

Dec. 4, 1962

TAISHO IKETANI

3,066,514

LIQUID GAS CIGARETTE LIGHTER

Filed Nov. 23, 1960

Fig. 1

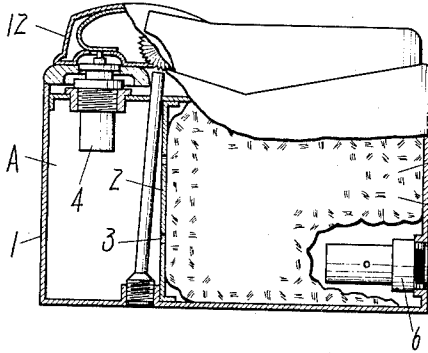


Fig. 4

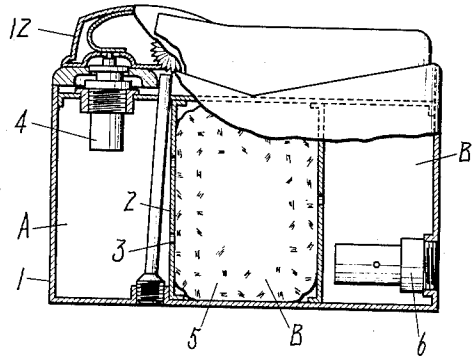


Fig. 2

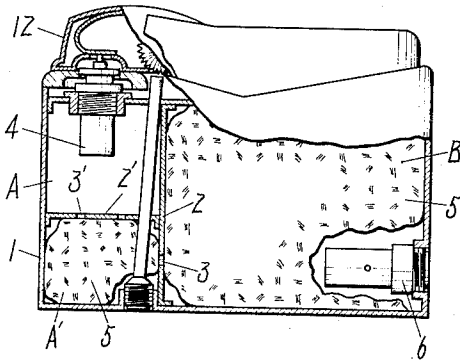


Fig. 5

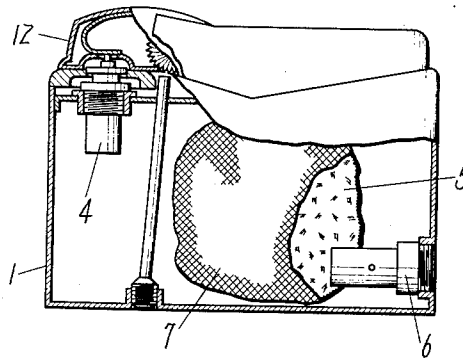


Fig. 3

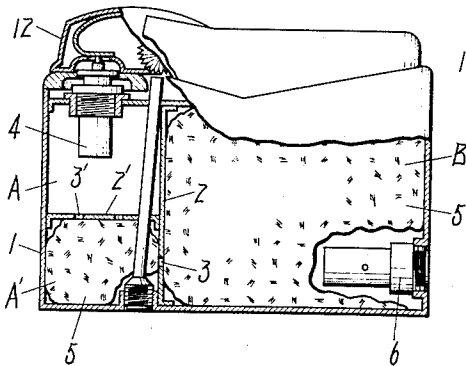
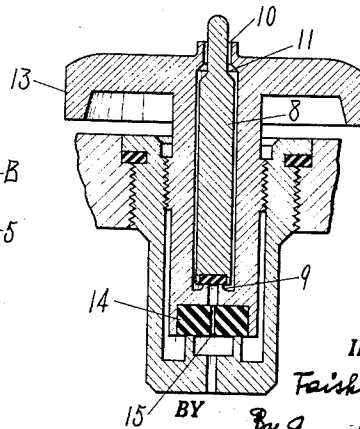


Fig. 6



INVENTOR.

Taisho Iketani

By *Frederic Montague*
Attorney

1

3,066,514

LIQUID GAS CIGARETTE LIGHTER

Taisho Iketani, Nogata-Cho, Nakano-Ku, Tokyo, Japan

Filed Nov. 23, 1960, Ser. No. 71,226

Claims priority, application Japan Oct. 3, 1960

2 Claims. (Cl. 67-7.1)

The present invention relates to a liquid gas burner, more particularly to a cigarette lighter, wherein liquid gas is made to flow into a gasifying room provided with a burner from a liquid gas containing substance by means of vapor pressure difference. The liquid gas containing substance may be covered by wire net, cloth or other suitable porous material and may be kept within the lighter body or in several compartments of the same.

In the known cigarette lighters, wherein liquid gas is introduced in liquid state to an adjusting part just before a fire nozzle by means of a porous suction material (wick), the gasified quantity of the liquid gas will not be exactly adjusted and no smooth adjusting is assured, therefore, because of the very high density of the gas at this part. Thus the lighter has such disadvantages that the flame length will suddenly change upon adjusting, which will inspire fear or danger in the user, and further considerable loss of liquid gas is inevitable, because the flow-out speed of the gas and the density thereof are high and the force of the flame becomes stronger than required.

