March 19, 1968 KYUJIRO KAJITA 3,373,776

FILLER VALVE FOR LIQUID GAS LIGHTERS

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FIG. 1.

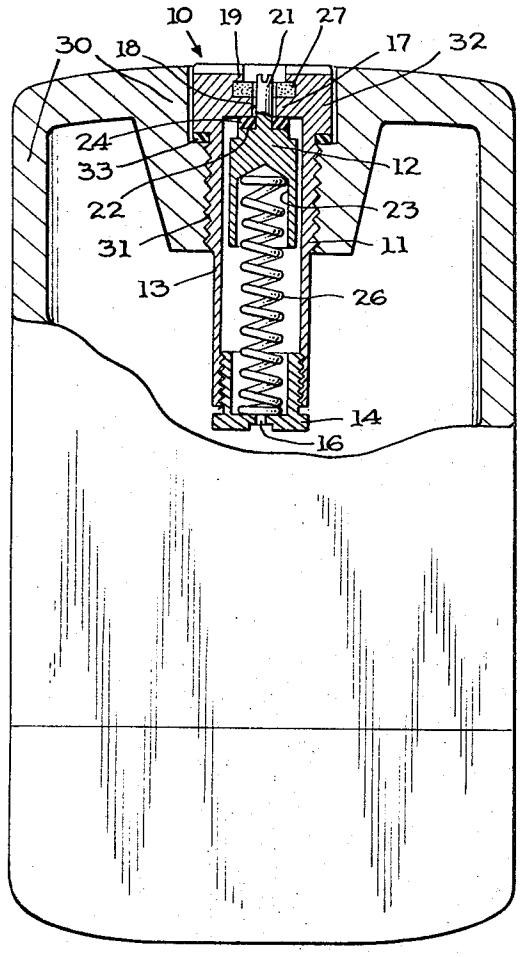
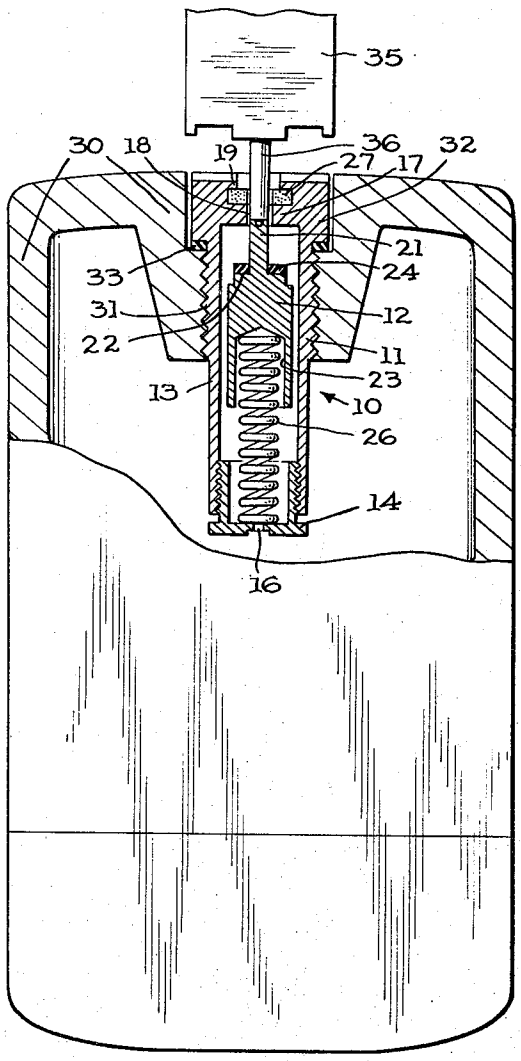


FIG. 2.



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FILLER VALVE FOR LIQUID GAS LIGHTERS

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ABSTRACT OF THE DISCLOSURE

A filler valve used with liquid gas lighters having an outer tubular section and a spring mounted inner tubular section. A porous member is mounted adjacent the opening through which fuel is fed from a fuel supply so as to absorb some of the escaping liquid and thereby cool the area and casing by means of the process of evaporation of the liquid from the porous material.

This invention relates to lighter structure and is particularly concerned with lighters fueled by combustible gas of the butane type which assumes gaseous form when released under usual atmospheric temperatures and pressure but which remain largely in liquid form at such temperatures when held under sufficient pressure. This invention relates more particularly to the filler mechanism used in accordance with the lighter structure.

Liquified gas pyrophoric lighters in which a reservoir within the lighter is connected to a filler valve through which a gas enters the reservoir from a supply container and is released through a burner in controlled amounts to be lit by a spark supplying a flame, the size of which is controlled by the flow of gas released at the burner, are known in the prior art.

