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SYSTEM AND APPARATUS FOR FILLING AND CLOSING
CANS CONTAINING PRESSURE PROPELLANT
AND OTHER INGREDIENTS

Filed May 9, 1952 2 Sheets-Sheet 1

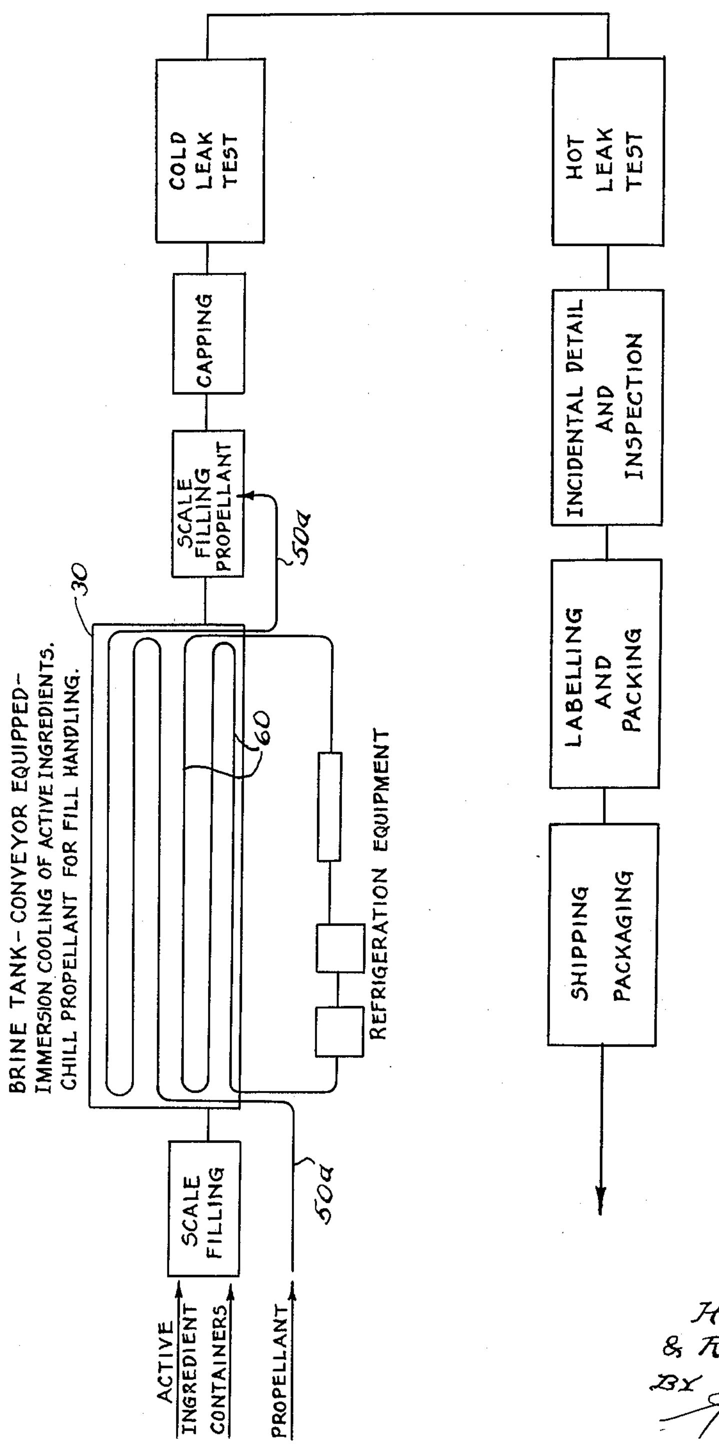

FIG. 1

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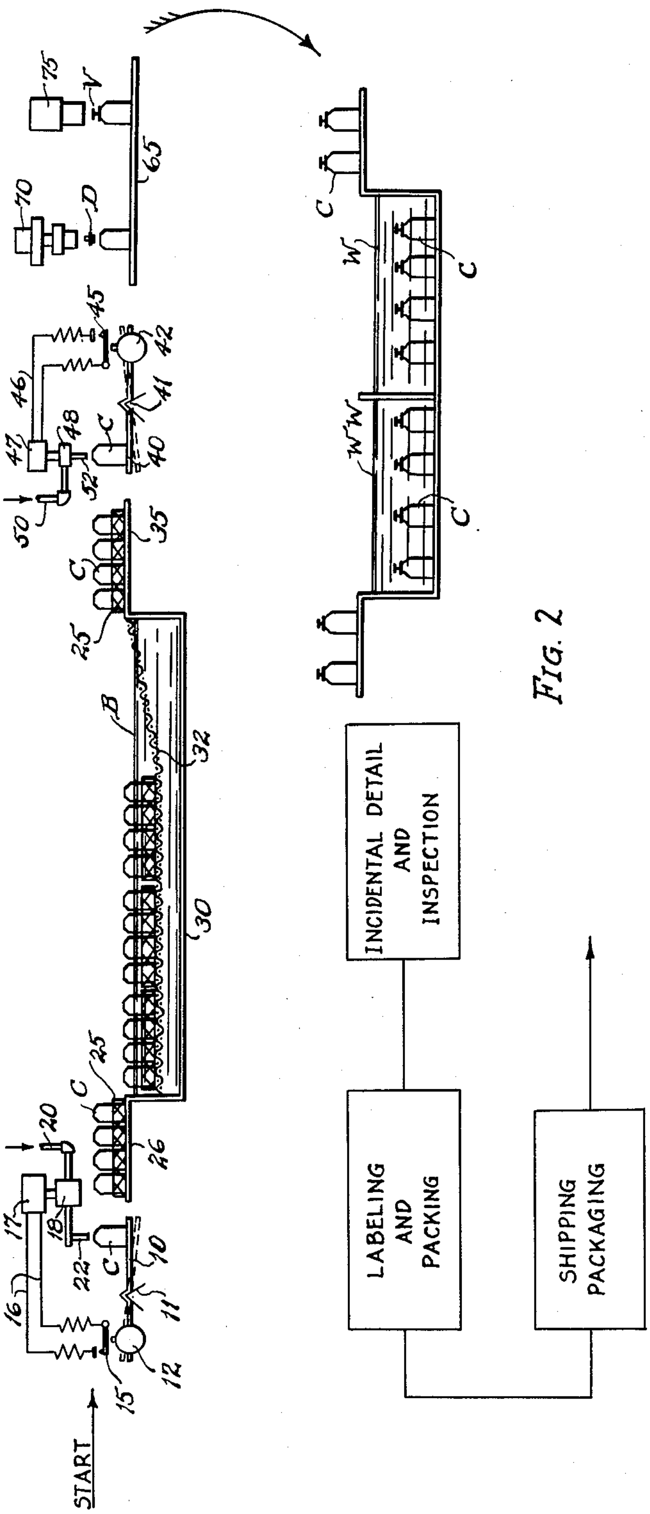

FIG. 2

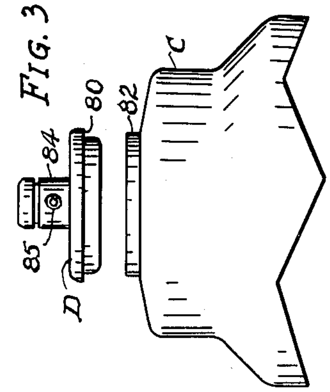

FIG. 3

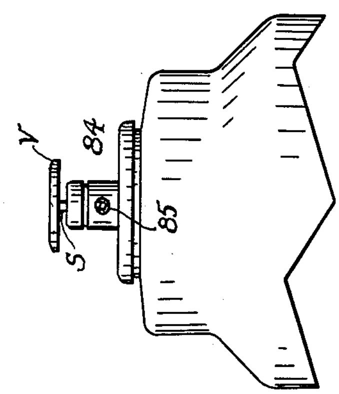

FIG. 4

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SYSTEM AND APPARATUS FOR FILLING AND CLOSING CANS CONTAINING PRESSURE PROPELLANT AND OTHER INGREDIENTS

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1 Claim. (Cl. 226—70)

This invention relates to a process and apparatus for mixing liquified gas with an active ingredient in an aerosol can, including filling, capping, testing and preparing the can for shipment and use.