It is, therefore, one object of the present invention to provide a liquid gas cigarette lighter, wherein a liquid reservoir, having an inlet valve and a gasifying room including a burner, is provided within the lighter body, gasified liquid gas is always supplied to the gas flow adjusting part of the burner, the gas flow is exactly and easily adjusted, the flow speed of gas is suitably adjusted to generate a gentle flame, and wasteful use of liquid gas is prevented.

With this and other objects in view, which will become apparent in the following detailed description, the present invention will be clearly understood in connection with the accompanying drawings, in which:

FIGURES 1 to 4 are side elevations of four different embodiments of a cigarette lighter, partly in section, showing the lighter body divided into a plurality of compartments by means of partition walls to keep the liquid gas containing substance;

FIG. 5 is a similar side elevation, partly in section, showing the liquid gas contained substance covered by wire net, cloth or other suitable porous substance and kept within the lighter body; and

FIG. 6 is an axial section of a part of the cigarette lighter in enlarged scale.

Referring now to the drawing, and in particular to FIG. 1, the lighter body 1 is divided into two chambers by means of a partition wall 2 provided with a through hole 3, the chamber A serving as a gasifying chamber, on the upper part of which a burner 4 is mounted, and another chamber B serving as a liquid gas reservoir, in which a liquid gas containing substance 5 is disposed and on the side wall of which an inlet valve 6 is provided.

Referring now again to the drawing, and in particular to FIGS. 2 and 3, the lighter body 1 is divided into three chambers by means of two partition walls 2 and 2' having through holes 3 and 3' respectively, in a T-shaped arrangement. The three chambers serve as a gasifying room A, an auxiliary gasifying room A' and a liquid gas reservoir B, respectively. As shown in FIG. 2, a liquid gas containing substance 5 is disposed in the auxiliary gasifying room A', wherein the filling density of the substance is smaller than that of a substance disposed in the liquid gas reservoir B. As shown in FIG. 3, on the other hand, the filling density of the liquid gas containing

2

substance 5 in the auxiliary gasifying room A' is greater than that of the substance disposed in the liquid gas reservoir B.

The other elements of the lighter shown in FIGS. 2 and 3 are similar to those shown in FIG. 1.

Referring now to FIG. 4, the lighter body 1 is vertically divided into three chambers by means of two partition walls 2 and 2' having through holes 3 and 3' to serve as a gasifying room A and liquid gas reservoirs B and B' respectively. In this embodiment, no liquid gas containing substance is disposed in the liquid gas reservoir B', the latter contains rather gas in liquid form. The other elements are similar to those of FIG. 1.

Referring now to FIG. 5, no partition wall is provided within the lighter body, but a liquid gas containing substance 5 covered with a wire net 7 is kept therein and a predetermined space is formed around the burner 4.

In the embodiments disclosed in FIGS. 2 to 4, the partition walls 2 and 2' are constructed by plates of a suitable porous substance having through holes therein, and are worked so as to take the same effect according to this principle, though they are not thick.

The burner 4 is applied in all embodiments disclosed in FIGS. 1 to 5, and, as shown in FIG. 6, consists of a valve rod 8, a valve seat 9, a fire nozzle 10, an expansion space 11 etc. The valve rod 8 is pushed down by a cap 12 of the lighter, when the cap 12 is closed. When a rotatable knob is turned, a variable compressive force is imposed on a porous elastic member 14 and a hole extending through the latter is opened or closed to control the flow quantity of the gas (FIG. 6).

In accordance with the present invention, when the liquid gas is supplied through the inlet valve 6, the gaseous fuel will be impregnated in the liquid gas containing substance 5 in a liquid state, and the liquid gas will pass through the through hole 3 or 3' of the partition wall 2 or 2' or through the wire net 7, by the pressure difference between the gas layer of the gasifying room A and the liquid gas reservoir B, into the gasifying room A to gasify therein. When the pressure in the gasifying room A rises to attain an equilibrium with the liquid layer, the flow of liquid gas will stop. In this case, the through hole 3 or 3' of the partition hole 2 or 2' or the small holes of the wire net 7 will be covered with the gas layer to prevent the flow of the liquid therethrough and further an equilibrium state of gasifying and liquefying is attained at the boundary surface of gas and liquid, so that the liquid flow into the gasifying room A is prevented. Therefore, when the vapor pressure of the gasifying room A is decreased by the use of the lighter, the equilibrium state of gasifying and liquefying is lost, and the liquid gas, which impregnated in the liquid gas containing substance 5 of the liquid gas reservoir B, is gasified and will flow into the gasifying room A through the hole 3 or 3' of the partition wall 2 or 2' or through the small holes of the wire net 7 until an equilibrium state is attained.

The liquid gas used in the present lighter is mainly isobutane gas, and the volumetric expansion of iso-butane ($\text{CH}_3)_3\text{CH}$ by gasifying will become 210-220 times of its liquid volume at normal temperature and pressure, while the receiving capacity of the liquid gas containing substance, for instance, of absorbent cotton, is approximately 7 times of its liquid volume. It is necessary for a stable flame that the gas pressure kept in the gasifying chamber A and the gas pressure at the fire nozzle will be approximately equal, however, a certain time difference is caused, at the time of use, between the flow out of the gas and the penetration of the gas from the liquid gas containing substance, and consequently some momentary pressure variations of flow out gas are inevitable.

