Jan. 9, 1934. E. F. STEPHENS 1,942,845

BOTTLE STOPPER

Filed March 13, 1933

Fig. 1.

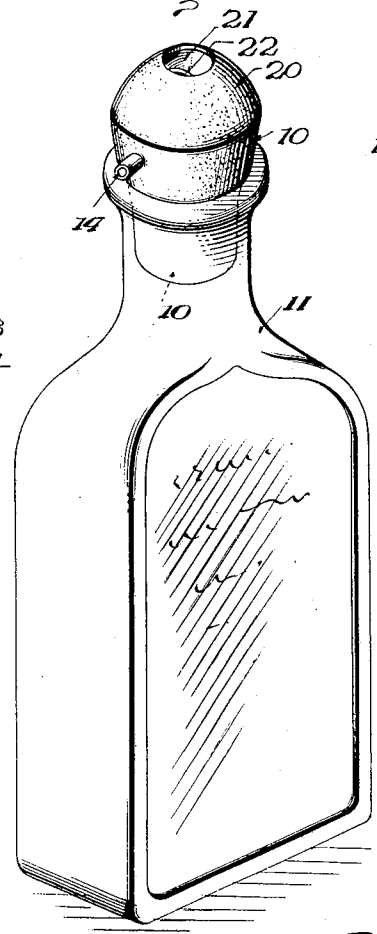


Fig. 2.

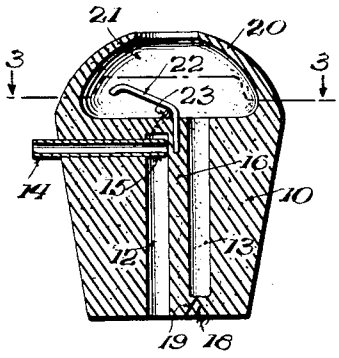


Fig. 3.

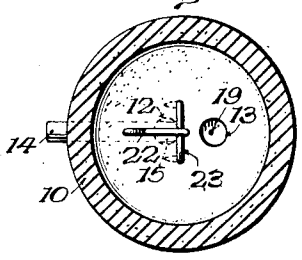
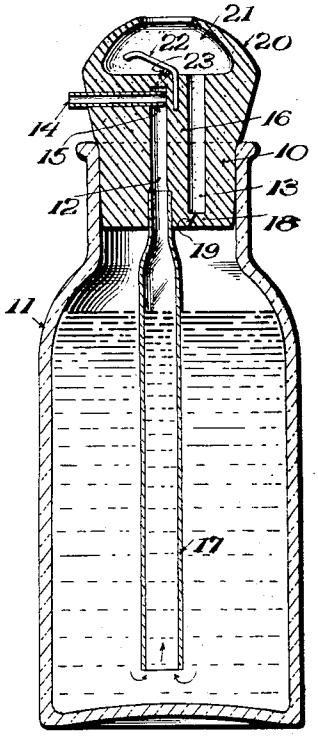


Fig. 5.



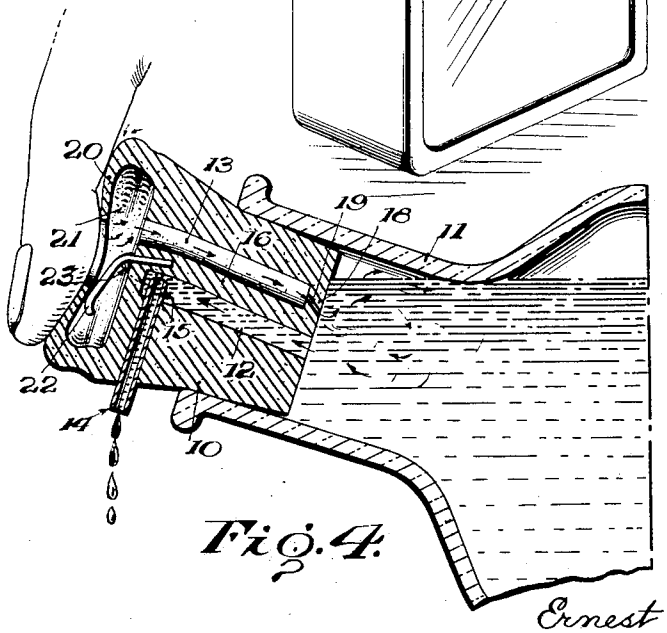


Fig. 4.

