

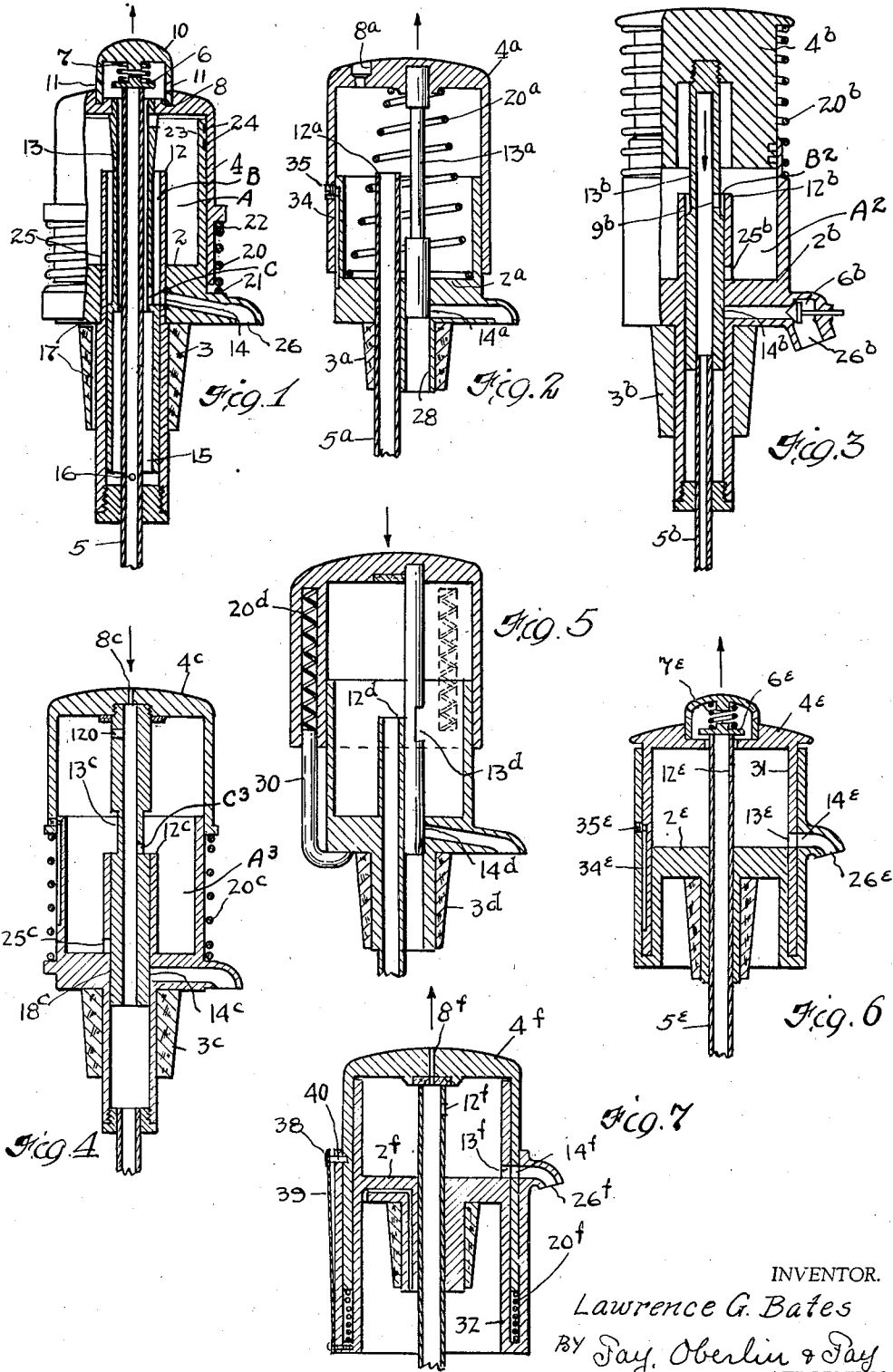
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LIQUID DISPENSING DEVICE

