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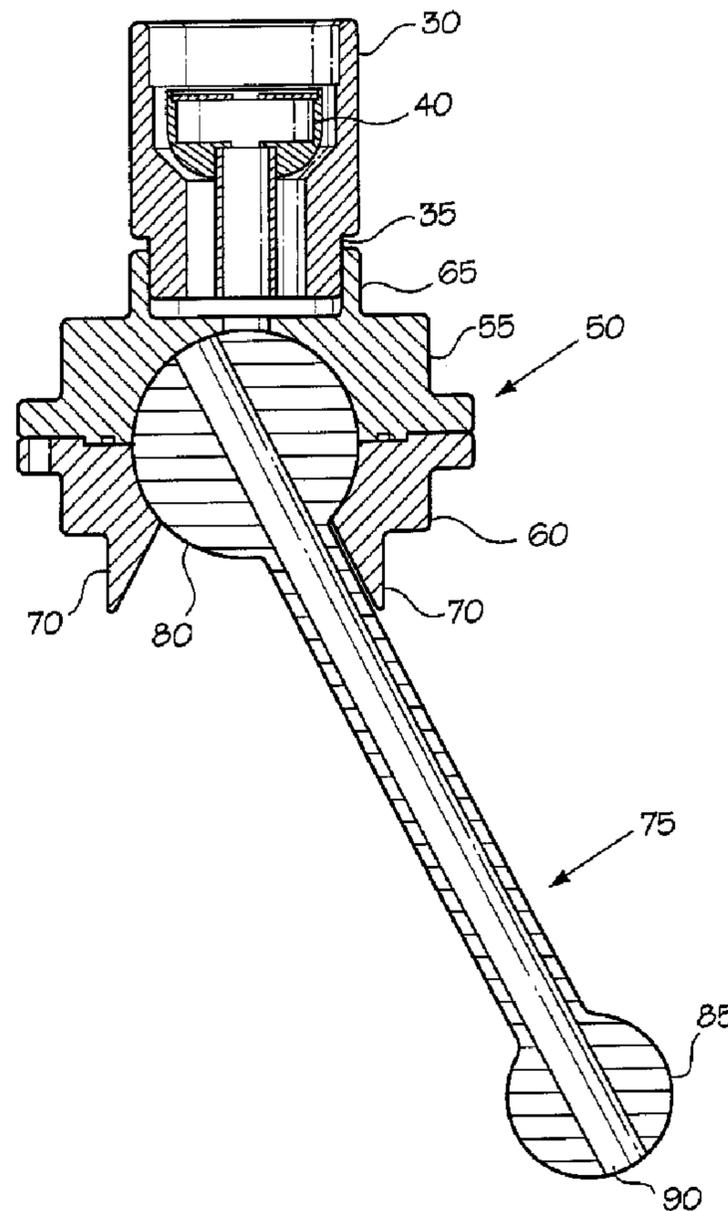
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(54) Title: SHUTOFF VALVE ASSEMBLY FOR A VENT PIPE



(57) Abrégé/Abstract:

A shutoff valve assembly for a vent pipe of a tank comprising a valve and a housing is provided. The housing is adapted to retain one end of the valve while the other end is free to oscillate. The valve has a bore positioned along its longitudinal axis and is

(57) **Abrégé(suite)/Abstract(continued):**

disposed in the vent pipe or the whistling vent of a tank. When the tank is in an upright position, the bore of the valve is aligned with the vent pipe opening to provide a continuous channel connecting the interior of the tank and the exterior thereof. In the event the tank is displaced from its upright position, the valve moves in response to gravity causing a misalignment of the bore of the valve and the vent pipe opening thereby cutting off the channel and thus preventing leakage of fuel.

ABSTRACT

A shutoff valve assembly for a vent pipe of a tank comprising a valve and a housing is provided. The housing is adapted to retain one end of the valve while the other end is free to oscillate. The valve has a bore positioned along its longitudinal axis and is disposed in the vent pipe or the whistling vent of a tank. When the tank is in an upright position, the bore of the valve is aligned with the vent pipe opening to provide a continuous channel connecting the interior of the tank and the exterior thereof. In the event the tank is displaced from its upright position, the valve moves in response to gravity causing a misalignment of the bore of the valve and the vent pipe opening thereby cutting off the channel and thus preventing leakage of fuel.

