Dec. 31, 1968 KENGO TASHIRO 3,419,054

FUEL CHARGE VALVE OF LIQUIFIED GAS FUELED LIGHTER

Filed June 3, 1966

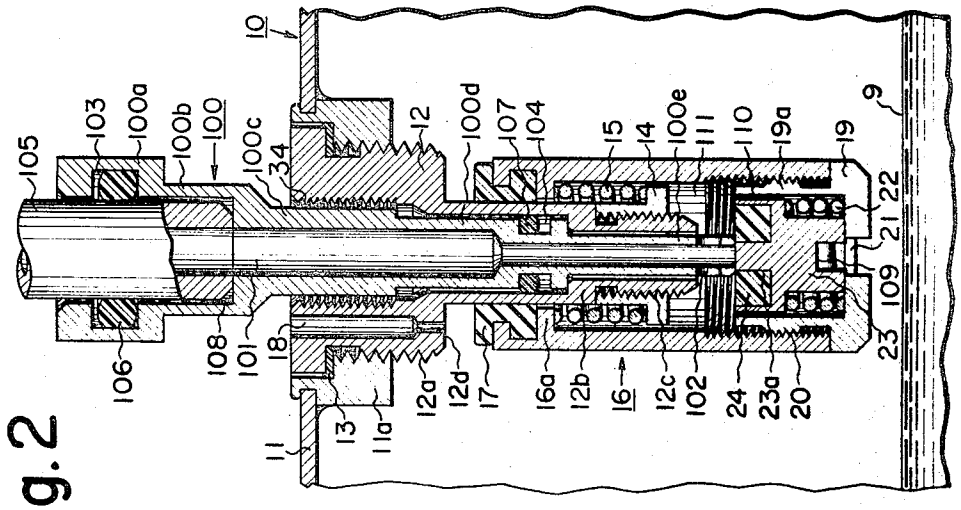


Fig. 2

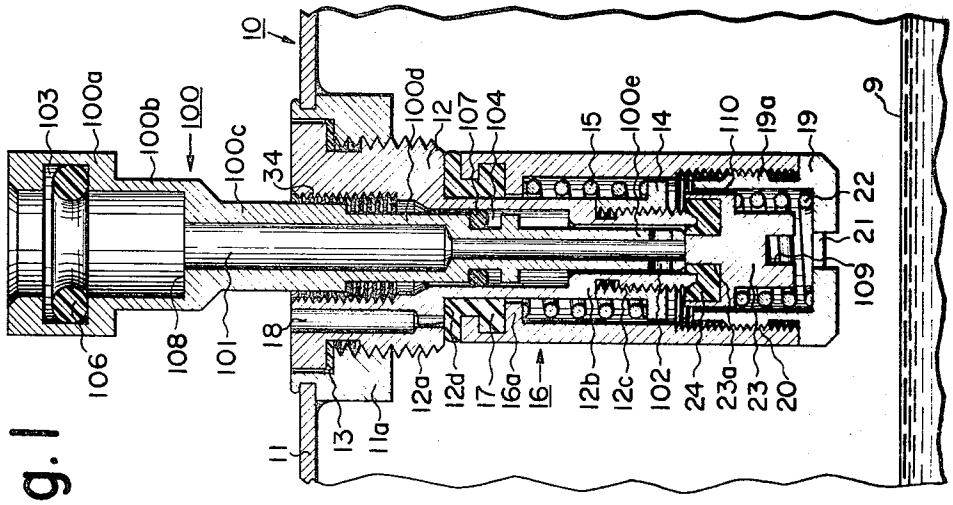


Fig. 1

United States Patent Office 3,419,054
Patented Dec. 31, 1968

3,419,054

FUEL CHARGE VALVE OF LIQUIFIED GAS FUELED LIGHTER

Kengo Tashiro, Tokyo, Japan, assignor to Mansei Kogyo Kabushiki Kaisha, Kawaguchi-shi, Saitama-ken, Japan

Filed June 3, 1966, Ser. No. 555,072
Claims priority, application Japan, June 5, 1965, 40/33,058
4 Claims. (Cl. 141—293)

ABSTRACT OF THE DISCLOSURE

A fuel charge valve of a liquified gas fueled lighter includes a detachable stationary sleeve with a bore for fuel charging closed by a spring biased valve. A gas purge passage in the wall of the lighter outside the wall of the sleeve is closed by another biased valve on a movable sleeve. An apertured cap on the end of the movable sleeve supports the spring biasing the fuel charging valve. A stepped attachment adapts the bore of the sleeve to a fuel charging cylinder. The bias of the springs is such that the fuel valve opens before the gas purge valve.

