

Sept. 20, 1966

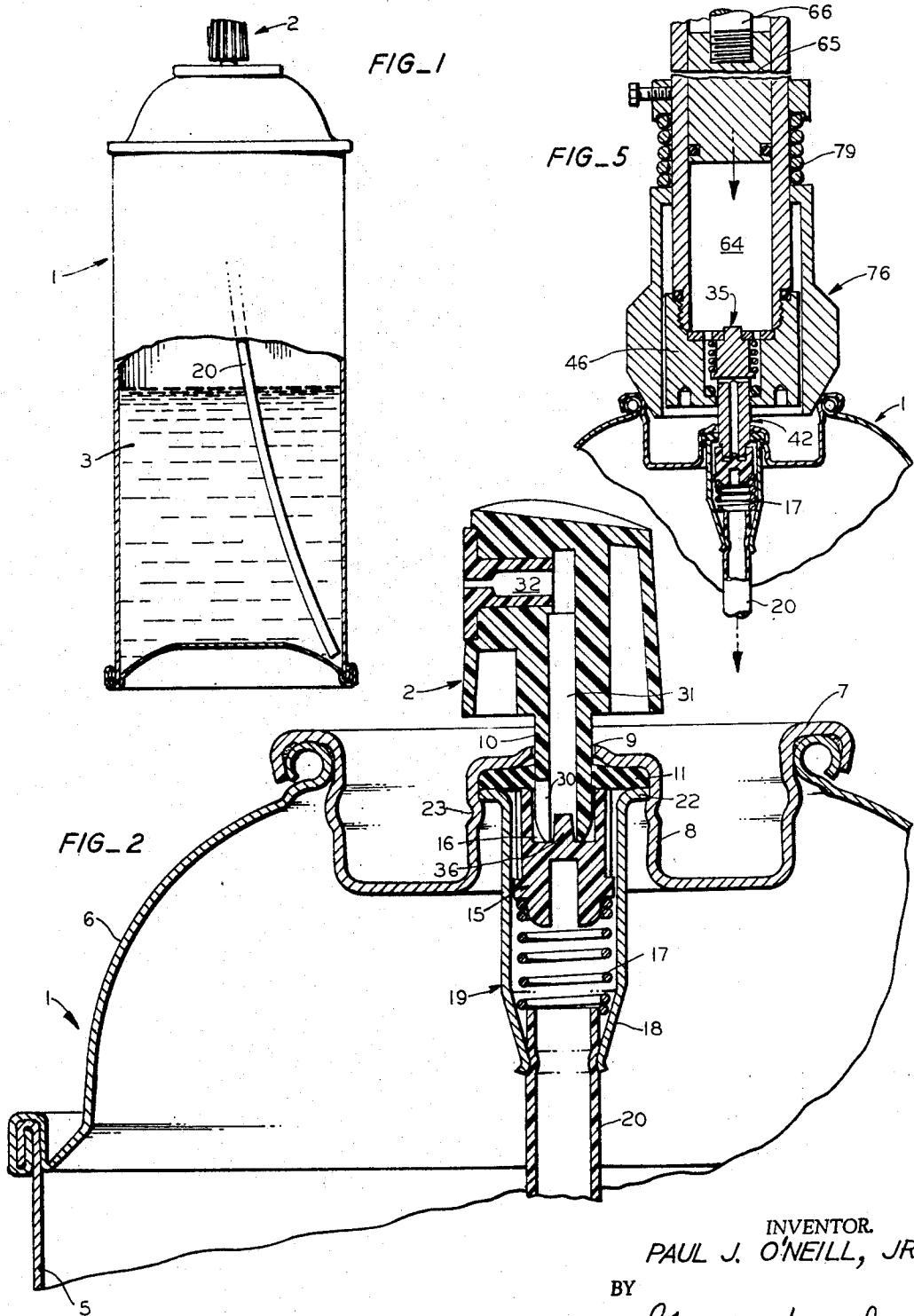
P. J. O'NEILL, JR

3,273,606

METHOD AND APPARATUS FOR PACKAGING PAINT AND THE LIKE  
IN A PRESSURIZED DISPENSING CONTAINER

Filed Oct. 29, 1962

4 Sheets-Sheet 1



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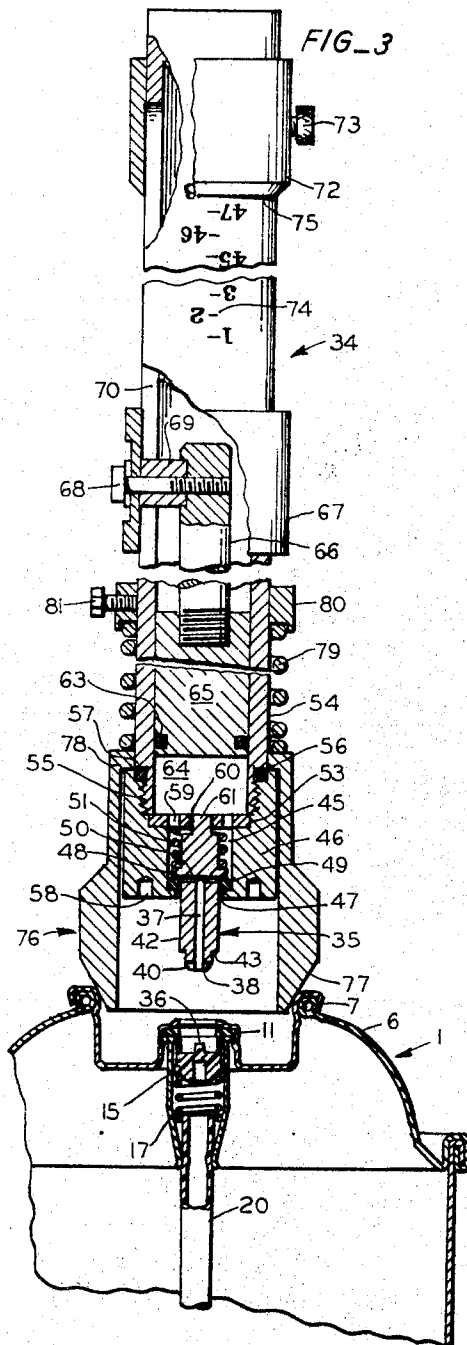