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LIQUID DISPENSING DEVICE

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In the dispensing of liquids, in many cases it is of importance that the amount discharged should not be subject to wide variations contingent upon the manner in which the device happens to be operated. Thus, for instance in discharging flavoring extracts in bakery usage, etc., a dependably uniform discharge-amount is important. And, in accordance with the present invention desired uniformity and controlled amount of discharge may be had notwithstanding a variation in conditions of usage.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described, and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail certain illustrative embodiments of the invention, these being indicative however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawing:

Fig. 1 is a part elevational, part vertical section view showing an embodiment of the invention; and Figs. 2-7 inclusive illustrate slight modifications.

The construction involves relatively movable piston and chamber elements, and valve port means for control of displaced air. And, in Fig. 1 there is shown a piston element 2 associated with and secured to a stopper 3 for engaging a container of liquid, such as for instance a bottle or jug or the like of flavoring extract, syrup, beverages, etc. Reciprocable upon the stationary piston is a hollow displacement element or chamber in the form of a cylinder 4, this being shown in depressed position in Fig. 1. Extending up from the liquid in the container is a conduit or tube 5 whose upper end strikes and unseats an air valve 6 when the cylinder 4 is depressed thus permitting air in chamber 15 to escape. The air valve 6 may have resilient means, as a spring 7, for normally urging the valve downwardly against its valve seat 8, such that normally when the cylinder 4 is not depressed, the valve 6 closes off the opening within the valve seat. Conveniently, the valve may be mounted in a separable cap 10 carried on the upper part of the cylinder and being in effect a cage having openings 11 to the atmosphere. Within the chamber is a constant level overflow sleeve 12, this projecting up to a predetermined extent in accordance with the size of the liquid charge that is to be handled in each operation of the displacement cylinder, the sleeve receiving in turn a further mating or internal sleeve

13 which is of smaller diameter through such portion of its length as extends from the top of the overflow sleeve down to the outlet opening 14 for the discharge when the cylinder is in depressed position, as in Fig. 1. The portion D below such opening 14 however fits against the sleeve 12 as a valve, and as readily seen such lower portion D of the internal sleeve 13 closes off the discharge outlet port 14 as the cylinder is raised, and continues to maintain it closed throughout all of the upper range of excursion of movement of the cylinder, the portion D of the sleeve also closing off the upper overflow chamber B when in raised position, but progressively providing a chamber B increasing in volume between the overflow edge 12 and the narrowed portion of the valve sleeve 13 as the latter descends, and thereby permitting a surplus of liquid in the displacement chamber A to overflow into chamber B and ultimately proceed down into the space 15 between the sleeve D and tube 5 and escape through a small opening 16 in the latter back to the liquid in the container. A small air-vent passage 17 is provided through the stopper element 3, such element being of any desired or convenient form, in view of the kind of liquid containers to be dealt with. A spring means of form as desired is arranged to normally urge the cylinder 4 into its uppermost or extended position, and such may be for instance a coil spring 20 between a shoulder 21 on the piston element and a shoulder 22 on the displacement or cylinder element. The operator then needs only to apply a downward pressing motion upon the cap for its operation as desired. The moving joint between the element 4 and the tubular extension 23 of the stationary element is particularly advantageously provided with slide ring packing means 24, I having found that cylindrical rings having a slanting split-cut are of surprising effectiveness as made of synthetic resin composition, such as "Vinylite" and the like, such construction having resiliency insuring continuing slide and fit and being remarkably frictionless and wear-proof. The device in its other portions may in fact also with advantage be made of synthetic resin composition, or at least such portions as are contacted by liquid.

