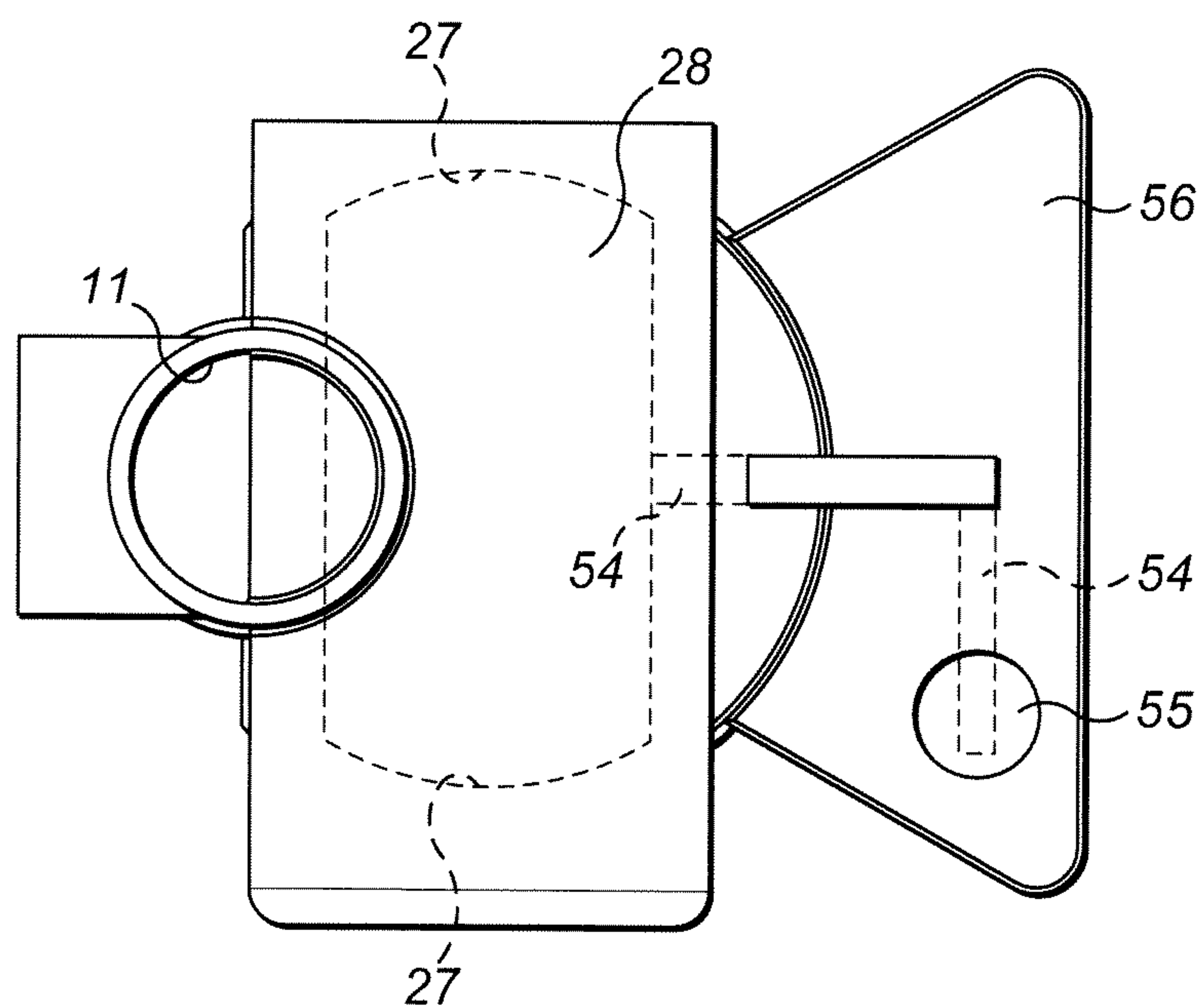
**FIG. 5****FIG. 6**

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**FIG. 7****FIG. 8**

