Jan. 25, 1966 E. H. GREEN ETAL 3,231,153

MULTIPLE SPRAY RATE PRESSURIZED PACKAGE DISPENSER

Filed Jan. 3, 1964 2 Sheets-Sheet 1

FIG. 1.

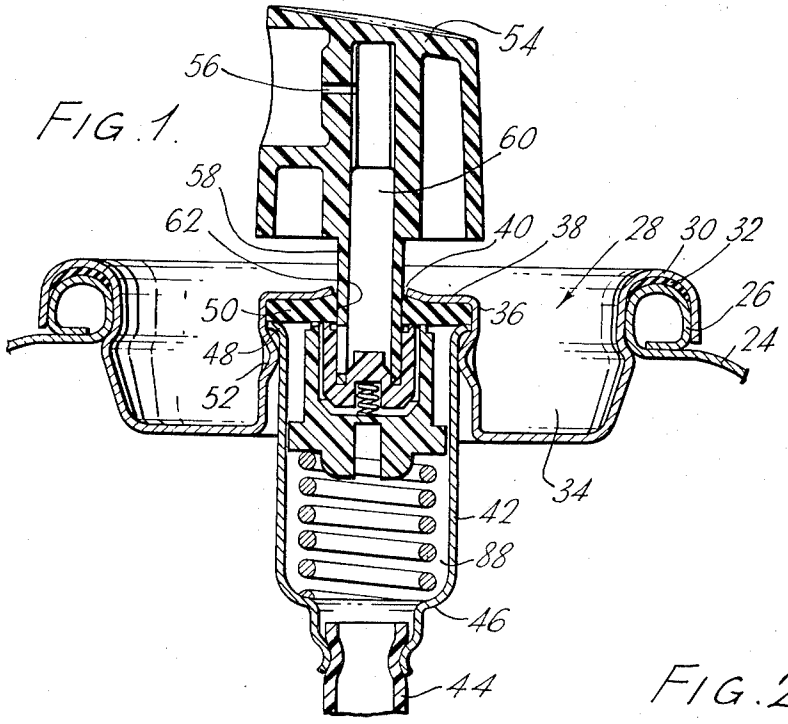
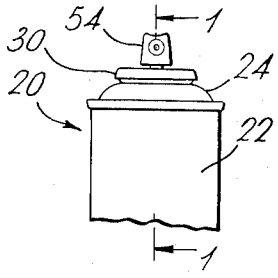


FIG. 2.



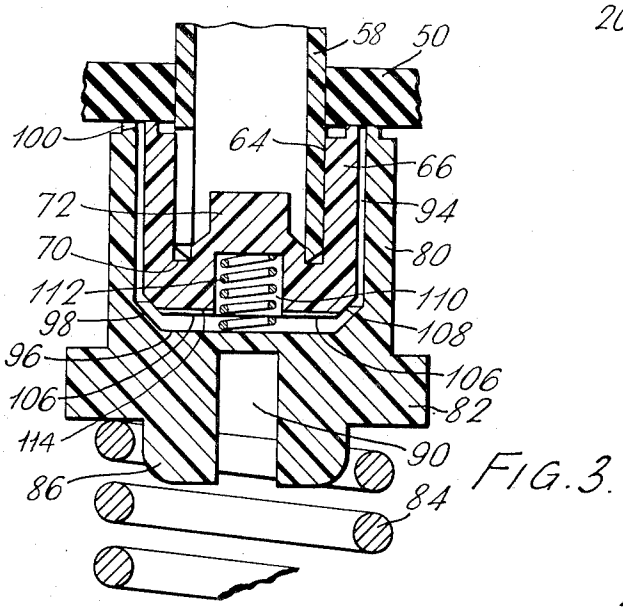


FIG. 3.

