Oct. 12, 1965 E. FRANKEL 3,211,330

LIQUID DISPENSING WITH AIR VENTING

Filed Feb. 19, 1963

FIG. 5.

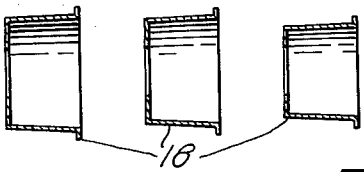


FIG. 1.

FIG. 2.

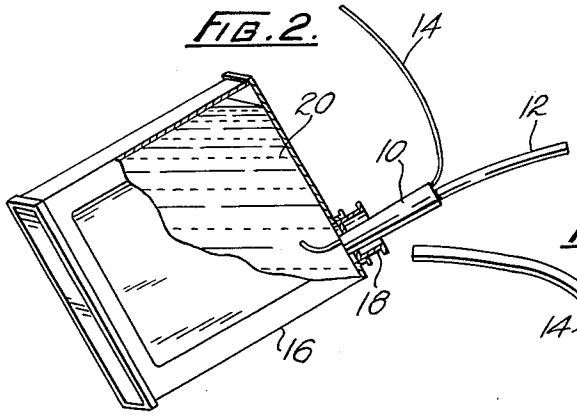


FIG. 4.

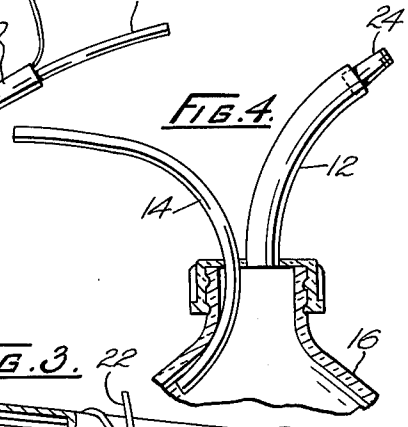
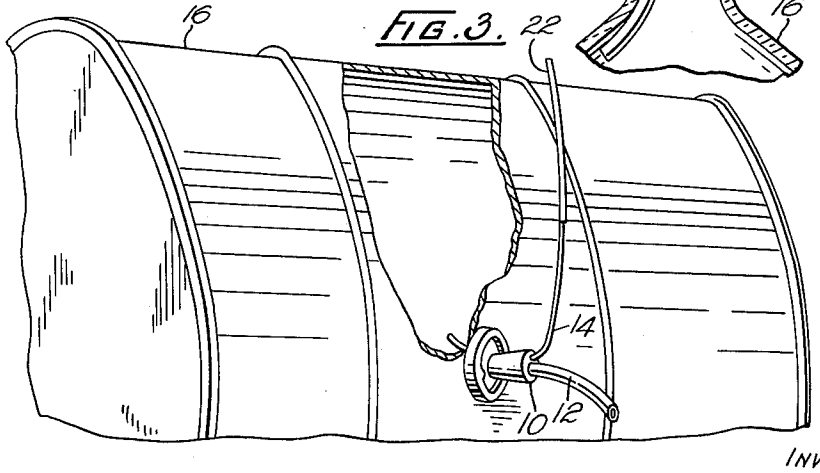


FIG. 3.



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LIQUID DISPENSING WITH AIR VENTING

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1 Claim. (Cl. 222—1)

This invention relates to liquid dispensing in which there is employed a pouring spout combined with an air vent as a pouring unit as well as pouring devices which apply spouts and air vents as separate adjuncts to containers from which liquids are to be poured.

Hitherto it was thought that the air vent should extend in the container being poured from, either to the highest point in the container in the pouring position or at least to a point at or near the surface of the liquid. Thus it has been suggested to provide a flexible tube carrying a float so that the venting tube would always terminate above the level of the liquid. However, this construction suffers from the disadvantage that the tube is often "snagged" in the container with the result that the terminal of the air vent remains immersed in the liquid when pouring first commences and liquid tends to run out of the air vent. This can be serious when dealing with corrosive or other dangerous liquids.

A further suggestion has been to provide a substantially rigid air vent, so shaped that it will terminate at the highest point in the container in the pouring position. In this case the air vent has to be correctly inserted for efficient operation and to be of different lengths for different sized containers. Short air vents of the rigid type whose terminals will remain immersed in the liquid at the commence of pouring will also tend to shed liquid through the air vent.

Both types of air vents described above suffer from lack of universality, because venting tubes of different lengths have to be provided for different sized containers; although this could be overcome by providing an extensible air vent—for example a larger tube telescoping over a smaller tube; such arrangements suffer from the disadvantage that it is necessary to estimate the required lengths of tube before commencing pouring. With unskilled labour this is obviously unsatisfactory; also the disadvantage of spillage remains.

It is an object of the present invention to eliminate the above disadvantages.

According to the present invention an air vent is provided which commences externally to the container from which it is desired to pour at a point substantially at or above the level of the liquid when the container is in its pouring position.

In this specification the term "pouring position" is to be construed as meaning that position in which, on tilting a container from its upright position, pouring first commences.

The air vent need not extend any substantial distance into the container.

