

Sept. 2, 1969

TADAMICHI HATTORI

3,464,442

LIQUEFIED GAS LIGHTER

Filed Sept. 26, 1966

2 Sheets-Sheet 1

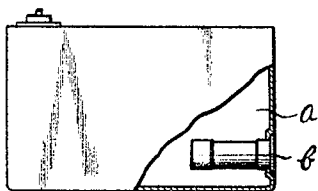


FIG. 1

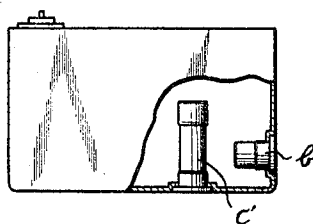


FIG. 2

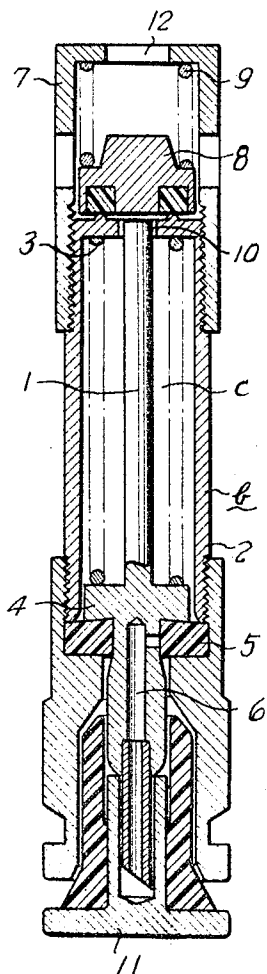


FIG. 2A

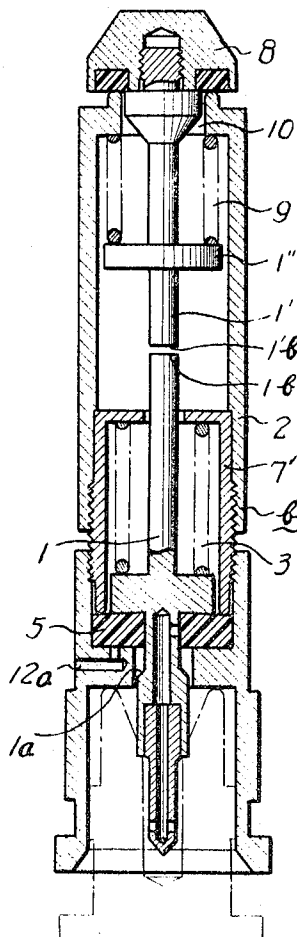


FIG. 2B

INVENTOR.