SHUTOFF VALVE ASSEMBLY FOR A VENT PIPE

TECHNICAL FIELD

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The present invention relates to a shutoff valve assembly for a vent pipe of a tank. In particular, the present invention relates to a shutoff valve assembly for a vent pipe that prevents leakage of fuel in the event the tank is tilted or overturned.

10 BACKGROUND OF THE INVENTION

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A typical fuel storage tank is provided, inter alia, with a fill pipe, a fuel outlet, and a vent pipe. The tank is filled through the fill pipe and fuel from the tank is delivered through a supply line connected to the fuel outlet. The vent pipe provides a means for the tank to breathe when fuel is withdrawn or added to the tank. Venting also provides pressure relief in case of overfill or rapid expansion or gasification of contents in the event of fire. A whistle may also be provided in the vent pipe in order to indicate fluid levels when filling the tank. The whistle provides a change in an audible signal when the fluid in the tank has reached a particular level. Vent pipes comprising a whistle are commonly referred to as whistling vents.

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Fuel spills or leakage occurring from any of the aforementioned pipes or outlets of a tank poses severe environmental and safety hazards. Typically, the fill pipe is covered with a removable cap fastened with a wing nut or the like after a filling operation. Automatic shutoff valves and valve protectors are employed to prevent fuel leakage from the fuel outlet in case the supply line is damaged or the tank is accidentally toppled or overturned. However, fuel may still spill or leak through the vent pipe or the whistling vents when a tank is toppled or overturned. Numerous devices have been provided in the past for preventing such spills or leakages.

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Canadian Patent Application No. 2,358,546 to Denby discloses a valve incorporating a roll-over mechanism. A pendulous mass automatically urges, due to gravity, an o-ring towards, and ultimately against, a pressure surface when the valve is rotated as a result of displacing the tank from its normal upright position.

United States Patent No. 6,142,167 to Pettesch describes a vent valve assembly capable of shutting off the valve during a rollover situation. A roll over valve is provided to open and close the fluid flow path between the vent valve and the tank interior. A rocker arm assembly rotatably mounted to a housing, positions
5 the roll over valve in the open position when the tanker is upright and moves the roll over valve to the closed position when the tanker rolls more than a predetermined angle relative to the upright position.

United States Patent No. 1,942,630 to Woodbridge describes a vent plug. In
10 the normal upright position, a weighted valve member of the vent plug is out of contact with a valve seat permitting venting from the container. When the container is tilted, the weighted member rocks about a point of contact on a supporting ledge and closes a venting orifice by bringing the valve member into contact with the valve seat and thus prevents liquid from escaping the container.

15 United States Patent No. 4,846,208 to Hempel et al. discloses a closing arrangement for a vent line of a tank. When a vehicle is in an inclined or inverted position, a mass part slides along guiding ribs and pulls a closing element against an outlet opening thus closing the vent line.

20 United States Patent No. 4,593,711 to Morris describes an overturn valve for a tank to prevent leakage of fluid in the event the tank is accidentally tilted or overturned. The overturn valve is biased open by gravity in the normal upright orientation of the valve assembly and is closed when the assembly is inclined to
25 approximately 45 degrees from the normal upright orientation.

The shutoff assemblies described above contain numerous components, are often difficult to assemble, and are expensive to manufacture. The components of the shutoff assemblies are typically exposed to adverse conditions that may cause
30 them to malfunction. Therefore, there is a need for a shutoff valve assembly that is simple in construction and has fewer moving components.

SUMMARY OF THE INVENTION

An object of the present invention is thus to provide an improved shutoff valve assembly for a vent pipe that addresses the limitations of the prior art.

