Jan. 28, 1969 E. E. MEADOR ET AL 3,424,353

AEROSOL VALVE ASSEMBLY

Filed Nov. 29, 1965 Sheet 1 of 2

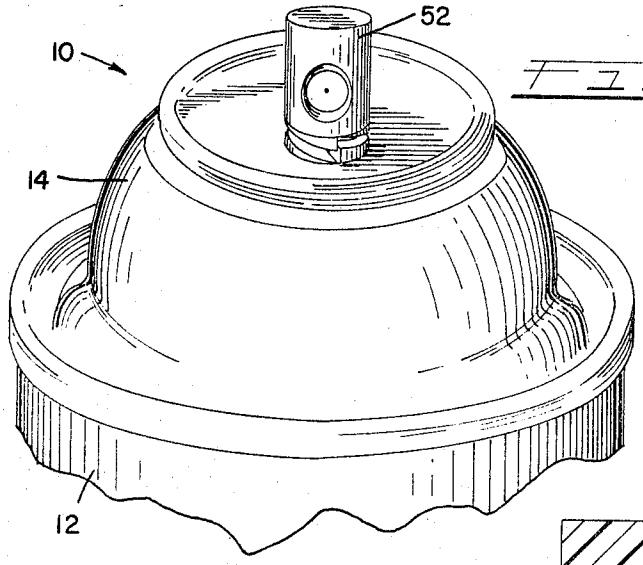


FIG. 1

