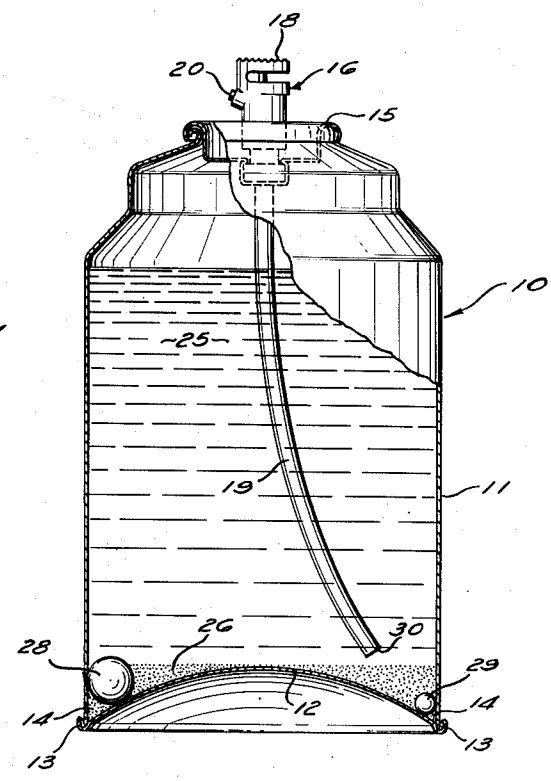
April 30, 1963 W. MOONAN 3,087,707

AGITATING MEANS FOR AEROSOL SPRAY CANS

Filed Feb. 1, 1962

Fig. 1



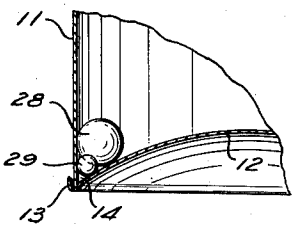


Fig. 2

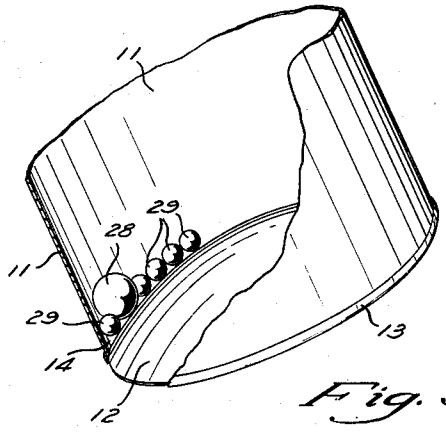


Fig. 3

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United States Patent Office 3,087,707 Patented Apr. 30, 1963

3,087,707

AGITATING MEANS FOR AEROSOL SPRAY CANS

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Filed Feb. 1, 1962, Ser. No. 170,320
9 Claims. (Cl. 259—29)

This invention relates to agitating or mixing devices for aerosol products containing pigments or other materials which tend to settle out during storage.

Aerosol spray cans containing paints, lacquers, enamels and the like are sold in large quantities. These cans contain the required pigments, a vehicle composed of appropriate resins, oils, solvents and the like in which the pigments are suspended, and a liquefied propellant gas such as dichlorofluoromethane. Many of them, containing lacquers, enamels, paints and the like formulated to match original factory-applied finishes, are used in refinishing or retouching marred appliances, slightly damaged automobiles and for similar purposes where color matching is of great importance.

In practically all paints, varnishes and lacquers the pigments tend to settle out during storage and unless the pigments are thoroughly mixed with the vehicle before the material is applied, the desired color will not be produced. The problem of settling is particularly severe with aerosol products for the reason that the liquefied propellant gas, which is necessarily compatible with the remaining constituents of the paint, lacquer or enamel is of very low viscosity and thus acts to thin the vehicle in the spray can and increase the rate of settling as compared to the rate in conventional paint containers. The different pigments used to produce a given desired shade usually settle at different rates and thus settle in layers of different compositions. For this reason true colors cannot be obtained unless substantially all of the pigments are very thoroughly mixed in the can. The differential settling effect is accentuated in aerosol containers by the presence of the liquefied propellant.