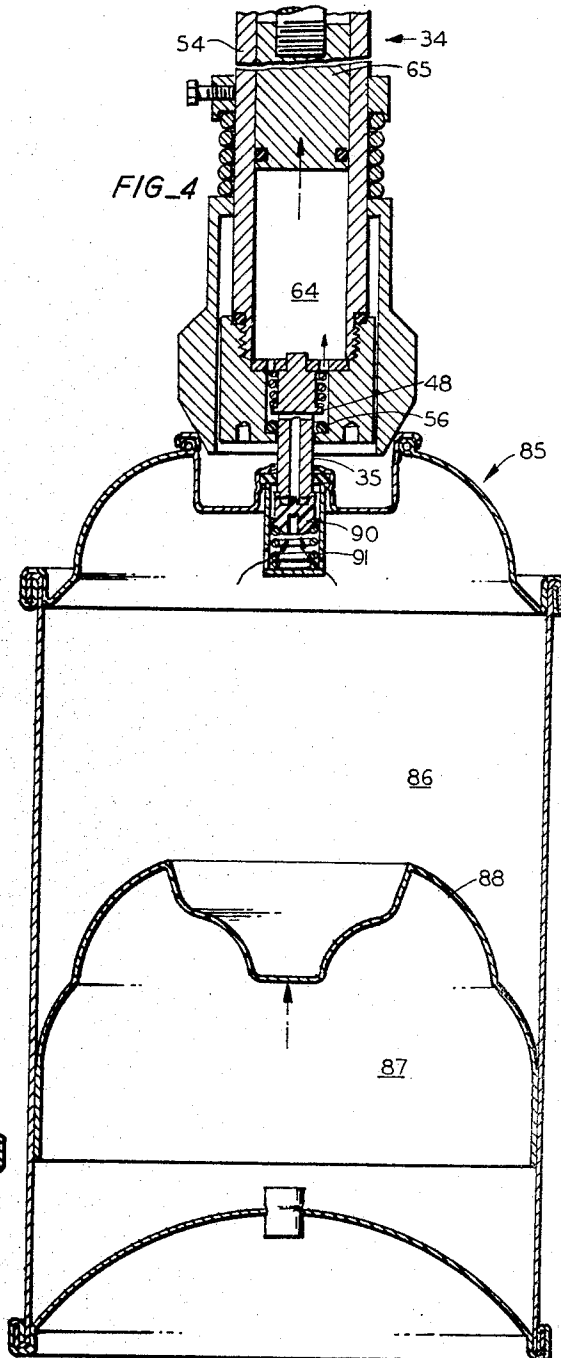
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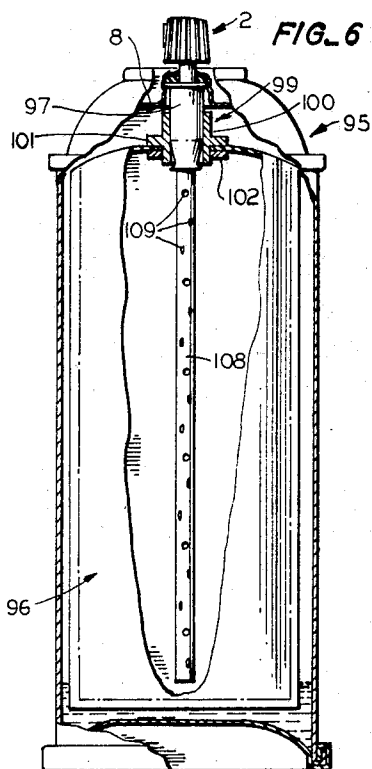
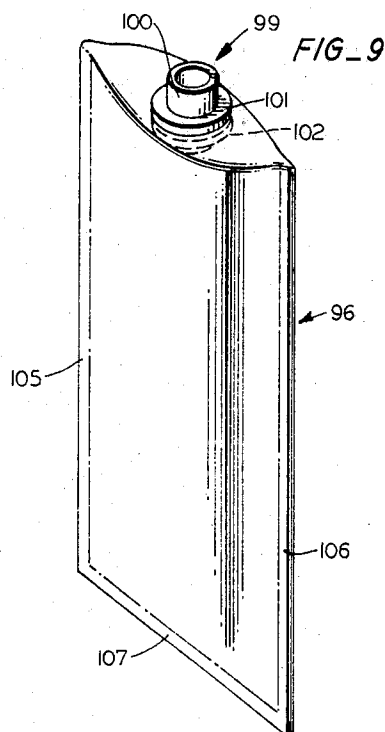
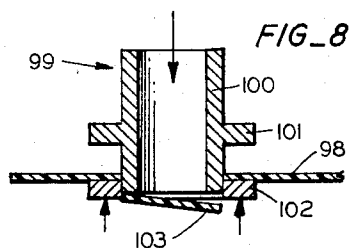
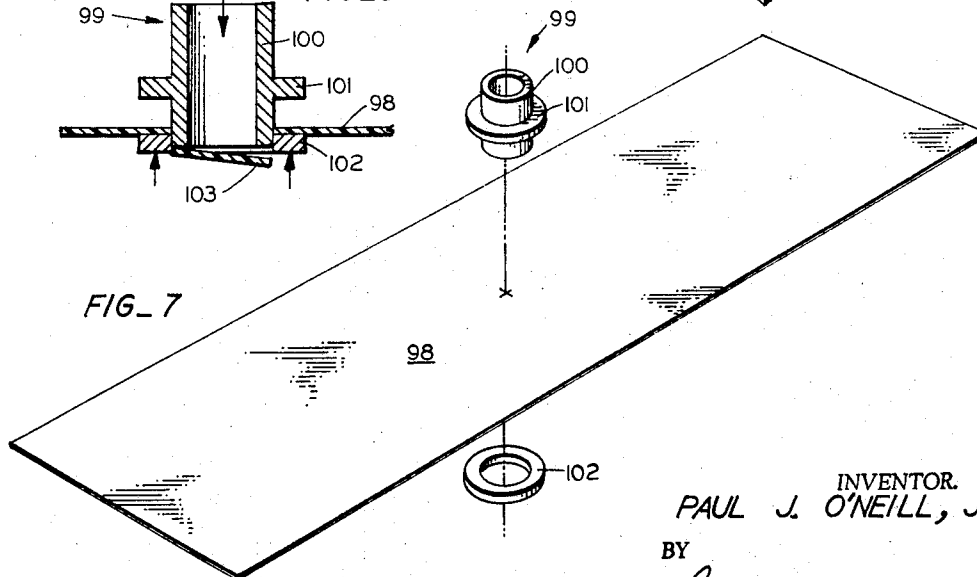
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4 Sheets-Sheet 3