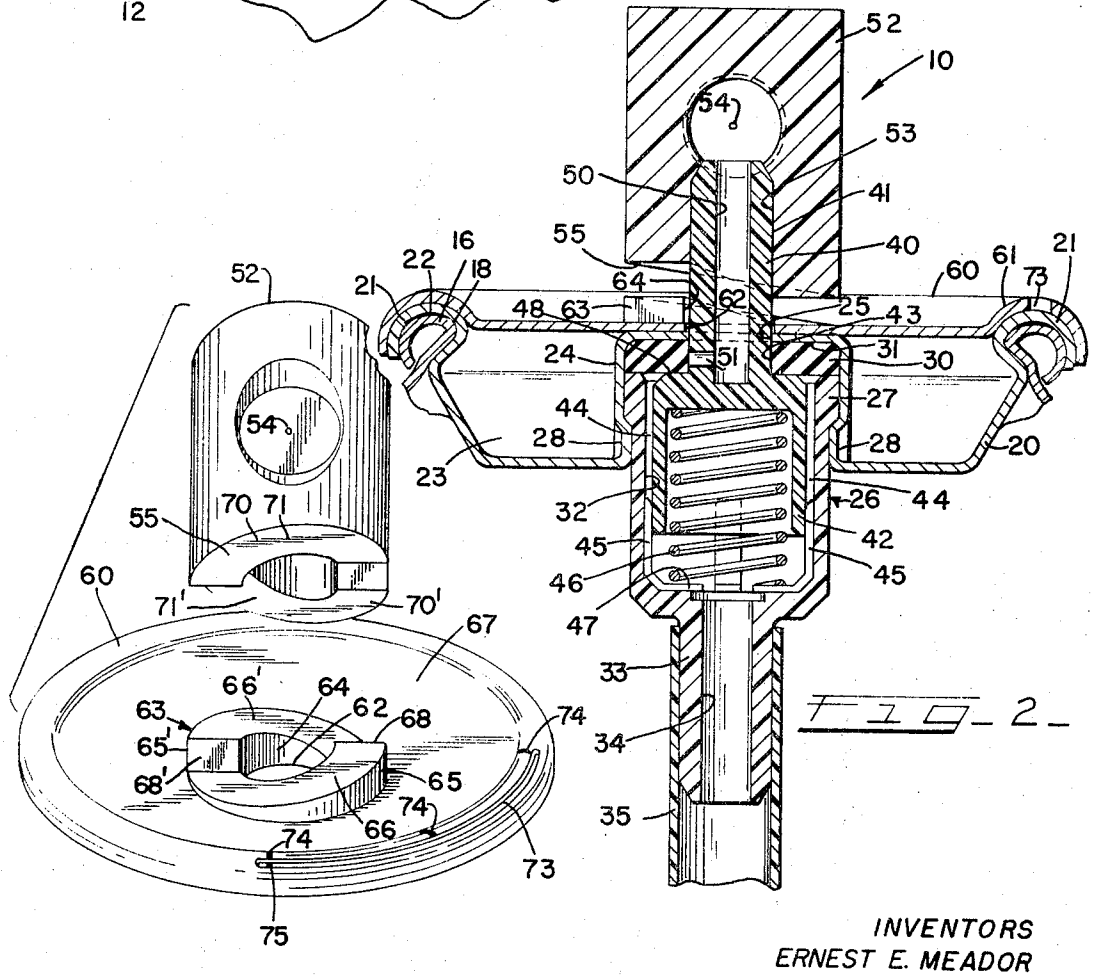


FIG. 2

FIG. 5

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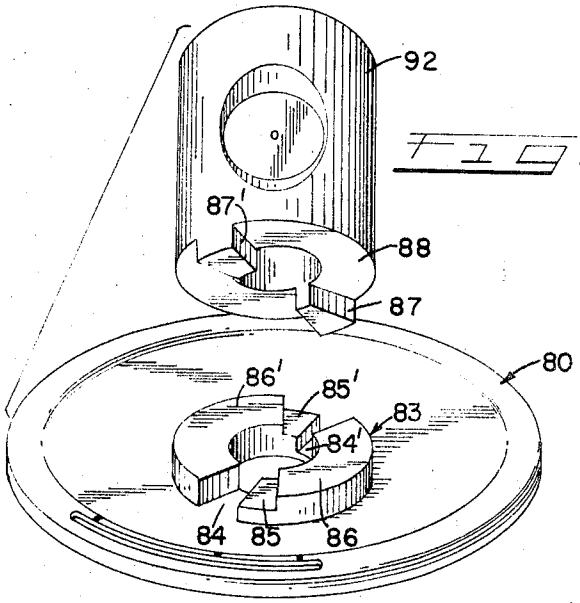