The manner of use of the device will be understood from the foregoing. Placed upon a liquid container, for instance a bottle of flavoring, and with the closure portion 3 engaged in the opening thereof, as a cork or stopper, the operator presses down on the cap, this being normally in its extended or elevated position by

the action of a spring 20, and the sleeve valve 13 initially being in its uppermost position closing off the overflow chamber B and the sleeve D closing discharge outlet port 14, and the air-valve 6 being closed against its seat, it being well above the top end of tube 5 at such time. But, as the cap or hollow displacement cylinder is pushed downward the sleeve valve D opens up an annular space B of increasing depth within the overflow 12, and since on an "empty" stroke the device is full of air, when the sleeve valve D at length clears the port 14 and the upper end of the tube 5 unseats the valve 6 a volume of air escapes through openings 11 and port 14; and when the operator releases pressure to allow the cap to re-ascend, liquid flows up from the container through the tube 5 in sufficient quantity to more than supply the volume of the space A between the overflow edge 12 and the bottom of the chamber, and when the operator then depresses the cap the surplus liquid overflows into the progressively increasing space B between the sleeve 12 and the narrowed portion of the sleeve valve 13 and escapes through the small opening 16 back to the container, and in due sequence the port C in sleeve valve 13 mates with the port 14 and occasions discharge of the measured liquid through the opening 25 from the chamber into the chamber B and thence through the port 14 to the outside discharge nozzle 26. It will be noted that the liquid in chamber B can follow two paths when the port C mates with the port 14. One of these paths leads through the port 14 and thence outwardly through the nozzle 26 and due to the lack of resistance to flow along this path the major portion of the liquid will pass through nozzle 26. On the other hand, a very small proportion of liquid can pass from chamber B through port C, thence downwardly into chamber 15 and back to the tube 5 through the small opening 16. The amount of liquid following this path will be extremely small because sleeve 13 has an internal diameter slightly in excess of the external diameter of tube 5. Obviously then, very little liquid can flow from port C downwardly due to the slight clearance between the parts. Furthermore, the chamber 15 is substantially full of liquid at all times because of its relatively large volume in comparison to the diameter of the drainage port 16. The liquid in chamber 15 will then offer some resistance to flow of liquid from chamber B radially inwardly through port C.

In some cases it is advantageous to mount the extension spring internally, and as illustrated in Fig. 2, the spring 20a may be placed between the piston member 2a and the cylinder member 4a. Here again, an overflow sleeve 12a is provided, and conveniently this may be combined with and be in fact the upper end of the conduit 5a which extends through the closure element 3a to the liquid in the container. Again, the valve member having its upper portion 13a of reduced diameter, controls the outlet port 14a by its enlarged lower portion, this closing off the avenue to discharge when the cap 4a is in its uppermost position, but opening a discharge passage past the small diameter portion 12a when the valve is pushed down such that its lower large-diameter portion is down in the guideway 28 below the port 14. A valve port means 3a is provided in the cap 4a, and conveniently this may be simply operated by the finger or thumb of the operator in association with the action of depressing the cap.

Where valves in the top of the reciprocable member are undesirable for any reason, the air control valve may be combined with the outlet discharge passage, as for instance air valve 6b, Fig. 3, in discharge passage 26b. Here again, the stationary piston element 2b has a reciprocable element 4b in association, the thrust of the spring 20b normally holding it in extended or raised position, and an overflow sleeve 12b is provided and within the sleeve the valve 13b may be carried by the member 4b its reduced diameter portion allowing an overflow space B² within sleeve 12b, while the large diameter lower portion of the valve 13b maintains the port 14b closed until ready for discharge. Again, the sleeve valve 13b reciprocates between the sleeve 12b and the conduit 5b which leads down to the liquid in the container. An opening 9b allows the overflow surplus liquid to escape back through the conduit 5b to the container, the valve action being proportioned to open in the movement such as to allow drainage of the surplus or overflow liquid back to the bottle and in turn the final discharge of the segregated liquid in the chamber A² occurs when the sleeve valve 13b has been depressed far enough to uncover both the ports 25b and 14b to form a continuous passage from the chamber A² past the small diameter of the valve 13b through to the outlet 26b.

The bore of tube 5b is extremely small so as to prevent excess drainage from the chamber A² back into the bottle. When the parts are in the position just mentioned the liquid will flow through port 25b, then downwardly through chamber B² and then outwardly through port 14b. Some of the liquid in chamber B² will be diverted through port 9b but at this time the tube 5b is full of liquid which allows drainage of the contents of chamber A². It will be apparent that as the sleeve 13b descends the chamber B² increases in volume and is rapidly filled with liquid which passes through port 9b and fills up the bore of sleeve 13b. This prevents excess drainage back into the bottle.

