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(54) Filling device for a fuel tank

(57) A filling device for a fuel tank comprises a filling line (18) which is connected to a fuel tank (17) and at an opposite end is provided with a filling mouth (20) for receiving a filling pistol. The filling mouth (20) is for this purpose accessible via a filling opening (25) which can be closed off by means of a cap (5). To counteract an escape of fuel from the filling opening (25), the filling device is provided with an overflow protection. The filling device is for this purpose fitted with an overflow chamber (1) which surrounds the filling mouth (20) and inside which the filling line issues with the filling mouth (20). The overflow chamber (1) is accessible via the closable filling opening (25).

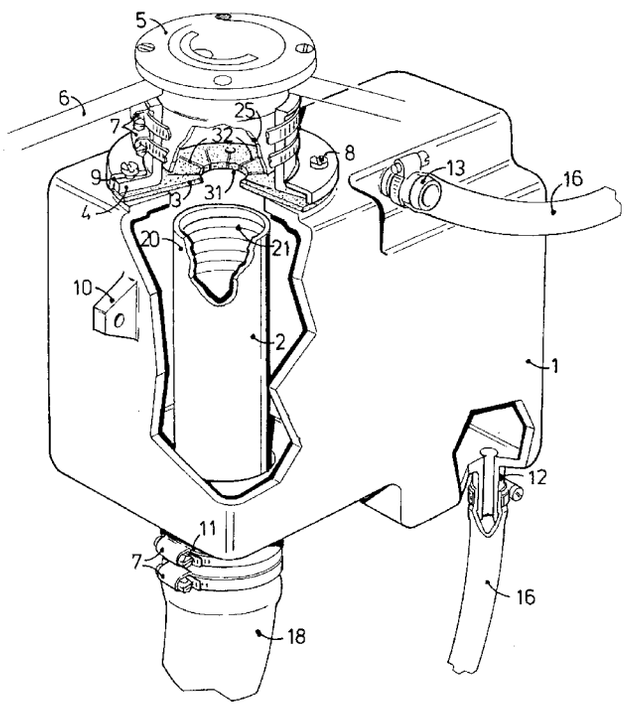

Fig. 3

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Description

The invention relates to a filling device for a fuel tank, comprising a filling line which at a first end is in open communication with the fuel tank and at a second, opposite end is provided with a filling mouth designed to receive a filling pistol and accessible via a closable filling opening. The invention relates in particular to a filling device for a fuel tank placed on board a ship.

A fuel tank of a ship provided with a prior-art filling device is depicted in Fig. 1. The device comprises an internal filling line (18) which at one end is in open communication with the fuel tank (17) and at an opposite end comprises a filling mouth (20) which is fastened in the gangway (6) of the ship. A filling opening of the filling mouth (20) can be closed here by means of a cap (5). To fill the fuel tank (17), the cap (5) is removed and a filling pistol of a pump installation is inserted through the filling opening thus made accessible into the filling mouth (20). Air and fuel vapour driven from the fuel tank (17) by this can escape through a vent line (16) and a vent nipple (15).

It is a disadvantage of such a known device, however, that it frequently tends to cause spillage of fuel in practice. Keeping the environment clean and endangering it as little as possible is the aim of everybody nowadays. This is also true for filling of fuel tanks on board ships and other craft. A few drops of fuel spilled into the surface water will readily cause a clearly visible oil film of several square metres. The known filling device is a constant source of irritation in this respect, especially when the tank is almost full. If the fuel pistol shuts itself off or is shut off too late, fuel or at least the foam thereof will squirt from the filling opening or the vent nipple with the above unpleasant consequences.

The present invention accordingly has for its object inter alia to provide a filling device of the kind mentioned in the opening paragraph wherein the above disadvantages are counteracted at least to a considerable extent.

According to the invention, a filling device of the kind mentioned in the opening paragraph is for this purpose characterized in that the filling line issues with its filling mouth at the second end inside an overflow chamber which surrounds the filling mouth, and in that the overflow chamber is accessible through the closable filling opening. If the filling pistol shuts itself off or is shut off too late in this arrangement, the fuel or the foam thereof will initially flow over from the filling mouth into the surrounding overflow chamber and will accordingly not flow from the filling opening. It can thus be prevented that fuel is spilled onto the deck and from there into the surface water in the majority of cases, if not indeed in all cases, in that the overflow chamber is given a sufficiently large capacity.

The overflow chamber of the filling device according to the invention may be mounted in an existing filling device in that it is places in the internal fuel hose. To simplify this, a special embodiment of the device according to the invention is characterized in that the overflow chamber comprises a tubular portion of the filling line, mounted therein in a manner so as to be impermeable to liquids, and comprises the the filling mouth, in that said tubular portion is provided with a connection sleeve for a filling hose to the fuel tank at an end facing away from the filling mouth, and in that the overflow chamber is provided with the filling opening at an end situated opposite the filling mouth. In that case all that need be done is that the existing fuel hose, possibly made shorter, is joined to the connection sleeve, and the overflow chamber is mounted to the deck in the desired location.