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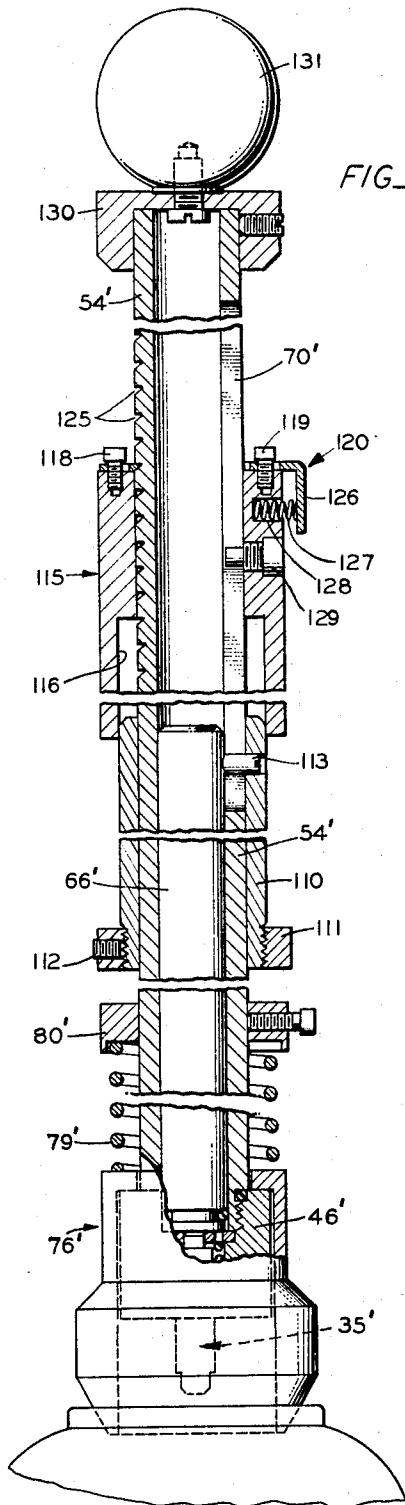
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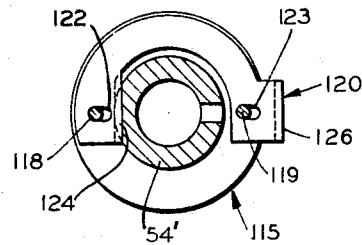
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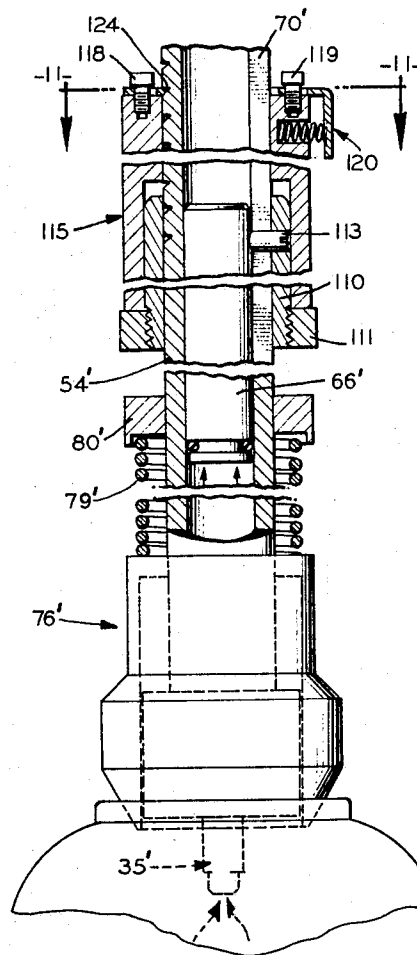
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FIG\_10



FIG\_11



FIG\_12

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## METHOD AND APPARATUS FOR PACKAGING PAINT AND THE LIKE IN A PRESSURIZED DISPENSING CONTAINER

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7 Claims. (Cl. 141-3)

This invention relates to pressurized cans and more particularly to the type of pressurized cans for dispensing liquids which are frequently referred to as aerosols.

It is customary to package a variety of fluids and semi-solid plastics in pressurized cans which contain the material to be dispensed and a charge of Freon or other highly volatile gas usually in liquid form. Such pressurized containers have heretofore been employed to dispense paint and are advantageous for this purpose in that the very fine stream which may be ejected permits the dispensing of a very fine coat of the paint in a simple and speedy manner.