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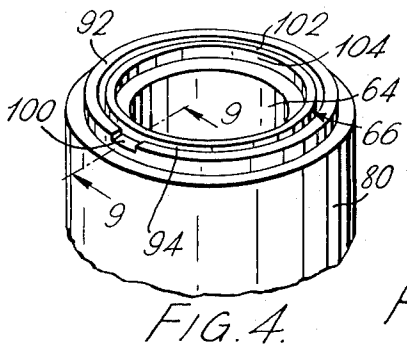

FIG. 4.

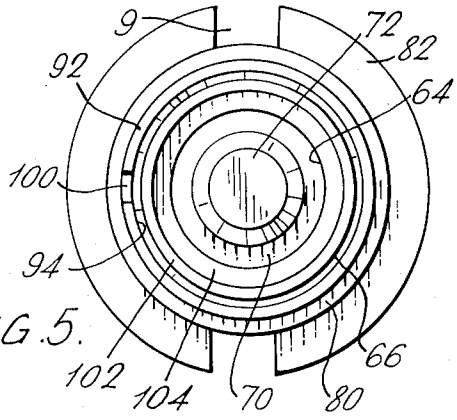

FIG. 5.

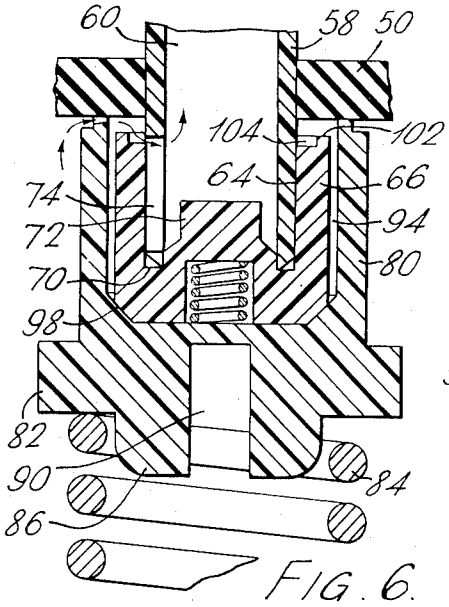

FIG. 6.

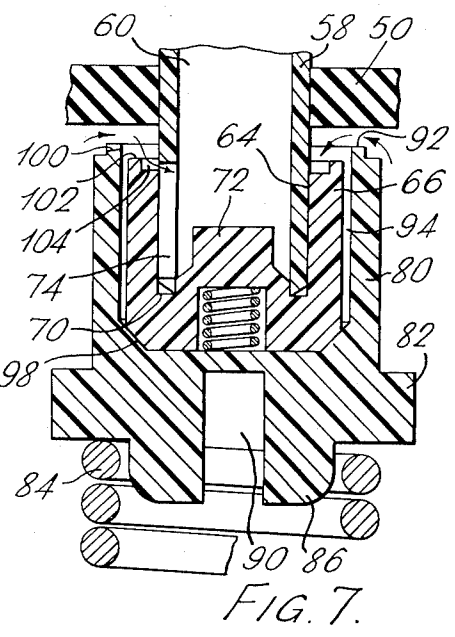

FIG. 7.

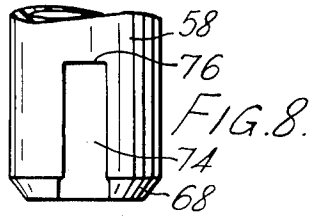

FIG. 8.

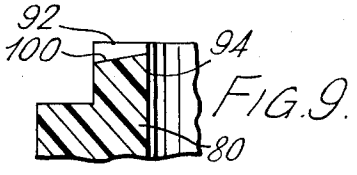

FIG. 9.

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3,231,153

MULTIPLE SPRAY RATE PRESSURIZED PACKAGE DISPENSER

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11 Claims. (Cl. 222—394)

This invention relates generally to the type of apparatus known as aerosal spray devices, and more particularly is concerned with apparatus which will enable the user to select one of a plurality of spray rates from the same pressurized package.