To remove any fuel which has flown into the overflow chamber from this chamber; a further special embodiment of the filling device according to the invention is characterized in that the overflow chamber comprises vent means and in that the overflow chamber is provided at or at least near its bottom with a drain hole which is connected to vent means of the fuel tank via a discharge line. Any fuel spilled into the overflow chamber can then flow into the fuel tank through the drain hole, discharge line, and vent means. The vent means in the overflow chamber ensure that a vent path from the fuel tank is nevertheless maintained during this.

The invention will now be explained in more detail with reference to an embodiment and an accompanying drawing in which:

- Fig. 1 shows a fuel tank with the filling device described above placed below a ship's gangway;
- Fig. 2 shows a fuel tank with an embodiment of the filling device according to the invention where the filling opening with cap is mounted in a horizontal portion of a ship's deck;
- Fig. 3 is a perspective view of the device mounted as depicted in Fig. 2;
- Fig. 4 shows a fuel tank with the filling device of Fig. 2, but with the filling opening with cap being mounted in a raised, vertical portion of a ship's deck;
- Fig. 5A is a cross-section of the overflow chamber of the filling device of Fig. 2; and
- Fig. 5B is a side elevation of the overflow chamber of Fig. 2.

The Figures are purely diagrammatic and not always true to scale. Some dimensions have been particularly exaggerated for the sake of clarity. Corresponding components have been given the same reference numerals as much as possible in the Figures.

An embodiment of the filling device according to the invention for use on board a ship is shown in Figs. 2 and 3 with the filling opening in a horizontal and in a vertical portion of the deck, respectively, more in particular in the gangway 6 and in a raised, vertical portion 19. The filling device can be mounted on the existing fuel tank 17 of the ship, which does not require any special ad-

aptations for this purpose. The filling device comprises an overflow chamber 1 which surrounds a tubular portion 2 of the filling device in the relevant area, see Fig. 5A. The tubular portion 2 is mounted in the chamber 1 in a manner impermeable to liquids and comprises at its free end a filling mouth 20 inside the overflow chamber 1 for receiving a filling pistol of a pump installation. At the opposite end, the tubular portion 2 comprises a connection sleeve 11 for connection to an existing, possibly shortened filling hose 18 to the fuel tank 17. Opposite the filling mouth 20, the overflow chamber 1 is provided with a filling opening 25 through which the filling mouth 20 is accessible to a filling pistol. The filling opening 25 is provided with an internal thread into which a cap 5 can be screwed, which cap is provided with a mating external thread for this purpose.

The material of the overflow chamber 1 is a HD polyethylene or aluminium, both being particularly well resistant to petrol and diesel fuels. The overflow chamber 1 can be mounted in any rotational position in the horizontal plane relative to the fuel line cap 5. As a result, the ideal position of the chamber 1 relative to the cap 5 can always be found when the former is mounted, for example, below the gangway of a ship. The fuel overflow chamber 1 is so designed that it can be connected adjacent any fuel line cap 5 fitted with a standard hose connector of, for example, 50 mm or 38 mm diameter. The fuel overflow chamber 1 can be mounted directly to the fuel line caps 5 already present in many cases, provided sufficient space is available for the chamber 1. Fuel line caps 5 are often fitted with a long filling connection; the latter should preferably project easily over the internal filling line 2 when a fuel overflow chamber 1 is used. The overflow chamber 1 is fitted with fastening means in the form of two fastening eyelets 10. It is in fact preferable to mount the chamber 1 to, for example, the deck by means of two strips or similar parts. The strips then absorb the weight of the chamber 1 and of any fuel present therein as well as the forces exerted by the fuel hose (18).

Instead of a fuel hose 18, a rubber closing piece 4 is fastened to the - possibly shortened - fuel line cap 5 by means of at least two stainless steel hose clips 7 in the present embodiment of the invention. Two hose clips 7 are used because this offers more security and certainly also because ISO guidelines for yacht construction will render this compulsory in the future. The rubber used for the closing piece 4 is highly resistant to petrol and diesel fuels and is provided with a reinforcement fabric. A rubber splash guard 3 is mounted between the rubber closing piece 4 and the chamber 1. The rubber closing piece 4 and the splash guard 3 are fastened to the chamber 1 by means of a stainless steel retaining ring 9 and screws 8. The rubber splah guard 3 has a central opening 31 from which a number of incisions 32 extend radially outwards. This serves to render possible the ready insertion of filling pistols of different diameters, for example for petrol and diesel, into the internal filling line 2.

The tubular portion 2 of the internal filling line may form an integral whole with the housing of the overflow chamber, for example, it may be integrally cast or injection-moulded thereto, or as in the present example may be formed by a separate insert which is mounted with exact fit in the filling connection sleeve 11 so as to be impermeable to liquids. When a fuel supply hose 18 is mounted to the connection sleeve 11, again with two hose clips 7, the tubular portion 2 of the internal filling line will be held securely and leak-free in the connection sleeve 11 after the hose clips 7 have been tightened. The tubular portion 2 is internally provided with a kind of screwthread at the area of the filling mouth 20 in the form of a number of circumferential ridges 21. The filling mouth is further fitted with a flared end so that a filling pistol can be easily guided into it.