The potential of pressurized containers for paint has not been realized as yet since it has not been economically feasible to supply the tremendously large variety of colors which are demanded by the public. Thus, although the customer desires to use the pressurized dispenser because it is efficient and saves time, he is discouraged from the use of such devices since he is obliged to take one of a relatively small number of colors available. The present invention overcomes this disadvantage in the use of pressurized containers for paint by providing means for obtaining any color desired. This is done by injecting a measured amount of colorant into a base paint already packaged within the pressurized can so as to obtain the particular color required. It is contemplated by the present invention that pressurized can containing a base white paint and a charge of propellant will be supplied to the paint retailer so that said retailer is in a position to provide whatever shade of color is desired by simply adding a measured amount of whatever additional colorant is required to make the color to be used.

It is, therefore, the main object of the invention to provide a method and apparatus for injecting colorant into a pressurized can so that this step may be readily carried out by any retailer in a speedy and efficient manner.

Another object of the invention is the provision of a colorant dispensing gun which is foolproof in operation and has a sufficiently high degree of accuracy to insure perfect operation.

Still another object of the invention is the provision of a dispensing gun which is particularly adapted for use with standard pressurized containers and which may be operated without escape of fluid from said container and with the assurance that the exact amount of colorant desired will be injected into the pressurized container.

Yet another object of the invention is the provision of a method of forming a bag within a pressurized can so as to effectively separate the commodity to be dispensed from the propellant.

Another object of the invention is the provision of a method and apparatus for transferring paint pigments to and from pressure cans so as to enhance the quality of the paint that may be employed.

Other objects of the invention will be apparent from the following specification and drawings.

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FIG. 1 is a side elevation of a conventional pressurized container. The lower portion of the drawing is broken away to show internal structure.

FIG. 2 is a greatly enlarged vertical sectional view of the upper end of the container of FIG. 1.

FIG. 3 is a longitudinal sectional view of the dispensing gun shown cooperating with the pressurized container to which colorant is to be added.

FIG. 4 is an enlarged longitudinal sectional view of the discharge end of the gun shown in cooperation with a pressurized supply cannister of the type having a free piston therein.

FIG. 5 is a view similar to FIG. 4 but showing the gun in cooperation with the pressurized container and discharging a measured quantity of colorant therein through the discharge valve.

FIG. 6 is a vertical section of a pressurized can similar to that shown in FIG. 1 but provided with a flexible bag containing the commodity to be dispensed.

FIG. 7 is an exploded perspective of the bag securing elements and the sheet of plastic from which the bag is made in their proper relative positions in the first step of forming the bag.

FIG. 8 is a fragmentary cross section through the top of the bag showing the assembly step.

FIG. 9 is a perspective of the finished bag.

FIG. 10 is a side elevation, partly in section of a modified form of gun which has certain advantages over that shown in FIG. 3. The gun is shown in completely discharged position in FIG. 10.

FIG. 11 is a cross section of the gun of FIG. 10 as taken along lines 11-11 of FIG. 12.

FIG. 12 is a fragmentary side elevation of the discharge end of the gun showing it in filled condition.

Referring first to FIG. 1 the invention is adapted to be used with a conventional pressurized container generally designated 1 (FIG. 1) provided at its upper end with a spray head 2 which is in the form of a removable push button. One of the end products of the present invention is a pressurized container which contains a charge indicated at 3 of colored paint combined with a propellant such as Freon. Upon depressing the spray head 2 the mixture of propellant and paint is discharged from said spray head in a fine spray. In most cases the propellant is in gaseous form as it emerges from the spray head and readily disappears before striking the material to which the spray is to be applied.

As shown in greater detail in FIG. 2, the container 1 includes cylindrical sidewalls 5, an upper domed portion 6, and a mounting cover 7. The mounting cover 7 is attached to the upper end of the domed portion 6 by crimping and is provided with a central boss portion 8 in which the discharge valve is mounted. As best seen in FIG. 2, the central portion 8 is provided with a central aperture 9 through which the hollow cylindrical shank 10 of the push button spray head 2 is adapted to be loosely received.

Received against the under side of the boss portion 8 is an annular gasket 11 which functions as a valve seat as will be seen later on. The inner periphery of the annular gasket 11 snugly receives the outer periphery of the shank portion 10 of spray head 2 so that a seal is effected against the escape of the contents of the pressurized can while the valve is depressed to its open position.

Seated against gasket 11 is a valve stem generally designated 15 which is provided with an annular recess 16

adapted to receive therein the lower annular portion of the shank 10. The valve stem 15 is urged upwardly against the gasket 11 by a compression spring 17 which is received at its lower end in the frustoconical portion 18 of a generally tubular valve housing generally designated 19 which is connected at its lower end to the upper end of the discharge tube 20. The upper end of the valve housing 19 is swaged outwardly to provide an annular flange 22 which abuts against and retains the annular gasket 11.

At assembly the valve housing 19 and the mounting cover 8 are fixedly secured together by crimping as indicated at 23.

In the operation of the conventional structure shown in FIG. 2 depression of the spray head 2 causes the valve stem 15 to be moved away from the gasket 11 against the urgency of spring 17 and the fluid is permitted to escape from the interior of the can 1 between the gasket and the upper end of the valve stem 15 which forms an annular seat. The hollow shank portion 10 of the head 2 is formed at its end with a relatively narrow slot 30 which constitutes the only means through which passage of the fluid is effected from the interior of the can to the central bore 31 of the spray head 2. Said central bore terminates at its upper end in a horizontally extending discharge passageway 32.

The push button spray head 2 is readily removed by simply pulling outwardly on the same so as to release it from the grip of gasket 11 into which it has been press fitted.

As seen in FIG. 3 the gun employed in the present invention is adapted to cooperate with the above described pressure can and to this end is provided with a discharge nozzle generally designated 35 which is formed at its outermost end to cooperate with the stem 15 of the pressurized can valve. The stem 15 includes an upwardly projecting central projection 36. However, the bore 37 is smaller in diameter than the upper diameter of projection 36 so that the stem 15 is permitted to shift laterally relative to the nozzle 35 as the latter is urged inwardly of the valve. If such shifting were not permitted the stem 15 might have a tendency to stick to the gasket 11 and move the nozzle out of coaxial alignment relative to the gasket thus elongating the hole in gasket 11 and causing leakage. Adjacent said tip 38 the nozzle 35 is provided with a plurality of transversely extending slots 40 providing an opening to permit the passage of fluid into the bore 37 and out of the same depending on whether the gun is being charged or discharged.

