

PATENT SPECIFICATION

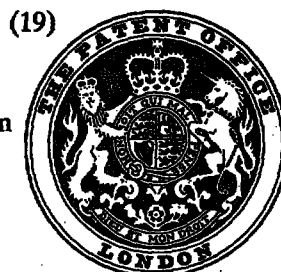
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(54) LIQUID DISPENSER

(71) We, J.D. ENGINEERING SERVICES PTY LIMITED., a Company incorporated under the Laws of the State of Queensland, of 8 Jones Road, Capalaba, in the State of Queensland 4157, Commonwealth of Australia, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:-

This invention relates to a liquid dispenser. In its simplest form, it comprises a liquid dispenser of the type which is adapted to co-operate with an inverted open topped container to dispense, upon actuation, a predetermined quantity of liquid from said inverted container.

There have been provided in the past many spirit dispensers for dispensing a predetermined quantity of spirit from a reservoir, for example a bottle. The dispensers that have been available for dispensing from a supported inverted bottle or other remote source utilise valve means or spring diaphragms to regulate the quantity of fluid dispensed. Accordingly, many of the presently available types of dispensers dispense amounts of spirit which may vary over a wide range.

The invention seeks to provide a liquid dispenser which will overcome the disadvantages of the presently available dispensers. In its simplest form, the present invention utilizes gravitational operation and simple construction in order to achieve consistent operation. Other objects and advantages of the invention will become apparent from the following description.

According to this invention we provide a liquid dispenser having a metering chamber constituted by a lower voluminous part which contains substantially all the liquid in said metering chamber and an upper part having a relatively small cross-sectional

area, whereby variations of the level of liquid in said upper part will result in only small percentage variations in volume of liquid dispensed, means being provided for varying the volume of the lower voluminous part when it is desired to vary the volume of liquid dispensed; a supply chamber adapted for liquid communication with the metering chamber through normally open supply valve means whereby the liquid in said chambers may be maintained at the same level; an outlet drain from said metering chamber through which liquid may be drained from said metering chamber; and normally closed outlet valve means for controlling the flow of liquid through said outlet drain, said supply valve means and said outlet valve means being adapted to co-operate in such manner that upon opening said outlet valve means to dispense liquid from said metering chamber, said supply valve means closes and then subsequently re-opens for replenishing said metering chamber from said supply chamber only after said outlet valve means has closed.

In order that the invention may be more readily understood and put into practical effect, reference will now be made to the accompanying drawings which illustrate the preferred embodiments of the invention, and wherein:-

Figure 1 illustrates a manually operable spirit dispenser made in accordance with the present invention;

Figure 2 illustrates an electrically operated embodiment and

Figure 3 illustrates diagrammatically the liquid valve and electric control apparatus for the embodiment illustrated in Figure 2.

As illustrated in Figure 1, the manually controlled dispenser 10 is adapted for dispensing a selected quantity of spirit from an inverted bottle 11, only the lowermost portion of which is shown, and the dispenser 10 comprises a body portion 12 moulded of

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clear plastics material and including a supply chamber 13 and a metering chamber 14. A reciprocable piston 15 is sealably slidable in the metering chamber 14 and is adjustably mounted so that the volume of the metering chamber 14 therebelow may be selectively varied. For this purpose, the piston 15 is supported by a hollow piston rod 16 which passes threadedly through a top cap 17 which is fixed into the open upper end of the metering chamber 14. The passage through the hollow rod 16 communicates with the underside of the piston 15. Thus, the piston rod 16 performs the dual functions of supporting the piston 15 at a selected position within the chamber and of providing an air bleed to the metering chamber 14.

The metering chamber 14 is adapted to be replenished from the supply chamber 13 through the manually operable two-way valve means 18 provided to control the flow of fluid between the chambers 13 and 14, and through the outlet 19. In this embodiment, the manually operable valve means comprises a single movable valve member 20 reciprocable between opposed upper and lower valve seats 21 and 22 so that in use, when one valve seat is sealed by the member 20 the other is open. The support shaft 28 for the valve member 20 is urged downwardly by the spring 29 fitted between the top cap 30 and the circlip 31 so that the outlet 19 is normally closed. The support shaft 28 may be moved upwards by downward movement of the outer end of the trigger shaft 32 connected pivotally to the upper end of the shaft 28 and supported pivotally on a bracket 33 retained beneath the top lock nut 34 for the piston rod 16.