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BOTTLE STOPPER

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Application March 13, 1933. Serial No. 660,591

15 Claims. (Cl. 215—58)

This invention relates to a bottle stopper, and more particularly to a stopper provided with manually controlled means for determining the rate or quantity of flow of a liquid from a bottle. The invention has particular utility when applied to a stopper for causing the liquid to escape in drops, and it will be illustrated and described with particular regard to its use for this purpose, but it is to be expressly understood that the invention is not limited thereto, as the invention can be used with equal facility where a controlled but continuous stream of liquid is desired, as will be apparent from the description hereinafter.

It is an object of this invention to provide a bottle stopper with improved means within the body of the stopper whereby liquid may be delivered therefrom under the control of the pressure of a thumb or finger thereon.

Another object of this invention is to provide a device of the type characterized with means whereby air is admitted to the bottle simultaneously with the delivery of the liquid therefrom.

Another object of this invention is to provide a device of the type characterized wherein the pressure of a thumb or finger of the hand holding the bottle may be used both to open a valve which normally prevents outflow of the liquid and to open a vent so that air may flow into the bottle.

Another object of this invention is to provide a device of the type characterized which may be used to deliver liquid in drops or in a small stream and in different quantities.

Another object of this invention is to provide a device of the type characterized which is simple and rugged in construction, inexpensive to produce, and durable and certain in operation.

Other objects will appear as the description of the invention proceeds.

The invention is capable of receiving a variety of mechanical expressions, one of which is shown on the accompanying drawings, but it is to be expressly understood that the drawings are for purposes of illustration only and are not to be construed as a definition of the limits of the invention, reference being had to the appended claims for that purpose.

Referring in detail to the drawing, wherein the same reference characters are employed to designate corresponding parts in the several figures:—

Fig. 1 is a perspective view of a bottle provided with a stopper embodying the present invention;

Fig. 2 is an axial section on an enlarged scale through a stopper embodying the present invention;

Fig. 3 is a sectional plan view on the line 3—3 of Fig. 2;

Fig. 4 is a fragmentary section showing the stopper in use to deliver drops of liquid from the bottle; and

Fig. 5 is a sectional elevation to show a stopper in conformity with the present invention provided with a depending tube.

It has heretofore been proposed to provide a bottle with a stopper having an outlet duct and composed of elastic material so that under normal conditions said duct is closed but by the pressure of a thumb or finger the stopper may be deformed so as to force or permit the escape of a few drops of liquid therefrom. Devices of this character are open to a number of objections, among which may be noted particularly the fact that the number of drops that may be emitted is narrowly limited by the absence of means for the ingress of air when liquid is to be discharged from the bottle. The present invention, stated broadly, overcomes the disadvantages of prior constructions by so constructing an elastic stopper that deformation under the pressure of a thumb or finger not only opens an outlet duct so as to permit a controlled flow of liquid therefrom, but simultaneously provides for the ingress of air.

In the form shown the stopper 10, which may be of any suitable size and adapted to fit the mouth of any suitable bottle 11, is provided interiorly with a pair of ducts 12 and 13, shown as generally parallel and extending axially although there may be considerable variation in their size, location, direction and arrangement. Said stopper is preferablly made of a suitable elastic material such as rubber. Duct 12 extends from the inner end of the stopper outwardly to a suitable distance but terminating short of the outer end of the body of the stopper. Duct 13 extends inwardly from the outer end of the stopper and terminates short of the inner end thereof. Projecting into the duct 12 is a tubular outlet member 14 which may be made of any suitable material, as a small-bore glass or metallic tube. The size of the passage through said outlet member 14 may be varied to conform with the rate of flow desired from the bottle, and therefore it may be made such that the delivery will be in drops only, or in a thin stream, depending upon the service to which the device is to be put. Outlet member

14 may terminate flush with the outer periphery of the stopper, but preferably projects therefrom as illustrated and if desired it may be curved or bent in any desired direction. The inner end of said outlet member 14 projects into the duct 12 to such a position, as shown at 15, that the partition wall 16 between the ducts 12 and 13 normally closes the inner end of said member and constitutes a valve therefor. Duct 12 preferably but not necessarily has a tube 17 as shown in Fig. 5 suitably inserted thereinto and extending therefrom into proximity with the bottom of the bottle. The wall 18 at the inner end of the duct 13 is provided with a cut or slit 19 extending from the inner end of the duct 13 to the inner face of the stopper.