The type of pressurized product with which the invention is most likely to be used is hair lacquer or similar cosmetic and paint or the like. For example, during the process of adjusting coiffure, the user of sprayed hair lacquer may wish to dispense very small quantities for interim setting of the parts of the hair and when completely arranged, the user will wish to cover the entire coiffure with a heavy spray. Similar situations in applying paint, enamel, varnish or the like are understood to occur.

The invention enables the same spray package to be used with different spray rates. Since the most ordinary requirements are for a fine and a coarse spray, the preferred embodiment which is described shows a construction providing two rates. More than two can be achieved, but only with added expense, as described hereinafter.

Since other constructions have been devised to provide multiple spray rates from pressurized packages, the primary object of the invention is to provide a structure which differs from others in that: there is no need to twist the spray head to different positions in using the package; the user can change the spray rate by merely varying the finger pressure on the spray head without putting the package down or stopping an operation being performed by his other hand; no special construction of spray head or valve housing differing from well-known slotted-stem dispensers need be used; no complicated parts are required.

Other objects will appear to those skilled in this art as a description of the preferred embodiment appears hereinafter, in connection with which the drawings illustrate the same.

In the drawings:

FIG. 1 is a median sectional view taken through a pressurized package constructed in accordance with the invention taken generally along the line 1—1 of FIG. 2 and in the direction indicated.

FIG. 2 is a fragmentary elevational view of the upper end of a pressurized package to show the environment of the invention.

FIG. 3 is a fragmentary enlarged sectional view of a portion of FIG. 2 showing the apparatus in the condition where none of the pressurized product is being dispensed.

FIG. 4 is a fragmentary perspective view of the top of the assembled inner and outer plungers, here shown in their relative position according to a condition shown in FIG. 3.

FIG. 5 is a top plan view of the plungers of FIG. 4.

FIG. 6 is a view similar to that of FIG. 3 but in this case the user has pressed the spray head downward to its first stage and the pressurized product is being dispensed at a fine rate.

FIG. 7 is a view similar to that of FIGS. 3 and 4, but in this case, the user has pressed the spray head downward to its second stage, and the pressurized product is being dispensd at a coarse rate.

FIG. 8 is a fragmentary bottom view of the stem of the spray head.

FIG. 9 is a fragmentary sectional view of a modified form of the first stage metering groove taken on the line 9—9 of FIG. 4 and in the indicated direction.

As may be noted from a cursory examination of the illustrations, the invention is characterized by the provision of two valve plungers telescopically arranged one inside the other, each having a valve seat, the inner being urged against the sealing gasket by a weak spring engaging between the bottom of the inner plunger and the floor of a cup-like cavity formed in the outer plunger, while the outer plunger is urged against the sealing gasket by the strong spring bearing against its underside and seated in the valve housing. The first stage movement consists of overcoming the bias of the weak spring, giving access for the pressurized product over the inner valve seat into the hollow stem of the spray head from the valve housing through a radial metering groove in the outer valve seat. The second stage movement consists of further pushing down on the spray head and overcoming the bias on the stronger spring, giving the same access for the pressurized product over the inner valve seat, but now also giving additional access over the outer valve seat.

The construction and operation of the basic apparatus is based upon the well-known slotted stem, single stage aerosol dispenser. In this device there is a spring-pressed single valve plunger having a socket and being mounted for vertical reciprocation in a valve housing. The valve housing is enclosed, has a bottom dip tube extending down into the pressurized package and has an upper flared end. The flared end is crimped into an upstanding boss formed in a cover member secured to the top of the package and clamps an annular sealing gasket into the boss. A spray head with an external orifice and a hollow depending stem has the stem removably engaged through holes in the boss and gasket and engaged in the socket. The gasket seals the stem and a slot in the bottom end of the stem is blocked off from the housing because the valve plunger has a seat on its top end pressed against the bottom of the gasket around the stem and gasket hole. Where the socket opens at the seat the slot extends into the gasket. Where the socket opens to a gallery or pocket below the seat, the slot need not extend into the gasket, but need only extend into the gallery or pocket. In either case, pushing the spray head down unseats the plunger from the bottom face of the gasket and exposes the upper end of the slot. The pressurized product passes over the valve seat, into the slot end, into the hollow bore of the stem, where it expands, then out the external orifice of the spray head.