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The present invention accomplishes this by providing a valve having a bore positioned along its longitudinal axis disposed in the vent pipe or the whistling vent of a tank. When the tank is in an upright position, the bore of the valve is aligned with the vent pipe opening to provide a continuous channel connecting the interior of the tank and the exterior thereof. In the event the tank is displaced from its upright position, the valve moves in response to gravity causing a misalignment of the bore of the valve and the vent pipe opening thereby cutting off the channel and thus preventing leakage of fuel.

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According to an aspect of the present invention there is provided a shutoff valve assembly for a vent pipe of a tank comprising a valve having a first end, a second end and an axial portion connecting the first and second ends; a housing unit for retaining the first end of the valve while the second end is free to oscillate. The valve has a bore extending substantially the length of the longitudinal axis of the valve, such that a channel is formed connecting the interior of the tank and the exterior thereof through the bore of the valve and the vent pipe when the tank is in an upright position and the channel is cutoff when the tank is displaced from the upright position.

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BRIEF DESCRIPTION OF THE DRAWINGS

These and other features of the invention will become more apparent from the following description in which reference is made to appended drawings wherein:

30 Fig.1 is a schematic view of a shutoff valve assembly for a vent pipe of a tank according to an embodiment of the present invention;

Fig. 2 (a) is a cross-section of a shutoff valve assembly for a vent pipe of a tank according to another embodiment of the present invention when the tank is in an upright position;

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Fig. 2 (b) is a cross-section of a shutoff valve assembly of Fig. 2(a) when the tank is displaced from an upright position; and,

5 Fig. 3 is a side elevation of a tank provided with a shutoff valve assembly (shown in ghosted view) for the vent pipe of Fig. 2(a).

DETAILED DESCRIPTION OF THE INVENTION

10 The shutoff valve assembly according to an embodiment of the present invention is shown in detail in Figs. 1, 2(a), and 2(b). The housing 50 retains the first end 80 of the valve 75 while the second end 85 thereof is free to oscillate. The valve 75 has a bore 90 positioned substantially along its longitudinal axis. When the tank 100 is in an upright position, the bore 90 of the valve 75 is aligned with the vent pipe 30 to provide a continuous channel connecting the interior of the tank 100 and the exterior thereof as shown in Fig. 2(a). In the event the tank is displaced from its upright position, the second end 85 of the valve 75 moves in response to gravity. As shown in Fig 2(b), the displacement of the tank causes a misalignment of the bore 90 of the valve 75 and the vent pipe 30 thereby cutting off the continuous channel and thus preventing leakage of fuel.

20 The valve 75 is shown to have a dumbbell-shape with spherical first 80 and second 85 ends in Figs. 2(a) and 2(b). However, it is not restricted to this shape alone. Valves of other geometric designs with a bore therethrough may be envisioned. However, the valve must provide a continuous channel connecting the interior of the tank with the exterior thereof, when the tank 100 is in an upright position and the channel must be cutoff by the misalignment, due to gravity, of the bore 90 and the vent pipe opening when the tank 100 is tilted or overturned.

30 The housing 50 is shown to have an upper chamber 55 and a lower chamber 60 in Figs. 2(a) and 2(b). The upper chamber 55 has a neck portion 65 dimensioned to receive a stem portion 35 of the vent pipe 30. The lower chamber 60 has flanges 70 that define the extremities of the oscillation of the valve 75 as shown in Fig 2(b). The housing 50 may be constructed in several other ways so long as the housing 50 retains one end 80 of the valve 75 in a pivotal manner and the second end 85 of the valve 75 is free to oscillate. Additionally, a gasket or an o-ring may be provided in

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between the neck portion 65 of the upper chamber 55 and the first end 80 of the valve 75. The inner surface of the housing 50 may be lubricated with suitable lubricants such as grease, petroleum jelly, graphite etc., so as to facilitate the movement of the valve 75.

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The valve 75 may have an opening (not shown) disposed thereon along the length of the longitudinal axis. The opening extends to the bore 90 and may prevent any leak caused due to overfilling of the tank 100 by creating a back pressure. Typically, the opening may have a diameter of about 3 mm to 4mm.