Since the contents of the cans must be maintained under pressure, the cans cannot be opened for the purpose of stirring and mixing the contents. For this reason, it has been the practice to use agitators within the cans to help break up and mix the settled pigments when the can is shaken. These have taken the form of relatively large balls or agitators of various shapes. With prior types of agitators, however, it has been necessary to shake the cans containing the agitators for inordinately long times even to approximate good color matching. The user frequently fails to shake the can long enough and then when he sprays the contents he does not obtain the desired color and as a result becomes an immediately dissatisfied customer.

The reason for the failure of the agitators of the prior art, which generally consist in one or two balls of uniform size and about ⅜" in diameter, is that the usual aerosol can, since it must withstand an internal pressure of approximately 70 pounds per square inch, has a domed bottom leaving an annular V-shaped groove at the juncture of the bottom and the side wall of the can. If a ball or other agitator is employed that is large enough and of sufficient mass to enable it to be shaken loose from and effectively to mix the settled pigments, then the ball is too large to remove the pigments from this groove. If the balls are small enough to remove most of the pigments from the groove they are ordinarily of insufficient mass to be shaken loose from the settled pigment and are ineffective as agitators.

According to the present invention, an improved and greatly superior agitating or mixing system for aerosol

spray cans having domed bottoms is provided by disposing within the can one or two agitating elements, preferably in the form of balls, that are large enough and of sufficient mass that they can be readily broken loose from the settled pigment when the can is shaken, in combination with several, for example, five to seven, smaller agitating elements, also preferably in the form of balls, that are of such size that they can clean out most of the pigments from the groove between the domed bottom of the can and the side wall thereof. These smaller elements, however, are of a size so related to the angle of the groove and the size of the larger elements that they can be engaged by the larger elements and moved through the pigment by the larger elements, even when the smaller elements are disposed as deeply as possible in the groove. With this arrangement, thorough mixing of settled solid materials with the remainder of the contents of the cans can be obtained by shaking the cans. The mixing is much more thorough and much faster than with conventional agitators. The result is that with paints, lacquers, enamels and the like excellent color matching can be obtained by shaking the cans for a comparatively short time.

A preferred form of the invention is illustrated in the accompanying drawings in which:

FIGURE 1 is a side elevational view, partly in section, showing an aerosol spray can embodying a preferred form of the invention and illustrating somewhat diagrammatically the manner in which pigments or other solids settle to the bottom of the can;

FIGURE 2 is a fragmentary sectional view showing the manner in which the agitators engage each other in the groove at the base of the can; and

FIGURE 3 is a perspective on the same scale as FIGURE 1 showing a plurality of agitator balls in the groove at the base of the can.

As shown in FIGURE 1 of the drawings, the invention is adaptable to a typical aerosol can **10** having a cylindrical side wall **11** and an upwardly convex or domed bottom **12**. The bottom is domed in order to give it strength to withstand the pressure within the can which may be of the order of 70 p.s.i. The bottom **12** is crimped and soldered to the can in a conventional manner as indicated at **13**. The convex bottom intersects the side wall at an angle of about 60° to form an annular V-shaped groove **14**.

The upper end of the can **11** is reduced in diameter as shown and has an opening which is closed by a conventional closure cap **15** which supports a valve **16** that may be of any conventional construction. In the form of the invention shown, the valve has an actuating flap **18**. When this is depressed by the user the valve is opened and the pressure of the propellant fluid within the can causes the contents of the can to flow upwardly through a dip tube **19**, which is preferably composed of a flexible plastic, to the valve **16** and finally to be discharged from a spray orifice **20**. The dip tube **19** projects downwardly and is preferably curved toward one side of the can as shown.

As shown in FIGURE 1 of the drawings, the can when sold is filled to a level near the top of the can with the material **25** to be dispensed. In the case of a pigmented paint, lacquer, enamel or the like, the contents of the can consist of a liquefied propellant gas, such as dichlorodifluoromethane, and the paint, enamel or lacquer to be dispensed, which in turn consists of appropriate pigments suspended in a vehicle that includes the usual resins, solvents, oils and the like. Inasmuch as the liquefied propellant is miscible with the vehicle in which the pigment is suspended, the liquid portion of the contents of the can is of very low viscosity, and accordingly it is for all practical purposes impossible to prevent settling of

the pigments during storage. In fact, for some types of materials settling takes place so rapidly that if it is desired to maintain the desired composition of the material being sprayed, the can should be shaken every few minutes during use.