Referring now to the drawings, the reference character 20 is a pressurized package comprising a sheet metal canister 22 designed to contain the high pressure associated with such packages, having a dome 24 with a curled opening 26 to which the construction of the invention is secured. A cover member 28 has a lip 30 curled over the opening 26 and crimped in place, being sealed by gasket material 32. The cover member has an annular well 34 provided with a central upstanding boss 36 in the top wall 38 of which there is a central opening 40. A hollow valve housing 42 with a dip tube 44 secured at its constricted narrow end 46 has a flared upper end 48 that clamps an annular disc-like rubber gasket 50 to bottom of the wall 38, the housing 42 being fixed in place by pinches or crimps 52 around the boss 36.

A spray head 54 of any suitable upper end construction and having an external spray orifice 56, has a hollow stem 58 with expansion bore 60 which passes through the hole 40 and through an aligned opening 62 in gasket 50 and is removably mated with a socket 64 in the inner

valve plunger **66**. The plunger **66** will be described in greater detail hereinafter, but at this point only its socket **64** will be referred to.

The spray head stem **58** fits in the socket **64** close enough to be sealed therein, but is readily removed or installed therein. Its bottom end is chamfered at **68** for ready passage through openings **40** and **62** since opening **62** is a tight and constricting fit. The floor **70** of the socket is annular and enables positive bottoming of the chamfered end **68**, while there is an upwardly projecting pilot protuberance **72** to stabilize the bottom end of the stem and aid in properly seating the same in the socket **64**. The stem has a slot **74** in its side opening to the bottom **68** of the stem and extending axially in the level **76**. The slot **74** is quite wide compared to most single stage slotted stem spray heads, but this is for a purpose to be described.

Referring now especially to FIGS. 3 to 7, there are two valve plungers, an inner one **66** mentioned above, and an outer one **80**. The outer plunger **80** has a guide-flange **82** to permit vertical reciprocation in the housing **42** and is urged upward by helical spring **84** which extends from constriction **46** to engage reduced diameter bottom end **86**. Pressurized material readily finds its way up the dip tube **44** into the chamber **88** of the housing **42** and up past the flange **82** through the transverse passageway **90**. The spring **84** is referred to herein as strong, but this is a relative word, since another much smaller and hence much weaker spring will be referred to. The spring **84** urges the outer plunger **80** upward so that an annular valve seat **92** provided on the upper end of the plunger **80** bears against the underside of gasket **50**. A cup-like cavity **94** is formed in the outer plunger **80** having a floor **96** and a conical centering fillet **98** formed at the juncture of floor **96** and the inner face of the cavity **94**. Obviously the seat **92** would seal the cavity **80** from the chamber **88** when engaged against the gasket **50** if it were continuous, but according to the invention there is a radial groove **100** in the seat **92** which provides the first stage metering for the device. This groove **100** is very small and is chosen to provide a passage for fluid at a fine spray rate. It may be a plurality of much narrower grooves to prevent blockage by the resilient bulging of the gasket **50** or a single groove. If wide, it may be canted to promote drainage as shown in FIG. 9.