Should fuel rise during filling, when the tank is almost full, the flow will become turbulent at the area of the ridges 21. The fuel will then flow rotating from the filling mouth 20 over the flared end thereof and enter the overflow chamber 1. Any fuel issuing from the filling mouth in a linear upward movement will be substantially entirely stopped by the rubber splash guard 3. The rising fuel will at the same time switch off the filling pistol so that the flow of fuel from the filling mouth 20 is stopped. Any fuel or fuel foam flowing from the filling mouth 20 will always be caught by the overflow chamber. This renders it impossible for fuel to escape from the filling opening 25 onto the deck 6 and from there possibly into the surface water. The overflow chamber has a capacity of approximately 3 litres, which was found to be sufficient in practice. All fuel present in the chamber 1 after tanking has ended will flow back into the fuel tank 17 through the connection 12 in the bottom and the vent hose 16 coupled thereto.

When fuel flows towards and into the fuel tank 17 during filling of the tank, air will want to flow from the tank to the exterior. This air will escape through the vent hose 16. The air will enter the overflow chamber 1 through the vent hose connection 12. It will be able to escape to the outside because the overflow chamber 1 is also provided with vent means, i.e. a vent hose connection 13 and the vent hose 16 coupled thereto. The overflow chamber 1 in the present example is even fitted with two vent hose connections 13, see Fig. 5B, to enable the ship builder to connect the vent hose there where it is most convenient. The connection 13 which is not used is or remains sealed. Fuel rising inside the vent line 16 at the end of the tanking process and threatening to escape to the exterior through the vent line 16 is also effectively caught in the overflow chamber in this embodiment, so that any pollution of the environment is avoided.

The vent means 13, 16 of the chamber 1 are in communication with an externally mounted vent nipple 15, with or without an interposed odour filter 14 as in the present example. The vent nipple 15 must always be

mounted at a higher level than the fill cap 5. The connection 13 serves not only to allow air driven from the fuel tank to escape to the exterior through the vent nipple 15; inversely, air can flow towards the fuel tank 17, for example when fuel is being consumed.

The odour filter 14 mounted between the connection 13 and the vent nipple 15 prevents the air escaping from the fuel tank from spreading an unpleasant diesel smell. A filtering material comprising a particular type of activated carbon is provided in the fuel odour filter 14. The activated carbon absorbs the molecules causing the diesel smell from the air flowing past. The activated carbon filter must on no account come into contact with liquid fuel. It is to be preferred, accordingly, that the odour filter 14 should be mounted as far above the fuel overflow chamber 1 as possible. If the fast-flowing air should contain some drops of fuel, these will be separated from the air in the chamber 1 before the air issues to the exterior through connection 13.

The filling device according to the invention can also be used if the fuel line cap 5 is not mounted in a deck or gangway 6, but instead in a vertical wall of, for example, a raised deck structure 19 as depicted in Fig. 4. The tubular end 2 of the internal filling line is then allowed to be mounted in one manner only: sloping in downward direction so that as little fuel as possible can flow from the filling opening 25.

The fuel overflow chamber 1 also counteracts at least partly another problem associated with the existing filling device:

The following problem may arise when a fuel tank 17 on board a ship has been filled to capacity. Suppose the tank from which the fuel originates lies below ground and has a temperature of 10°C. The fuel tank of the ship has a capacity of, for example, 500 l. The ship is not used after being filled up, but owing to fine, hot weather the temperature in the ship rises to 35°C. The fuel is also heated up thereby. The temperature rise will cause the fuel to expand. The coefficient of thermal expansion of, for example, diesel fuel is 0.000875. The 500 l will expand to approximately 511 l. These 11 l of fuel must remain somewhere and, if there is no space in the tank and in the filling line 2, 18 coupled thereto, will flow eventually from the vent nipple 15 onto the deck or gangway 6 and possibly pollute the surface water, unless indeed a fuel overflow chamber 1 is present. The overflow chamber 1 with its capacity of 3 l, however, forms a buffer which absorbs the first attack of the expanding fuel. If so desired, a larger overflow chamber may be used to counteract this problen still further.

Although the invention was explained in detail with reference to only a single embodiment, it will be obvious to all that the invention is by no means limited to the example given above. On the contrary, many variations are possible to those skilled in the art without departing from the scope of the invention. Thus, for example, the dimensions specified and the materials used in the embodiment are given purely by way of example and may be adapted to suit any particular application. This application, moreover, may lie not on board a ship or other craft, but may be on board a vehicle of any kind or even a fixed tank installation. A combined vent line for the fuel tank and for the drain of the overflow chamber, as in the example given, may be replaced by separate lines, each for its individual function. The combination of the two functions in a single line, however, leads to a saving in components and requires no adaptation of an existing fuel tank.

In general, the invention offers an overflow protection against the unwanted escape of a liquid fuel and the accompanying environmental pollution during filling of a fuel tank caused by a too late switching-off of a filling pistol or by e.g. the thermal expansion of the liquid fuel.