In filling a reservoir using valves of the prior art, use has been made of the difference of the pressure of the gas inside the lighter reservoir as compared to the pressure inside the filler can, the latter having a higher pressure in order for the gas to flow into the reservoir of the lighter. When the lighter has been kept in the pocket and warmed from the heat of the body or by handling of the lighter, the pressure of the gas in the reservoir of the lighter is increased so that in order for the gas to be inserted through the filler valve into the reservoir either the lighter must be cooled and the gas pressure lowered in the reservoir or the gas pressure in the filler can must be increased by warming of the can making the filling of the reservoir very inconvenient for practical use with these valves.

Therefore it is an object of the present invention to fill the reservoir of a gas lighter with the greatest possible quantity of gas in liquified form by lowering the pressure of the gas in the reservoir through a cooling process.

Accordingly, the present invention is directed to a lighter having a reservoir which is supplied with liquified gas through a filler valve from a supply container while a portion of the liquified gas in cooperation with the elements of the filler valve cools the lighter thereby lowering the pressure of the gas in the reservoir of the lighter.

Other objects and the nature and advantages of the instant invention will be apparent from the following description taken in conjunction with the accompanying drawings wherein:

FIG. 1 is a side elevation of a lighter with the filler valve pointed upward and a central vertical section taken through the filler valve of the present invention; and

FIG. 2 is a similar view to that of FIG 1 with a similarly sectioned view of the filler valve of the present invention now shown in a filling position, the filling container being shown only in part.

With reference to FIG. 1, the filler valve **10** is shown in cross section in a closed position. The valve **10** structure has a stationary part **11** of the valve and a movable part **12** contained therein.

Stationary part **11** of the valve has a tubular member **13** internally threaded at its lower end to receive a cap **14** externally threaded at its sides and having an opening **16** at its bottom.

The upper or opposite end of tubular member **13** from which cap **14** is attached has a circular internal projection **17** leaving an opening **18** at that end of tubular member **13**.

Movable part **12** of the valve **10** has a stem portion **21** extending from a circular shoulder **22**. Its opposite end is formed with a recess **23** therein. Resting on circular shoulder **22** and firmly attached thereto is a fluid-tight ring **24** fitted around stem portion **21** in a manner to close opening **18** in cooperation with stem portion **21**. A compression spring **26** has one end resting within cap **14** and its opposite end extending within recess **23** of movable part **12** in such position so as to press movable part **12** against the circular internal projection **17** of tubular member **13**

A porous material ring **27** is supported on circular internal projection **17** on the opposite side of the projection **17** which contacts fluid-tight ring **24**. Retaining porous material ring **27** in position so that it will not fall away from filler valve **10** when this valve is moved to other positions due to movement of the lighter, is an additional internal projection **19** on the outer end of tubular member **13**.

For secure insertion of stationary part **11** within the wall **30** of the reservoir of the lighter, tubular member **13** has external threads **31** below a flanged portion **32** with a fluid tight ring **33** resting on the shoulder of the flanged portion **32** preventing leakage of gas from the reservoir along the outer surface of tubular member **13** where it is screwed into wall **30** of the reservoir of the lighter.

Filler valve **10** in the filling position is shown in FIG. 2. A supply can **35** has its spout **36** inserted through an opening in porous material ring **27** into opening **18** of tubular member **13**.

In order to pass the liquid gas from the supply can **35** into the reservoir of the lighter through filler valve **10**, spout **36** of supply can **35** is pushed into opening **18** with a greater pressure against stem portion **21** than that exerted by compression spring **26** in a direction against the force of the spring. This movement of movable part **12** moves the fluid-tight ring **24** away from opening **18** making way for the liquid gas to pass through opening **18** into tubular member **13** and then through opening **16** in cap **14** into the reservoir of the lighter.

The liquid gas coming out of the spout **36** of supply can **35** will be partially fed into the reservoir of the lighter as mentioned above and at the same time a portion of the liquid gas will pass out through opening **18** wetting the porous material ring **27**. The liquid gas which is caught by porous material ring **27** will then slowly evaporate from this porous material ring **27**. As the liquid gas evaporates heat will be taken from the surrounding portion of the stationary part **11** of filler valve **10** and by conduction from the wall **30** of the reservoir of the lighter. Thus the wall of the reservoir and also the body of the lighter will be quickly cooled thereby lowering the pressure of the gas inside the reservoir. In this manner a larger quantity of liquid gas will enter the reservoir due to the comparative differences in pressure in the reservoir with that in supply can **35**.