Tadamichi Hattori

BY

Michael S. Striker
RH

Sept. 2, 1969

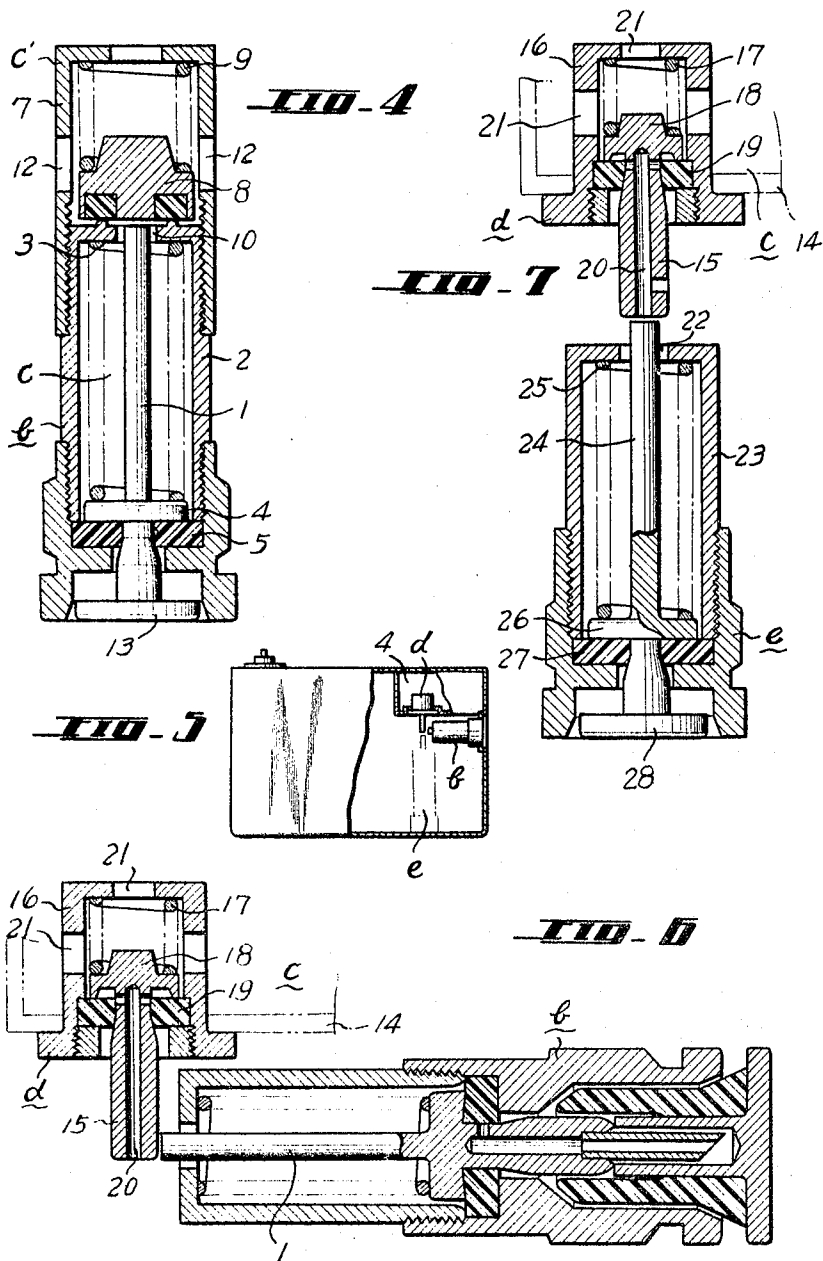
TADAMICHI HATTORI

3,464,442

LIQUEFIED GAS LIGHTER

Filed Sept. 26, 1966

2 Sheets-Sheet 2



INVENTOR

Tadamichi Hattori

BY

Michael S. Striker
Attorney

1

2

3,464,442

LIQUEFIED GAS LIGHTER

Tadamichi Hattori, Tokyo-to, Japan, assignor to
Kabushiki Kaisha Crown Sangyo, Tokyo-to, Japan,
a corporation of Japan

Filed Sept. 26, 1966, Ser. No. 582,034

Int. Cl. F17d 1/08; F23q 2/06, 2/30

U.S. Cl. 137—576

8 Claims

ABSTRACT OF THE DISCLOSURE

A pocket lighter using liquefied gas as fuel and including a fuel tank and a separate storage chamber arranged in the fuel tank and having a volume considerably smaller than the latter. The fuel tank and the storage chamber can both be filled with liquefied gas and the lighter includes means operable from the exterior of the lighter to permit flow of liquefied gas from the storage chamber into the fuel tank so that, when the gas filled into the tank is exhausted, the lighter may still be temporarily used before refilling the same.

The present invention relates to a liquefied gas lighter characterized in that the main fuel tank is provided with a separate storing chamber in such a manner that the tank and the chamber may communicate with each other by means of a normally closed valve which when necessary may be operated from outside to discharge the liquefied gas of said chamber into said tank.

Thus the present invention contemplates supply of further amount of liquefied gas after the liquefied gas in the main tank has been used up. Accordingly, if the fuel of the main tank is used up while the user is away from home, he can use the fuel in the separate chamber before he returns home. Thus, the present invention eliminates such disadvantage of conventional devices that for immediate use the tank must be filled as soon as the fuel therein is used up. Further objects of the present invention will become apparent from reading the following description in connection with several embodiments as shown in the attached drawings, in which:

FIG. 1 is an elevational view of the first embodiment;

FIG. 2A is a sectional view of the injecting-storing valve of the first embodiment, and FIG. 2B is a modified form of the valve shown in FIG. 2A;

FIG. 3 is an elevational view of the second embodiment;

FIG. 4 is a sectional view of the storing valve of the second embodiment;

FIG. 5 is an elevational view of the third embodiment;

FIG. 6 is a sectional view of the valves respectively of the third embodiment; and

FIG. 7 is a sectional view illustrating the valve and the related operative mechanism of the fourth embodiment.

In the embodiment as shown in FIGS. 1 and 2, a conventional liquefied gas injecting valve is additionally provided with a storing chamber. When injection of fuel into the main tank is completed, the storing chamber is also filled with fuel which will be discharged into the main tank when the injecting valve rod is operated.

In FIGS. 1 and 2A there are shown a tank *a* and an injecting valve *b* for injecting fuel into the tank *a*. A valve rod 1 passes through a sleeve 2. A spring 3, which abuts against the sleeve bottom portion, normally urges a flange 4 against a packing 5. One open end of a bore 6 is at the outward end portion of the valve rod 1, while the other end portion of the bore 6 is so formed as to be perpendicular to the main portion of the bore 6 and the open end thereof abuts against a packing 5. An auxiliary sleeve 7 is attached to the sleeve 2 and holds a valve

element 8 therein. Due to the action of a spring 9, the valve element 8 blocks an opening 10 through which the interior of the sleeve 2 communicates with the auxiliary sleeve 7.

