Jan. 31, 1967 D. S. TILLOTSON 3,301,438

DIP TUBE

Filed July 6, 1965

Fig. 1

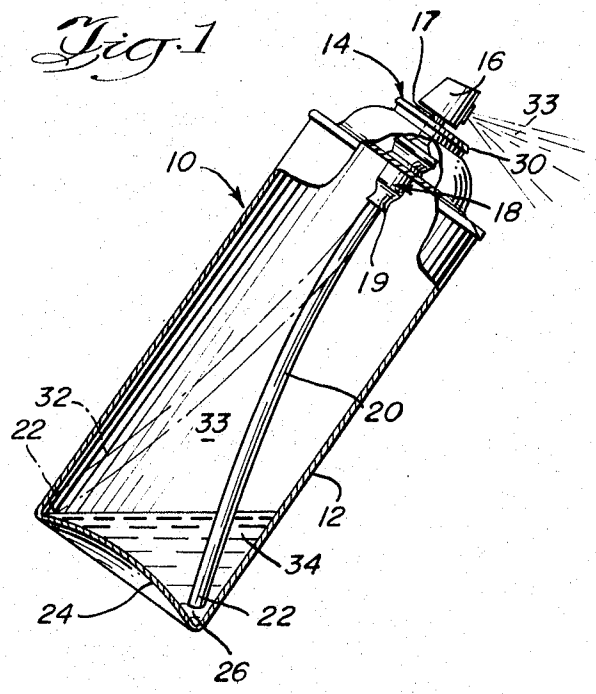


Fig. 3

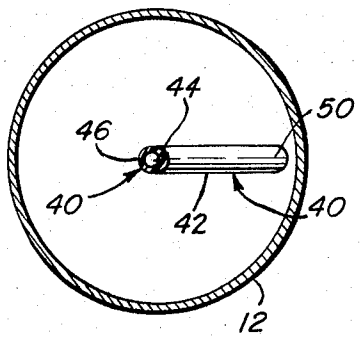


Fig. 2

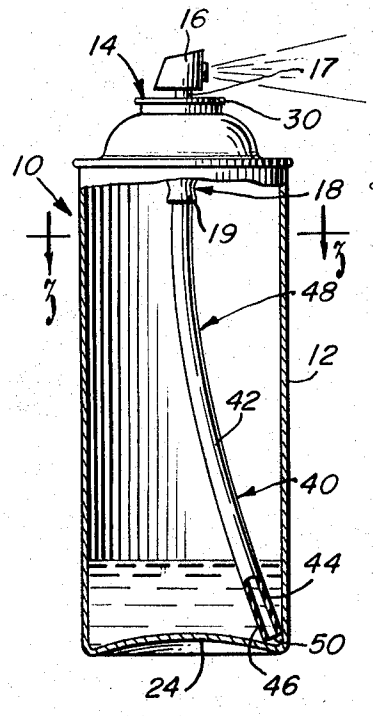


Fig. 4

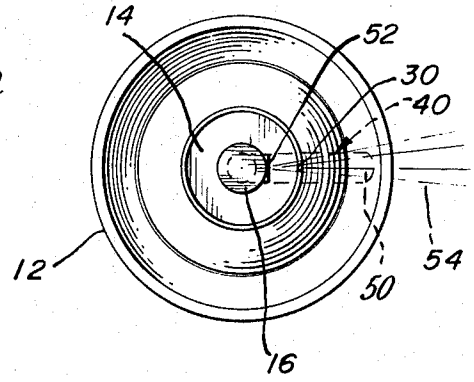
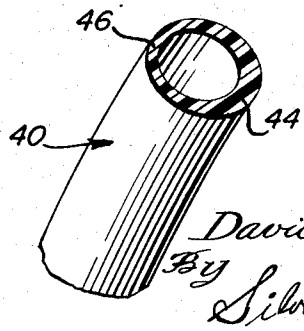


Fig. 5



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3,301,438

DIP TUBE

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This invention relates generally to pressurized product containers and more particularly, relates to an improved plastic dip tube construction for use in valve assemblies for dispensing pressurized products from such containers.

Pressurized products are conveniently packaged in a metal canister or glass container mounting a dispensing valve mechanism at the upper end of the container. The valve mechanism usually includes an exposed spray head and a hollow valve housing in the container depending from a mounting cover attached at the upper end of the container and having a valve assembly therein which is actuated by said spray head. To the bottom end of the valve housing is attached an elongate dip tube of suitable plastic material which permits passage of the pressurized product from the interior of the canister into the valve housing. The product is propelled out of the canister through the valve mechanism and spray head by means of a suitable propellant in gas or vapor phase. The body of propellant is located above the product in the container under pressure but outside of the valve housing so that normally, there always should be a body of pressurized propellant above the product in the canister.