It is believed that, on pouring, a quantity of liquid enters the pouring spout. The pressure above the liquid in the container is therefore sub-atmospheric and air is drawn through the air vent to take the place of this quantity of liquid. Thereafter a continuous stream of air enters the container through the air vent and steady and continuous pouring results. In other words, the provision of the air vent according to the invention, overcomes the resistance offered by the hydrostatic head of the liquid in the container to the entry of air.

The length of the air vent may be adjusted externally. For example, the tube may be composed of two or more telescopic portions.

It has also been found that lengthening the pouring spout increases the velocity of discharge to a much greater extent under partial vacuum than under atmospheric conditions where Torricelli's law of discharge applies.

In an embodiment of apparatus useful in practicing the invention a pouring spout is associated with a suitable bung which preferably consists of a set of concentrically arranged tapered rings or a hollow stopper or a screw-on cap. The air vent is inserted through the pouring spout and extends into the container. The air vent is substantially rigid and is bent into a position so that in the pouring position its outer end is above the level of the liquid. As has been mentioned above the air vent may be composed of telescopic members to achieve universality.

The invention may also be practiced by means of an integral device comprising a pouring spout associated with a bung or any standard container closure and an air vent passing through the spout or a container closure which is adapted, when the device is located in a container, to extend to a point externally of the container at or above the level of the liquid in the container when the container is in its pouring position.

The invention may further be practiced in connection with venting devices which are structurally not associated with pouring spouts but make use of the venting principle evolved earlier, namely the principle of neutralizing the resistance offered to the entry of air into a liquid-filled container by the hydrostatic head of the liquid by providing a bent venting tube to a container in such manner that the suction end of the venting tube, which is open to atmosphere, is located at or near the highest point of the vessel when the container is in its pouring position whereas the delivery end of the vent, located in the interior of the vessel, is bent downward, and immersed into the liquid.

The device by which the method of this invention is practiced may be made of plastic material or metal. The bung may comprise a set of tapered rings, a set of hollow stoppers, or consist of any standard container closure.

The invention may be more easily understood by the following description with reference to the accompanying drawings, in which:

FIGURE 1 is a side view of a pouring device for use in performing a method according to the invention;

FIGURE 2 is a side view, partly in section, of a can fitted with the device of FIGURE 1;

FIGURE 3 is a side view, partly broken away, of a drum fitted with a modification of the device of FIGURE 1;

FIGURE 4 is a side view, partly in section, of an alternative form of the pouring device; and

FIGURE 5 is a sectional side view of tapered hollow stoppers adapted to be used with a pouring device of the invention.

In FIGURE 1, a tapered stopper **10** is fitted with a pouring spout **12** and an air vent **14**, the air vent extending away from the spout and the length of the air vent being chosen with regard to the container from which pouring is to take place. This will be better understood with reference to FIGURE 2.

In FIGURE 2 the device is fitted into the opening of a can **16** with the aid of a hollow tapered stopper **18**. The air vent **14** is arranged for its end to be above the level **20** of the liquid in the can when the can is in its pouring position—in other words when the can is tilted to a position in which pouring first commences. The length of the air vent **14** has, therefore, to be predetermined depending on the size and shape of the particular container from which it is desired to pour. Thus, for instance, when it is required to pour from a drum, the length of the air vent **14** will have to be quite considerable. However, the problem of choosing the correct length of air vent may be overcome by providing an additional tube which telescopes

over or in the air vent. This is shown in FIGURE 3, where a tube **22** whose bore is substantially equal to the outside diameter of the air vent **14** is provided so that the effective length of the air vent may be varied.

The arrangement shown in FIGURE 3 is the correct one for pouring from a drum. As the drum is rolled over to a position in which pouring just commences, the end of tube **22** will be in a horizontal plane above the level of the liquid.

Many variations of apparatus for practicing the invention are possible and FIGURE 4 illustrates a screw-cap for a bottle fitted with a pouring spout **12** and air vent **14**. The pouring spout **12** is fitted with a removable nozzle **24** where a fine stream of liquid is required. It will be noted that in this case the air vent **14** is relatively short due to the shape of a bottle. Pouring will only commence when the bottle has been tilted some considerable distance and the end of the air vent will soon be in a horizontal plane above the level of the liquid.

A series of hollow stoppers **18** are illustrated in FIGURE 5. A set of such stoppers may be provided with a device so that the device may be fitted to a wide range of containers. With the additional provision of the extension tube **22**, the device becomes universal in its application.

Instead of the hollow stoppers, a set of rings having the same taper as the stopper **10** may be provided to increase its diameter to the desired dimension.

I claim:

A method of dispensing liquid from a container having an open liquid outlet, comprising tilting the container to a tilted position in which the outlet is lower than the level of liquid in the container thereby to dispense liquid from the container through the open outlet, and establishing a confined path for the flow of air into the container to replace liquid that leaves the container through said outlet, said confined path having its upper end outside the container and at least as high as the level of liquid in the container when the container is in said tilted position, said confined path having its lower end inside the container and a substantial distance below the level of liquid in the container when the container is in said tilted position.

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