When a lid member 11 at the outward end portion of the sleeve 2 is removed, the fuel supply container is attached to the outward end portion of the valve rod 1 and the valve rod 1 is pushed in against the action of the spring 3, the inward open end portion of the bore 6 is brought to such position as to communicate with the interior of the sleeve 2, and the inward end of the valve rod 1 pushes the valve element 8 against the action of the spring 9 so that the opening 10 is cleared to perform its function. Therefore, the fuel of the supply container passes through the bore 6, the interior of the sleeve 2, the opening 10, the interior of the auxiliary sleeve 7, an opening 12 of the sleeve 7, and finally into the tank *a*.

When the supply container is removed, the springs 3 and 9 expand to their respective original state so that the interior of the sleeve 2 constitutes a closed storing chamber *c* filled with surplus amount of fuel that could not enter the main tank.

The injecting and storing valve as shown in FIG. 2B is of a structure similar to that as shown in FIG. 2A. This modified form, however, lacks the auxiliary sleeve 7 as seen in FIG. 2A and instead is provided with an auxiliary sleeve 7' fixed to the interior of the sleeve 2 and having a spring 3 urging the valve rod 1. The valve rod 1' which is integral with the valve element 8 is provided with a flange portion 1''. A spring 9 is arranged between said flange 1'' and the end portion of the sleeve 2 so that the opening 10 is blocked by the valve element 8. Upon fuel injecting operation, the shoulder 1a engages and partially lifts the packing 5 so that the air in the main tank escapes through the bent passage 12a, the passage under the lifted portion of the packing 5 and around the valve rod 1, thereby facilitating the fuel injecting operation; and, the end 1b of the valve rod 1 abuts against the end 1'b of the valve rod 1' and further so urges same that the valve rod 1' tends to be pushed out. Thus, upon fuel injection, the fuel is stored within the valve *b*.

When the fuel in the main tank is exhausted, the valve rod 1 is pushed in from outside. Then, the valve element 8 is disengaged from the opening 10 and the fuel in the storing chamber *c* is discharged into the main tank. Thus, the lighter may be used without fuel supply to the main tank. Since upon vaporization liquefied gas expands by some 200–250 times the original volume, 0.1–0.2 g. of fuel in the storing chamber will be enough to light a cigarette 20–30 times.

In the embodiment as shown in FIGS. 3 and 4, a storing valve *c'* is so provided as to be operable from outside. After fuel injection operation by means of the injection valve *b* is completed, the storing valve *c'* is operated to draw the fuel from the main tank into itself, and, when the fuel in the main tank is exhausted, the storing valve *c'* is again operated to discharge the stored fuel into the main tank.

In this embodiment the injecting valve rod is not provided with a bore as seen in the first embodiment, and the outward end portion of the injecting valve rod is formed into a push button 13 suitable for finger-tip operation. In order to prevent accidental depression, the push button 13 is surrounded by a wall-forming portion. In the drawings of the first and the second embodiments, the same reference character is used to indicate any corresponding part.

After filling the main tank with fuel, the button 13 is depressed so that the valve rod 1 is pushed in against the action of the spring 3. Then a portion of the fuel in the

main tank passes through the openings 12 and 10, enters the storing chamber *c* so as to be stored therein. When the fuel in the main tank is used up the user again depresses the button 13 to push in the valve rod 1. Then the fuel is discharged from the storing chamber *c* into the main tank.

In the embodiment as shown in FIGS. 5 and 6, a separate storing chamber *c* is provided within the main tank. An additional valve *d* is arranged at the wall 14. In association with fuel injection operation with the injecting valve *b*, the valve *d* is opened and admits fuel therein. Discharge of this fuel into the main tank is performed by again operating the valve rod of the injecting valve *b*. Thus, this embodiment may be regarded as a modification of the first embodiment.

As seen in the drawing, the valve rod 15 of the valve *d* enters the interior of a sleeve 16 and the flange portion 18 is urged by the action of a spring 17 against the packing 19 so that a bore 20 through said rod 15 is kept in a state in which it does not communicate with the storing chamber *c*.

The valve rod 1 of the injecting valve *b* is axially movable in fuel injecting operation and is so arranged that its internal end is positioned adjacent to and at the side of the external end portion of the valve rod 15. Accordingly, in fuel injection operation, the internal end of the axially moving valve rod 1 pushes and tilts the valve rod 15 so that a portion of the flange 18 is lifted from the surface of the packing 19. Then, a portion of fuel being injected into the main tank passes through the bore 20 of the valve rod 15, the interior of the sleeve 16 and the opening 21 of the sleeve 16, and finally enters the storing chamber *c*. When the fuel in the main tank is used up, the fuel in the storing chamber may be discharged into the main tank by again pushing in the valve rod 1 of the injecting rod *b* and tilting the valve rod 15.