FIG. 6

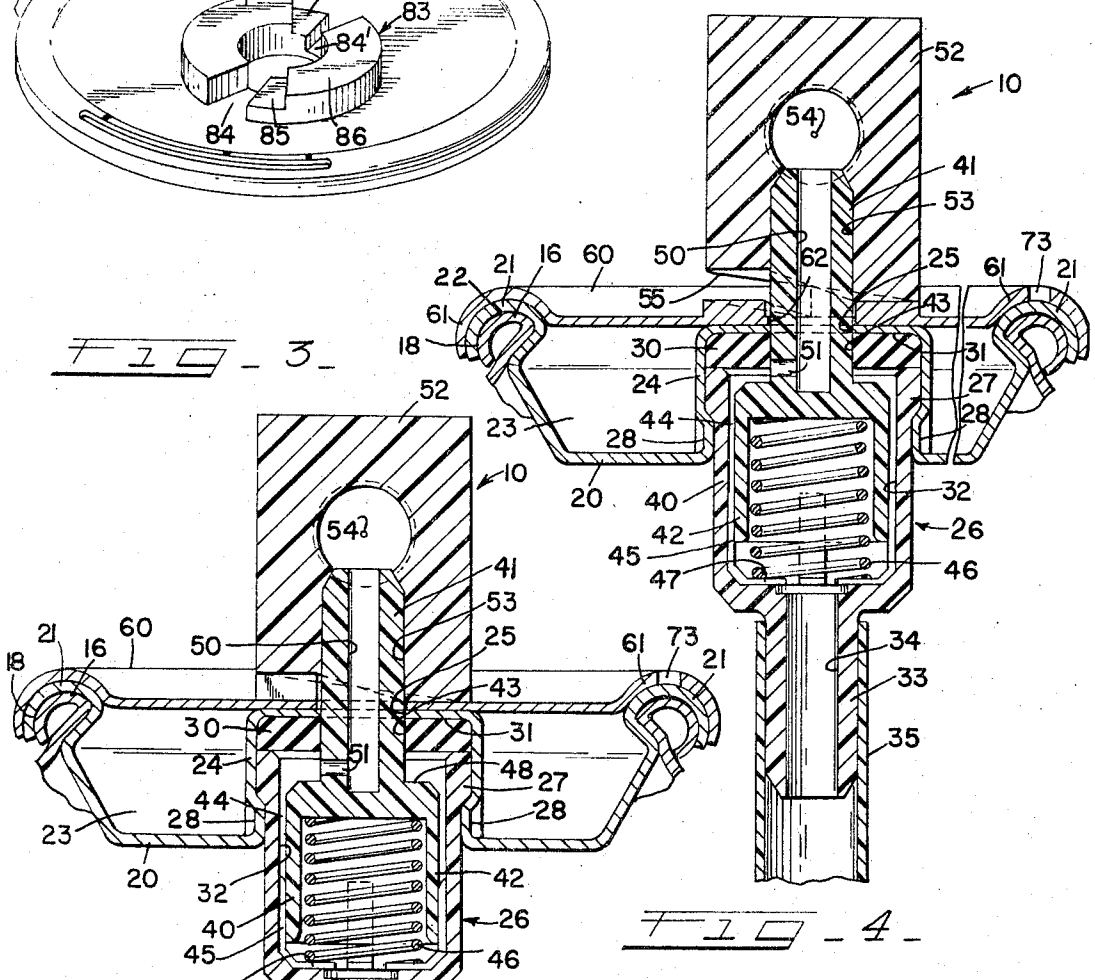


FIG. 3

FIG. 4

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AEROSOL VALVE ASSEMBLY

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Int. Cl. B65d 83/14

ABSTRACT OF THE DISCLOSURE

A spray valve assembly for aerosol containers which includes a discharge tube slidably mounted in a cap forming housing with an operating button forming a nozzle on the upper end thereof and the tube having a laterally opening internal orifice which is opened or closed according to the axial movement of the tube and a stop mounted for rotation about the axis of the tube and disposed in the path of the operating button so that, by adjusting the position of the stop, the travel of the discharge tube is controlled and thereby the volume of the spray is varied.

This invention relates to packaging and is more particularly concerned with improvements in a dispensing valve assembly for aerosol-type packages.

Numerous valve assemblies have been developed for use in aerosol containers so as to permit the pressurized contents of the container to be dispensed therefrom in a spray or other discharge pattern. Some assemblies which have been proposed include an arrangement for changing the spray pattern or for providing in a single valve a number of different spray patterns so as to give the user a choice as to the character of discharge to be produced when the valve is operated or to change the discharge pattern according to a particular use of the product being dispensed. However, many of these proposed arrangements have not proven successful generally because they have been too complicated or too expensive for a consumer type package where the container and valve assemblies are discarded when emptied of the contents.

It is a general object of the invention to provide in an aerosol package a valve arrangement for dispensing the package contents wherein the dispensing valve assembly has associated means for adjusting the stroke of the valve actuating member, thereby enabling the user to vary the spray pattern and the rate of discharge of the packaged contents.

Another object of the invention is to provide in an aerosol dispensing package a valve adjusting mechanism which will enable the user to change the dispensing characteristics of the valve and which is adapted to be readily incorporated in a conventional aerosol dispenser.

A more specific object of the invention is to provide in an aerosol package assembly a valve having a manually operated reciprocating actuator and associated mechanism for controlling the length of the stroke of the valve actuator so as to permit the opening of an internal orifice to be adjusted and the spray characteristics of the pressurized product to be changed.

A still more specific object of the invention is to provide a valve adjusting arrangement for an aerosol package wherein a variable height block is disposed between the valve actuator button and the valve hub so as to enable the length of stroke of the valve stem member to be varied thereby changing the flow of the product to the discharge orifice by varying the size and/or shape of an internal orifice through which the product must pass in order to reach the discharge orifice.