Claims

1. A filling device for a fuel tank, comprising a filling line which at a first end is in open communication with the fuel tank and at a second, opposite end is provided with a filling mouth designed to receive a filling pistol and accessible via a closable filling opening, characterized in that the filling line issues with its filling mouth at the second end inside an overflow chamber which surrounds the filling mouth, and in that the overflow chamber is accessible through the closable filling opening.

2. A filling device as claimed in Claim 1, characterized in that the overflow chamber comprises a tubular portion of the filling line, mounted therein in a manner so as to be impermeable to liquids, and comprises the the filling mouth, in that said tubular portion is provided with a connection sleeve for a filling hose to the fuel tank at an end facing away from the filling mouth, and in that the overflow chamber is provided with the filling opening at an end situated opposite the filling mouth.

3. A filling device as claimed in Claim 1 or 2, characterized in that the overflow chamber comprises vent means and in that the overflow chamber is provided at or at least near its bottom with a drain hole which is connected to vent means of the fuel tank via a discharge line.

4. A filling device as claimed in Claim 3, characterized in that the vent means of the overflow chamber are in communication with an externally mounted vent nipple via an odour filter.

5. A filling device as claimed in any one or several of the preceding Claims, characterized in that a flexible splash guard comprising a disc-shaped body with an opening for receiving the filling pistol is provided between the filling mouth and the filling open-

ing.

6. A filling device as claimed in Claim 5, characterized in that a number of incisions extending from said opening in radial directions is provided in the splash guard.

7. A filling device as claimed in any one or several of the preceding Claims, characterized in that the filling mouth is provided with a flared end.

8. A filling device as claimed in any one or several of the preceding Claims, characterized in that the filling mouth is internally provided with a number of ridges which extend in circumferential direction.

9. A filling device as claimed in any one or several of the preceding Claims, characterized in that the overflow chamber is provided with fastening means on its outside for the purpose of suspended mounting.