In the course of filling an aerosol can with a mixed active ingredient and a liquified gas, it is essential that the active ingredient or element, which may be paint, insecticide, varnish, or the like, be at a low temperature consistent with that necessary to mix with the gas material which may be liquified dichlorodifluoromethane or trichlorodifluoromethane, or the like (Freon).

Such a liquified gas must be maintained at a low temperature to prevent evaporation. The evaporation must be minimized until after the capping and closing of the can. Following the comingling of the material and the gas, and the closing, it is essential to test the cans for leakage under cold or low temperature condition, followed by a required test at a higher temperature, substantially above that of normal room temperature. To this end the closed and capped cans are immersed for predetermined period in cold liquid (water) and then are immersed in hot water for further test under the resulting higher pressure of the contained propellant.

The filled and tested cans are then given incidental detail treatment and inspection, and may be labeled and packed for shipping.

Heretofore, the bringing together of the materials at the proper temperature in the can has afforded both mechanical difficulties and time-consuming preparatory steps.

The filling is simplified by the present method, and it has been found that by carrying out the process with a simple apparatus illustrated and hereinafter described, that with different types of active ingredients or material in the can, the balance of the can may be filled with the liquified gas, and the subsequent steps carried out without the delays heretofore encountered in the preparatory and filling steps. For example, cans containing the material to be mixed with liquified gas have been subjected to low temperature in apparatus such as a special "deep freeze" device which requires opening and closing the chamber, and if progressive or continuous movement is attempted it becomes necessary to automatically open and close the entrance and exit.

Furthermore, the step of subjecting the can in partially filled condition, that is, with its active ingredient content, to very low air temperature, involves difficulty in attaining precise control and is not effective in utilization of the low temperature-producing means.

In carrying out the present invention, the cans are partially filled at room temperature with the desired active ingredient to the precise predetermined amount, as by scale-controlled filling apparatus. These partially filled cans are then placed in a carrier or basket with others, and the cans, with the tops open, are partially immersed in an elongated shallow body of brine in an open tank. While cooling the cans may be progressed, over a period of time, from one end of the brine tank to the other.

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When the cans and the active ingredient are chilled to the desired temperature of approximately zero Fahrenheit, they are then removed from the open tank. The open end of the can is then placed under a spout supplying liquified gas fed through a cooling body and insulated pipes. The pipe or conduit for the liquified gas may be passed in a series of turns through the same body of cold brine in the tank—both for convenience and simplicity and cheapness of construction. By so doing one refrigerating apparatus only is needed to maintain the desired low temperature of the brine, which cools both the active ingredient and the liquified gas. The filling of the cans to a desired amount may also be controlled by a scale-operated valve, and the can and its contents in this cold condition are moved to a capping device which seals the cover end on the can. A suitable valve on the cover is now closed, sealing the contents therein. While still cold the cans are arranged for easy inspection for the detection of any leaks. They are then completely immersed in another open shallow tank containing cool to warm water. Next, they are immersed in hot water of a temperature required by safety regulations, the temperature varying according to the nature of the can and to the pressure generated by the liquified gas and other conditions.

The water in this open tank may be maintained, for example, at 140° F. for an aerosol can which normally expels its contents under 35 or 40 pounds per square inch of internal pressure at normal room temperatures. Thus, for example, if the liquified gas is Freon, dichlorodifluoromethane and trichlorodifluoromethane, that temperature will result in a test of internal pressure at 75 to 80 pounds.

The liquid in the brine tank should not be allowed to spill into the cans. To assure cooling the contents, the brine level should come to a point near the top of the can, say, an inch or so from the top, when the cans are held in baskets resting on the supports in the brine tank. These baskets may be moved along progressively, the desired cool temperature being assured by the time the cans reach the end opposite from that at which they were put in, and from where they are removed for completing the filling with a liquified gas.

In the accompanying drawings is illustrated a diagrammatic arrangement of apparatus and the order of the movement or flow sequence of the cans, and also accompanying diagrammatic illustrations of the scale-control can-filling devices, etc.

Referring to the drawings:

Fig. 1 is a diagram of the apparatus used in carrying out our process, and in which the rectangles and legends associated therewith indicate the steps and order of sequence;

Fig. 2 is a somewhat diagrammatic view showing the scale filling brine tank capping and testing apparatus in side elevation, and continuing with the finishing steps indicated by rectangles and legends;

Fig. 3 is an elevation of the can top and valve body about to be placed on the can; and

Fig. 4 is an elevation of the upper portion of the can with the top, valve body and valve in position.