These and other objects and advantages of the invention will be apparent from a consideration of the valve assembly and associated mechanism which is shown by way of illustration in the accompanying drawings wherein:

FIGURE 1 is a perspective view of a top portion of an aerosol package having a valve assembly which incorporates the principal features of the invention;

FIGURE 2 is a vertical cross section through the top portion of the aerosol package of FIGURE 1, to an enlarged scale, and with portions broken away or omitted, the valve assembly being shown mounted in the valve supporting cup and in normal closed position;

FIGURE 3 is a cross section similar to FIGURE 2, with the valve assembly being shown in the fully opened position;

FIGURE 4 is a cross section similar to FIGURE 2, with portions broken away, and the valve assembly being shown in a partially open position;

FIGURE 5 is an exploded perspective view, to an enlarged scale, showing the stroke control portions of the valve assembly; and

FIGURE 6 is a perspective view, similar to FIGURE 5, illustrating a valve assembly having a modified form of stroke control mechanism.

Referring to the drawings, the invention is illustrated as incorporated in a valve assembly **10** mounted in the top of a typical aerosol package which comprises a container **12** having a dome top **14** provided with a rolled edge **16** defining an opening **18**. The valve assembly **10** which is seated in the opening **18** comprises a cover or closure forming cup **20** having a rolled edge **21** adapted to be engaged over and crimped upon the rolled edge **16** when the package is assembled and filled, with a gasketing material **22** adapted to assure a sealed connection. The cover forming member or cup has an annular well **23** and a center island or boss **24** provided at its top end with a central opening **25**. A cylindrical valve housing **26** is secured in the boss **24** with a flared portion **27** crimped in place by the crimps or pinches **28** so as to tightly clamp an annular rubber gasket **30** against the bottom surface of the top wall **31** of the boss. In the embodiment shown, the housing **26** is molded of a plastic material so as to provide an upwardly opening, cup-shaped chamber **32** and a depending neck forming portion **33** provided with an internal bore **34** in communication with the chamber **32** and adapted to receive the upper end of a dip tube **35** which extends to the bottom of the container **12** and which is secured to the neck **33** in any desired manner so as to provide for passage of the pressurized contents of the container into the chamber **32**.

A valve plunger **40** is mounted for reciprocal vertical movement in the chamber **32** having an integral hollow stem forming upper portion **41** which is of smaller external diameter than the diameter of the bottom portion **42** and which passes through the opening **25** in the top wall **31** of the cup **20**. A central opening **43** in the gasket **30** accommodates the stem portion **41**. The downwardly opening cup-shaped bottom portion **42** of the plunger **40** is provided on its exterior wall with diametrically opposed axially extending grooves **44** which receive co-operating axially extending ribs **45** on the inside wall of the housing **26** so as to prevent rotation of the plunger **40** while permitting vertical reciprocation thereof. A compression spring **46** is seated at one end in the cup-shaped lower end portion **42** of plunger **40** with the opposite end engaging the shelf **47** provided in the housing **26** so as to normally urge the plunger **40** in an upward direction and hold the upwardly facing shoulder **48** in sealing engagement with the gasket **30**.

The plunger **40** has a loose fit in the chamber **32** so that when it is depressed against the action of the spring **46** the pressurized contents rising through the dip tube **35** will pass around the periphery of the plunger section **42**, or the latter may have the side wall slotted to provide

for passage of the material into the area above the shoulder **48** when the plunger is depressed as in FIGURES 3 and 4. The stem forming portion **41** has an axial bore **50** which is closed at the bottom but in communication with an internal orifice **51** located in the side wall of the stem **41** and opening at a small distance above the shoulder **48**. An operating button **52** of plastic or like material has a central blind hole **53** extending from the bottom surface thereof into which the top end of the plunger stem **41** fits. The button **52** has an external discharge orifice **54** extending from the outer surface to the central hole **53**. The bottom surface **55** of the button **52** is of special construction as hereinafter described.