The inner plunger **66** has a valve seat **102** on its upper end and may have a gallery or pocket **104** into which slot **74** opens and above which slot end **76** does not extend. If there were no gallery, slot end **76** would be above the valve seat **102** and the slot **74** could extend somewhat into the gasket, because the socket would then open at the valve seat **102** and block the remainder of the slot **74** under all conditions. The lower surface **106** of the inner plunger **66** is adapted to engage against and be stopped in downward movement of plunger **66** by the floor **96** and a chamfer **108** on the plunger cooperates with fillet **98** to keep the inner plunger **66** centered in cavity **94**. A central spring seating recess **110** has a small or weak spring **112** mounted therein engaging floor **96** and urging plunger **66** upward so that its seat **102** engages the underside of the gasket **50** and seals the slot **74** and socket **64** from the cavity **94**. The bottom **106** may have transverse relief grooves **114** to prevent the capture of fluid in a compression piston effect in movement of the plunger **66** relative to the plunger **80**.

The operation of the apparatus is shown progressively in the three views FIGS. 3, 6 and 7.

In FIG. 3, the plungers **66** and **80** are both seated and there is no dispensing. The spray head **54** may be readily removed or installed without disturbing this situation, even if spring **112** is very light in its pressure.

In FIG. 6, the user has pushed the spray head **54** down with his finger, against the pressure of spring **112**, compressing the spring, unseating the inner valve seat **102**, exposing the upper end of slot **74** in gallery **104** to the cavity **94**. The pressure of the spring **112** is light and as soon as the plunger **66** bottoms on the floor **96** the operator feels a resistance, requiring greater pressure for further movement. This feeling is easily recognized after one or two trials, and in most instances, the plunger **66** need not even be bottomed, since the fine spray will come immediately.

The opening to the slot **74** is chosen to be much larger than the opening afforded by the metering groove **100**, hence the latter controls spray rate, so long as the plunger **80** is not unseated. The flow of pressurized product is shown by arrows in FIG. 6.

In FIG. 7, the operator has pushed the spray head and stem down further than in FIG. 6, against the pressure of both springs **112** and **84**, so that both plungers are unseated. The groove **100** is now ineffectual to control spray rate. This being the function of the opening to the slot **74** and the pressurized product comes over the seat **92**, all around the plunger **80**, down into the gallery **104**, and through slot **74**. This is shown by arrows.

Further explanation is believed unnecessary. Modification and minor changes are readily made without departing from the spirit of the invention.

What it is desired to claim is:

1. A valve assembly for providing selectively different spray rates from a pressurized package, said assembly comprising:

(a) a dispenser spray head with a hollow depending stem, and an axial slot extending clear through the wall of said stem,

(b) a pair of valve plungers,

(c) the first one of said plungers being nested within the second one of said plungers,

(d) said spray head being seated within said first plunger for joint movement therewith,

(e) a lost motion connection for enabling the joint movement of said second plunger and said first plunger only after said first plunger has been moved a predetermined distance,

(f) said second plunger having first metering means for determining a relatively fine rate of flow of the pressurized product being dispensed through said spray head,

(g) second metering means defined between said first valve plunger and said slot in said spray head for determining a relatively coarse rate of flow of the pressurized product being dispensed through said spray head,

(h) said first and second metering means being selectively operable in response to the extent of joint movement of said spray head and the first one of said pair of nested plungers.

2. A valve assembly as claimed in claim **1** wherein said first metering means in said second plunger is normally blocked by said first plunger prior to the joint movement of said first plunger and said spray head.

3. A valve assembly as claimed in claim **1** wherein said first metering means is a radial groove through the wall of said second valve plunger, and said second metering means comprises a gallery in the upper end of said first valve plunger in communication with said axial slot.

4. A valve assembly as claimed in claim **1** wherein said lost-motion connection comprises a recess in the inner wall of said first plunger, and a compression spring mounted therein, said spring being mounted within said recess and extending outwardly and downwardly into engagement with the interior of said second valve plunger for permitting the joint movement of said valve plungers.

5. A valve assembly as claimed in claim **1** wherein said lost motion connection consists of a first spring normally biasing said valve assembly to a closed position, and a second, weaker spring interposed between said nested plungers, so that said first plunger moves downwardly within said second plunger a pre-determined

distance before said plungers overcome the bias of said stronger spring and move jointly.

