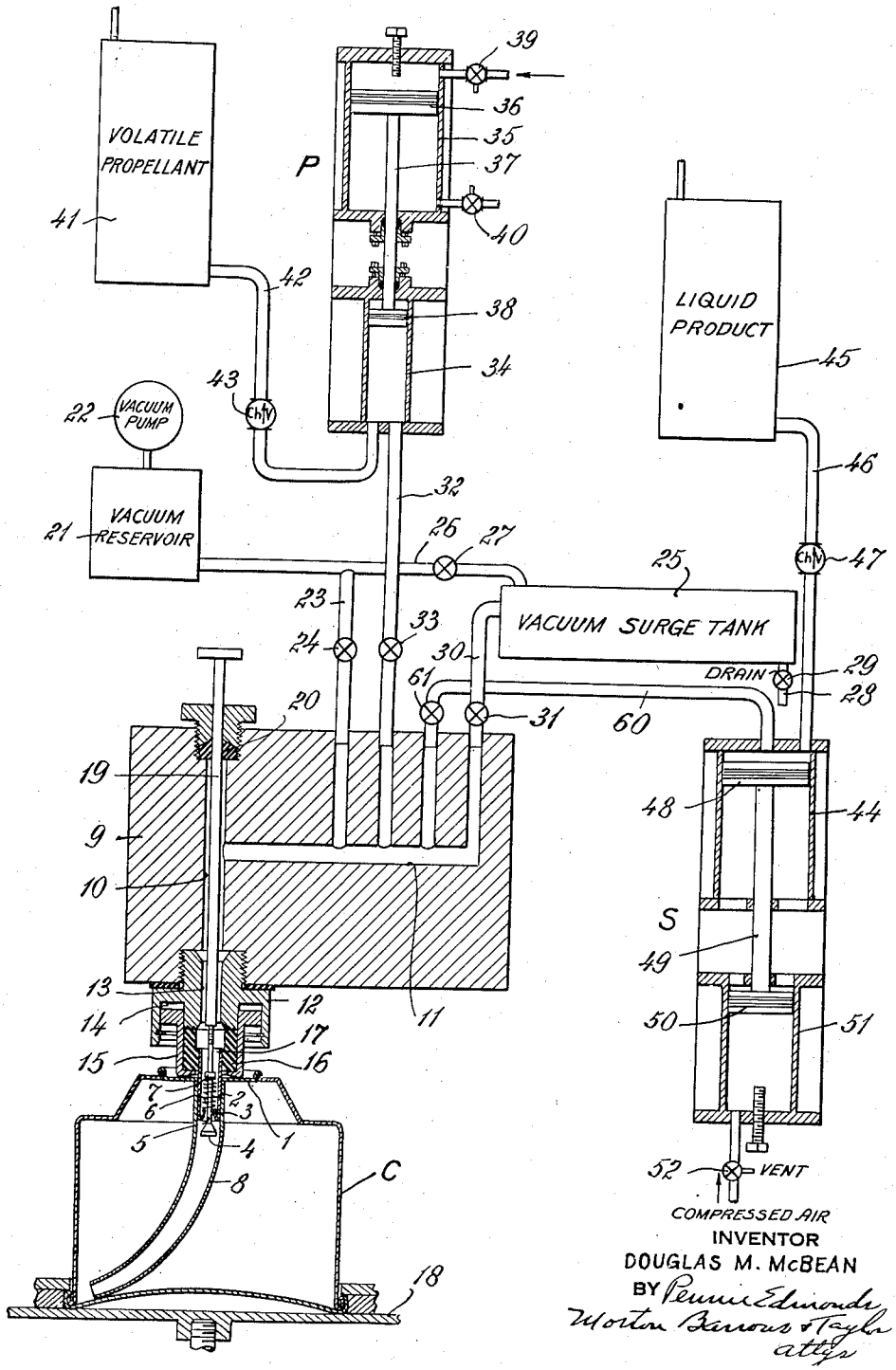
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METHOD FOR CHARGING LIQUID PRODUCTS AND VOLATILE PROPELLANTS INTO PRESSURE-TIGHT CONTAINERS

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METHOD FOR CHARGING LIQUID PRODUCTS AND VOLATILE PROPELLANTS INTO PRESSURE-TIGHT CONTAINERS

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5 Claims. (Cl. 226—100)

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This invention relates to the filling of compositions comprising liquid products and volatile propellants into pressure-tight packaging containers, and more particularly to a method in which the composition is maintained under considerable superatmospheric pressure during the filling operation so as to maintain the volatile propellant in liquid phase during filling and in the filled container. The invention also includes improved apparatus by which the method may be carried out.