As indicated in the diagram in Fig. 1, the active ingredients and containers are brought together at the filling scale position indicated by the rectangle and as indicated by the legends.

Referring to Fig. 2 by the use of reference characters, this first step constitutes partially filling a can C supported on a scale platform **10**, indicated diagrammatically as balanced on the pivot **11** and as having an adjustable weight **12** on the side of the pivot opposite that of the can-supporting platform.

When sufficient weight of the ingredient in the can C causes the scale to tip, an electric switch, indicated at 15, is closed, which, in turn, through wires indicated at 16, operates an electromagnet 17 to close a valve, indicated at 18, cutting off the flow of the ingredient through the pipe 20 to the filling spout 22, shown as adapted to discharge into the top of the can C.

Thus, whatever amount is desired may be regulated by adjusting the scale to cause it to tip and close the valve when the can is partially filled to a given predetermined weight.

Obviously, this operation may be very quick, and as soon as the can C is removed, another may be placed in position to receive flow of the ingredient from the nozzle 22, which again continues to flow until the switch 15 is again closed to close the valve 18.

The cans thus partially filled to the desired amount may be set into a suitable shallow basket-like container 25 at an adjacent position as on a platform 26 at the end of a shallow tank 30. The filled baskets 25 containing say, a dozen or more cans, may be set into a cooling liquid, such as a brine indicated at B in the shallow tank, while a suitable supporting screen 32 holds the basket and cans with the open can tops above the surface of the cooling liquid.

The cans in their baskets may be moved along from left to right in Fig. 2, and thence upwardly to a support 35 from which the partially filled cans may be placed on the platform 40 of another scale, shown as having a pivot 41 and a weight 42, and arranged to actuate a switch 45 in a circuit, indicated at 46, controlling a solenoid 47, in turn acting to close a valve 48.

A pipe line 50 for liquified gas is shown as discharging through the nozzle 52 into the can C on the scale so that the weight of the added liquified gas when tipping the scale may effect a shutting off of the flow of the liquified gas to the can.

Referring to Fig. 1 as well as to Fig. 2, it will be noted that the rectangle 30 indicates the shallow brine tank just described, and the line 50*a* diagrammatically illustrates a pipe leading through the cooling liquid in the tank 30, preferably below the supporting screen, and to the valve 48 and nozzle 52. Thus, the propellant, i. e., the liquified gas, is brought to the can C at about the same temperature as the contents of the can, that is, the active ingredient, which has been chilled to a temperature below the freezing point of water, preferably in the approximate range of a few degrees below to a few degrees above zero Fahrenheit.

The rectangles designated "Refrigerating equipment" are shown as connected with cooling coils 60 in the liquid within the shallow tank 30 to hold the temperature of the brine at the desired low temperature.

It has been found that even though this shallow tank is left open, the efficiency is not measurably reduced and the accessibility, permitting easily moving the can-holding baskets along in the cooling liquid, makes for great convenience in carrying out the steps of this process.

The rectangle marked "Capping" corresponds to the platform 65 in Fig. 2, above which are two rotating spindles 70 and 75. The spindles 70 acting to crimp the flange of a can top closure D into sealing engagement with the top of the can, while the spindle 75 may serve to spin the screw valve V into position, sealing the can closed.

The rectangles carrying the legends "Cold leak test" and "Hot leak test" correspond to the one having cold water, as indicated at W, and the other having warm water, as indicated at WW.

The closed cans which are, of course, still cold are passed in a matter of seconds from the valve-closing position to the cold or room temperature water W where the cans are immersed, as indicated, and are there observed for leakage which would show by bubbles rising to the surface. Here they may remain for any suitable period sufficient for the temperature of the contents to approach room temperature. These cans are then transferred to the container of warm water WW which may be at a temperature of 120° to 150° F., or more if desired, the temperature depending upon the nature of the propellant, the amount of it, and the degree of internal pressure for which it is desired to test the cans.

