March 30, 1943. C. H. LINDSAY 2,315,263

LIQUID DISCHARGE SYSTEM

Filed Aug. 2, 1941

Fig. 1.

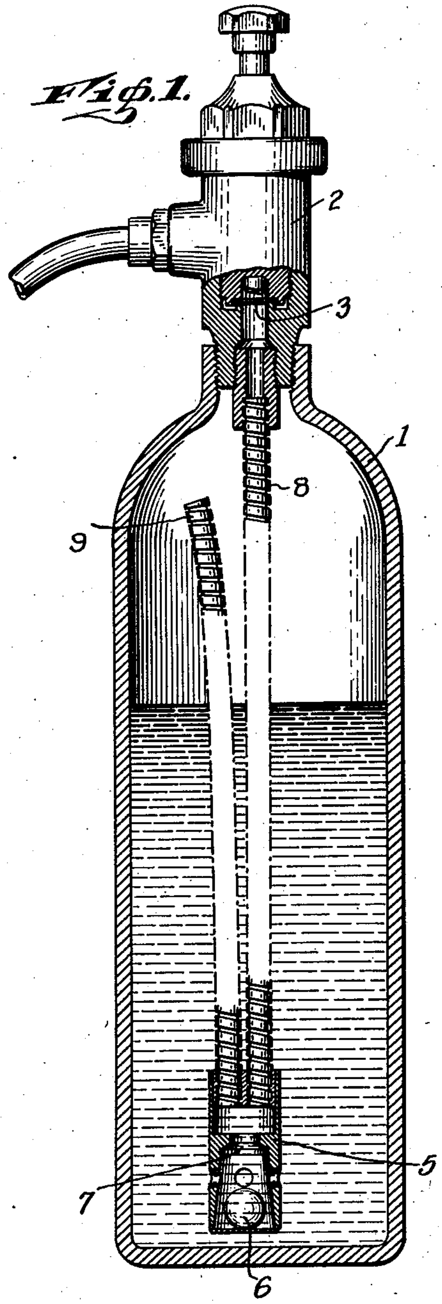
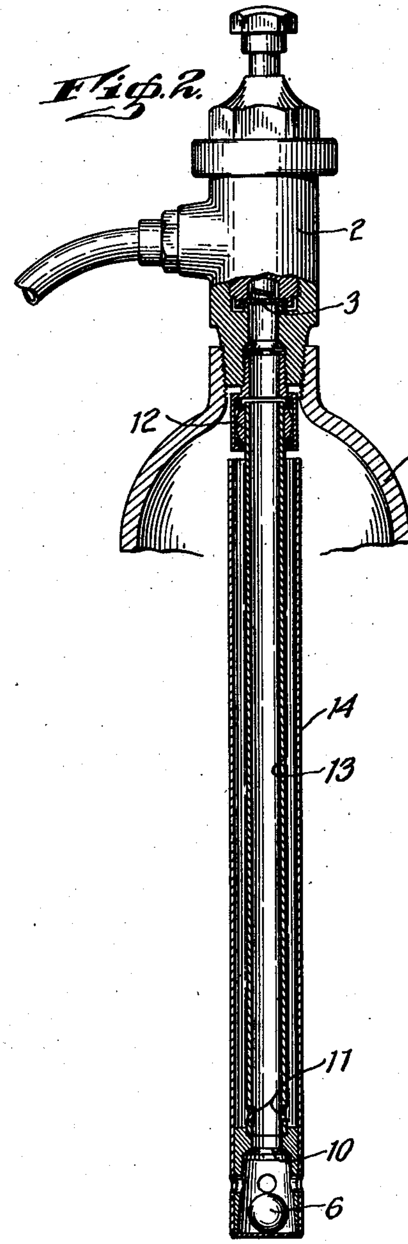


Fig. 2.



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LIQUID DISCHARGE SYSTEM

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4 Claims. (Cl. 169—31)

The invention relates to liquid discharge systems for flasks or containers intended to be used, either-end-up or in any intermediate position, and adapted to discharge their liquid content prior to the discharge of the vapor therein, and such as are used in certain types of liquid-containing fire extinguishers, particularly liquid CO_2 fire extinguishers.

Such systems commonly include switch-valve mechanism of one kind or another, actuated by gravity and so as to open only that one of two conduits which leads to the part of the container happening to be the lowest at the moment, and to close the other. By such mechanism liquid is discharged in preference to the vapor and such sequence is of utmost importance in CO_2 systems because if the vapor is discharged first the resulting internal vaporization and depression of temperature freezes the liquid and inhibits rapid or complete discharge.