Thus, if the valve member 20 is moved upwards to engage the upper valve seat 21, the valve member 20 will clear the lower valve seat 22 so that spirit will flow from the metering chamber 14 through the outlet 19. After emptying the metering chamber 14, if the trigger 32 is released, the valve member 20 is moved downwards by the spring 29 to engage the lower valve seat 22 to close the outlet 19. Simultaneously, the valve member 20 is moved from the upper valve seat 21 so that the chambers 13 and 14 are again placed in fluid communication through the passageway 23. Thus, the emptied metering chamber 14 will fill from the supply chamber 13 until the level of both chambers is the same.

It will be seen from the drawings that the open metering chamber 14 comprises a lower bulbous portion, beneath the piston 15, and an upper small diameter portion formed by the air bleed passage in the piston rod 16. With this arrangement, any variation in the level of the liquid in the metering chamber will be a variation in the level within the very small diameter air bleed pas-

sage 31 and will result in only a very small percentage variation in the volume of liquid contained in the metering chamber 14.

In this embodiment, the level of the liquid in the supply chamber 13, is maintained by supporting the bottle 11 with its lowermost opening positioned at the desired liquid level and on a grate-type cradle 25. When the liquid level in the supply chamber 13 drops, spirit will flow into the supply chamber 13 until it contacts the open neck portion of the bottle.

To facilitate inversion of the bottle for insertion into the supply chamber 13, there is provided a safety valve assembly 24 in the neck of the bottle 11 adapted to prevent spillage during inversion of the bottle prior to its engagement with the support cradle 25 at the upper end of the chamber 13. This safety valve assembly has a valve member 26 co-operating with a spring urged stem 27 to maintain the valve closed until the bottle is moved vertically downwards to its final supported position on the cradle 25. Upon this action, the stem 27 co-acts with the cradle 25 and moves upwards relative to the bottle 11 to open the valve assembly 24.

For comparison purposes, parts of the embodiment illustrated in Figs. 2 and 3 corresponding with parts of the just described embodiment are denoted with the same numeral suffixed by the letter "a".

This dispenser 10a differs from the dispenser 10 mainly in that the metering chamber 14a is formed above the piston 15a and the passage 28a in the piston rod forms the dispensing outlet from the metering chamber 14a. Also the valve means 18a operable to place the chambers 14a and 13a and the outlet 19a in the desired communication is a separate fitting and is electrically controlled.

The metering chamber 14a is replenished from the supply chamber 13a through the valve means 18a which in this embodiment is a flap valve biased for closure of the outlet passage 19a but normally permitting communication between the drain passage 28a and the passage 41 communicating with the metering chamber 14a and the supply chamber 13a respectively. When the flap valve member 20a is pivoted to close the passage 41 at the seat 42 the spirit in the metering chamber 14a will flow through the drain passage 28a, the interior 43 of the valve 18a to and through the outlet 19a. After the metering chamber 14a has been emptied the valve member 20a is actuated to return to its normal position across the outlet valve seat 43, as illustrated, so that the emptied metering chamber 14 will re-fill from the supply chamber 13a until the level of both chambers is the same. The chamber 14a is provided with an upper small diameter level passage 44 for achieving consis-

tently accurate results as previously described. Furthermore the liquid level is fixed at the lower end of the inlet stem 45 so that the only variable is the position of the piston 15a.

As shown in Fig. 3, the two-way flap valve 18a is arranged for actuation by a cam 50 connected to the output shaft 51 of a synchronous motor and gearbox assembly 52. The flap valve member 20a is connected operatively to a valve pivot lever 53 which is disposed with its cam-contacting abutment 54 in operative relationship relative to the cam face 55 of the cam 50. The valve member 20a is contained sealably within a flexible shroud (not shown) which passes into the chamber 43 and which seals around the opening 46 through which the valve lever 53 passes. The output shaft 51 also supports a notched cam 56 which co-operates with the switch lever 57 of a limit switch assembly 58 such that when the abutment 59 of the switch lever 57 is located within the notch 60 of the cam 56, the contacts of the switch are placed in open-circuit, but are closed when the cam 56 is rotated causing the abutment 59 to move outwards and bear against the outer periphery 61 of the cam 56.