This invention relates to improvement in and relating to fuel charge valves of liquified gas lighters, especially cigarette lighters.

Since this kind of charge valve is an important constituent of the gas lighter, considerable efforts in the art have been directed to improving their performance.

It is common in the design of this kind of charge valve to provide a fuel charging step, by attaching the spout of a portable liquified gas fuel cylinder to the inlet of the valve assembly in a liquid tight manner, manually pushing the liquified gas cylinder by a single touch and thereby establishing a gas escape passage communicating from a gas space in the interior of the liquified fuel tank within the lighter through the interior of the valve assembly, to the atmosphere, for reducing the gas pressure prevailing in the gas space, while the liquified fuel is being fed from the supply cylinder to the interior of the fuel tank through a liquid passage established in the charge valve assembly by the pushing manipulation.

In almost all conventional charge valve assemblies of the above-mentioned kind, the possible gas passage has a shut off controller at a place selected within a sleeve or socket mounted in the central interior of the assembly. In such arrangement, the liquid fuel opening from the valve assembly to the interior of the lighter fuel tank is positioned only a short distance from the gas outlet opening from the tank to the valve assembly. More specifically, the gas purge opening has been generally provided in the proximity of the lower end of said sleeve or socket. If the liquid fuel should leak out from the interior of the gas lighter, the user thereof would observe the leaking fuel in gaseous form issuing from the sleeve. It is highly difficult in this case for the user to ascertain this leakage has arisen from the gaseous phase or liquid phase of fuel contained in the fuel tank of the gas lighter. Adjacent positioning of liquid and gaseous fuel passage openings results in a highly complicated and thus costly design of the valve assembly, since all the various working components are within the sleeve. Provision of gas purge opening at the lower part of sleeve will invite a corresponding reduction in the effective capacity of the fuel tank for liquified fuel gas. It is a necessity for the gas lighter to have a fuel tank of maximum possible capacity of liquified fuel with limited tank dimensions, since gas lighters must have the greatest possible space economy. Frequent troublesome fuel recharging operations will inevitably be invited if the gas lighter fuel tank could not be filled with the liquified fuel to an almost fully occupied state.

It is therefore the main object of the invention to provide an improved fuel charge valve assembly provided for a gas lighter of the kind above referred to, yet capable of substantially obviating the aforementioned drawbacks inherent in conventional prior art. More specifically, this invention provides a fuel charge valve assembly allowing charging a considerably larger volume of liquified gas fuel in comparison with that attainable with use of a comparative fuel reservoir tank of the prior art.

Another and subsidiary object of the present invention is to provide a fuel charge valve assembly of the kind above referred to, having a highly simplified design with the least possible working parts provided within the sleeve.

These and further objects, features and advantages of the invention will appear from the following detailed description of a preferred embodiment of the invention shown in the accompanying drawing only by way of example, and thus not in any limiting sense of the invention.

In the drawing:

FIGS. 1 and 2 are longitudinal sections of a charge valve assembly of this invention in its preparatory and intermediate steps of fuel charging operation.

Now referring to the drawing, especially FIG. 1 thereof, the charge valve assembly illustrated is detachably attached to a mouth piece **11***a* rigidly attached to tank top wall **11** of a fuel reservoir tank **10** which is an interior constituent of a liquified fuel gas lighter, although only partially illustrated, wherein the liquid level of occasionally contained liquified gas fuel is shown at **9**. For this purpose, mouth piece **11***a* is formed with female screw threads as shown which are in engagement with male screw threads at **12***a* of a hollow mounting piece **12** constituting a member of the valve assembly. A resilient sealing ring **13** is provided between both pieces **11***a* and **12** for effectively sealing off the inevitable fine gaps formed at the threadedly engaging parts.

A reduced and depending sleeve **12***b* is made integral with mounting piece **12** and formed at its lower part with male screw threads at **12***c*. A flange piece **14** is in threaded engagement with the male screw threads **12***c* on the sleeve **12**. A coil spring **15** abuts with its one end upon the flange piece, while another end of the spring abuts on the lower one of the double inside flange at **16***a* formed on a movable outside sleeve **16**. A sealing ring **17** is fixedly mounted on the uppermost end of the sleeve **16** and kept in slidable engagement with the outer plain cylindrical surface of the upper larger part of the inner sleeve **12***b*. By the resilient force provided by the coil spring **15**, the outside sleeve **16** is urged resiliently in the upward direction so that the sleeve is normally kept at its upper resting position in abutting relation through the intermediary of sealing ring **17** with a ring shoulder at **12***d* formed on the lower end of the main part of the mounting piece. There is provided a gas purge opening **18** bored vertically through the main part of the mounting piece **12***a* at a position considerably off the axis of the latter and normally closed sealingly at its lowermost end by the sealing ring **17**. At the lower end of outside sleeve **16**, there is provided a bottom cap **19** having an integral and hollow stem **19***a* kept in threaded engagement at **20** with mating female threads formed on the inside peripheral cylindrical wall of lower part of outside sleeve **16**. The inside bore space of the hollow stem **19***a* communicates through a bored opening **21** formed axially through the cap **19** with the interior space of the tank **10**. The hollow space of stem **19***a* contains an urging coil spring **22** resiliently supporting a valve member **23** which is formed in the upper surface with a ring groove **23***a* snugly receiving a resilient sealing ring **24** made of Teflon or other

