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PATENT SPECIFICATION 967,733

DRAWINGS ATTACHED.

967,733

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COMPLETE SPECIFICATION.

Improvements relating to Valves for the Filling of Reservoirs with Liquefied Gas.

We, LA NATIONALE S.A., a Corporation organised under the laws of Switzerland, of 2, Rue des Falaises, Geneva, Switzerland, and RONSON CORPORATION, a Corporation organised under the laws of the State of New Jersey, United States of America, of 1 Ronson Road, Woodbridge, New Jersey, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to reservoirs for liquefied gas and, more particularly, to valves for use in filling such reservoirs with liquefied gas.

As normally used, more especially on the fuel reservoirs of smokers' lighters which are fuelled with a liquefied gas such as butane, such filling valves are arranged for co-operation with a refill vessel containing a supply of liquefied gas whereby such liquefied gas may be transferred from the vessel to the reservoir and retained therein. For this purpose the filling valve is adapted to be engaged by an appropriately shaped part of the refill vessel, which part is termed herein the spout, and is arranged when so engaged that the application of a force between the refill vessel and the reservoir will cause the valve to be actuated so as to open an inlet passage communicating between the spout and the interior of the reservoir and an exhaust passage communicating between the interior of the reservoir and the atmosphere, a further valve being usually provided in the refill vessel which is likewise actuated to open a passage leading from the vessel to the spout.

[*Price 4s. 6d.*]

The improved filling valve of the present invention comprises an inlet passage, an exhaust passage, and a movable closure member for each passage, and the closure members are normally operative to prevent the flow of gas from the reservoir and are adapted and arranged so as to be unseated by the application of the spout of the filling vessel.

Embodiments of the invention will now be described, by way of example, with reference to the accompanying drawing, in which:—

Figure 1 shows, in section, a filling valve on a reservoir and the spout of the refill vessel;

Figure 2 is a view from beneath (partly broken away) of the valve shown in Figure 1; and

Figures 3 and 4 show, in section, two alternative forms of filling valve and spout.

The valve shown in Figure 1 comprises a body 1 which is cylindrical in shape and is screwed into the wall 2 of a reservoir of a smoker's lighter fuelled with liquefied gas. A sealing washer 3 is provided between the body and the wall. The body 1 is in the form of a socket having a base 4 in which are formed inlet and exhaust passages 5 and 6. These two passages are normally closed by means of closure members comprising a resilient membrane 7 which is located in the interior of the reservoir and bears against the base 4 by virtue of the pressure of gas contained in the reservoir. This membrane 7 is held in position on the base 4 of the valve by two bent tabs 8 and 9 which can be seen in Figure 2.

This valve co-operates with a spout 10 of a refill vessel. The end of the spout 10

has two projecting parts which are adapted to unseat respectively the closure member for the inlet passage and the closure member for the exhaust passage. As shown, these parts comprise end pieces 11 and 12 which enter the two passages 5 and 6, respectively, to open the valve by moving the membrane 7 away from the end of these passages. The part 11 has a longitudinal bore 13 constituting an inlet channel for the admission of liquefied gas into the reservoir, while part 12 has bores 14 constituting an exhaust channel for the gas contained in the reservoir.

To fill the reservoir, which may be for instance on a smoker's lighter, the reservoir is positioned so that the valve is uppermost and the spout 10 is inserted downwardly into the valve. When the parts 11 and 12 enter the passages 5 and 6, they unseat the closure members and thus open the inlet and exhaust passages. The refill vessel has closure means which are not shown and which could be, for example, an automatic valve whose opening is governed by a displacement of the spout 10 towards the interior of the refill vessel. When the closure means on the refill vessel are opened to allow the passage of liquefied gas, the liquefied gas can enter the reservoir by way of the bore 13. So that the membrane 7 shall not close up the lower orifices of the bores 13 and 14, these bores end in a transverse milling 15 through which the gas flows laterally. Part of the gas contained in the reservoir can escape to atmosphere through the bore 14 and the space, due to clearance, between the spout 10 and the body 1. During the filling of the reservoir with liquefied gas, part of the gas escapes (in gaseous state) in this manner. However, when the reservoir is filled to a level substantially up to the bottom of bore 14, the gas then escapes to atmosphere in liquid form which warns the user that the filling operation is completed. On removal of the refill vessel from the reservoir the valve closes automatically.

An object of the exhaust channel is to lower the pressure in the reservoir during the filling operation so that for the usual difference in temperature between the reservoir and the refill vessel a drop in pressure occurs in the reservoir to be filled such that the reservoir pressure is lower than the pressure in the refill vessel.

If the reservoir to be filled contains a little liquefied gas, the pressure obtaining in the reservoir is that of the vapour pressure corresponding to the temperature of the reservoir; if the reservoir is warmer than the refill vessel the pressure in the reservoir is higher than in the refill vessel and the filling operation cannot take place.