According to the experimental results it has been determined, that the length of the flame is practically

constant, when the pressure variation is made less than 10%, and in the above mentioned relation, more than 10 times of total volume of gas passage of the burner is necessary for the volume of gasifying room.

It takes more or less time until an equilibrium state is attained, when the vapor pressure of the gasifying chamber A is decreased by the use of the lighter and the equilibrium state against the liquid gas chamber B is lost and the liquid impregnated in the liquid gas containing substance 5 is gasified and made to flow into the gasifying chamber A, so that care should be taken not to cause such troubles that the flame becomes short or the ignition becomes null, when the lighter is continuously used. These troubles may be avoided by adjusting the proportion of the volume between the gasifying chamber A and the liquid gas chamber B as well as the way how to keep the liquid gas containing substance 5.

According to researches which were conducted, in the embodiment shown in FIG. 1, the volume ratio of the liquid gas chamber B to the gasifying chamber A is made to about 4:1, and that of the gasifying chamber A to the expansion space 11 is made to about 100:1, and about 1.5 gr. of cotton is used as liquid gas containing substance 5, to which about 4 gr. of liquid butane, thus the desired result is obtained.

The lighter shown in the embodiment of FIG. 2 is an improvement for fear that by unforeseen reasons, an excess amount liquid gas (e.g. liquid butane) is poured into the liquid gas reservoir and thus the liquid butane may flow into the gasifying chamber A. In such a case, ungasified liquid gas is caught by the liquid gas containing substance 5 in the auxiliary gasifying chamber A' so that only the gasified liquid gas is made to flow into the gasifying chamber A. In this case, the density of the liquid gas containing substance (e.g. cotton) in the auxiliary gasifying chamber A' is preferably made to about $\frac{1}{2}$ to $\frac{1}{3}$ of that of the liquid gas containing substance in the liquid gas chamber B, and the volume ratio of the gasifying chamber A to the expansion space 11 is preferably made to 60:1.

The lighter shown in the FIG. 3 is designed so as to increase the reserve quantity of liquid gas therein. The density of the liquid gas containing substance in the auxiliary gasifying chamber A' is made twice as much as that of in the liquid gas chamber B, so that the reserve quantity of liquid gas is remarkably increased.

The lighter shown in the FIG. 4 has a volume ratio of 60:1 between the gasifying chamber A and the expansion space 11, and is provided with two liquid gas reservoirs B and B' arranged in parallel. In this case, the liquid gas chamber B', which is arranged on opposite sides of the gasifying chamber A, is not equipped with any liquid gas containing substance, and its volume is preferably made about $\frac{1}{4}$ to $\frac{1}{5}$ of that of the liquid gas chamber B.

In the lighter shown in FIG. 5, the liquid gas containing substance 5 is covered with wire net 7, cloth or other suitable porous material within the lighter body 1, so

that these materials may play the role of the partition walls, and thus the construction of the lighter may be considerably simplified. In this case, it is necessary to fix the covering material to a certain portion of the lighter body and to form a space around the burner 4, corresponding to the gasifying room A.

While I have disclosed several embodiments of the present invention, it is to be understood that these embodiments are given by example only and not in a limiting sense, the scope of the present invention being determined by the object and the claims.

I claim:

1. A liquid gas lighter, comprising a hollow body, a partition wall of T-shape dividing said body into three chambers, the head portion of said T separating one of said chambers in said hollow body to constitute a liquid gas reservoir, the leg portion of said T dividing the remaining portion of said body into an auxiliary gasifying chamber and a gasifying chamber, a liquid gas absorbing substance disposed in said liquid gas reservoir and in said auxiliary gasifying chamber, said head portion of said T having a first opening leading from said liquid gas reservoir to said auxiliary gasifying chamber to provide communication therebetween, said leg portion of said T having a second opening leading from said auxiliary gasifying chamber to said gasifying chamber to provide communication therebetween, a burner disposed on top of and extending into said gasifying chamber, an inlet valve leading into said liquid gas reservoir, the density of said liquid absorbing substance in said liquid gas reservoir being greater than the density of said liquid absorbing substance in said auxiliary gasifying chamber, and the vapor pressure in said liquid gas reservoir differing from that in said auxiliary gasifying chamber during operation of said burner.

2. The liquid gas lighter, as set forth in claim 1, wherein said vapor pressure in said liquid gas reservoir is greater than the vapor pressure in said auxiliary gasifying chamber.

References Cited in the file of this patent

UNITED STATES PATENTS

1,650,148	Nathan	Nov. 22, 1927
2,594,755	Felt	Apr. 29, 1952
2,727,376	Felt	Dec. 20, 1955

FOREIGN PATENTS

971,070	Germany	Dec. 4, 1958
---------	---------	--------------