Therefore, even when the lighter has been warmed through use or handling thereby raising the gas pressure inside the reservoir to a point higher than the pressure inside the supply can, it will not be necessary to use other means to cool the lighter or to attempt to heat the supply can. Through he apparatus and method of the present in-

vention a lighter reservoir may be conveniently filled. With the quantity of liquid gas entering the reservoir controlled through use of the porous material ring 27 and in accordance with this by the lowering of the gas pressure inside the lighter reservoir to a point lower than the gas pressure within the supply can, more liquid gas may be inserted into the reservoir by this means.

It will be obvious to those skilled in the art that various changes may be made without departing from the spirit of the invention and therefore the invention is not limited to what is shown in the drawings and described in the specification but only as indicated in the appended claims.

What is claimed is:

1. A lighter constructed to be charged with liquefied gas fuel under pressure and including in combination,
a casing having therein a fuel reservoir;
and fuel charging means carried by said casing,
said fuel charging means including
an outer hollow tubular valve member fixed with respect to said casing and having an internal projecting portion on the outer end of said outer valve member forming a passage from inside the outer hollow tubular valve member out of said outer valve member,
an inner valve member having an imperforate outer stem portion mounted to move in said hollow tubular outer valve member between open and closed positions in substantially rectilinear movement inwardly and outwardly with respect to said outer valve member,
and a porous cooling means for absorbing liquefied gas fuel for evaporation to the atmosphere outside said casing, held on an outer portion of said outer valve member externally of said inner valve member and located adjacent and in operative communication with said passage,
said porous cooling means having an outwardly directed surface exposed to the atmosphere and a passage for the liquefied gas through said means located concentrically with said passage formed by said internal projecting portion
whereby liquefied gas escaping through said passages during filling of said fuel reservoir through said fuel charging means wets said porous member and then evaporates these from cooling said fuel reservoir.

2. The lighter of claim 1, further characterized by
said stem portion on one end positioned to pass into said passage formed by said internal projecting portion,
and said inner valve member having a recessed portion on the opposite end from said stem portion.

3. The lighter of claim 2, further characterized by
a cap member threaded into said outer valve member at the opposite end from said internal projecting portion on said outer valve member and having an opening therethrough to said fuel reservoir.

4. The lighter of claim 3, further characterized by
compression spring means extending between and into said cap member on one of its ends and into said recessed portion of said inner valve member on the other of its ends.

5. A lighter constructed to be charged with liquefied gas fuel under pressure and including in combination,
a casing having therein a fuel reservoir,
and fuel charging means carried by said casing,
said fuel charging means including
an outer hollow tubular valve member fixed with respect to said casing having a first internal projecting portion on the outer end of said outer valve member forming a passage out of said outer valve member,
an inner valve member having a stem portion on one end and a recessed portion on its opposite end and mounted to move in said hollow tubular outer valve member between open and closed positions in substantially rectilinear movement inwardly and outwardly with respect to said outer valve member,
a fluid-tight ring mounted around the base of said stem portion so as to close said passage in said outer valve member when positioned against said internal projecting portion,
a cap member threaded into the end of said outer valve member opposite from said internal projecting portion and having an opening therethrough into said fuel reservoir,
compression spring means normally forcing said inner valve member away from said cap member with one end of said spring means in said recessed portion of said inner valve member and the opposite end of said spring means in said cap member,
a porous ring-shaped means having an outwardly directed surface and having its center opening substantially over said passage in said outer valve member for passage of liquefied gas therethrough and supported on said internal projecting portion of said outer valve member,
and a second internal projecting portion on said outer valve member supporting said ring-shaped means between it and said first internal projecting portion and extending over only a portion of a surface of said porous member facing outward of said casing leaving the remainder of the outwardly facing surface of said porous member exposed to the atmosphere
whereby liquefied gas escaping through said passage during filling of said fuel reservoir through said fuel charging means wets said porous member and then evaporates therefrom cooling said fuel reservoir.

6. Method of filling a lighter constructed to be charged with liquefied gas fuel under pressure which comprises
filling liquefied gas from a fuel supply can through a passageway leading into the tank of the lighter,
allowing a portion of the liquefied gas to escape out of the passageway away from said tank,
absorbing the escaping liquefied gas in a porous means,
and allowing controlled evaporation of the liquefied gas from said porous means provided at the top of said passageway to the atmosphere thereby cooling said tank of the lighter and lowering the pressure of gas confined therein whereby a greater quantity of liquefied gas may be transferred to said tank from said fuel supply.

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