A special arrangement is provided for controlling the length of stroke of the plunger **40**. A collar or cap member **60** is provided which has a depending peripheral flange **61** adapted to fit over the cup bead **21** so that it may rotate relative to the cup **20**. A central opening **62** is provided in the member **60** which accommodates the stem portion **41** of the plunger **40** and a block or collar member **63** of special construction is mounted on or formed integral with the member **60**. The block member **63** has a central opening **64** forming a continuation of opening **62** for accommodating the stem **41** of the plunger **40** and is divided into two upstanding shoulder forming sections or axially extending protuberances **65** and **65'** surrounding the opening **64** and having ramp-like upwardly spiraled surfaces **66** and **66'**. The shoulder forming sections **65** and **65'** are in diametrically opposed relation and the ramp-like upper surfaces **66** and **66'** each extending from merging relation with the surface **67** of the block supporting member **60** in upwardly spiraled relation to the top edges of vertical wall sections **68** and **68'** which are in common axial plane and face in opposite directions as shown in FIGURE 5.

The bottom face **55** of the actuating button **52** is shaped to provide circumferential wall sections **70** and **70'** of the same character as the wall sections **65** and **65'** and which are complementary relative to the wall sections **65** and **65'**, with ramp forming surfaces **71** and **71'** which are spiraled in a direction opposite that of the surfaces **66** and **66'** on the block **30** so that when these surfaces are engaged and there is relative rotation of block **63** and the button **52** axial movement between the two results, that is, they move relative to each other in the direction of the axis of the stem member **41**. The distance the button **52** can travel may be varied by rotation of the block **63** on the member **60** on which the block **63** is carried. This in turn controls the stroke of the plunger **40** and the opening and closing of the internal orifice **51**. When in the normal positions as shown in FIGURE 2, with the orifice **51** fully closed so that there is no flow of the pressurized contents of the package into the stem **41** of the plunger **40**, the actuating button **52** is in its uppermost or outermost position and the bottom face **55** is spaced a predetermined distance from the oppositely disposed uppermost face of the block member **63** which confronts the bottom face **55**. When the block member **63** is rotated to a position which permits maximum depression of the actuating button **52** as shown in FIGURE 3, depression of plunger **40** through its full stroke opens the internal orifice **51** fully and there is maximum flow of the pressurized contents of the package into the plunger stem **41**. The collar **60** or the block **63** may be rotated to provide for a partial opening of the internal orifice **51** as shown in FIGURE 4. The interengaging protuberances or collar sections on the block **63** and on the button **52** may be proportioned so that, in one rotative position of the block **63**, the travel of the actuting button **52**, when depressed, will not be sufficient to open the internal orifice **51** so that there is any discharge of the package contents. The supporting member **60** and/or the block **63** may be marked to indicate different positions so that the user may see at a glance the rotative position of the block **63** and thus be informed of the rate at which the contents of the package will be dispensed upon depressing the button **52**. The member **60** may have a window forming slot **73** (FIGURE 5) and radial marks **74** serving as position indicators when aligned with a fixed indicating mark **75** on the underlying bead **21** of the cup member **20**, or a suitable mark on button **52**. The internal orifices **51** may be of varied shape to further modify the spray pattern which is produced at the external orifice **54**.

The stroke control elements may be modified, for example, as shown in FIGURE 6. The cap or collar member **80** may be provided with a height adjusting block **83** which may be formed to provide a number of surfaces in step arrangement as shown at **84**, **85**, **86** and **84'**, **85'** and **86'** for co-operation with a pair of depending shoulder sections **87** and **87'** on the bottom face **88** of an operating button **92** which corresponds to the button **52**. While three stepped shoulders **84**, **85** and **86** are illustrated to provide three possible positions for the internal orifice **51** as illustrated in FIGURES 2, 3 and 4, it will be apparent that the block **83** may be divided into a different number of stepped shoulders so as to provide more than three possible positions of the internal orifice **51** when the button **92** is depressed.