In the embodiment as shown in FIG. 7, a valve *d*, which is the same as that used in the third embodiment, is arranged at the wall portion of the storing chamber *c*. After filling the main tank with fuel, the valve *d* is operated to store the fuel in the chamber *c*. When the fuel in the main tank is used up, the valve *d* is again operated to discharge fuel from the chamber to the main tank. The position of an arrangement for this operation is shown in FIG. 5 in dot-and-dash lines and is indicated by a reference character *e*.

The arrangement *e* comprises a sleeve 23 with an opening 22 at the bottom and an operative rod 24 passing through the interior of the sleeve 23. The flange portion 26 of the operative rod 24 is urged by a spring 25 against a packing 27. The outer end of the operative rod 24 is formed into a push button 28 and is surrounded by a wall portion. When the button 28 is depressed, the operative rod 24 is pushed in so that the end thereof passes through the opening 22 and pushes up the valve rod 15 of the valve *d*. Upon this, part of the fuel in the main tank passes through the bore 20 and enters the storing chamber, or the fuel in the storing chamber is discharged into the main tank.

The third and the fourth embodiments may be combined. In this case, filling of the storing chamber is carried out in association with fuel injection into the main tank by means of the injection valve *b*, and fuel discharge from the storing chamber into the main tank is performed by the operative arrangement *e*.

Now, leakage of fuel due to communication of storing chamber with the air must be prevented when the fuel is discharged from the storing chamber to the main tank. For this purpose, in the type wherein the injecting valve rod is operated from outside, it is desirable to so arrange the system that the storing chamber and the main tank start to communicate with each other before the inner end of the injecting bore communicates with the storing

chamber or the main tank, and also to provide the lid 11 with suitable packing so as to prevent leakage of fuel when the valve rod or operative rod is pushed in.

Thus, the storing chamber is filled with fuel either in association with the main tank filling operation or by operation from outside after the main tank is filled, and, when the fuel in the main tank is exhausted, the fuel in the storing chamber is discharged into the main tank. This will assure the user some further use of the lighter without carrying the fuel supply container with him.

What is claimed is:

1. A pocket lighter using liquefied gas as a fuel, comprising, in combination, a fuel tank for liquefied gas; a separate storage chamber arranged in said fuel tank and having a volume considerably smaller than the latter and also adapted to be filled with liquefied gas; passage means providing communication between the interior of said chamber and that of said tank; valve means in said passage means movable between a closed position preventing flow of liquefied gas between said chamber and said tank and an open position, said valve means including biasing means for normally holding said valve means in said closed position; injection means for filling both said storage chamber and said tank with liquefied gas from the exterior of the lighter; and operating means actuable from the exterior of the lighter and cooperating, when actuated, with said valve means to move the latter against the action of said said biasing means to said open position to permit flow of liquefied gas from said chamber into said tank so that after liquefied gas in said tank has been exhausted, the lighter may be temporarily used before refilling the same.

2. A pocket lighter as defined in claim 1, wherein said injection means communicates with said storage chamber, and wherein said injection means forms part of said operating means to automatically move said valve means to said open position during injection of liquefied gas into said storage chamber so that liquefied gas injected in the latter may flow from said chamber through said passage means into said fuel tank.

3. A pocket lighter as defined in claim 1, wherein said injection means communicates with said fuel tank so that during injection of liquefied gas into the latter and actuation of said operating means, liquefied gas may also flow through said passage means into said storage chamber.

4. A pocket lighter as defined in claim 3, wherein said injection means forms part of said operating means to automatically move said valve means to said open position during injection of liquefied gas into said fuel tank so that liquefied gas injected into the latter may also flow through said passage means into said storage chamber.

5. A pocket lighter as defined in claim 3, wherein said operating means is independent from said injection means.

6. A pocket lighter as defined in claim 1, wherein said storage chamber comprises a tubular member provided at one end thereof with a valve seat, said valve means comprising a valve member and said biasing means being in the form of spring means cooperating with said valve member for yieldably pressing the latter against said valve seat, and said operating means comprising an elongated operating member having a portion projecting in a sealed manner through the other end of said tubular member.

7. A pocket lighter as defined in claim 6, wherein said operating member has a free end adjacent said valve member and including additional spring means for cooperating with said operating member for normally maintaining the free end thereof spaced a small distance from said valve member.

8. A pocket lighter as defined in claim 7, wherein said injection means comprises passage means formed in said

portion of said operating member and additional valve means connected to said operating member and yieldably held in closed position by said additional spring means.

References Cited

UNITED STATES PATENTS

3,152,460 10/1964 Piffath.
3,159,991 12/1964 Maltner et al. ----- 67—7.1

FOREIGN PATENTS

1,091,653 11/1954 France.

M. CARY NELSON, Primary Examiner

5 W. R. CLINE, Assistant Examiner

U.S. Cl. X.R.

137—588; 431—267