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The shutoff valve assembly of the present invention may be retro-fitted on an existing tank 100 or may be manufactured in conjunction with a tank 100. The lower chamber 60 of the housing 50 can be mounted on a pre-existing opening for receiving a vent pipe 30 in a tank 100. The first end 80 of the valve 75 is retained in the housing 50 such that the valve 75 is directed to the interior of the tank 100. The stem portion 35 of the vent pipe 30 is then mounted into the neck portion 65 of the upper chamber 55 as shown in Figs 2(a) and 2(b).

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A vent whistle 40 is provided in the vent pipe 30 as illustrated in Figs. 2(a) and 2(b). During filling of the tank 100, the vent whistle 40 provides a change in an audible signal when the fluid in the tank 100 has reached a particular level.

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A tank 100 provided with a shutoff valve assembly according to an embodiment of the present invention is shown in Fig. 3. As seen in Fig. 3, a tank 100 has a fill pipe 5, fluid level gauge 25, and a vent pipe 30 on the top portion thereof. An outlet 15 is provided on the lower portion of the tank 100 and is connected to a supply line 20. The fill pipe 5 is closed with a removable cap 10 when not in use. The whistle 40 provided in the vent pipe 30 indicates the fuel level when the tank 100 is being filled. A shutoff valve assembly comprising a housing 50 and a valve 75 is disposed in the vent pipe 30 such that the valve 75 is exposed to the interior of the tank 100.

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A flexible metal hose may serve as the supply line 20. The advantage of having a flexible metal hose as the supply line 20 is that in the event that the tank 100 is tilted or toppled, the supply line is not easily cut off, thus preventing a spill.

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Furthermore, the cap 10 may be screwed on to the fill pipe 5 and sealed up with a rubber gasket or the like. In addition, the cap may be locked by a butterfly screw. The fill pipe 5 is thus sealed to prevent any spills.

5 The shutoff valve assembly of the present invention may be manufactured using a host of natural and synthetic materials. These may include, but are not limited to, alloys such as brass, bronze, steel; metals such as, copper, iron, aluminum, titanium; and, synthetic materials such as plastic, poly-carbons, fiber glass, etc.

10 In an alternate embodiment of the present invention, the shutoff valve assembly can be combined with a flexible hose adapted for connection to an outlet of the tank and a replaceable cap for the fill pipe to provide a safety kit for tanks.

15 Although specific embodiments refer exclusively to a fuel tank, it will be appreciated by those skilled in the art that the invention may be employed for any storage tank that requires a similar shutoff protection. As will be apparent to those skilled in the art, many alterations and modifications are possible in the practice of this invention without departing from the spirit of the essential characteristics thereof.

20 The present embodiments are therefore illustrative and not restrictive.

THE EMBODIMENTS OF THE PRESENT INVENTION IN WHICH AN EXCLUSIVE PRIVILEGE OR PROPERTY IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A shutoff valve assembly for a vent pipe of a tank comprising:
 - a valve having a first end, a second end and an axial portion connecting said first and second ends;
 - a housing unit for retaining said first end of said valve while said second end is free to oscillate; and,
 - said valve having a bore extending substantially the length of the longitudinal axis of said valve,whereby a channel is formed connecting the interior of said tank and the exterior thereof through said bore of said valve and said vent pipe when said tank is in an upright position and said channel is cutoff when said tank is displaced from said upright position.
2. The shutoff valve assembly according to claim 1, wherein said valve is a dumbbell-shaped valve having substantially spherical first and second ends.
3. The shutoff valve assembly according to claim 1 or 2, wherein said housing unit comprises an upper chamber and a lower chamber.
4. The shutoff valve assembly according to claim 3, wherein said upper chamber has a neck portion dimensioned to receive said vent pipe.
5. The shutoff valve assembly according to claim 3 or 4, wherein said lower chamber has a flange that define the extremities of oscillation of said valve.
6. The shutoff valve assembly according to any one of claims 3 to 5, wherein said lower chamber is adapted to be secured in a vent pipe opening of said tank.
7. The shutoff valve assembly according to any one of claims 1 to 6, wherein said valve is weighted at said second end.