The nozzle 35 is provided with cylindrical sidewalls 42 and is reduced at its outermost end adjacent tip 38 so as to provide an outwardly projecting shoulder 43. As it will be seen in FIG. 3 when the nozzle 35 is inserted through the gasket 11 of the pressurized can 1, fluid tight engagement with said gasket is effected by the large diameter portion of the sidewalls 42 of nozzle 35 before the tip 38 of the nozzle engages the central projection 36 of the valve stem 15. Thus, upon further insertion of the nozzle 35 into the valve, the valve stem 15 is depressed against the urgency of spring 17 to permit communication between the interior of can 1 and the bore 37 in nozzle 35.

The above described structure of nozzle 35 is important in that it is necessary to provide clearance in the very limited space in the annular recess 16 (FIG. 2) to permit the product to pass into the bore 37 of the nozzle 35. Without the reduction in diameter at the nozzle tip there would be insufficient space to permit the flow of material without undue resistance as the colorant is being injected into the can.

The nozzle 35 of the gun generally designated 34 (FIG. 3) is slidably received within a cylindrical recess 45 formed in a generally cylindrical head 46 which in turn is provided with an integral radially inwardly projecting annular flange 47 through which nozzle 35 is slidable. Intermediate its

ends, nozzle 35 is formed with an outwardly projecting annular flange 48 which is adapted to engage an O-ring seal 49 interposed between flange 47 and flange 48.

On the outer side of flange 48 nozzle 35 is provided with a transverse bore 50 which communicates with the inner end of the axially extending bore 37. When the nozzle 35 is in the position shown in FIG. 3 the radially outwardly directed ends of transverse bore 50 are in meeting relation with the O-ring seal 49 so that, in said position, communication between bore 37 and the interior of gun 34 is prevented. Nozzle 35 is normally urged to the position of FIG. 3 by a compression spring 51 surrounding the inner end of said nozzle. One end of spring 51 abuts flange 48 on nozzle 35 and the other end abuts a circular plate 53 which defines the inner end of recess 45.

Plate 53 is received within a complementarily formed depression in head 46 and is retained in place by one end of the tubular cylinder 54 of gun 34. Head 46 and cylinder 54 are threaded as indicated at 55 so that, upon screwing head 46 onto cylinder 54 the adjacent end of the latter engages circular plate 53 to hold it in place. An O-ring seal 56 is interposed between head 46 and an annular shoulder 57 on cylinder 54 to prevent leakage. Outwardly opening holes 58 may be drilled in head 46 to receive a spanner wrench to permit the above described assembly.

Plate 53 is provided with a circular row of apertures 59 to permit flow of fluid therethrough and is formed with a central aperture 60 to receive therein the reduced inner end portion 61 of nozzle 35. Upon inward movement of nozzle 35 against the urgency of spring 51 communication is established between the space 64 within the cylinder 54 and the nozzle bore 37 through apertures 59, recess 45, and transverse bore 50.

A piston 65 provided with seal 63 is slidably disposed within cylinder 54 and is adapted to engage the inner side of aperture plate 53 when said position is moved to its extreme discharge position. Screw threadedly secured to piston 65 is one end of a piston rod 66 that is connected at its other end to a sleeve 67 surrounding cylinder 54. The connection between rod 66 and sleeve 67 is made by means of a bolt 68 and spacer 69, the latter being received within a slot 70 extending longitudinally of the cylinder 54 thereby preventing relative rotation between the piston and the cylinder.

Also mounted on cylinder 54 is a stop in the form of a sleeve 72 which may be adjustably positioned at any desired point along the length of cylinder 54 by means of a locking bolt 73. Inscribed at points along the length of cylinder 54 is a row of indicia 74 which may represent units of volume such as ounces. When piston 65 is in abutment with plate 53 the stop sleeve 72 may be positioned with its edge 75 in registration with the particular indicium representing the volume of fluid desired to be transferred into the gun. The gun may then be filled with fluid under pressure, in a manner to be described, until the sleeve 67 engages stop sleeve 72 at which point filling will automatically stop with the gun containing the exact amount of fluid desired.

Surrounding the discharge end of the gun is a positioning sleeve 76 which is provided with an enlarged outer end formed with a bevelled can engaging surface 77. The opposite end of the sleeve 76 is provided with a radially inwardly projecting flange 78 which fits over the axially directed inner end of head 46 of the gun 34. Positioning sleeve 76 is urged to the outer position shown in FIG. 3 by a compression spring 79 which is interposed between said positioning sleeve and an adjustable collar 80 secured to cylinder 54 by bolt 81.

When it is desired to inject colorant into the pressurized can 1 that contains the base paint, the gun is positioned on the mounting cover 7 as shown in FIG. 3 (except that sleeve 67 is against stop 72 when the gun is filled). Upon pressing downwardly on the cylinder 54 the same moves relative to sleeve 76 against the force of spring 79. Because of the presence of the positioning sleeve 76 the

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nozzle 42 approaches the discharge valve of can 1 along a line coaxial with the latter. Nozzle 42 enters the aperture 9 in mounting plate 7, through the apertured gasket 11 and into engagement with valve stem 15.

At this point it should be noted that the force of compression spring 51 in gun 34 is greater than the force of compression spring 17 in the valve of the can 1. For this reason, after the nozzle 35 moves downwardly through gasket 11 in sealing engagement therewith and into abutment with valve stem 15, further downward movement of the gun opens the valve of the can and subsequently unseats nozzle 35 from seal 49 after valve spring 17 develops sufficient resistance. By sliding sleeve 67 of gun 34 downwardly the user is then able to force the contents of the space 64 in cylinder 54 into the can 1 against the internal pressure in the latter. (See FIG. 5.)