In any event, while the can is in its normal upright position on the shelf of a dealer or in the possession of the ultimate user, the pigments at least in part settle out, as indicated at **26** in FIGURE 1. The end **30** of the dip tube is preferably slightly above the level of the settled pigments, as shown. Ordinarily, mixtures of pigments are employed to obtain desired colors and shades. These pigments generally have different rates of settling. Pigments having a higher rate settle in the groove **14** in greater proportion than the remainder of the pigments and the pigments become somewhat stratified in settling. Therefore, unless most of the settled pigments are scoured out of the groove **14** and mixed with the liquid in the can, the desired color simply will not be sprayed.

According to the present invention, effective agitation and mixing of the contents of aerosol cans is obtained by employing one or more relatively large agitating elements shown herein as balls **28** in combination with several, preferably five to seven smaller agitating elements shown herein as balls **29**. Ordinarily, one large ball is sufficient, but two or more may be employed if desired. The large ball or balls **28** must have sufficient mass to enable it to be broken loose from the settled pigments by shaking the can. For conventional aerosol cans, such as the six to sixteen ounce cans that are widely used, a ⅜" diameter steel ball is a satisfactory large agitating element. Balls of this size can be shaken loose from the settled pigment without much difficulty. If substantially smaller balls are employed, however, it may be impossible to shake them loose. It will be noted from FIGURES 1 and 2 that balls of this size are held a substantial distance away from the bottom of the groove **14** by engagement with the domed bottom **12** and the side wall **11** of the can. Hence, balls of this size when used alone do not perform an adequate mixing job.

This deficiency is corrected in accordance with the present invention by the smaller balls **29**. These preferably take the form of conventional lead BB shot. Such shot have a diameter of about 0.18 inch and are readily available at low cost. While BB shot by themselves have insufficient mass to act as adequate mixers or agitators they work effectively in combination with one or more larger balls or agitators. The reason for the effectiveness of the combination will be evident from a consideration of FIGURE 2 of the drawings. As there shown, the smaller balls or shot **29** go deep enough into the groove so that only a small amount of pigment can remain in the groove if the balls are forced around near the base of the groove. At the same time, the balls are large enough so that they project above the lowest position that can be taken by the larger ball **28**. When the can is shaken the larger ball not only disrupts and breaks loose the solidified pigment but also strikes the smaller balls and moves them around through the pigment, thus securing superior agitation and mixing of the material. It is to be noted that, as shown particularly in FIGURE 3, a lower surface of the larger ball engages an upper surface of a smaller ball and thus tends to force the smaller ball down into the groove where it will do the required job.

In operation, the pigments or other solid materials are suspended in the liquid when the cans are filled and, therefore, the balls simply roll down the domed bottom **12** and remain disposed in the groove in the positions such as shown in the drawings during the time that the goods are in upright position as they normally are on a shelf. After some period of storage, the pigment or other solid material in the can settles, as shown diagrammatically in the drawing. The first few shakes of the can serve to break loose the larger ball or balls from the pigment, and continued shaking causes both the large and small balls to be moved through the pigment and to agitate the contents of the can. The engagement of the larger balls with the smaller balls causes the smaller balls effectively to scour out substantially all of the settled-out material from the bottom of the groove. While the smaller balls do not reach entirely into the bottom of the groove, it appears that the currents they create in the liquid contents of the can cause the liquid to scour or wash substantially all of the pigments or other solids out of the groove, even though an appreciable amount of pigment cannot be contacted directly by the balls. This hitherto unobtainable result has been demonstrated not only by the excellent color matching obtained with cans embodying the present invention, but also by tests in which aerosol cans containing pigmented materials have been allowed to settle for periods of time up to several months, the cans shaken, the contents of the cans discharged and the cans cut open and examined. These examinations have shown substantially complete removal of the solids from the grooves with cans embodying the present invention. Generally speaking, tests show that with average materials brisk shaking for about 15 to 30 seconds is sufficient properly to mix the pigments, whereas previously known agitators require at least about 4 times as much shaking for the same materials allowed to stand for the same periods of time, and with some materials, conventional agitators are simply unable to do a satisfactory job in any reasonable period of time. With some materials, such as certain metallic pigments, it may be desirable periodically to shake the can as the spraying operation is carried out. The contents of the can are sprayed in normal fashion. If the can is replaced on a shelf after partial spraying of its contents the agitator balls simply take their usual positions in the groove and are ready to agitate and mix the contents of the can again when the can is shaken again preparatory to further use.