After a sufficient interval in the warm water, the cans are then removed and passed along to a series of stations, indicated in both Figs. 1 and 2 as "Incidental and detail inspection," "Labeling and packing," and "Shipping and packaging."

While the nature of the can top closure may vary, a type extensively used is that shown in Fig. 3, in which a flange 80 embraces a flange 82 on the top of the can C, and is crimped and spun into position by a suitable die in the pressure member 70, which, as indicated, may be a rotating spindle or may simply seal the cans by pressure-crimping, if desired.

The valve comprises a suitable screw stem S in Fig. 4 which is threaded into the valve body 84 previously assembled with the can covered element having a flange 80. The valve body is provided with the usual nozzle or nozzle opening, indicated at 85.

Following the steps briefly, it will be seen from the foregoing description that the empty open top cans may be set on the scale platform 10 for only a second or two of time, while the desired amount of paint, insecticide, varnish, or other active ingredient is discharged therein through the spout 22, and that the precise amount desired will be governed by the scale, the movement of which controls the solenoid operated shutoff valve.

The partially filled cans containing this active ingredient are then transferred to the baskets, or like suitable containers or holders 25, which, as indicated, are open framework or open wire, or the like, to permit circulation of the cooling liquid around the cans.

As they are moved along at intervals on the support 32, they are cooled for a matter of minutes down to a few degrees above or below zero Fahrenheit.

The liquid propellant in the form of liquified gas is likewise weighed into the can by discharging the precise amount desired through the spout 52 under the control of the scale and solenoid circuit and valve 48.

The capping device which closes the cover and seals it on the can, as indicated, may be of any suitable form—depending on the can construction.

The capping and inserting and tightening of the valve member is likewise quickly done, and with such control as is suitable to avoid injuring the valve stem or making the valve too tight.

The closed and sealed cans now containing the desired mixture of active ingredient and propellant, and both at a low temperature, are then first observed while submerged in cool water—but substantially warmer than the temperature of the contents of the filled can.

As the contents approach room temperature, the cans are again tested and observed while submerged in warm or hot water, which causes the propellant to create a pressure comparable to that required for a safety test.

The tested cans are then inspected, labeled, packed and shipped, as indicated.

The advantages in addition to convenience and simplicity of the apparatus required for carrying out my process are that while using uniform ingredient and propellant, the handling of the cans and material may continue uninterruptedly and at a very economically efficient rate of speed at a minimum of labor and with assurance and precision as to the chilling temperatures and accurate filling.

Furthermore, when changing from one active ingredient to another, such, for example, as from a roach spray to a fly spray ingredient, or when changing from one color of paint to another color of paint ingredient, no change is necessary in the apparatus, and any desired change in the degree of cooling may be controlled very simply by merely lowering or raising the temperature of the brine in the tank. Thus, it is equally simple and efficient, as well as economical, to run a small batch of a few hundred or a few thousand of one kind of ingredient with an appropriate propellant, or to make continuous runs of a great many thousands.

While the temperature of the liquid propellant is lowered for the filling by running its feed pipe through the same brine tank, this is a convenience, but obviously is not necessary. Separate chilling or refrigerating means may be used for cooling and propellant.

It is necessary, however, that the ingredient be put into the can in liquid form and to the right amount, and that it then be cooled to the low temperature which is desired for maintaining the liquid condition of the propellant.

Obviously, if the ingredient were substantially warmer than the propellant, it would be impossible to fill the can with the liquid propellant. Much of the propellant would be lost in gas, and the remainder would be enough to create the necessary propelling pressure for later discharging the contents of the can.

The propellant normally used for such active ingredients as mentioned may be a mixture in suitable proportions of liquified dichlorodifluoromethane and trichlorodifluoromethane.

Having thus described our invention, what we claim is:

A process of filling aerosol cans with an active ingredient and a liquified gas for a propellant adapted to exert superatmospheric pressure at normal temperatures, comprising pouring an active ingredient into the open can and controlling the amount by shutting off flow consequent upon the weight reaching said amount, immersing the major portion of the can with ingredient therein in an open brine tank with the brine liquid level below the open top, cooling the contents and can below freezing temperature of water, removing the can from the brine, and adding cold liquified gas in amount controlled by its own weight, and then capping and sealing the can with an aerosol valve therein while the contents are still cold.

No references cited.