**FIG. 9****FIG. 10**

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**FIG. 11****FIG. 12**

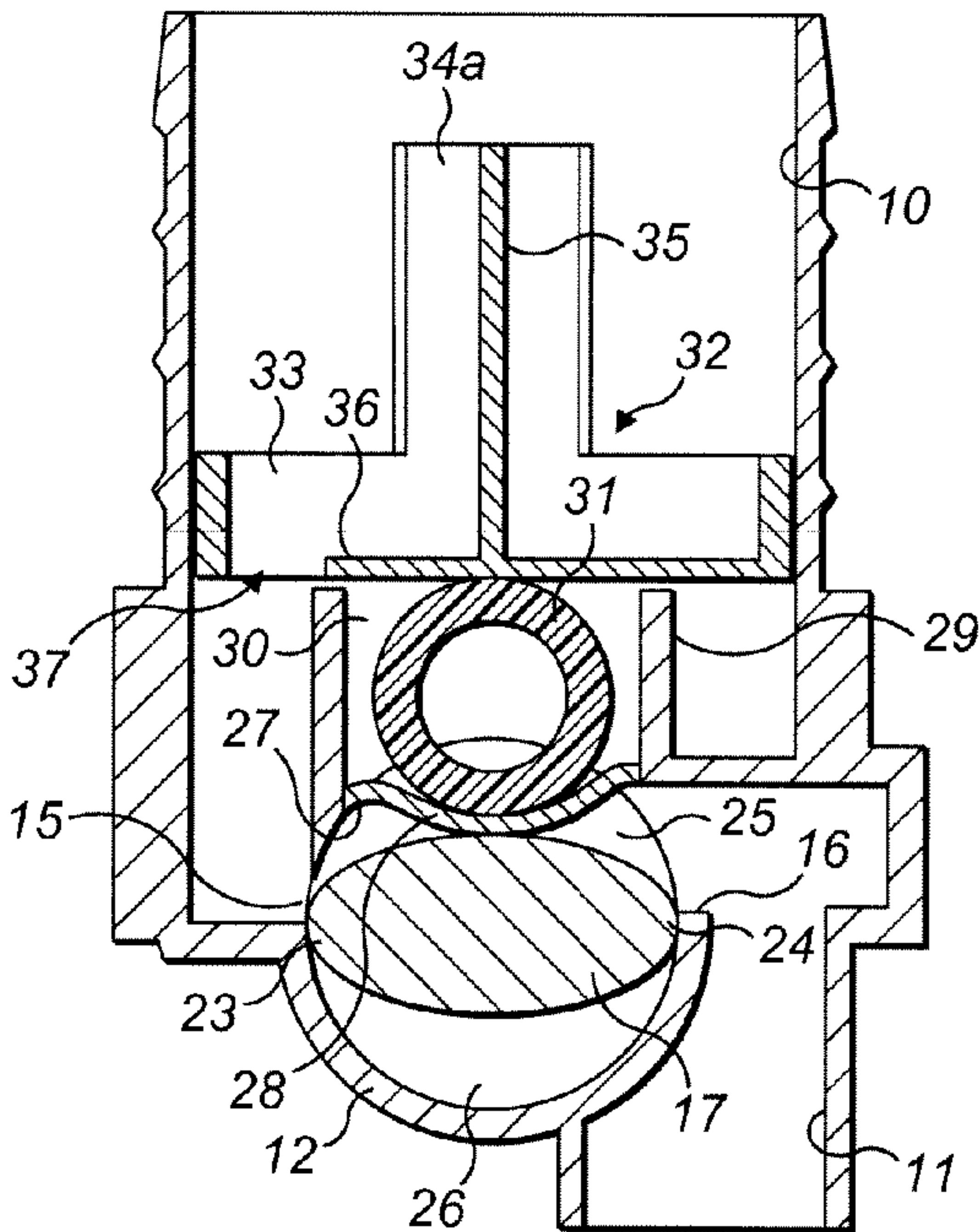


FIG. 5