In the illustrated forms of the invention the co-operating interengaging surfaces on the valve buttons **52** and **92** and the rotatable stop blocks **63** and **83** control the length of stroke of the valve actuating member **40** and thereby control the degree of opening of the internal valve orifice **51**. This in turn controls the characteristics of the spray discharge. In using the device the operator rotates the block member **63** or **83** to the position required to obtain the desired spray when the actuating button is depressed. The shape and/or size of the internal orifice **51** may be changed and the number of such orifices and length of valve stem **41** may also be varied to obtain different spray characteristics. If orientation of the dip tube is not objectionable, the actuating button **52** may be rotatably mounted and the block **63** mounted to remain in fixed position. The block **63** may be formed as an integral portion of the valve actuator, if the latter is rotatable, for co-operation with a fixed portion of the valve assembly, to provide for varying the stroke of the actuator. Also, the stroke control principle can be employed with a conventional tilt action valve to control the degree of tilt and thereby vary the opening of an internal orifice which results in varying the spray discharge.

We claim:

1. An aerosol package comprising a cylindrical container for receiving a pressurized fluid therein and having a top opening, and dispensing valve assembly mounted in said top opening, said valve assembly comprising a tubular body member having an aperture in the top thereof and a dip tube connected to the bottom end which is in communication with the interior of said body member so as to permit the pressurized contents to flow into said body member, a discharge control member having a stem-like portion slidably mounted in said aperture in the top of the body member, said control member having an axial bore which is open at the upper end, is closed at the bottom end and provides a side wall in which an internal orifice is located adjacent the lower end of said stem portion which orifice is closed by a wall member at the top of the tubular body in the uppermost position of the control member, spring means normally urging the control member toward its uppermost position, a nozzle forming button mounted on the uppermost end of said stem portion adapted to be depressed so as to cause the control member to be moved downwardly to a position where said internal orifice is opened for passage of the pressurized contents through said body member and into the bore of said control member, stop means interposed between said body member and said button and means fixed on said control member and interengageable with said stop means to limit

the downward movement of said stem portion, said stop means being adjustable so as to adjust the extent of downward movement of said stem portion and thereby to vary the size of the opening provided by said internal orifice for passage of the pressurized contents.

2. In an aerosol package which comprises a cylindrical container for a pressurized fluid having a top opening with a dispensing valve assembly mounted therein, said valve assembly comprising a tubular body member having a dip tube connected to the bottom end which is in communication with the interior of said body member so as to permit the pressurized contents to flow into said body member, a discharge control member having a stem-like portion mounted in vertical sliding relation in an aperture in the top of the body member, said control member having an axial bore which is open at the upper end is closed at the bottom end and provides a side wall in which an internal orifice is located adjacent the lower end of said stem portion which orifice is closed by a wall member at the upper end of the tubular body in one position of the control member, means normally urging the control member toward orifice closing position, a nozzle forming member on the uppermost end of said stem portion which is adapted to be engaged so as to cause the control member to be moved vertically to a position where said internal orifice is below an edge of said wall member and open for passage of the pressurized contents through said body member and into the bore of said control member, stop means interposed between said body member and said nozzle forming member, and means fixed on said nozzle forming member and interengageable with said stop means to limit the movement of said stem portion in the direction for opening said orifice, said stop means being adjustable so as to vary the extent of movement of said stem portion and thereby vary the poistion of said internal orifice relative to the edge of said wall member.

3. A dispensing valve assembly for an aerosol package, said assembly comprising a tubular body, a discharge control member movable axially relative to said body and formed with an axial bore open at the outer end thereof and having a passageway for communication with the interior of said body at the inner end thereof, means closing said passageway when said control member is in a first position and opening said passageway when said control member is moved to a second position relative to said body, spring means normally urging said control member toward said first position, means mounted in the path of said control member which forms a stop for limiting the movement of said control member toward said second position, and means fixed on said control member and engageable with said stop means upon movement of said control member toward said second position, said stop means being adjustable so as to vary the extent of the movement of said control member thereby to stop the control member when said passageway is moved to a partially open position.