This invention simplifies and improves such type of system by eliminating one of the usual gravity valves and its port, thus reducing complication and production cost and at the same time promoting reliability and insuring perfect discharge under all conditions. The invention lends itself to incorporation in a form in which it can be mounted on the end of the flask head customarily used on the dioxide container to be insertable into the flask through the relatively narrow neck opening thereof.

The principle of the invention is exemplified in the accompanying drawing wherein Fig. 1 represents a conventional flask having the invention applied in one form, and Fig. 2 is a similar view of a modified form.

The flask marked 1 is closed by an operating head 2 containing a sealing disc 3 or equivalent closure member adapted to be open when the flask is to be discharged, as by an appropriately actuated piercer. The dip-tube structure is connected to the operating head so as to form therewith a discharge passageway. It can be flexible or rigid or a combination of both, as preferred, but is in any event flexibly or jointedly connected to the operating head so that its far end will by gravity seek the lower side of the flask when the latter is in horizontal or inclined positions.

At its far end, the bottom when the flask is erect, the dip tube carries the cage 5 of a gravity valve 6, in this case a ball valve. The cage and its ball suffice as a weight-bob for the end of the structure to assist it in taking its lowest position, and overcome any stiffness due to possible corrosion.

When the flask is erect, or tilted not substantially more than 90° from vertical, the ball valve 6 remains away from its seat 7 so that its valve port is open and liquid CO_2 can flow under pressure of the contained vapor upwardly through the tube 8 and out through the operating head 2 when the sealing disc has been opened.

The tube 8 is in communication, in this case through the interior of the valve cage, with a companion tube 9 supported on and extending from the cage to the upper or head end of the flask. The free end of this tube is permanently open and may have a small weight-bob on it, if desired, to help it find the lowest position when the flask has been tilted more than 90°, although this is not always important.

When the flask is erect the open communication through the tube 9, between the valve cage 5 and the vapor space above the liquid level, does not conduct or permit the escape of vapor through the tube 8 because under hydrostatic law the column of liquid occupying the tube 9 prevents it.

When, however, the flask is tilted to the position in which the ball valve 6 closes on its seat, the liquid in the then lower end of the flask flows up through the supplemental tube 9 and down through the main tube 8 and out through the operating head. It thus delivers the liquid before any gas or vapor can escape. The two tubes form a siphon in this position, valve 6 being closed. The internal slope of the valve cage 5 is of course selected so that the valve closes as the container passes horizontal.

In Fig. 2 the two legs of the siphon are concentric, being rigid light-weight tubes mechanically connected to each other by the gravity valve cage 10 at the far end and being in communication with each other at that end through the port 11 cut of proper size in the inner tube. In other respects the action will be seen to be the same as already described.

In both cases it is desirable that the far or valve cage end of the structure shall swing freely and such condition is met in the form of Fig. 1 by making both tubes flexible, ordinary metallic flexible tubing being indicated. In the other form it is met by connecting the inner concentric tube to the operating head by means of a ball joint 12 of obvious construction, or the main or inner tube in this form could be flexible for some or all of its length. When the supplemental tube is flexible, as in Fig. 1, its free end will be understood to be so disposed with relation to the container as to reach as deeply as possible into the liquid, when the top end is down. It will be understood also that source of pressure in the case of carbon dioxide is the dioxide itself, but in other embodiments the pressure can be admitted to the container when discharge is required; in such cases the discharge head may be merely a nozzle.

Reference is made to co-pending application S. N. 317,075, filed Feb. 3, 1940, for any matter herein shown and not claimed.

I claim:

1. In a liquid discharge system, in combination with the container having an operating head, a dip-tube structure in the form of a siphon, one leg being a flexible tube connected to the outlet through the head and the other being a similar tube connecting with the space in the container adjacent the head, and a gravity valve controlling an entrance into the siphon at the end opposite said space.

2. In a liquid discharge system, a container having an outlet fixture, a dip-tube structure in the form of a siphon, one leg having a flexible connection with the outlet through such fixture and the other connecting with a space in the container adjacent such fixture, a valve-cage weighting the far end of the siphon and a gravity valve therein controlling an entrance into the siphon.

3. In a carbon dioxide discharge system, a flask having an outlet fixture screwed into the neck opening thereof, a dip-tube structure in the form of a siphon fastened to said fixture and removable therewith from said neck opening, one leg of said structure having a flexible connection with the outlet fixture and the other leg connecting with a space in the flask adjacent such fixture, a valve-cage weighting the far end of the siphon and a gravity valve therein controlling an entrance into the siphon.

4. In a liquid discharge system, a container having an outlet fixture, a dip-tube structure in the form of a siphon, one leg having a flexible connection with the outlet through such fixture and the other leg being concentric to the first leg and connecting with a space in the container adjacent said fixture, a valve-cage weighting the far end of the siphon and a gravity valve therein controlling an entrance into the siphon.

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