6. A pressurized valve structure adapted to be secured to a pressurized container and comprising: a cover member having a sealing member secured therein, a pair of hollow bore, closed bottom telescoping valve plungers secured in sealing engagement with the sealing member and a passageway through the cover member and sealing member aligned with the bore of the inner plunger, a dispensing spray head with a slotted bottom hollow stem removably and sealingly engaged through the passageway and bottomed in the inner bore, a spring biasing the inner plunger upward in the bore of the outer plunger and against said sealing member, a stronger spring biasing the outer plunger against the sealing member, a first metering orifice in the stem and being a part of the slot, said first metering orifice being blocked when the inner plunger is in sealing engagement with the sealing member but establishing communication between the bore of the outer plunger and the hollow stem when the stem has been partially pushed downward to lower the inner plunger out of engagement with said sealing member, and a second metering orifice in the outer plunger between the bore of the outer plunger and its exterior for passing a relatively small flow of pressurized product when only the inner plunger has been lowered, the outer plunger adapted to be lowered by pushing the stem downward to bottom the inner plunger in the bore of the outer plunger and thereafter continuing to push said stem downward until the outer plunger is also out of engagement with said sealing member to provide for a greater flow from the exterior of said outer plunger to its bore and thence through said first metering orifice.

7. The structure as claimed in claim 6 in which there is a valve housing secured to said cover member on its bottom face, and said plungers are disposed in said housing and guided for reciprocal movement therein, and in which the said strong spring extends between the inside bottom end of the housing and the bottom end of the outer plunger.

8. The structure as claimed in claim 1 in which the outer plunger has a valve seat on its end engaging the sealing member, and the second metering orifice is a transverse groove in said valve seat.

9. The structure as claimed in claim 1 in which the upper end of the slot extends out of said bore and the exposed portion comprises said first metering orifice.

10. Apparatus for providing at least two different spray rates selectively from a pressurized container, the apparatus adapted to be mounted to the container and the container adapted to carry a pressurized product therein to be dispensed through the medium of the apparatus, said apparatus comprising a cover member adapted for sealed securement to the container top, a central boss

formed in the cover member, a hollow valve housing secured to the bottom of the boss with means connected thereto for leading pressurized product into the housing, an annular resilient gasket clamped to the inside of the boss by the valve housing, openings in the gasket and boss coaxially aligned, a pair of valve plungers in the housing nested one inside the other and coaxial with the gasket opening, the outer plunger being arranged for vertical reciprocal movement in the housing and having a first valve seat on its upper end and spring biased from its bottom end to press the said first valve seat against the underside of the gasket, the outer plunger having a closed bottom cavity with the inner plunger disposed in the cavity for vertical reciprocal movement therein and said inner plunger having a second valve seat on its upper end and being spring biased from its bottom end to press the second valve seat against the underside of the gasket to block the opening in the gasket, first and second spring means in the housing and cavity respectively to provide said bias, the first means being substantially stronger than the second, a closed bottom socket in the inner plunger opening upward and coaxial with the openings, a dispenser spray head having a hollow depending stem with a side slot opening to the bottom of the stem and the stem being removably engaged slidingly and sealingly through the openings and into the socket with the upper end of the slot terminating above the socket, a first internal metering orifice in the outer plunger communicating between the housing and cavity and being always open, the upper end of said slot and the top of the socket cooperating to provide a second internal metering orifice of greater flow capacity than the first but being blocked from communication with said cavity when said second valve seat is engaged against the gasket, the apparatus being operable in two stages to provide different spray rates, first when the spray head is depressed to move the second plunger unseating the second valve seat without unseating the first valve seat, and second when further depressed to also move the first plunger and unseat the first valve seat.

11. The apparatus as claimed in claim 10 in which there are means for centering the first valve plunger relative to the second as said first plunger moves downward.

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