The outer end of the stopper is provided with a peripheral flange 20 which may be of any suitable shape to effect the functions to be described, but which provides a deformable lip which forms a chamber 21. As illustrated said flange 20 is made integral with the body of the stopper, although it could be made separate therefrom and suitably attached thereto if preferred. Mounted within the chamber 21 in which it is protected from injury is a member 22 which is attached in any suitable way to the wall 16, as by insertion thereinto, and is bent to extend angularly to the axis of the stopper for a reason to be explained. To provide an axis of tiltable movement for said member 22 a fulcrum member 23, which may take the form of a U-shaped piece of wire inserted into the body of the stopper, engages the member 22 at the bend therein. When pressure is applied to member 22 it rotates around the member 23 and produces flexure of the wall 16 away from the inner end 15 of the outlet member 14.

In operation the bottle is tilted when delivery is desired therefrom, as illustrated in Fig. 4, and the deformable flange 20 is depressed by a thumb or finger to engage and tilt the member 22. Movement of the member 22 as heretofore explained flexes the wall 16 to move the latter away from the inlet end of the outlet member 14. Simultaneously air is forced into the bottle through the slit 19. Liquid may therefore flow from the bottle through duct 12 and outlet member 14, dropping from the latter or flowing in a thin stream from the latter depending upon the size of the passages provided for the outlet flow. The air forced from the chamber 21 through the duct 13 and slit 19 into the bottle increases the air pressure within the bottle, and hence the outflow of liquid may be continued for a considerable period of time unless the outlet member 14 is again closed. If care is taken that the bottle is so tilted as to keep the inner end of the duct submerged as shown in Fig. 4, the tube 17 is unnecessary, but the use of such a tube is preferred because after the first delivery the tube remains full of the liquid since the inlet end 15 to the outlet member 14 is sealed by the wall 16, and thereafter the liquid may be discharged from the bottle as long as there is enough liquid to close the inner end of the tube 17 without tilting the bottle to the same extent that might be required to keep the inner end of the duct 12 covered by the liquid as the contents of the bottle is lowered, and even in a vertical position of the bottle, drops may be ejected from member 14 by manipulation of the stopper.

It will be noted that the only part of the body of the stopper that is flexed in service is the wall 16 to uncover the inner end of the member 14 and the wall of the slit 19. Therefore, if this part of the stopper is made of suitable material so that it may be flexed or actuated in the manner described, the remainder of the body of the stopper can be of non-deformable material. To facilitate construction, however, it is preferred to make the entire body of the stopper together with the flange 20 of the same material, as rubber, after which the outlet member 14 and the members 22, 23 may be inserted and, assuming that the slit 19 is properly formed therein before or after the insertion of members 14, 22 and 23, the stopper is ready for service.

It will therefore be perceived that a bottle stopper has been provided which may be readily manipulated by the thumb or a finger of the hand holding the bottle to cause the discharge of liquid to the desired amount by mere compression of the flange 20. The rate of flow can also be varied by the extent of compression of said flange 20, because the extent to which the member 22 is moved and the extent to which the wall 16 is removed from the inner end of outlet member 14 varies with the extent of pressure applied to said flange 20. As air is admitted to the stopper simultaneously with the discharge of the liquid, the delivery is not retarded by a vacuum immediately forming in the bottle. The device is one that is simple and inexpensive to form, as the stopper can be readily molded of a single material with the ducts 12 and 13 and the chamber 21 with its surrounding deformable flange 20 formed in the molding operation, while the operating members 22, 23 and outlet member 14 are inexpensive to form and insert. The slit 19 may be formed by a mere puncturing operation, and hence the entire device may be manufactured at a low cost.

While the embodiment of the invention illustrated on the drawings has been described with considerable particularity, it is to be expressly understood that the invention is not restricted thereto as the same is capable of receiving other mechanical expressions, as will now be apparent to those skilled in the art, while changes may be made in the details of construction, material employed, dimensions, proportions and arrangement of parts, without departing from the spirit of this invention. Reference is therefore to be had to the appended claims for a definition of said invention.