4. A dispensing valve assembly for mounting in a valve supporting cup in the mouth of an aerosol container, said valve cup having an upwardly extending central boss with an aperture in the top wall, said assembly comprising a tubular body adapted to be secured at its upper end in said cup boss and having means on a depending bottom end thereof for delivery thereto of the pressurized contents of the container, a discharge control member movable axially relative to said body and formed with an axial chamber open at the outer end thereof, said control member having an internal port for communicating with the interior of said body adjacent the inner end thereof, means closing said internal port when said control member is in an outermost position and opening said internal port when said control member is moved to an innermost position relative to said body, resilient means normally urging said control member toward said outermost position, stop means mounted in the path of said control member, and a member fixedly attached to said control member which is interengageable with said stop means, said stop means being adjustable so as to vary the extent of axial movement of said control member toward said innermost position thereby to enable the control member to be stopped intermediate the innermost and outermost position and partially open said internal port.

5. A dispensing valve assembly as recited in claim 4, and said adjustable stop means comprising a block member disposed between said body and an outer shoulder forming portion on said control member which block member is rotatable to shorten the length of the path of movement of said control member between the innermost and outermost positions thereof.

6. A dispensing valve assembly as recited in claim 4, and said discharge control member having a shoulder forming means on the outer end thereof, and said adjustable stop means comprising a collar-like stop member disposed along the axis of said control member and rotatable about said axis, said stop member having axially extending protuberances and co-operating protuberances on said shoulder forming means for varying the length of the path of movement of said control member.

7. A dispensing valve assembly as recited in claim 4, and said discharge control member having an operating button on the outer end thereof with an inwardly facing shoulder having step forming abutment surfaces and said adjustable stop means comprising a stop collar disposed about said discharge control member, said discharge control member being movable in an axial direction relative to said stop collar, said stop collar having step forming abutment surfaces disposed in opposed relation to the abutment surfaces on said inwardly facing shoulder and engageable therewith upon axial movement of said control member, said stop collar being rotatable about the axis of said control member and said abutment surfaces being arranged to permit the axial movement of said control member in the direction of said stop collar to be varied by rotation of said stop collar.

8. A dispensing valve assembly as recited in claim 4, and said discharge control member having an outer shoulder facing toward said body with the surfaces thereof in the form of circumferentially spaced spiral ramps and said stop means comprising a block member aperture to receive said control member in sliding relation and rotatable about the axis of said body, said block member having portions facing toward the outer end of said control member with surfaces in the form of circumferentially spaced spiral ramps for co-operative engagement with the spiral surfaces on the outer shoulder of said control member so as to vary the extent of the axial movement of said control member relative to said block member by rotation of said block member.

9. A dispensing valve assembly as recited in claim 4, and said stop means comprising a cap-like member which is rotatably mounted on said valve supporting cup with a stop block formation disposed about said control member which cooperates with said control member to adjust the length of the path of movement of said control member in the direction of said body.

10. A dispensing valve assembly as recited in claim 9, and said cap-like member having a viewing slot and co-operating position indicia on said cap-like member and a portion of said valve supporting cup which is visible through said slot.

11. A valve assembly for dispensing a pressurized material from an aerosol container, said assembly comprising a tubular body, a discharge control member movable relative to said body and formed with an axially extending bore open to the atmosphere at the outer end thereof and adapted to communicate with the interior of said body at the inner end thereof, means closing said bore at the inner end thereof when said control member is in a first posi-

tion and opening said bore when said control member is moved to a second position relative to said body, means normally urging said control member toward said first position stop means positioned in the path of said discharge control member between said first and second positions, and a member fixedly attached to the control member which is interengageable with said stop means, said stop means being adjustable to vary the extent of axial movement of said discharge control member between said first and second positions whereby to adjust the opening of said bore and control the flow of material into said bore in response to downward movement of said discharge control member.

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