resilient and tough material (similar material is used for sealing ring **17**). By the urging force provided by spring **22**, valve member **23** with its sealing ring **24** is kept normally in sealing engagement with the lowermost end of sleeve **12***b*. By turning manually the cap **19** in one direction or another, the urging pressure provided by spring **22** can be regulated as desired.

The bore passing commonly through the mounting piece **12** and sleeve **12***b* is formed at its upper part with female screw **34** which normally receives a screw plug, not shown, for normally closing, through the agency of a conventional sealing ring, the bore at the uppermost end, which condition corresponds to that prior to a fuel charging operation.

Numeral **100** denotes generally an attachment which does not normally constitute any part of the charge valve assembly so far shown and described. This attachment is however preferably used in the course of fuel charging operation. The attachment comprises generally a hollow cylinder consisting of several serially reduced and stepped parts **100***a*–**100***e*, having an equally stepped axial bore **101** opening at the upper and lower ends thereof. In close proximity to the lower opening of the bore **101**, there is provided a lateral passage **102** bored completely through the most reduced tube wall **102***e* of the attachment.

In proximity to the upper end of the attachment, there is formed an inside peripheral groove **103** which receives a sealing ring **106**, for sealing the spout at **105** shown in FIG. 2, of a conventional portable charging container or cylinder, not shown, filled with liquified fuel gas used to charge the fuel tank of the lighter. At an intermediate position on the attachment, there is formed with an outer circular groove **104** which receives a sealing ring **107** adapted for sealing cooperation with the corresponding intermediate bore wall of the mounting piece-sleeve unit **12**–**12***b*, when the attachment has been introduced into the bore for the preparatory manipulation in advance of the desired fuel charge operation, as will be more fully described hereinafter.

The operation of the charge valve assembly described above is as follows.

For initiating the fuel charge, the screw plug, not shown, is loosened and removed from the threads **34** upper end of the axial bore of the unit **12**–**12***b* and the attachment **100** is inserted from above into the bore until the tip end is brought into contact with the upper surface of valve member **23** at its central rigid part defined by the inner peripheral circle of ring groove **23***a*. The spring tension at **22** is so selected and adjusted that the application of attachment **100** brought about in the above-mentioned way can not open the sealing contact of valve member **23** through the agency of sealing ring **24** with the lowermost end of sleeve **12***b*.

Next, a fuel container is inserted with its spout **105** into the axial bore of the attachment **100**, until the lower end of the spout is brought into contact with a ring shoulder **108** formed on the bore **101** of the attachment **100**. In this case, sealing ring **106** serves for establishing an intimate and effective seal between the inserted spout and the inside wall surface of the attachment.

Instead of the aforementioned successive insertion of attachment **100** and spout **105**, these both can be preliminarily assembled together outside the lighter, for the purpose of simultaneous insertion of the assembly into the bore of the unit **12**–**12***a*.

Then, finger pressure is exerted upon the fuel container, so as to lower the assembly **100** and **105**, **106**, so that the valve member **23** with sealing ring **24** is lowered against the action of spring **22**, until the bottom of valve member **23** is brought into contact with the bottom cap **19** and thus sealing ring **24** is separated from contact with the lowest end of stem **12***b*. Therefore, the interior space of tank **10** is brought into communication with the bore of spout **105** through the opening **21**, a diametral groove **109** formed on the bottom of valve

member **23**, spring space around the lower part of the latter, a small ring gap at **110** formed between the upper parts of said valve member and said cap, idle space at **111** now formed above the upper surface of said valve member and in the bore of outside sleeve **16**, lateral bore **102** and axial bore **101** of attachment **100**.

Meanwhile, the spring-loaded fuel supply valve, not shown, in the liquified gas container is released and the liquified fuel rushes from the container through the bore **101** and the like to the opening **21**, thence into the interior of tank **10**.