According to the preferred form of the invention, one steel ball of about ⅜" diameter is utilized in conjunction with five to seven lead BB shot. The sizes and materials used for the balls may vary within reasonable limits, and the number of balls employed may also be varied. However, the larger ball must be big enough so that it can be broken free from the settled material without too much difficulty, and the smaller balls should be as small as possible to enable them to penetrate into the groove as far as possible but at the same time they must be large enough so that the large ball and the small balls overlap when both of the balls are disposed in the groove 14, as shown in FIGURE 2. The overlap insures that the small balls can be struck by the larger ball when the smaller balls are as deep in the groove as they can go. Also, they must not be so small that they can become jammed or stuck in the groove and thus made ineffective.

While the invention has been explained with particular reference to its use in conjunction with aerosol spray cans containing lacquer, enamel, paint or the like, it will be understood that the invention is also useful in connection with aerosol sprays embodying other materials that are apt to settle out during storage of the cans.

Those skilled in the art will appreciate that various changes and modifications can be made in the preferred form of the invention disclosed herein without departing from the spirit and scope thereof. The essential characteristics of the invention are defined in the claims.

I claim:

1. In an aerosol spray can having a cylindrical side wall and a domed bottom secured to the side wall and defining with said side wall an annular V-shaped groove,

said can containing a liquefied propellant gas and a material to be sprayed comprising a suspension of solid particles subject to settling during storage of said can,

means for agitating and mixing the contents of said can comprising

a relatively large agitating element disposed within

said can, said element being of sufficient mass to be broken loose readily from said settled solid particles when said can is shaken and being of such size that it is supported by engagement with said domed bottom and said side wall at a distance spaced substantially from the bottom of said groove, and

a plurality of relatively small agitating elements of such size that they extend within said groove substantially farther than said relatively large element when in engagement with said domed bottom and said cylindrical side wall,

said relatively small elements being engageable by said relatively large element when both large and small elements are disposed as close to the bottom of said groove as possible, and

said relatively small elements being adapted to cause the removal of substantially all of said settled solid particles from said groove when said can is shaken.

2. A device according to claim 1 wherein the agitating elements are balls.

3. A device according to claim 2 wherein the larger element has a diameter about twice the diameter of the smaller element.

4. A device according to claim 3 wherein the larger element is a steel ball having a diameter of about ⅜ inch and the smaller elements are balls having a diameter of about 0.18 inch.

5. A device according to claim 4 wherein the smaller elements are BB shot.

6. A device according to claim 5 wherein only one steel ball is employed and from five to seven BB shot are employed.

7. A device according to claim 6 wherein said side wall and said bottom intersect at an angle of approximately 60 degrees.

8. In an aerosol spray can having a cylindrical side wall, a domed bottom secured to the side wall and defining with the said wall an annular V-shaped groove, the walls of which intersect at an angle of approximately 60 degrees,

a discharge valve at the top of the can and

a flexible dip tube extending from said discharge valve partially into said V-shaped groove,

said can containing a liquefied propellant gas and

a pigmented material to be sprayed, the pigments in said material being subject to settling during storage of said can,

means for agitating and mixing the contents of said can comprising a relatively large ball disposed within said can, said ball being of sufficient mass to be broken loose readily from said settled pigment when said can is shaken and being of such size that it is supported by engagement with said domed bottom and said side wall of said can at a distance spaced substantially from the bottom of said groove, and

a plurality of relatively small balls of such size that they extend within said groove substantially farther than said relatively large ball when in engagement with said domed bottom and said cylindrical side wall,

said relatively small balls being engageable by said relatively large ball when both large and small balls are disposed as close to the bottom of said groove as possible, and

said relatively small balls being adapted to cause the removal of substantially all of said settled pigment from said groove when said can is shaken.

9. A device according to claim 8 wherein the large ball has a diameter of about ⅜ inch and the small balls have a diameter about one half the diameter of the large ball.

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