8. The shutoff valve assembly according to any one of claims 1 to 7, wherein said valve has an opening disposed thereon along the length of the longitudinal axis of said valve and extending to said bore.

9. A safety kit for a tank, comprising the shutoff valve assembly according any one of claims 1 to 8, a replaceable cap for sealing a fill pipe of said tank, and a flexible hose for connection to an outlet of said tank.

10. The use of the shutoff valve assembly according to any one of claims 1 to 8 in a residential fuel tank.

11. The use of the safety kit according to claim 9 in a residential fuel tank.

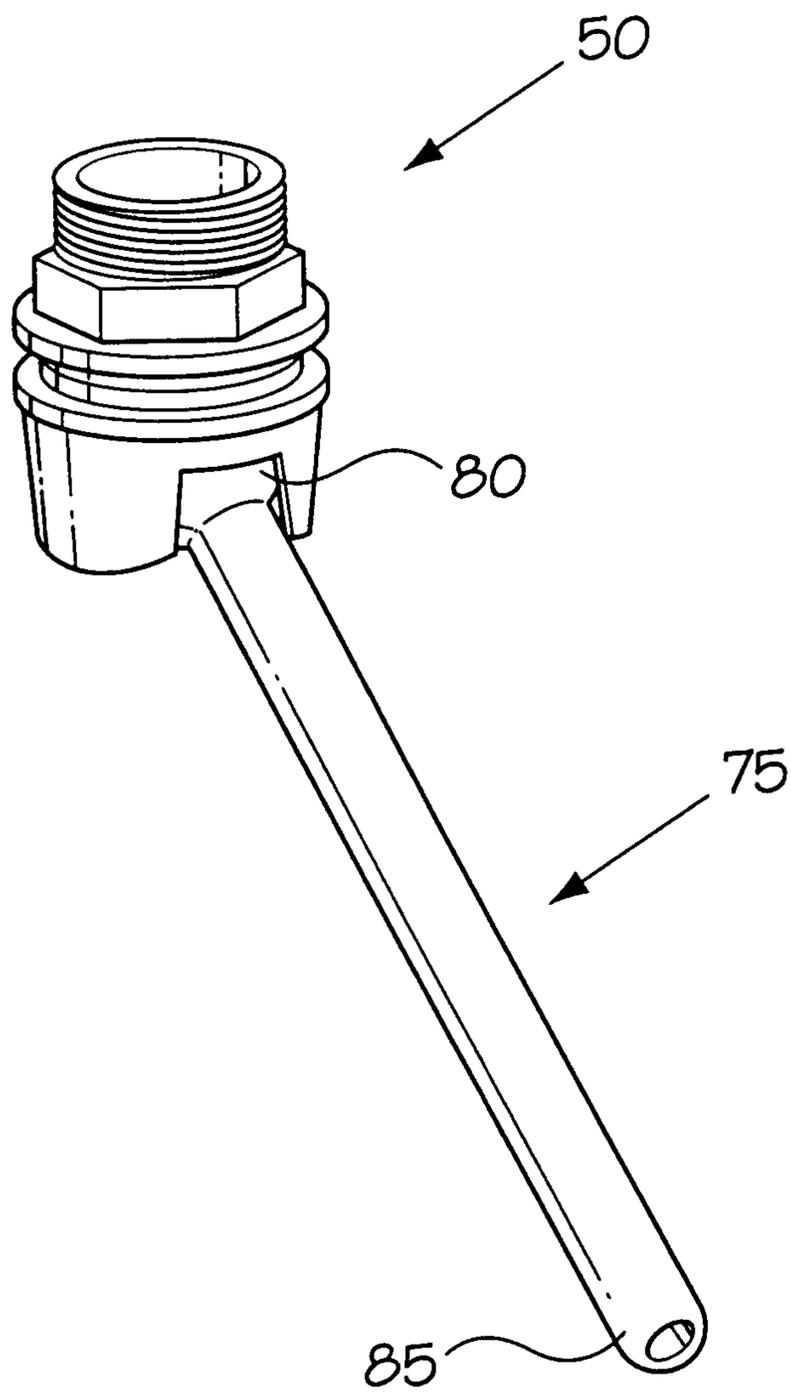
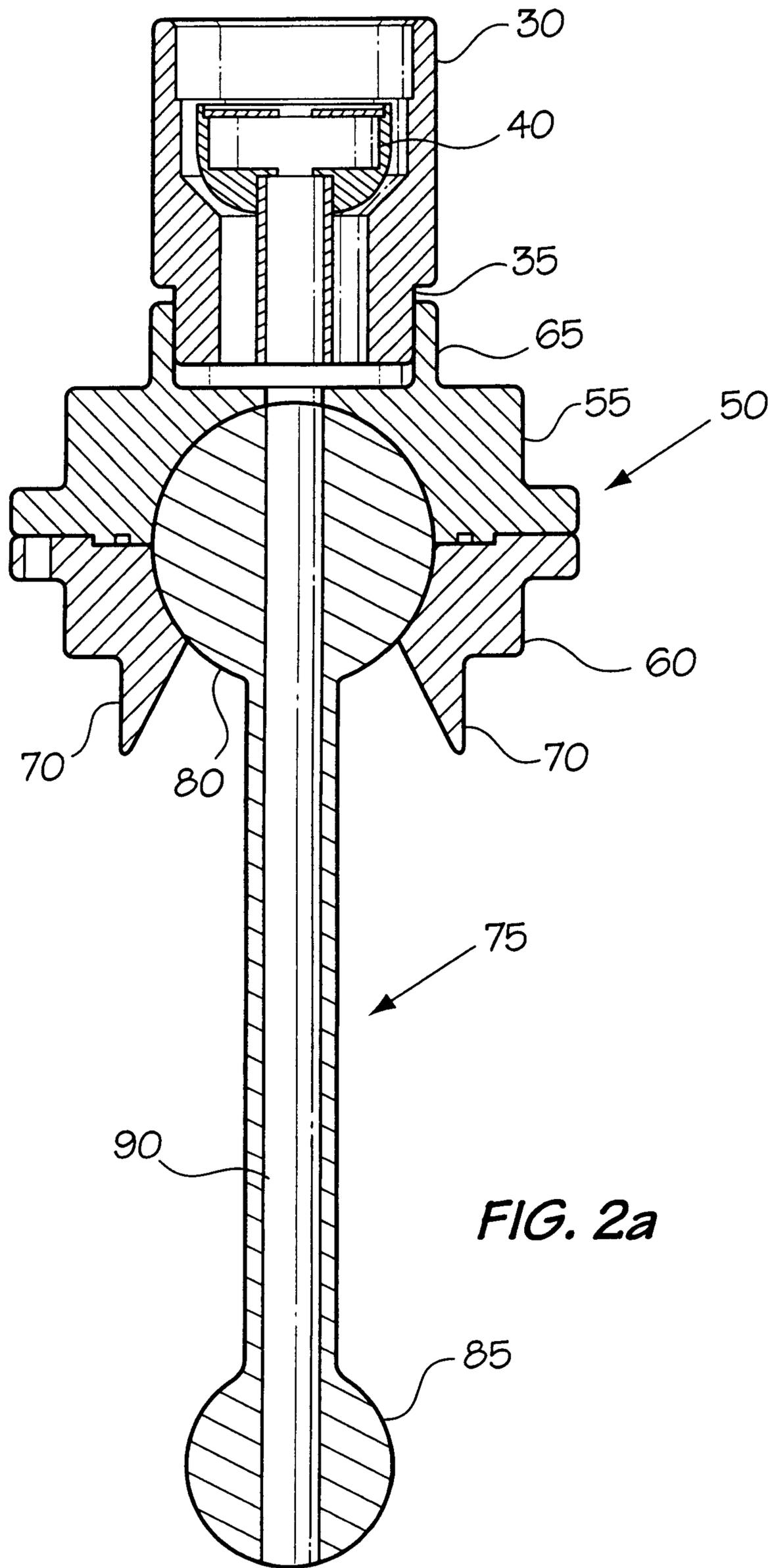