Heretofore, the plastic dip tubes consisted of an extruded, hollow tubular member having a cylindrical wall of uniform thickness along the entire length thereof. The extruded tubing was wound on a reel and normally supplied on the reel to be pulled off and severed in suitable lengths for installation on the valve housing. Because of the fact that the tube was wound on a reel, it was normally bowed or curved slightly along its length in the same direction as it was wound on the reel. The length of the dip tube was selected so that when the valve assembly was installed on the cam, the dip tube would reach into a corner adjacent the bottom end wall of the container.

The dip tube was installed with its line of curvature opening toward an index mark carried on the mounting cover for the valve assembly with the intention that the spray head orifice be aligned with the index mark at all times during dispensing of product. In this manner, as the contents of the pressurized container were depleted and the canister was tilted during use, the bottom open end of the dip tube always would be immersed in the remaining product because directions for proper use were to align the external orifice of the spray head with said index mark for dispensing. This assured that the dip tube always was immersed in the pressurized product and assured that all of the contents of the container would be available to the purchaser.

In this latter regard, a common disadvantage occurred when hydrocarbons were commenced to be used for propellants, such as, butane, propane, etc., and nitrous oxide, as well. After filling, the propellant gases would come out of solution and accumulate above the surface of the product to be dispensed. The packaged products in the container were capable of straightening the tube and/or curving it in a direction opposite to that of its installation in the container, or its normal curvature coming off the reel. This action would move the tube from its preferred position wherein its bottom open end was aligned with an index mark on the mounting cup. As the quantity of packaged product was depleted and the can was tipped for use, it was possible for the lower end of the dip tube to be withdrawn from the pressurized product in the container although the spray head was aligned with the index

mark. Consequently, when the spray head was depressed, instead of pressurized product being forced into the dip tube, only gas or propellant would be expelled. This would deplete the quantity of a propellant gas in the container such that it would not be possible to dispense pressurized product, notwithstanding that a substantial quantity of such product remained in the container. This would result in many complaints from customers that the canisters were not being filled with the designated quantity of pressurized product appearing on the container and that they were being misled and deceived as to the quantity of pressurized product which was packaged or that the valve mechanisms were faulty.

This problem of maintaining the dip tube in desired position relative to the spray head for dispensing the complete contents of the canister has become aggravated in recent times. With the varied nature of pressurized products being packaged, such dip tube displacement by reason of the solvents causing the dip tube to straighten out has occurred with greater incidence. Insofar as I am aware, there has been a long felt need in this area for which there has been no adequate solution prior to the advent of my invention.

Accordingly, a primary object of this invention is to provide a dip tube of the character described which will substantially eliminate all of the disadvantages heretofore enumerated.

Another object of the invention is to provide a dip tube of the character described in which the circumferential wall of the dip tube is not of uniform thickness but instead, has a thickened wall segment or portion extending longitudinally along one side of the dip tube to cause said dip tube to take a fixed or set curved condition in the direction of the thicker dimension of the side wall of the tube.

Another object of the invention is to provide a dip tube of the character described which by reason of said side wall portion of thicker dimension, the direction of curvature of the tube is substantially permanent and the tube resists straightening out in the container.

Another object of the invention is to provide a dip tube of the character described which can be manufactured economically and efficiently without materially or significant increased cost over dip tubes of conventional construction having a circumferential or cylindrical wall of uniform thickness.

The foregoing and other objects of the invention will become apparent from the ensuing disclosure in which a preferred embodiment of the invention has been described in detail in the specification and illustrated in the accompanying drawing.

In the drawing:

FIG. 1 is an elevational view of a pressurized product container of conventional construction with portions broken away to illustrate a dip tube of known construction and the manner in which it has been adversely affected by pressurized product packaged in the container.

FIG. 2 is an elevational view of a conventional pressurized product container with portions broken away to show the dip tube embodying the invention secured to the valve housing of a dispenser valve mechanism provided on the container, portions of the said tube being in sections to show details.

FIG. 3 is a sectional view taken along the line 3—3 of FIG. 2 and in the general direction indicated.

FIG. 4 is a top plan view of the pressurized container with the dip tube embodying the invention shown in phantom outline.

FIG. 5 is a view of a section of tubing from which the dip tube embodying the invention is obtained to show relative dimensions of the tube wall.

Referring now to the drawing, a representative pres-

surized product container is designated generally by the reference character 10 in FIGS. 1 and 2. The container 10 includes a sheet metal cylindrical body 12 capped at the top or upper end thereof by a mounting cover 14 also formed from metal. The cover 14 usually is stamped and shaped to provide a suitable central boss through which a spray head 16 is mounted. The spray head 16 has a depending stem 17 which will be engaged with a valve mechanism normally including a plunger reciprocal in a valve housing 18. The valve housing 18 has an open bottom end 19 in which is secured one end of a dip tube 20 of conventional structure. The spray head 16 and the valve structure which is carried on the inside of the container body 12 can be of the well known construction described and claimed in Patent No. 2,777,735 or Patent No. 3,045,877, for example. The manner in which the dip tube 20 is secured to the lower end of the valve housing 18 likewise can be varied within the scope of this invention. For instance, the valve housing 18 and the manner in which the dip tube 20 is secured thereto may be in accordance with the teachings of my Patent No. 3,159,318.