Discharge of the contents of gun 34 is completed when piston 65 abuts the inner side of plate 53 and the gun may then be withdrawn from the can. Upon such withdrawal it will be understood that the seal in nozzle 35 is closed before the can valve closes so that only the material that is in the spaces between the inner side of gasket 11 and the O-ring seal 49 of the gun remains in the nozzle. However, the volume of such spaces is so minute as to be negligible insofar as practical amounts are concerned. However, it is essential that the volume between O-ring 49 and gasket 11 be an absolute minimum not only in the interest of accuracy, but also to prevent undesirable dripping from the gun after it has been removed from the can. Since the bores 37, 50 are extremely small the fluid left therein is less than one half drop, or in the order of .00036 cubic inch for a gun having a  $\frac{3}{8}$ " diameter piston.

By the present invention the undischarged spaces above noted may be kept to an absolute minimum because the gun is filled from a source that is under pressure. If it were necessary to pull the fluid into the gun by retracting the piston and permitting atmospheric pressure to fill it, not only would the time consumed be excessive because of the friction in the narrow passageways but the operation would be inherently inaccurate.

After the gun is removed from the can 1, the fluid within passageways 37, 50 is at the elevated working pressure of the pressurized can. Such captured material tends to expand when the nozzle is exposed to atmospheric pressure thus enhancing the tendency for a drip to form at the tip of the nozzle.

It will be understood that the length of the external portion 42 of nozzle 35 must be sufficient to operate the valve in the can. However, by making such length a minimum and by forming the bores 37, 50 to the relative sizes shown, it is possible to completely obviate any objectionable dripping.

The operation of filling the gun to the desired amount of coloring pigment will now be described with reference to FIG. 4.

In FIG. 4 there is shown a pressurized can 85 of the type disclosed in U.S. Patent No. 3,022,923 to Hoffman wherein the space 86 containing the material to be dispensed is separated from the space 87 containing the propellant by a sliding piston 88. This type of can, wherein the commodity is separated from the propellant, is desirable for use in filling the gun of the present invention with pigment since the pigment is pure and not diluted with propellant (assuming, of course, that there is no leakage past piston 88).

In operation it is merely necessary to apply the empty gun 34 to the can 85 so that the nozzle 35 depresses valve stem 90 against the urgency of spring 91 and so that the nozzle flange 48 is retracted from seal 56. The pressure of propellant within space 87 then forces the pigment out of space 86 into the space 64 in cylinder 54 causing the piston 65 to retract until it engages the preset stop sleeve 72 (FIG. 3) determining the exact amount of pigment to be received in gun 34.

When the gun 34 contains the desired amount of pig-

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ment it is a simple matter to transfer it to the can 1 containing the base paint in the manner described previously.

Because of the danger of the propellant leaking past the piston 88 (FIG. 4) and fouling the pigment in space 86, it is desirable to insure that the pigment maintains its purity by employing the structure shown in FIGS. 6-9.

In this case the pigment dispensing can 95 may be identical to can 1, described previously, except that a flexible bag 96 (FIG. 6) is provided on the valve housing 97 (which is the same as the valve housing 19 of FIG. 2).

The use of flexible bags for containing the material to be dispensed and separating it from the propellant is not new (see, for example, U.S. Patent Nos. 2,671,578 and 2,937,791). However, considerable difficulty has been encountered in the past in effecting a tight connection between the bag and the upper portion of the dispensing can. The lack of a solution to this difficulty has required the adoption of the free piston type of structure shown in FIG. 4 despite the fact that the possibility of leakage past the piston is always present.

By the present invention an extremely effective leak proof structure is effected in an economical manner which will now be described.

The bag 96 is formed from a rectangular sheet 98, preferably of heat-sealable polyester film. Such material need not be very strong since the working pressures on opposite sides are equal. However, it is essential that no leakage occurs.

The fitting generally designated 99 (FIG. 8) by which the bag 96 is secured to the valve housing 97 comprises a sleeve 100 provided with an integral annular flange 101. Said fitting is secured to the sheet 98 at the exact geometrical center of the latter in the manner shown in FIG. 8. Cooperating with the sleeve 100 is a washer 102 which has an inside diameter about equal to the outside diameter of sleeve 100. With the central portion of sheet 98 interposed between sleeve 100 and washer 102 the latter is forced onto the sleeve so as to clamp the adjacent portion of the sheet 98 between the flange 101 and the washer 102. With an interference fit existing between sleeve 100 and washer 102 this assembly results in the annular marginal portion of sheet 98 being tightly clamped to prevent leakage. In the process a circular section 103 is cut out of the sheet 98, thereby forming the discharge aperture of the bag.

The sheet 98 is then folded transversely along a central line that includes the fitting 99 and the longitudinally extending side edges are heat sealed along their margins as indicated at 105, 106 (FIG. 9). The opposite ends are also integrally connected along their marginal portions by heat sealing as indicated at 107.

The bag is then secured to the pressure can by inserting the sleeve 100 onto the valve housing 97 with an interference fit before the final assembly of the can is effected. In order to insure discharge of the material from within bag 96 regardless of how the bag collapses during use, it is preferable to provide the discharge tube 108 with perforations 109 (FIG. 6) along its length.

The structure of FIGS. 6-9 has been found to be preferable over the free piston structure of FIG. 4 not only because it is less expensive, but also because leakage of propellant into the pigment is effectively obviated.

Another advantage of the bag over the free piston is that a greater amount of product may be contained in the dispensing can. Thus, although the volume of the contents of the bag 96 may be about 95% of the total volume of the can 95, the corresponding volume of product in can 85 is only about 65% because of the lost space attributable to the presence of the skirt of the piston.