So as to avoid too great a loss of gas it is advantageous to choose a ratio between the cross sectional area of the inlet channel and the cross sectional area of the exhaust channel so as to obtain only a small drop in pressure in the interior of the reservoir to be filled, a drop for instance of one-tenth of the initial pressure. If the cross-sectional area of the exhaust channel is much larger than that of the inlet channel, great drops in pressure occur which can even lead to equilibrium with atmospheric pressure and the gas losses can exceed by many times the contents of the reservoir which is to be filled. Furthermore, if the exhaust channel is too large in relation to the inlet channel, considerable upheavals and boiling can occur in the interior of the reservoir which is to be filled, whereupon liquefied gas escapes through the exhaust channel. By a suitable balance between the two cross sectional areas, the filling of the reservoir can take place with an acceptable loss of gas and without undue upheavals.

Figure 3 shows a construction similar to that of Figures 1 and 2. Differences are, firstly, the use of resilient, for example rubber, balls 16 and 17 as closure members for the inlet and exhaust passages 5 and 6, in the base 4 of body 1 of the valve and, secondly, in dispensing with a bore in the part 12 of the spout. In this embodiment part 12 has sufficient clearance in the bore 6 to provide a passage for the escape of gas. Fluid-tightness of the inlet passage between the spout 10 and the valve is obtained by virtue of a shoulder 18 which bears against the base of the valve. It can also be seen that the diameter of each bore 5 and 6 is slightly smaller near each end of the bore than in its central part, which prevents the balls 16 and 17 from leaving the bores. Radial bores 19 and 20 open into the bores 5 and 6 respectively to allow gas to flow when the balls 16 and 17 are pressed against the lower part of their respective bores by the parts 11 and 12 of the spout 10. The operation of this embodiment is similar to that which has been described, with reference to Figures 1 and 2, the rubber balls 16 and 17 being held in their upper position upon the withdrawal of the spout 10 by virtue of the pressure obtaining in the reservoir.

In the embodiments described it is possible to stagger the opening and closing of the inlet and the exhaust passages by making parts 11 and 12 of different lengths. If part 12 is longer than part 11, the exhaust passage is closed after the inlet passage when the refill vessel is removed from the lighter which reduces the risk of over-filling the lighter.

Figure 4 shows a variation of the embodiment according to Figure 3 in that the exhaust passage is closed by a closure member 21 which has a stem 22 extending outwardly

from the base 4 of the valve body, while the spout has one part 11 projecting from a flat surface 24, which surface engages the stem 22 to unseat the closure member 21 during the filling operation. The closure member 21 and the stem 22 are in one piece which is retained in the bore 6 by means of a screw 23.

Modifications may be made without departing from the scope of the invention; for instance, it is possible to dispense with the transverse cavity 15 on the projecting part which provides the inlet channel 13 by forming the end of this part in such a way as to allow the liquefied gas to escape at an angle to this part by providing, for example a chamfer or a sloping face on the part or by providing an angled bore in the projecting part.

In our Application No. 44461/62 (Serial No. 967,734) which was divided from this Application there is claimed a spout for a liquefied gas refill vessel and which is adapted to be applied during the filling operation to the filling valve of a liquefied gas reservoir, the said valve having an inlet passage and an exhaust passage, and a closure member for each passage, wherein the spout is formed at its end with two projecting parts or alternatively with one part projecting from a flat surface, the two projecting parts, or the one projecting part and the flat surface, being so positioned as to engage and unseat the respective closure members when the spout is applied to the valve.

WHAT WE CLAIM IS:—

1. A filling valve for a liquefied gas reservoir and adapted for co-operation with the spout of a refill vessel containing liquefied gas comprising an inlet passage, an exhaust passage, and a movable closure member for each passage, wherein the closure members are normally operative to prevent the flow of gas from the reservoir and are adapted and arranged so as to be unseated by the application of the spout of the filling vessel.

2. A filling valve as claimed in Claim 1, comprising a tubular body adapted to be secured in a wall of the reservoir and having a base, the body and base defining a socket for receiving the spout, and the said passages being formed in the base.

3. A filling valve as claimed in Claim 1 or Claim 2, wherein at least one of the closure members comprises a flexible membrane which is secured on the valve and overlies an end of a passage.

4. A filling valve as claimed in Claim 1 or Claim 2, wherein at least one of the closure members comprises a resilient ball which is located in a central portion of a passage, which portion has a diameter which is greater than the diameter of the ends of the passage.

5. A filling valve as claimed in Claim 1 or Claim 2, wherein at least one of the closure members comprises a body located in a portion of the passage which has a diameter which is greater than the diameter of one end of the passage, and a stem which projects through the said end of the passage for engagement by a part of the spout.

6. A filling valve for a liquefied gas reservoir constructed and arranged for operation substantially as herein described with reference to Figures 1 and 2, Figure 3, or Figure 4 of the accompanying drawing.

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