FIG. 1



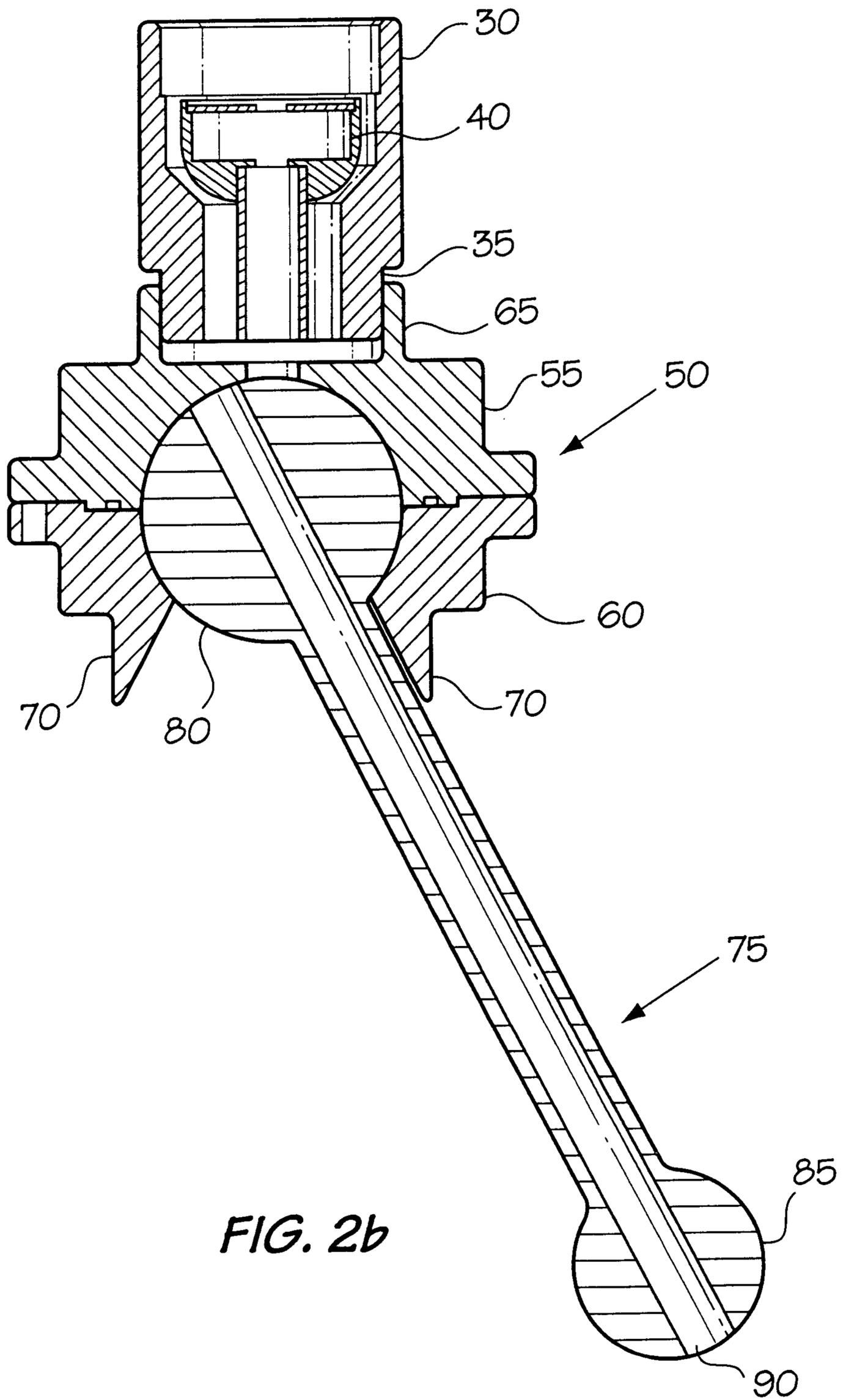