A modified form of gun is shown in FIGS. 10-12. The discharge end of the gun of FIGS. 10-12 is the same as that shown in FIG. 3 but instead of the sleeve 67 of FIG. 3 there is provided a sleeve 110 which is threaded at one end to receive a nut 111. For a purpose to be described the nut 111 may be axially shifted to an accurate pre-

determined position relative to sleeve 110 and then secured in the adjusted position by a set screw 112 on nut 111.

The inner end of sleeve 110 is secured to the inner end of piston rod 66' by screw 113 which passes through the slot 70' in cylinder 54'. In this case piston rod 66' is not provided with an enlarged piston and the rod 66' acts as a piston.

Slidably carried on cylinder 54' is another sleeve 115 which is provided at its inner end with an enlarged diameter bore 116 to telescopically receive therein the sleeve 110. The outer end of sleeve 115 is provided with flat headed screws 118, 119 which secure an adjustment plate 120 to said inner end of the sleeve 115. As best seen in FIG. 11 the screws 118, 119 are at diametrically opposite points on the inner end of sleeve 115 and are received through elongated slots 122, 123 respectively in plate 120 to permit transverse shifting of plate 120.

The plate 120 is generally C-shaped and is provided with a straight bevelled inner edge 124 which is adapted to be received in one of a row of serrations 125 cut in the periphery of cylinder 54 (FIG. 10).

The plate 120 is provided with a flange 126 which is adapted to be engaged by the thumb or finger of the user to urge the plate 120 to the left as seen in FIG. 10 to disengage the bevelled edge 124 from the serration in which it is received. Relative rotation of sleeve 115 and cylinder 54' is prevented by pin 129 on sleeve 115 and received in slot 70' of cylinder 54'.

The adjustment plate 120 is urged to the engaged position shown in FIG. 10 by a compression spring 127 which is received in a radially extending hole 128 in sleeve 115 and engages the inner side of flange 126. At this point it will be noted that the plate 120 is normally in engaged position holding sleeve 115 fixed relative to cylinder 54'. When it is desired to move sleeve 115 along cylinder 54' it is merely necessary to depress flange 126 of plate 120 and hold it depressed until the sleeve has been moved to the new desired position. Upon release of plate 120 the sleeve 115 will be held in a fixed position relative to cylinder 54' by the coaction of bevelled edge 124 and one of the serrations 125.

It will be noted that a very accurate measure of the movement of the piston relative to the serrations 125, which indicate the volume, may be obtained by rotation of nut 111 relative to sleeve 110. In this way slight axial shifting of nut 111 relative to sleeve 110 is possible in order to maintain to an accurate degree the proportionality of movement of sleeve 110 to the volume of charge within the cylinder.

In operation, when the gun of FIGS. 10-12 is empty and it is desired to charge it, the sleeve 115 is moved to a position so that plate 120 is held in the particular serration 125 corresponding to the amount of fluid desired. The nozzle of the gun is then inserted into the supply can, either of the type of FIG. 4 or that of FIG. 6, so that the piston 66' is retracted until sleeve 110 abuts sleeve 115. The gun is thus automatically filled to the desired amount of colorant. It will be noted that sleeves 110 and 115 act as stops in the above described operation.

The gun may then be discharged into the paint applying can such as the type shown in FIG. 1. In this last operation it will be noted that the operator merely disengages plate 120 and urges sleeve 115 toward discharge position so that sleeve 110 and piston rod 66 is carried with it. When the fully discharged position is reached the operator may release plate 120 so that sleeve 115 becomes releasably secured to cylinder 54'. This last step is desirable because the nozzle of the gun may be removed from the can without any danger of the piston being released by the operator during the withdrawal step. Such inadvertent release of the piston would, of course, permit the internal pressure of the dispensing can to drive the piston inwardly of the cylinder.

By bevelling the edge 124 of plate 120 on only one side as indicated in FIG. 10 it may not be necessary for the operator to depress plate 120 before discharging the gun. The particular structure shown also insures a positive stop insuring inadvertent movement of the piston inwardly of the discharge end.

The longitudinally extending slot 70' in cylinder 54' may conveniently extend to the end of the cylinder opposite the nozzle. An end cap 130 may then be employed to close the end of the cylinder 54' and, to facilitate manual handling of the gun, a ball 131 or other rounded element may be secured to cap 130.

The above described procedure for handling the colorant also permits a radical departure from conventional methods of formulating the colorant with advantageous results.

It will be apparent that fluidity, which is a necessary characteristic of paint colorants used by conventional methods, is not required by the present invention because it is not necessary that the viscosity be maintained low enough to permit free flow at atmospheric pressure. Thus, the slow drying or semidrying oils or resin vehicles which are conventionally employed to promote fluidity are not required by the method of the present invention and the disadvantages that attend the use of such materials are not present. For example, the thinning agents that are usually added to the colorant to permit use in accurate dispensing machines without clogging may be eliminated with the result that the paint film ultimately applied dries faster and is tougher than has heretofore been the case with conventional formulations.

Since the colorant used by the present invention may be of a relatively high viscosity, sedimentation of the pigment particles does not occur to any appreciable degree. The bothersome procedure of agitating the colorant is, therefore, obviated and a more uniform particle dispersion is achieved to promote greater accuracy in color matching.

The present invention contemplates the use of solvents or combinations of solvents for pigment particle dispersal as opposed to conventional pigment vehicles including oils and oil-resin combinations. Solvents have superior wetting characteristics because of their low molecular weight. For this reason, and because of their low viscosity, more effective penetration of the pigment particles results during the mixing process. Other advantages accruing from the use of a solvent as the vehicle are: reduced milling or grinding time; a more complete reduction of slurry to ultimate particle size; a higher ratio of pigment to vehicle resulting in more intense tinting power with less material; elimination of objectionable properties of slow drying or semidrying oils or resins; the use of materials that are conventionally added to prevent formation of hardened films in measuring and dispensing equipment are not required.