What is claimed is:

1. A bottle stopper provided with an outlet for delivering controlled quantities of liquid, a vent for the ingress of air, and deformable means for respectively controlling said outlet and said vent and simultaneously deformable by compression of the stopper body to open said outlet and said vent.

2. A bottle stopper provided with an outlet for delivering controlled quantities of liquid and a vent for the ingress of air, a portion of the body of said stopper normally closing said outlet and said stopper being deformable to open said outlet and force air through said vent.

3. A bottle stopper provided with an outlet for delivering controlled quantities of liquid, a vent for the ingress of air, a portion of the body of said stopper normally closing said outlet, and means engageable by a thumb or finger of the hand holding the bottle to deform said stopper and open said outlet and also to effect the opening of said vent.

4. A bottle stopper provided with an outlet for delivering controlled quantities of liquid, a vent for the ingress of air, a portion of said body normally closing said outlet, a deformable flange on said stopper providing a chamber, and means

within said chamber engageable upon deformation of said flange and operable to deform said body portion and open said outlet.

5. A bottle stopper composed of elastic material and having a pair of ducts, an outlet communicating with one of said ducts, and an air chamber and a vent communicating with the other of said ducts, a portion of said stopper between said ducts normally closing said outlet, and said stopper being compressible to open said outlet and compress said air chamber to open said vent.

6. A bottle stopper composed of elastic material and having a pair of ducts, an outlet communicating with one of said ducts, a vent communicating with the other of said ducts, a portion of said stopper between said ducts normally closing said outlet, and a member projecting from said portion and tiltable by pressure to move said body portion and open said outlet.

7. A bottle stopper composed of elastic material and having a pair of ducts, an outlet communicating with one of said ducts, a vent communicating with the other of said ducts, a portion of said stopper between said ducts normally closing said outlet, means projecting from said body portion to move the same and open said outlet, and a rim on said stopper surrounding said projecting member and deformable to permit actuation of said projecting member and force air from said chamber through said vent.

8. A bottle stopper composed of elastic material and having a pair of ducts, an outlet communicating with one of said ducts, a vent communicating with the other of said ducts, a portion of said stopper between said ducts normally closing said outlet, a member projecting into said body portion, means providing a tilting axis therefor, and a deformable flange surrounding said projecting member and providing a compressible air chamber.

9. A bottle stopper provided with an outlet and having a portion of its body normally closing said outlet, said stopper also having an air chamber leading to a normally closed vent and said air chamber being compressible to effect the deflection of said portion to open said outlet and also to force air through said vent.

10. A bottle stopper provided with an outlet and having a portion of its body normally closing said outlet, said body also having a normally closed vent, and separate means projecting from said body for flexing said portion and effecting the opening of said vent.

11. A bottle stopper provided with an outlet and having a portion of its body normally closing said outlet, said body also having a normally closed vent, a deformable flange on said stopper providing a chamber, and a member within said chamber and tiltable upon compression of said flange to flex said portion, compression of said flange simultaneously opening said vent.

12. A bottle stopper provided with a pair of ducts, an outlet member projecting into one of said ducts and normally closed by the wall thereof, said stopper having an air chamber communicating with the other of said ducts, a slit in the wall of said last named duct leading to the interior of the bottle, and manually operable means for opening said outlet and compressing the air in said chamber.

13. A bottle stopper provided with a pair of ducts, an outlet member projecting into one of said ducts and normally closed by the wall thereof, the other of said ducts having a normally closed slit leading to the interior of the bottle, and means operable by compression for flexing said wall and forcing air through said slit.

14. A bottle stopper provided with a pair of ducts, an outlet member projecting into one of said ducts and normally closed by the wall thereof, the other of said ducts having a normally closed slit leading to the interior of the bottle, a deformable flange on said stopper providing an air chamber communicating with said last named duct, and means in said chamber operable by compression of said flange and adapted to flex said wall to open said outlet.

15. A bottle stopper comprising an elastic body provided with a pair of ducts, an outlet member projecting into one of said ducts and normally closed by the wall thereof, a normally closed slit in the wall of the other of said ducts, a deformable flange on said stopper providing an air chamber communicating with said second named duct, a member projecting from said wall into said chamber, and means coacting with said member to provide a tilting axis therefor, said projecting member being tiltable by the compression of said flange to flex said wall and open said valve and said vent being opened by the simultaneous compression of said air chamber.

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