Some simplification of structure may be had by providing the element 4c, Fig. 4, with a valve port means 8c to be controlled by the finger or thumb of the operator in connection with the depressing of the cap. Again, the overflow sleeve 12c is provided, and the sleeve valve therewithin having a small diameter portion 13c and large diameter portion 18c which closes off the ports 25c and 14c, so as to allow discharge of the segregated liquid in chamber A³ only after the port C in the small diameter portion 13c registers with port 14c thus providing a passageway from the port 25c to 14c. As in the foregoing, the surplus liquid over the measured charge is allowed to return to the container by the appropriately timed valve action.

The same means for preventing excess drainage are present in this embodiment as explained in Figs. 1 and 3. The chamber formed by the small diameter portion of sleeve 13b increases in volume as the sleeve descends, thus constantly returning liquid to the bottle or container. When the cap 4c is fully depressed liquid readily flows through port 25c and around portion 13c and thence outwardly through port 14c. This is the easiest port of travel because C³ is relatively small compared with port 14c. Furthermore, the tube leading to the bottle and the bore of the sleeve valve are substantially full of liquid, thus preventing excess drainage.

Instead of external springs for maintaining the cap in upper or extended position, small diameter coil springs 20d, Fig. 5, may be placed in bores in the cylinder or cap member, two or three or such number as desired, being arranged, preferably at equi-spaced circumferential distances, and these react between the cap and stationary posts 30 extending from the lower stationary element on the closure 3d. Again, the overflow sleeve 12d is provided and the control valve having its reduced portion 13d such as to provide a passage from the chamber when the port 14d is in register.

The discharge outlet 26e, Fig. 6, where desired, may be arranged directly in connection with an outlet port 14e in the extended sleeve portion 3f of the reciprocable member 4e, port 14e being uncovered when the port 13e is in register, at the depressed or lower position. Again, constant level overflow is provided at 12e. The air valve port means may be in the form of valve 3e normally closed by the spring 7e, and unseated by the upper end of the conduit 5e, likewise as foregoing. Or, where preferred, the air valve port means may be more simply a finger-controlled port 8f, Fig. 7, the general relationship of overflow 12f and the relatively movable elements 4f and 2f and the registering ports 13f and 14f being analogous. In such form, the extension spring 20f may be housed within the suitably provided portion 32 of the stationary member.

Limiting stop means preventing over-separation of the relatively movable elements where not provided by the anchorage of the extension springs themselves, may be had suitably for instance by a groove 34, as in Fig. 2, determining the length of the excursion of movement, the pin or screw 35 through the other member into such groove then permitting the desired range of movement, but being detachable to allow disassembly when desired. In like manner, the groove 34e, Fig. 6, may have its cooperating pin or screw 35e. The reciprocable member may be arranged to be held in its lower or discharged position until released, if desired, as for instance by a catch pin 33, Fig. 7, normally urged inwardly by a spring 39, and seating into the recess 40 in the inner member when the cap is depressed to its lower or discharged position. It will be understood that the limiting stop means may be provided on all of the forms of the dispensing device.

Irrespective of the presence or absence of the overflow sleeve 12c as in Fig. 4, a constant level means may be had in the form of an opening 120 such as to position at an appropriate height with relation to the amount of liquid for the charge, as by control of the air port 8c appropriately, the charge of liquid may be gauged by the overflow means and the air pressure occasions discharge of the segregated liquid in the chamber provided by the stationary element.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims, or the equivalent of such, be employed.