10. An overflow chamber for use in the filling device as claimed in any one or several of the preceding Claims.

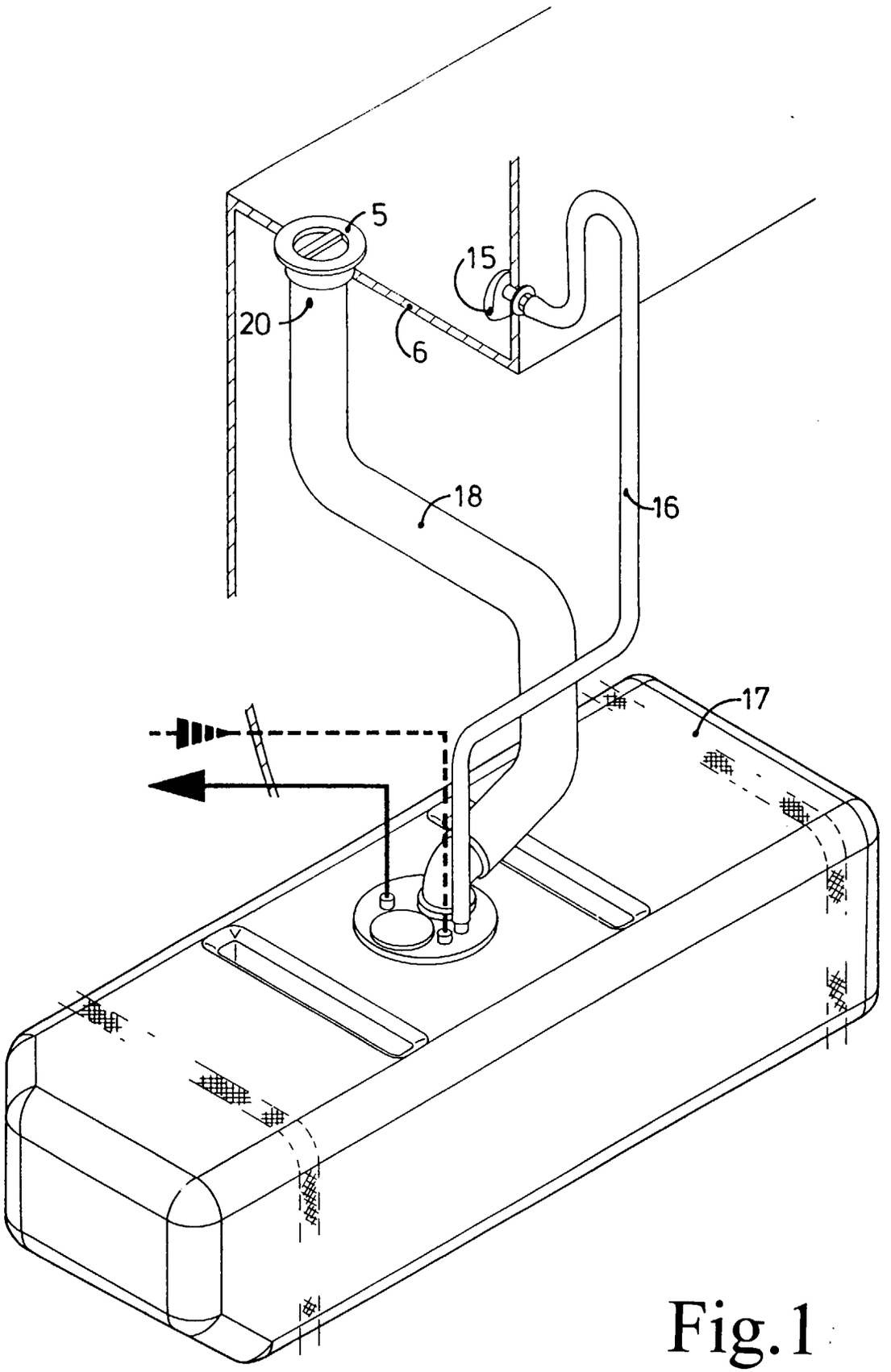

Fig.1

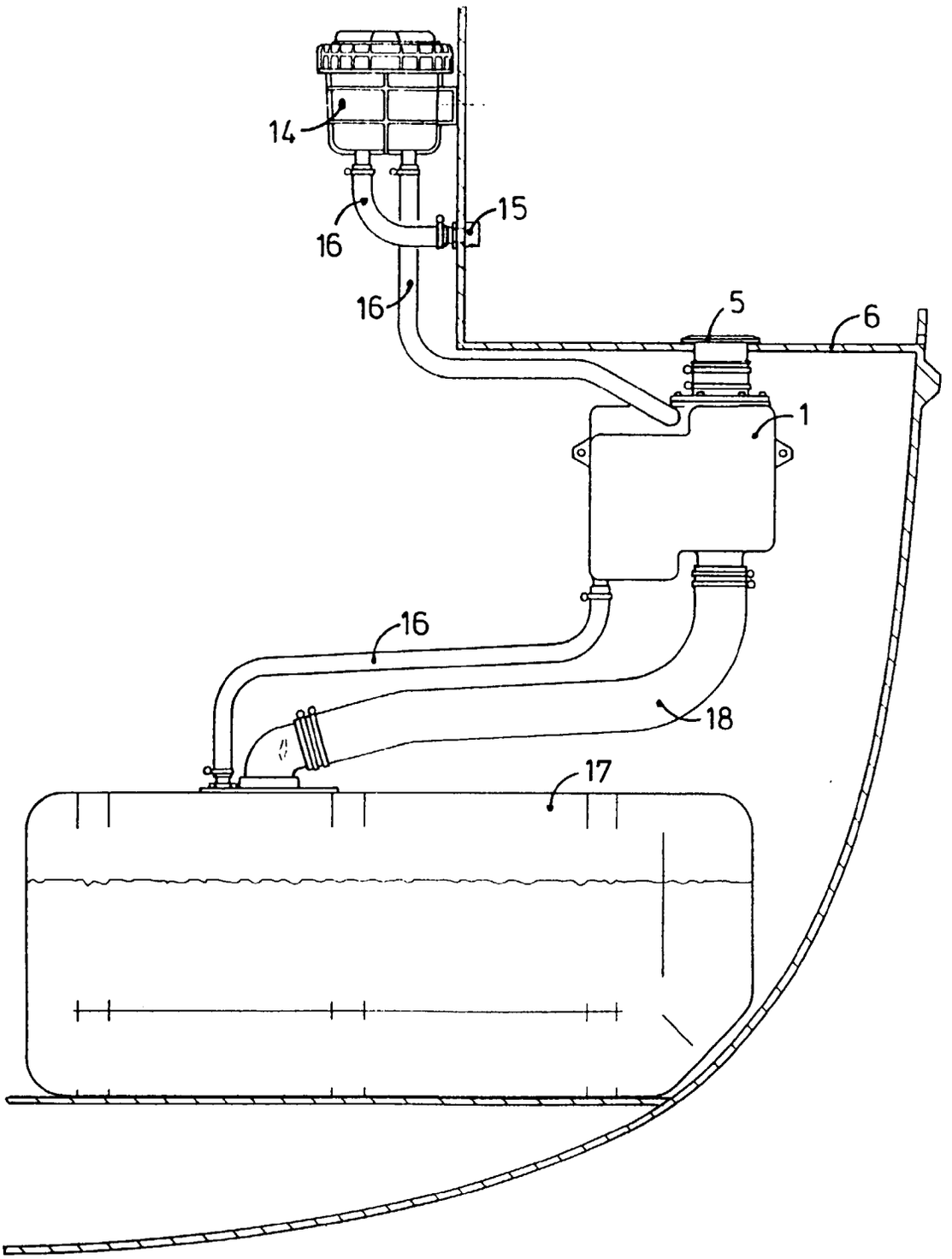