Pressure-tight cans or packaging containers having valve controlled outlets may be filled or charged with compositions comprising a volatile propellant and a liquid product by introducing these ingredients under a super-atmospheric pressure sufficient to maintain the propellant in liquid phase. By a volatile propellant, I mean a compound having a vapor pressure considerably above atmospheric pressure at normal room temperatures. Such compositions are desirably charged into the packaging containers under sufficient pressure to maintain the volatile propellant in liquid phase, both during the charging operation and in the charged container. If not maintained under such pressure, the propellant would vaporize and so expand to such a volume that only a small quantity of the composition could be charged into the container. One method involving the charging of such compositions into packaging containers under pressure is disclosed in my Patent No. 2,641,399, granted June 9, 1953, on a copending application.

When a composition of the type described is charged under pressure into a container through a valve controlled container opening, the charging passages leading to the container opening are, at the conclusion of the charging operation, filled with a mixture of the liquid preparation and the volatile propellant under considerable superatmospheric pressure. When the filled container is disconnected from the charging passages, this mixture is forcibly discharged from the charging passages by its pressure and by the flashing or sudden vaporization of the volatile propellant constituent thereof upon release of pressure therefrom. The thus discharged composition flows over the filled container being disconnected from the charging passage and over the container supporting and conveying means, necessitating subsequent cleansing of the filled container and frequent cleansing of the container supporting and conveying mechanism. This discharge of composition from the charging passages is particularly undesirable where the liquid product comprises a foam producing material, such as an aqueous soap solution, which is expanded into a lather or foam by vaporization of the volatile propellant when the composition is released to atmospheric pressure. Lather producing compositions of this type are disclosed in my Patent No. 2,655,480, granted October 13, 1953, on a copending application.

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It is the primary object of the present invention to provide an improved method for charging a liquid product and a volatile propellant into a pressure-tight packaging container through a valve controlled opening in the container without permitting vaporization of the volatile propellant so charged and without the discharge of the filled materials from the charging passage when the filled container is disconnected therefrom. A further object of the invention is the provision of improved apparatus by means of which the improved method can be carried out. In general, the method of the invention includes the steps of charging the container through an opening with the volatile propellant and liquid product under sufficient superatmospheric pressure to prevent substantial vaporization of the propellant, closing the container opening while the container is connected to the charging passage, then while the container is so connected, connecting the charging passage to a chamber maintained under partial vacuum whereby the volatile propellant and liquid product remaining in the charging passage is withdrawn therefrom and the pressure therein is reduced to a subatmospheric value, and finally disconnecting the container from the charging passage.

In describing the invention in detail, reference will be made to the accompanying drawing, in which the single figure illustrates apparatus embodying the invention and by means of which the method of the invention may be carried out.

As illustrated in the drawing, the pressure-tight packaging container comprises a can C having a top wall 1 with a central tube 2 sealed therein and forming the can opening. A suitable valve mechanism is provided and as here illustrated comprises an inturned flange 3 at the inner end of the tube 2, which forms a valve seat for cooperation with a valve plug 4 carried by a stem 5 extending through the tube 2. The stem 5 is biased to move the plug 4 to valve closing position by a spring 6 compressed between the inner face of the flange 3 and a stop 7 struck from the stem 5. Depression of the outwardly extending end of the stem 5 opens the valve and upon release of the stem the spring 6 closes it.

A syphon tube 8 may be fitted over the inner end of the valve tube 2 and extended to a point near the bottom of the can C to insure substantially complete expulsion of the can contents when the can is in use.