I therefore particularly point out and distinctly claim as my invention:

1. In a device of the character described adapted to be placed on a container of liquids, a stationary piston element, a cylinder element reciprocable thereon, a conduit extending from the cylinder into the liquid container, an air valve in the cylinder to be unseated by the top end

of the conduit when the cylinder is depressed, a conduit overflow sleeve on the piston element to determine the amount of liquid-charge, an internal sleeve carried by the cylinder reciprocable between said conduit and said overflow sleeve and having an opening above into the cylinder, a drain-opening below from said sleeve into said conduit, a passage from the lower part of said cylinder to a point of liquid discharge outside, resilient synthetic resin split ring packing means between said piston element and said cylinder, and spring means for raising the cylinder.

2. In a device of the character described adapted to be placed on a container of liquids, a stationary piston element, a cylinder element reciprocable thereon, a conduit extending from the cylinder into the liquid container, air port means in the top of said cylinder, a constant level overflow sleeve stationary on the piston element to determine the amount of liquid-charge, an internal sleeve carried by the cylinder reciprocable between said conduit and said overflow sleeve and having an opening above into the cylinder, a drain-opening below from said sleeve into said conduit, a passage from the lower part of said cylinder to a point of liquid discharge outside, resilient synthetic resin split ring packing means between said piston element and said cylinder, and spring means for raising the cylinder.

3. In a device of the character described adapted to be placed on a container of liquids, a stationary piston element, a displacement element reciprocable thereon to form a chamber between such elements on expansion, a conduit extending into the chamber between said elements from the liquid container, air port means in the top of said displacement element, a constant level overflow sleeve stationary on the piston element to determine the amount of liquid-charge, an internal sleeve carried by the displacement element reciprocable between said conduit and said overflow sleeve and having an opening above in the chamber, a drain-opening below from said sleeve to said conduit, a passage from the lower part of said displacement element to a point of liquid discharge outside, and spring means for raising the displacement element.

4. In a device of the character described adapted to be placed on a container of liquids, a stationary piston element, a displacement element reciprocable thereon, a conduit extending into the chamber between said elements from the liquid container, air port means in said displacement element, a constant level overflow sleeve stationary on the piston element, a passage from the lower part of said displacement element to a point of liquid discharge outside, and resilient means for raising the displacement element.

5. In a device of the character described adapted to be placed on a container of liquids, a stationary piston element, a displacement element reciprocable thereon, a conduit extending into the chamber between said elements from the liquid container, air port means in said displacement element, a constant level overflow to determine the amount of liquid-charge, and a passage from the lower part of said displacement element to a point of liquid discharge outside.

6. In a device of the character described adapted to be placed on a container of liquids, a stationary piston element, a displacement element reciprocable thereon, a conduit extending into the chamber between said elements from the liquid container, air port means in said displacement element, a constant level overflow to de-

termine the amount of liquid-charge, and synthetic resin ring packing means between said stationary element and said displacement element.

5 7. In a device of the character described adapted to be placed on a container of liquids, a stationary piston element, a displacement element reciprocable thereon, a conduit extending into the chamber between said elements from the liquid 10 container, air port means in said displacement element, a constant level overflow to determine the amount of liquid-charge, and limiting stop means for preventing separation of said displacement element from the stationary element. 15

8. In a device of the character described adapted to be placed on a container of liquids, a stationary piston element, a displacement element reciprocable thereon, a conduit extending into the 20 chamber between said elements from the liquid container, air port means in said displacement element, a constant level overflow to determine the amount of liquid-charge, and spring-controlled limiting stop means to prevent separation 25 of the elements.

9. In a device of the character described adapted to be placed on a container of liquids, a stationary piston element, a displacement element reciprocable thereon, a conduit extending into the chamber between said elements from the liquid 5 container, air port means in said displacement element, a constant level overflow to determine the amount of liquid-charge, spring means for raising said displacement element, bores in said displacement element to receive the same, and 10 posts on said stationary element engaging the spring means.

10. In a device of the character described adapted to be placed on a container of liquids, 15 a stationary piston element, a displacement element reciprocable thereon, a conduit extending into the chamber between said elements from the liquid container, air port means in said displacement element, a constant level overflow to 20 determine the amount of liquid-charge, and concealable resilient means normally urging the displacement element into extended position.

LAWRENCE G. BATES. 25