Fig. 2

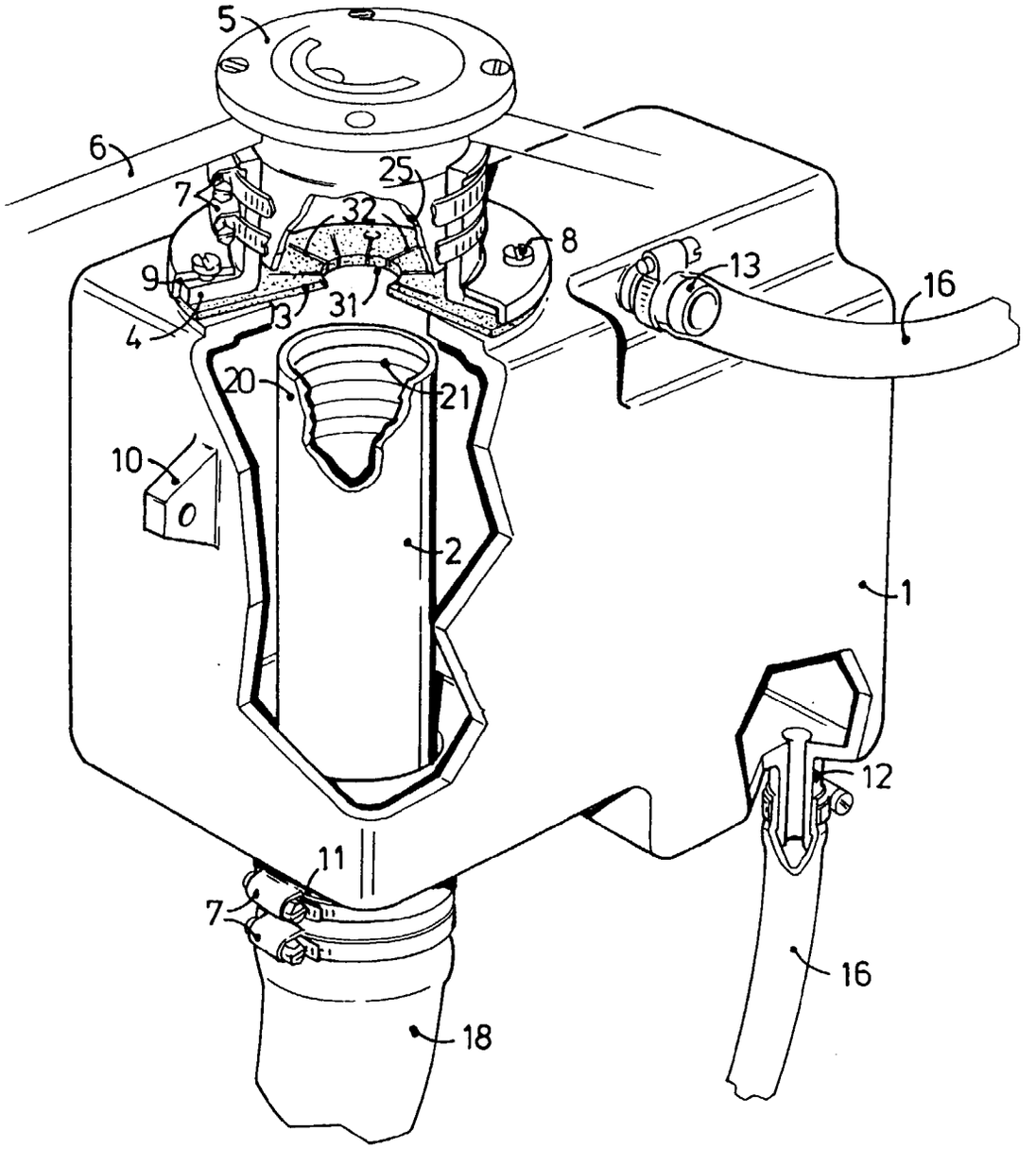

Fig. 3

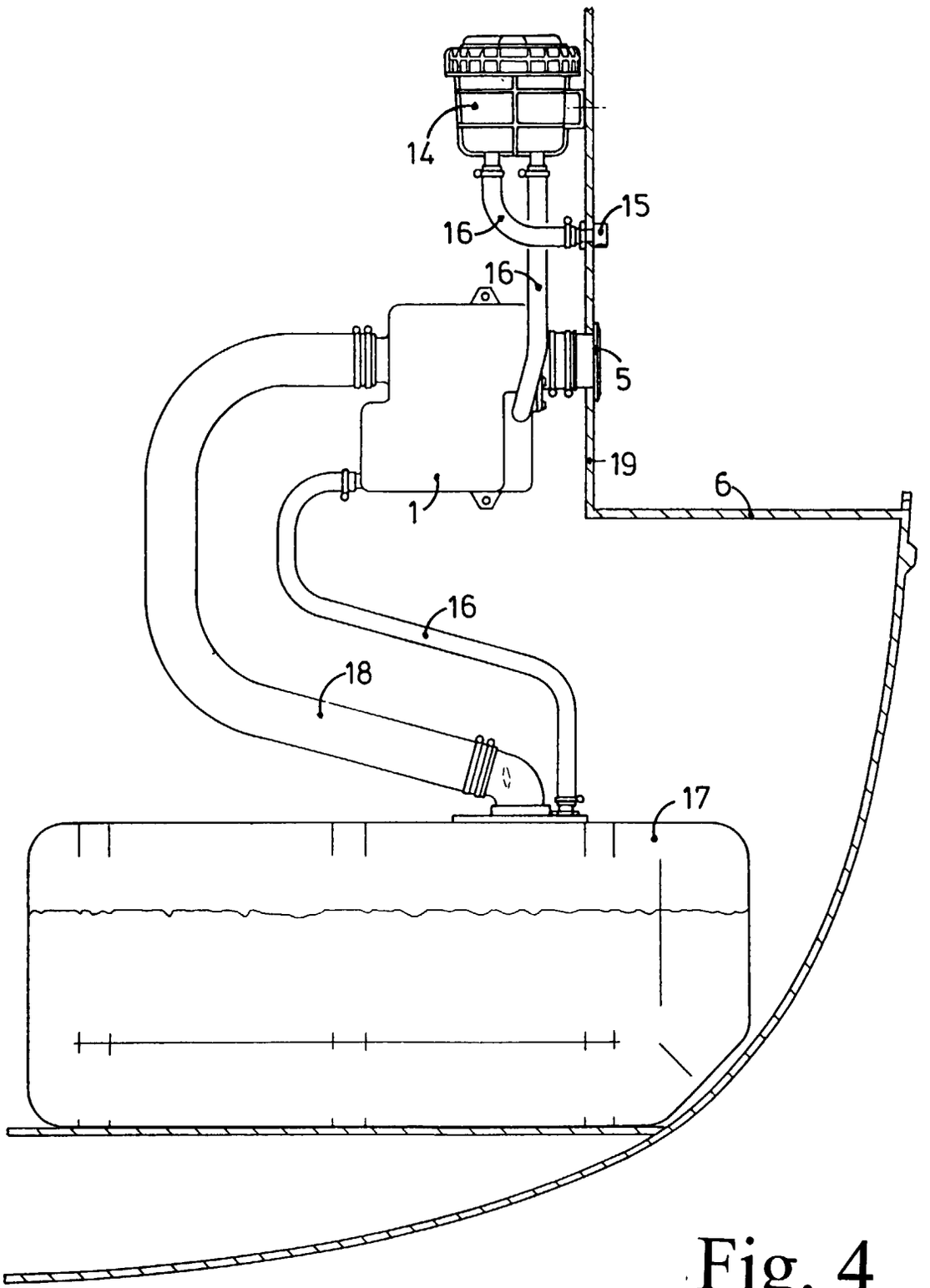

Fig. 4