FIG. 2b

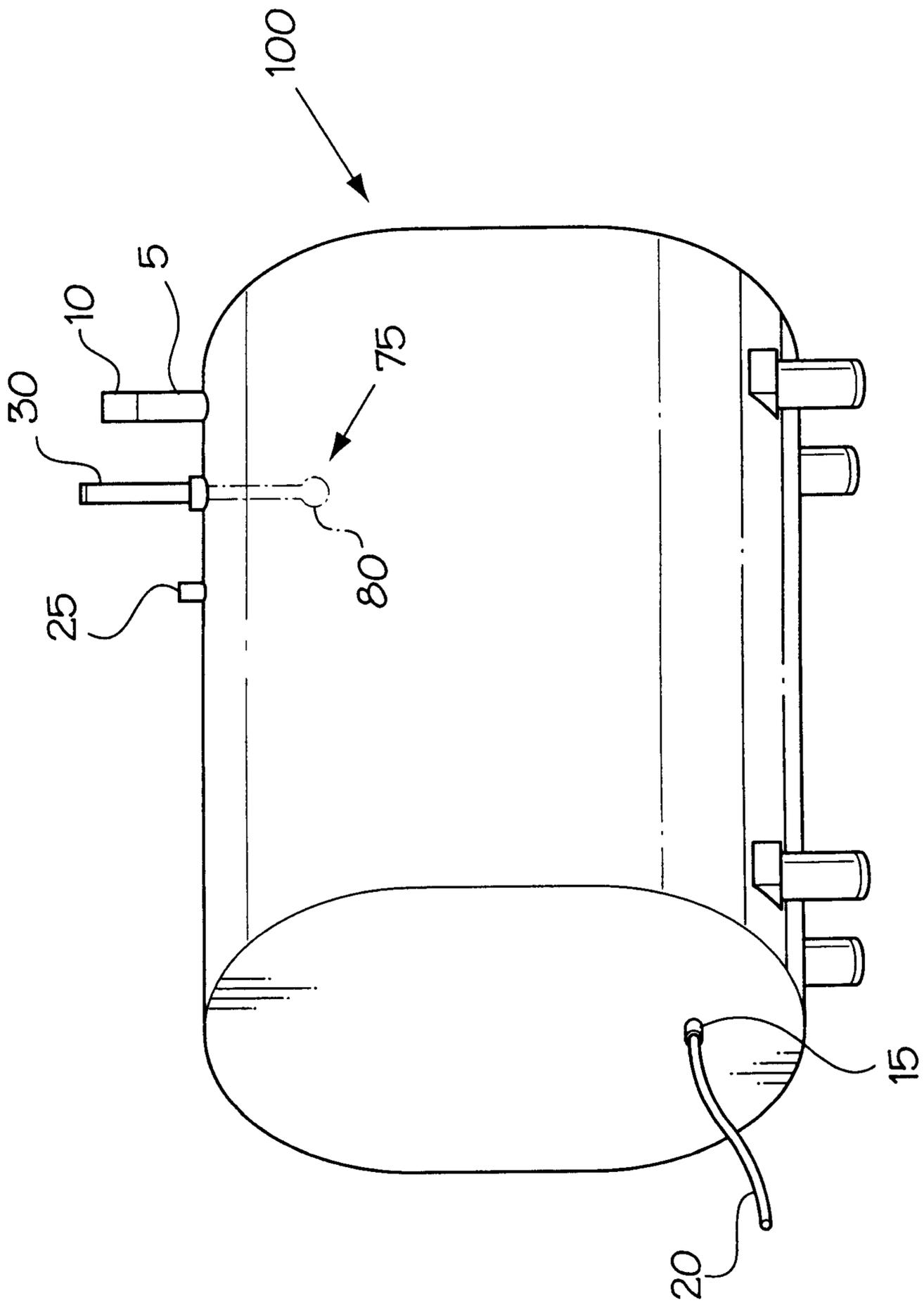


FIG. 3