The can C illustrates one of a series of pressure-tight valve equipped packaging containers that are successively connected in pressure-tight relation with a charging passage and there charged with volatile propellant and liquid product under superatmospheric pressure in accordance with the method of the invention. As shown, a block 9 is provided with a charging passage comprising a duct 10 and a connected duct 11. The duct 10 extends vertically in the block and its lower end forms a charging opening provided with suitable means for effecting a pressure-tight coupling or connection with the can opening comprising the upper end of the tube 2. As here illustrated, the coupling mechanism comprises a body 12 secured to the block 9 at the end of the duct 10 having a central opening 13 extending therethrough in line with the duct 10. An annular channel 14 in the lower face of the body 12 slidably carries a compression member 15, the flanged lower end of which lies beneath the lower end of a compressible resilient gasket 16 of rubber or other suitable material. The central opening 17 of the gasket 16 is of a size to receive the can tube 2 and pressure of the top wall 1 of the can C on the compression member 15 expands the gasket 16 so that it forms a pressure-tight connection between the can tube 2 and the opening 13 leading to the block duct 12. The can C is preferably lifted to connected position on a vertically movable platform 18, which forces the can upward to effect the described connection and which may be lowered to disconnect the can from the charging passage.

A can valve operating rod 19 is provided in the duct 10 and as here illustrated comprises a simple rod spaced concentrically from the wall of the duct and extending out of the top of the block 9 through a pressure-tight packing joint 20. When the rod 19 is depressed, its lower end engages the upper end of the valve stem 5 and so opens the valve, and when the rod 19 is lifted, the stem 5 is released and the valve is closed. The rod 19 may be operated by any suitable mechanism, such for example as that disclosed in my copending application Serial No. 147,583, filed March 4, 1950.

A source of vacuum, here illustrated as a vacuum reservoir 21 connected to be evacuated by a vacuum pump 22, is connected to the duct 11 through a conduit 23 controlled by a valve 24. A vacuum surge tank 25 is connected to the vacuum reservoir through a conduit 26 having a valve 27 therein. The vacuum surge tank 25 has a drain 28 provided with a valve 29. A conduit 30 provided with a valve 31 connects the vacuum surge tank 25 with the duct 11.

Suitable means are provided to supply volatile propellant and a liquid product under superatmospheric pressure to the ducts 10 and 11 that form the container charging passage. As here shown, a propellant conduit 32 provided with a control valve 33 is connected to the propellant cylinder 34 by a propellant metering device, generally designated P. The device P comprises essentially a power cylinder 35 carrying a piston 36 connected by a rod 37 to a piston 38 in a propellant cylinder 34. Compressed air or other motive fluid from a suitable source is alternatively admitted to and vented from opposite ends

of the power cylinder 35 under control of the valves 39 and 40 in order to reciprocate the connected pistons 36 and 38 and so force successive measured charges of propellant under superatmospheric pressure from the cylinder 34 into successive cans to be filled. Volatile propellant in liquid phase is supplied to the propellant cylinder 34 from a supply tank 41 through a conduit 42 provided with a check valve 43.

The means for supplying a liquid product which may be a foam or lather producing liquid, such as an aqueous soap solution, is here illustrated as a metering device S, including a product cylinder 44 connected to the block duct 11 by a conduit 60 controlled by a valve 61. A product supply tank 45 is connected to the product cylinder 44 through a conduit 46 having a check valve 47 therein. A piston 48 in the product cylder 44 is connected by a rod 49 to a power cylinder piston 50. Compressed air or other motive fluid is admitted to and vented from the power cylinder 51 by means of a valve 52 whereby the connected pistons 48 and 50 are reciprocated to deliver successive measured charges of liquid product under superatmospheric pressure to the successive cans to be filled. The pressure under which the volatile propellant and the liquid product are charged by means of the metering devices P and S is sufficiently high to maintain the volatile propellant in liquid phase at the prevailing temperatures.

In carrying out my improved method by the apparatus described, the can C is connected in pressure-tight relation to the charging passage comprising the ducts 10 and 11 and the can valve is opened by depressing the rod 19. The can may then be evacuated by opening the valve 24 for a suitable interval. Then measured quantities of liquid product and volatile propellant in liquid phase are charged into the can by opening the valves 33 and 61 and operating the metering devices S and P. The pressure under which the product and propellant are charged into the can is maintained at a high superatmospheric value substantially above the vapor pressure of the volatile propellant at the prevailing temperature, so that no substantial vaporization of the propellant occurs during the charging operation.