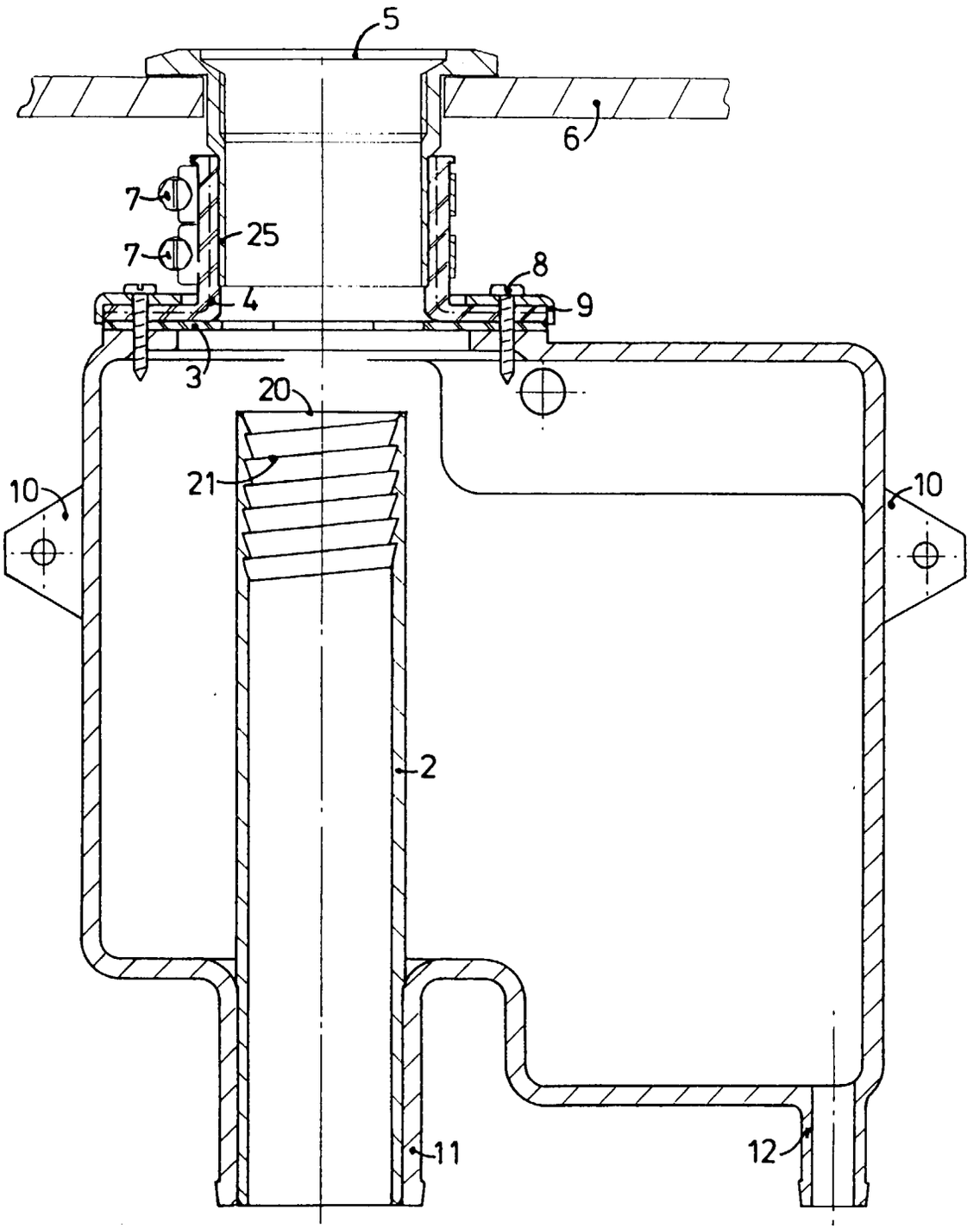

Fig. 5a

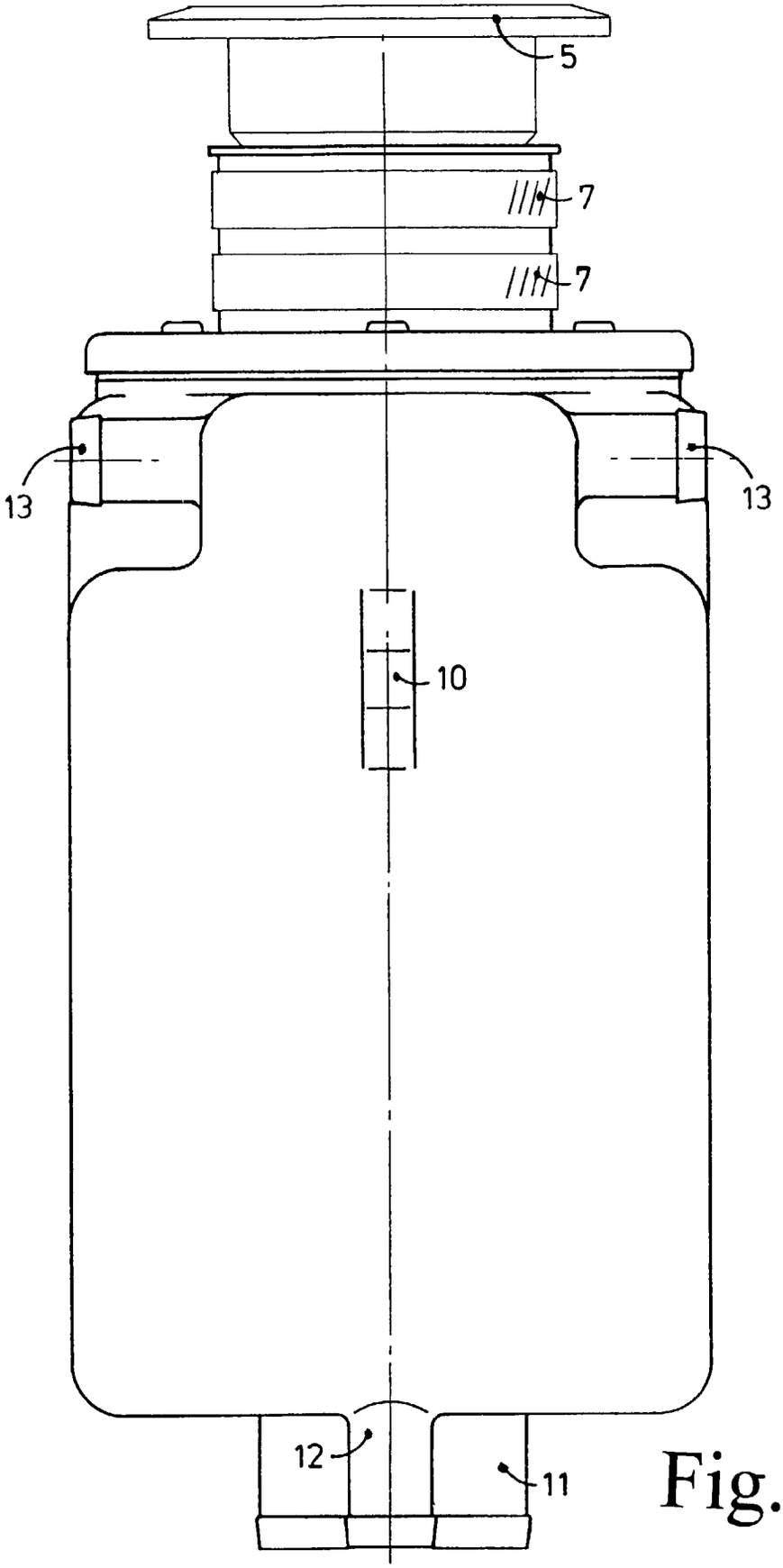

Fig. 5b