The dip tube 20 normally is sufficiently long for its bottom end 22 to extend adjacent of the bottom wall 24 of the canister and into the corner 26. As seen in FIG. 1, the dip tube 20 has a curve or bow along the length thereof from the point of attachment to the valve housing which is substantially coaxial with the container body 12 to its extremity 22 in said corner. It will be noted that the extremity 22 is slightly spaced from the bottom wall 24.

The conventional dip tube 20 has a circumferential wall of uniform thickness. By reason of the propellants used and the nature of the liquid products dispensed from such containers, after the dip tube has been in contact with the contents of the package for some time, it will increase in length and can straighten out. This causes the extremity 22 of the dip tube to shift laterally with respect to an index mark 30 on the mounting cup 14. Such shifting of position of the tube has been indicated by the broken outline 32 in FIG. 1 which is somewhat extreme for illustrative purpose. Consequently, as the canister is tipped in the manner shown in FIG. 1 for dispensing product, the extremity 22 of the dip tube 20 is immersed in the propellant gas 33 instead of the packaged product 34. Upon depressing the spray head, the gas 33 is expelled instead of the pressurized product. The same condition can occur where the container 12 is tipped at a greater angle and contains a larger amount of product. This depletes the supply of propellant so that eventually, not all of the packaged product can be expelled.

Referring now to FIG. 2, the dip tube embodying the invention has been designated generally by the reference character 40. Said dip tube 40 is shown secured to the valve housing 18 and in all other respects, the container designated 10 in FIG. 2 is identical to that of FIG. 1. The dip tube 40 has a circumferential wall 42 of non-uniform thickness. Thus, there is a side wall portion 44 which is thicker in dimension than the thickness of the side wall portion 46 diametrically opposite thereto. The thickened wall portion 44 extends the entire length of the dip tube. By reason of said thickened portion 44, the dip tube 40 has a permanent curve or arc along the length thereof which is designated 48. The tube 40 is made in a conventional manner by extrusion through a suitable die which causes the wall portions of varying thickness to be formed. It is believed that by reason of the variation in wall thickness, the portion of the circumferential lesser thickness cures faster than the thicker wall portion 44 whereby the wall of greater thickness shrinks more than the opposite wall portion 46.

The length of the wall portion 46 is greater than wall portion 44 which causes the tube 40 to be curved along the length thereof in the direction of the wall portion of greater thickness. Upon complete setting of the tube, said curve is substantially permanent. Consequently, as the dip tube 40 is exposed to the materials in the package, it resists being straightened out by the same and therefore, will hold the position to which it is installed initially with the valve mechanism in the container, namely, aligned with index mark 30.

Referring to FIGS. 2 and 4, it will be seen that the dip tube 40 can be installed with its lower end or extremity 50 facing toward and aligned with the index mark 30 in the mounting cover. The spray orifice 52 of the spray head likewise is aligned with said index mark 30 and this relative position between the spray head orifice 52, the index mark 30 and the lower extremity 50 of the dip tube 40 will be maintained at all times. The purchaser of the container is instructed to use the spray head only when the external orifice thereof is aligned with said index mark 30 and pressurized product represented at 54 always will be dispensed.

It will be appreciated that the dip tube 40 can be used and installed in the same manner as conventional dip tubes, such as tube 20. In other words, as the dip tube is formed by extrusion process, it is rolled onto a reel and delivered to manufacturers in this fashion to be drawn from said reels in desired severed length for use in a valve assembly.

In a practical embodiment, the dip tube 40 had a thin wall portion of approximately .015 inch thick and a thicker wall portion of about .025 inch. The O.D. of the tube 40 otherwise was conventional.

It is believed that the invention has been described in sufficient detail to enable the skilled artisan to understand and practice the same. Minor variations may occur to the skilled artisan without departing from the scope of the invention as set forth in the claims hereto appended.

What it is desired to secure by the Letters Patent is:

1. A pressurized product dispenser valve including a mounting cover for the valve having an index mark thereon and a spray head having a dispensing orifice in registry with said mark, a valve housing depending from said cover having a bottom open end, and a dip tube secured at one extremity thereof to said end of the housing, said tube having a substantially cylindrical wall having a thicker portion and a thinner portion extending along diametrically opposite sides of said tube, said tube being curved along the length thereof in an arc and having an opposite extremity displaced laterally from the bottom end of the housing in the direction of said index mark.

2. The structure of claim 1 in which said tube is longer in length along the side of the tube contiguous the thinner portion.

3. The structure of claim 1 in which said thicker portion is sufficiently greater in thickness than said thinner portion to provide for a substantially fixed curvature for the tube.

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