When the abutment 54 of the valve lever 53 bears against the cut-away face 62 of the cam member 50, the flap valve member 20a is held sealably against the outlet seat 43 (which is shown diagrammatically in half-section in the drawings). As the cam 50 is rotated, the abutment 54 is moved to engage the part-circular portion 63 of the cam face 55, in which position the valve lever 53 is positioned to maintain the flap member 20 sealably against the seat 42. In this position, spirit may flow from the dispenser 10a through the outlet 19a.

The valve lever 53 is provided with spring means 64 adapted to urge the flap for sealing engagement with the seat 43. There is also provided an actuating press button assembly 65 to actuate the device, the electrical connection between the press button assembly, electric motor, power supply and micro-switch being shown.

In operation, when the button 65 is pressed, the motor and gearbox assembly is activated and the output shaft 51 rotates. Upon initial rotation the abutment 59 of the micro-switch is moved to contact the outer periphery of the cam 56, whereupon the contacts of the micro-switch are maintained closed so that the motor will continue to operate until the abutment 59 falls back into the notch 60 at the end of one revolution of the cam 36. Simultaneously, the valve lever 53 is pivoted from its normal inoperative position, as shown, to urge the flap member 20a sealably against the valve seat 42. In this position, spirits can flow through the outlet

passage 19a. The flap 20a is maintained in this position long enough to dispense the contents of the metering chamber by correct selection of the arc of the part-circular cam surface 63. Prior to completion of the cycle, coinciding with one revolution of the output shaft 31 as set out above, the cam engages the cut-away portion 62 of the cam surface 55 to enable the spring 44 to urge the flap member 20 back into engagement with the outlet 19. It will thus be seen that the device is of simple construction and that actuation is entirely mechanical. However various other control arrangements could be used advantageously. Of course there is provided an air bleed 46 so that the liquid levels will be maintained at the same level.

Furthermore the dispenser could be produced to dispense one selected volume only, whence the inclusion of the piston 15a, would not be essential. However, it may be then desirable to provide fine adjustment by adjustably mounting the outlet stem 45 for providing adjustment of the liquid level in the supply chamber 13a.

Also, while in the preferred embodiments only one movable valve member provides a dual function, it will be understood that separate valves could be provided for controlling the flow of fluid of liquid between the supply chamber and the metering chamber and for controlling the flow of fluid from the metering chamber through the outlet. Many other means which are commonly employed may be provided to maintain the level of liquid in the supply chamber at the preselected level, even if the liquid source is remote from the dispenser. Also the metering chamber and the supply chamber may, if desired, be supported remotely from one another.

WHAT WE CLAIM IS:-

1. A liquid dispenser having a metering chamber constituted by a lower voluminous part which contains substantially all the liquid in said metering chamber and an upper part having a relatively small cross-sectional area, whereby variations of the level of liquid in said upper part will result in only small percentage variations in volume of liquid dispensed, means being provided for varying the volume of the lower voluminous part when it is desired to vary the volume of liquid dispensed; a supply chamber adapted for liquid communication with the metering chamber through normally open supply valve means whereby the liquid in said chambers may be maintained at the same level; an outlet drain from said metering chamber through which liquid may be drained from said metering chamber; and normally closed outlet valve means for controlling the flow of liquid through said outlet drain, said supply valve means and said outlet valve means being adapted to co-operate

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When the abutment 54 of the valve lever 53 bears against the cut-away face 62 of the cam member 50, the flap valve member 20a is held sealably against the outlet seat 43 (which is shown diagrammatically in half-section in the drawings). As the cam 50 is rotated, the abutment 54 is moved to engage the part-circular portion 63 of the cam face 55, in which position the valve lever 53 is positioned to maintain the flap member 20 sealably against the seat 42. In this position, spirit may flow from the dispenser 10a through the outlet 19a.

The valve lever 53 is provided with spring means 64 adapted to urge the flap for sealing engagement with the seat 43. There is also provided an actuating press button assembly 65 to actuate the device, the electrical connection between the press button assembly, electric motor, power supply and micro-switch being shown.