At the conclusion of the charging operation, the can C and the charging passage comprising the ducts 10 and 11 are filled with liquid product and some volatile propellant in liquid phase and are under considerable superatmospheric pressure. At this point, the can valve is closed by lifting the rod 19, and then the charging passage is connected to the vacuum surge tank 25 by opening the valve 31. This suddenly reduces the pressure in the charging passage, causing flashing or sudden vaporization of any volatile propellant contained therein, which draws some of the liquid product contained in the charging passage through the conduit 30 into the vacuum surge tank 25. By this operation, not only is the charging passage cleared of some of the liquid product and volatile propellant therein, but in addition the pressure in the charging passage is reduced to a value somewhat below atmospheric pressure. The can C is then disconnected from the charging passage and the remainder of the liquid product in the charging passage is forced into the tank 25 by atmospheric pressure. Due to the vacuum surge operation described, no liquid product or volatile propellant is discharged from the charging passage when the can is disconnected therefrom.

The vacuum surge tank 25 may be maintained at a suitable sub-atmospheric pressure by opening the valve 27. Liquid product may be periodically drawn from the vacuum surge tank 25 by closing the valve 27 and the valve 31 and opening the drain valve 29.

I claim:

1. The method of charging a liquid product and a volatile propellant into a pressure-tight packaging container having a valve controlled opening which comprises effecting a pressure-tight connection between the container opening and a charging passage, opening the container valve, introducing liquid product and volatile propellant to the container through the charging passage under superatmospheric pressure, closing the container valve, thereafter, but before breaking the pressure-tight connection, connecting the charging passage to a chamber maintained at sub-atmospheric pressure whereby volatile propellant and liquid product is withdrawn from the charging passage, and then disconnecting the container opening from the charging passage.

2. The method of charging a liquid product and a volatile propellant into a pressure-tight can having a valve controlled opening which comprises connecting the can opening to a charging passage, opening the can valve, introducing measured charges of liquid product and a volatile propellant to the can through the charging passage under superatmospheric pressure above the vapor pressure of the propellant at the prevailing temperature, closing the can valve, thereafter, but before breaking the pressure-tight connection, subjecting the charging passage to sub-atmospheric pressure whereby volatile propellant and liquid product remaining in the charging passage are withdrawn therefrom and the pressure in such passage is reduced to a sub-atmospheric value, and then disconnecting the can opening from the charging passage.

3. In a method of charging a liquid product and a volatile propellant into a pressure-tight container having a valve controlled opening in which the product and the propellant are introduced into the container through a charging passage to which the container is releasably connected under a superatmospheric pressure above the vapor pressure of the propellant at the prevailing temperature, the improvement which comprises closing the container valve after the product and propellant have been charged into the container and before disconnecting the container from the charging passage, then subjecting the charging passage to a subatmospheric pressure whereby

volatile propellant and liquid product remaining in the charging passage is withdrawn therefrom and the pressure in such passage is reduced to a subatmospheric value and then disconnecting the container from the charging passage.

4. In a method of charging a liquid product and a volatile propellant into a pressure-tight container having a valve controlled opening in which the product and the propellant are introduced into the container through a charging passage to which the container is releasably connected under a superatmospheric pressure above the vapor pressure of the propellant at the prevailing temperature, the improvement which comprises closing the container valve after the product and propellant have been charged into the container and before disconnecting the container from the charging passage, then connecting the charging passage to a chamber maintained at a sub-atmospheric pressure whereby volatile propellant and liquid product remaining in the charging passage are withdrawn therefrom, and then disconnecting the container from the charging passage.

5. Apparatus for charging a liquid product and a volatile propellant into a pressure-tight packaging container having an opening controlled by a valve comprising a charging passage having a container charging opening, means for releasably connecting a container opening in pressure-tight relation to said charging passage opening, means for forcing a volatile propellant and a liquid product through said charging passage and into said container under superatmospheric pressure, a movable valve operating rod in said charging passage for operating the container opening valve, a source of vacuum, a vacuum surge tank, means for connecting said surge tank to said source of vacuum, means for selectively connecting said surge tank to said charging passage, and means for draining accumulated liquid product and volatile propellant from said vacuum surge tank.

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