It will be understood that the use of a volatile solvent as the vehicle in the present invention results in a rapid release of the vehicle when the final paint film is applied. Such vehicle does not remain in the paint film and thus does not adversely affect the drying time or the ultimate paint film strength as do conventional vehicles.

However, it is desirable that certain steps be taken to counteract certain unstable characteristics associated with the use of such low molecular weight substances when solvents are used to form the continuous phase of a pigment dispersion.

An example of the method of formulation of the novel colorant follows:

The pigment and solvent are mixed to form a slurry with the volume of the solvent being only slightly more, preferably one or two percent more, than the volume of the voids that exist between the pigment particles when the free surfaces of all of the pigment particles have been completely wetted.

The second step is preferably the addition of a surfactant such as soya lecithin in an amount sufficient to provide a monomolecular layer on the free surfaces of the pigment particles. The ionic properties of the particular surfactant are preferably such that interfacial tension at the interfaces of the pigment particles is relieved, and so that interaction induces mild flocculation of the pigment surfactant micelles.

The third step is the reduction of the viscosity of the free solvent vehicle by the addition of a suitable quantity of a gelling agent so that the value  $V$  in Stokes' equation is reduced to a rate closely approximating zero. The increases in density of the external phase to a point near the density of the dispersed micelles and the increase in the viscosity as above described contribute to reduction of the rate of sedimentation as is seen from the Stokes' equation:

$$V = \frac{2R^2g(D_1 - D_2)}{9\eta}$$

where:

$V$ =velocity of sedimentation

$R$ =radius of particles

$g$ =gravity constant

$D_1$ =density of pigment micelles

$D_2$ =density of external phase

$\eta$ =viscosity of external phase

It will be understood that only an extremely small percentage of gelling agent is required since only a relatively small amount of free solvent is present to be affected thereby.

The fourth step is to package the resultant colorant in a hermetically sealed pressurized container having a discharge valve provided with a relatively small orifice.

The last step, which follows from the use of the apparatus above described, is to subject the colorant to relatively high shearing action by dispensing it through the small orifice of the valve under pressure. The result of such shearing action is to correct or reverse the flocculated condition of the pigment-surfactant micelles before the colorant is added to the base paint so as to obtain optimum colorant dispersal and tinting effect.

Although the above described invention has been illustrated with reference to paint and paint pigment in a field in which it finds its greatest effectiveness it will be apparent that the method and apparatus described will be applicable to other materials and in different environments.

I claim:

1. The method of packaging a paint, which includes a base paint and a colorant, within a pressurized dispensing container having a discharge valve adapted to be opened to discharge the contents thereof, comprising the steps of:

providing a propellant and a base paint under pressure within said container, and thereafter discharging a charge of colorant under pressure through said discharge valve into said container and simultaneously preventing escape of fluid from said container during such discharge.

2. The method of packaging a paint, which includes a base paint and a colorant, within a pressurized dispensing container having a discharge valve adapted to be opened to discharge the contents thereof, comprising the steps of:

providing a colorant under pressure within a closed vessel, connecting said vessel with a colorant gun and injecting a measured quantity of colorant into said gun from said vessel by the internal pressure of said vessel, providing a propellant and a base paint under pressure within said container, and thereafter, connecting said gun with the discharge valve of said container and discharging said measured quantity of colorant into said container through said dis-

charge valve, and simultaneously preventing escape of fluid from said container.

3. The method of packaging a paint, which includes a base paint and a colorant, within a pressurized dispensing container having a discharge valve adapted to be opened to discharge the contents thereof, comprising the steps of: providing a colorant under pressure within a closed vessel,

connecting said vessel with the discharge nozzle of a gun having a cylinder and a movable piston therein, injecting a measured quantity of colorant into the cylinder of said gun through said nozzle to force said piston a predetermined distance along said cylinder proportional to said measured quantity,

connecting said nozzle to said discharge valve of said container, moving said piston toward said nozzle to discharge said measured quantity of colorant into said container through said discharge valve, and simultaneously preventing escape of fluid from said container.

4. The method of tinting a base paint to achieve a desired final color comprising the steps of:

providing said base paint in a hermetically sealed dispensing container until the desired amount of colorant is to be added,

mixing a batch of colorant material with a gelling agent to increase its viscosity and thereby prevent settling of pigment particles in said batch.

placing said batch within a pressurized container provided with a propellant until tinting of said base paint is desired, and thereafter,

permitting a measured quantity of colorant to escape from said pressurized container and transferring said quantity into said dispensing container under pressure when it is desired to tint said base paint.

5. The method of preparing a paint colorant comprising the steps of:

forming a slurry by dispensing comminuted pigment particles in solvent of a volume equal to an amount slightly greater than the volume of voids between said particles when the free surfaces of the latter have been completely wetted,

adding a gelling agent to increase the viscosity of the free solvent to reduce the rate of sedimentation to substantially zero, and

thereafter packaging the final product within a pressurized container having a discharge valve.

6. A gun for colorants and the like comprising:

a housing formed with a cylinder therein, having a discharge end,

a piston slidably disposed in said cylinder,

a first sleeve slidable on said housing,

a second sleeve fixedly secured to said piston and slidable on said housing and interposed between said discharge end and said first sleeve,

manually actuatable means for fixedly but releasably securing said first sleeve to said housing in one of a plurality of predetermined positions,

said first sleeve being provided with an enlarged bore opening outwardly of the end of said first sleeve that is adjacent said second sleeve, for receiving a portion of said second sleeve therein in telescopic relation.

7. A gun for colorants and the like comprising:

a housing formed with a cylinder therein, having a discharge end,

a piston slidably disposed in said cylinder,

a first sleeve slidable on said housing,

a second sleeve fixedly secured to said piston and slidable on said housing and imposed between said discharge end and said first sleeve,

manually actuatable means for fixedly but releasably securing said first sleeve to said housing in one of a plurality of predetermined positions,

said means comprising a spring urged detent adapted to engage said housing.

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