In operation, when the button 65 is pressed, the motor and gearbox assembly is activated and the output shaft 51 rotates. Upon initial rotation the abutment 59 of the micro-switch is moved to contact the outer periphery of the cam 56, whereupon the contacts of the micro-switch are maintained closed so that the motor will continue to operate until the abutment 59 falls back into the notch 60 at the end of one revolution of the cam 36. Simultaneously, the valve lever 53 is pivoted from its normal inoperative position, as shown, to urge the flap member 20a sealably against the valve seat 42. In this position, spirits can flow through the outlet

passage 19a. The flap 20a is maintained in this position long enough to dispense the contents of the metering chamber by correct selection of the arc of the part-circular cam surface 63. Prior to completion of the cycle, coinciding with one revolution of the output shaft 31 as set out above, the cam engages the cut-away portion 62 of the cam surface 55 to enable the spring 44 to urge the flap member 20 back into engagement with the outlet 19. It will thus be seen that the device is of simple construction and that actuation is entirely mechanical. However various other control arrangements could be used advantageously. Of course there is provided an air bleed 46 so that the liquid levels will be maintained at the same level.

Furthermore the dispenser could be produced to dispense one selected volume only, whence the inclusion of the piston 15a, would not be essential. However, it may be then desirable to provide fine adjustment by adjustably mounting the outlet stem 45 for providing adjustment of the liquid level in the supply chamber 13a.

Also, while in the preferred embodiments only one movable valve member provides a dual function, it will be understood that separate valves could be provided for controlling the flow of fluid of liquid between the supply chamber and the metering chamber and for controlling the flow of fluid from the metering chamber through the outlet. Many other means which are commonly employed may be provided to maintain the level of liquid in the supply chamber at the preselected level, even if the liquid source is remote from the dispenser. Also the metering chamber and the supply chamber may, if desired, be supported remotely from one another.

WHAT WE CLAIM IS:-

1. A liquid dispenser having a metering chamber constituted by a lower voluminous part which contains substantially all the liquid in said metering chamber and an upper part having a relatively small cross-sectional area, whereby variations of the level of liquid in said upper part will result in only small percentage variations in volume of liquid dispensed, means being provided for varying the volume of the lower voluminous part when it is desired to vary the volume of liquid dispensed; a supply chamber adapted for liquid communication with the metering chamber through normally open supply valve means whereby the liquid in said chambers may be maintained at the same level; an outlet drain from said metering chamber through which liquid may be drained from said metering chamber; and normally closed outlet valve means for controlling the flow of liquid through said outlet drain, said supply valve means and said outlet valve means being adapted to co-operate

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- in such manner that upon opening said outlet valve means to dispense liquid from said metering chamber, said supply valve means closes and then subsequently re-opens for replenishing said metering chamber from said supply chamber only after said outlet valve means has closed. 45
2. A liquid dispenser according to claim 1, wherein said supply chamber is adapted to co-operate with an inverted bottle such that the level of liquid within said supply chamber is at the lower open end of said bottle. 50
3. A liquid dispenser according to claim 1 or 2, wherein said lower part is of cylindrical form and contains a piston assembly, the latter being selectively movable through said lower part to vary the volume of said metering chamber. 55
4. A liquid dispenser according to claim 3, wherein said piston assembly is connected to a hollow piston rod adapted to provide a flow-through passage communicating with the interior of said metering chamber. 60
5. A liquid dispenser according to claim 4, wherein said piston rod extends upwards from said piston and said flow-through passage constitutes said upper part of said metering chamber. 65
6. A liquid dispenser according to claim 4, wherein said piston rod extends downwards from said piston and constitutes a portion of said outlet drain. 70
7. A liquid dispenser according to any one of the preceding claims, wherein said metering chamber and said supply chamber communicates via a valve assembly having three ports communicating with a common valve chamber, said ports comprising a first port constituting a common inlet and outlet to or from said metering chamber, a second port operatively connected to said supply chamber and a third port operatively connected to the downstream portion of said outlet drain, and a valve member reciprocable within said valve chamber for sealable engagement with a respective one of either said second port or said third port, the valve member and first and second ports providing said supply valve means and said valve member and said second and third ports providing said outlet valve means. 75
8. A liquid dispenser according to claim 7, wherein said valve member is spring urged for closure of said third port and is operatively connected to electrically operated actuating means adapted, upon actuating, to move said valve member from said third port and into sealable engagement with said second port for a period of time sufficient to drain the contents of said metering chamber through said outlet drain. 80
9. A liquid dispenser according to any one of the preceding claims, wherein said metering chamber and said supply chamber are formed as a one piece moulding.
10. A liquid dispenser according to any one of the preceding claims, wherein the liquid level within said supply chamber is variable by varying the vertical position of the outlet from said bottle.
11. A liquid dispenser substantially as hereinbefore described with reference to the accompanying drawings.
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