By intensifying the applied finger pressure upon the spout **105** through the body of the fuel container, increased pressure is transmitted from the spout through attachment **100**, valve member **23** upon the cap **19**, so as to lower the latter together with outside sleeve **16** against the action of spring **15**, thereby opening the lowermost end of gas purge passage opening **18** by moving the sealing ring **17** carried by the sliding sleeve **16**, as clearly seen in FIG. 2.

Therefore, pressure gas contained in the gas space above the liquid level **9** in the fuel tank **10** is purged out through the now opened gas passage **18** to the open atmosphere, thereby reducing considerably and instantly the gas pressure.

By this gas purge operation for reducing considerably and suddenly the gas pressure prevailing in the tank **10**, the supply flow of the liquified fuel from the container to the tank is correspondingly intensified and accelerated. When the operator, observes finally an emergence of liquified fuel at the upper or outlet opening **18**, he releases his finger pressure exerted upon the spout **105** and then all the working parts of the valve assembly will return to their initial position, substantially shown in FIG. 1, by the resilient returning efforts provided by the both springs **15** and **22** and in the reverse order to that of the procedures as observed in the case of fuel charging. Therefore, the liquid fuel passage is also interrupted.

Then, the fuel supply container with spout **105**, together with attachment **100**, is removed from the gas lighter and finally the sealing plug is again attached to the upper threaded end **34** of the now empty longitudinal bore of the unit **12**–**12***a*. The gas lighter is filled up with a new supply of liquified fuel and is ready for use for igniting and use.

It will be clear from the foregoing that due to the provision of gas purge passage opening **18** in the top tank wall, the tank may be practically completely filled with fresh fuel. In addition, since the liquid is first introduced into the interior space of the tank **10** and then gas pressure is released through opening **18**, excessive escape of gaseous fuel from the tank can be effectively prevented. As can be further noted, since the sleeve has practically no movable parts within its interior space, the overall design of the valve assembly can be considerably simplified in comparison with comparative conventional charge valve.

As an example, although the aforementioned embodiment employs, in the course of charging operation, a separate attachment as at **100**, the substantial features thereof may be united into the spout of the fuel supply cylinder.

While the invention has been particularly shown and described with reference to a preferred embodiment thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. A fuel charge valve assembly for liquified gas fueled lighter, such as a cigarette lighter, having a fuel reservoir tank fixedly mounted therein, the assembly comprising; a stationary sleeve detachably secured to a wall of the tank and protruding into the interior of the tank,

the sleeve having a wall with a bore therethrough to receive the spout of a presurized fuel supply cylinder for liquified fuel charging, a gas purge passage formed in said stationary sleeve extending through the wall of the tank at a position spaced from said bore from the interior of the tank to the atmosphere, an outside sleeve slidably mounted on the outside peripheral surface of the stationary sleeve, sealing means mounted on the outer end of the outside sleeve for normally sealing and closing the inside end of the gas purge passage through the wall of the tank, a spring mounted between both sleeves and urging the outside sleeve toward a position to seal and close the gas purge passage, a cap having a fuel passage therethrough secured to the inner end of the outside sleeve, a valve member movably mounted within the cap and biased by a spring positioned between the cap and valve for normally closing and sealing the bore at the inside end of the stationary sleeve.

2. A fuel charge valve assembly as in claim 1 wherein the gas purge passage extends through an outer flange mounting piece portion formed on the stationary sleeve outside the wall of the sleeve.

3. A fuel charge valve assembly as in claim 1 further comprising a separate attachment in the form of a stepped hollow cylinder for the reception of a spout of a fuel charging cylinder and shaped for insertion into the bore of the stationary sleeve in sealing engagement therewith

for establishing a portion of a liquified fuel supply passage between the spout and the bore of the stationary sleeve.

4. A fuel charge valve assembly as in claim 1 wherein the spring normally biasing the movable sleeve provides a stronger bias for closing the gas purge passage than the spring normally biasing the movable valve member, and further wherein the cap is adjustable axially on the movable sleeve to vary the bias of the spring urging the movable valve member to closing position.

References Cited

UNITED STATES PATENTS

2,882,940	4/1959	Zellweger	141—293
3,044,504	7/1962	Iketani	141—293
3,044,505	7/1962	Iketani	137—588 X
3,195,590	7/1965	Iketani	141—295 X
3,217,762	11/1965	Burchett	137—588 X

SAMUEL ROTHBERG, *Primary Examiner.*

EDWARD J. EARLS, *Assistant Examiner.*

U.S. Cl. X.R.

141—302, 349; 137—588