United States Patent

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[54] **HIGH VOLUME CLEANING AEROSOL DISPENSING VALVE**
11 Claims, 8 Drawing Figs.

[52] **U.S. Cl.** **222/148,** 222/402.18
[51] **Int. Cl.** **B65d 83/14**
[50] **Field of Search** 222/402.18, 148

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ABSTRACT: A sequentially operable aerosol dispensing valve whose cycle of operation involves a dispensing cycle followed by a purging cycle. The valve is provided with a valve means and an operator means, slidably mounted in the bore of a housing. The operator means cooperates with the valve means to open a purging (cleaning) port, after the product dispensing cycle, for a longer period of time than is possible with existing valves. The longer purging cycle permits a greater volume of purging substance to pass through the valve during this cycle and effects a thorough cleaning o6 the valve in preparation for its next dispensing cycle.

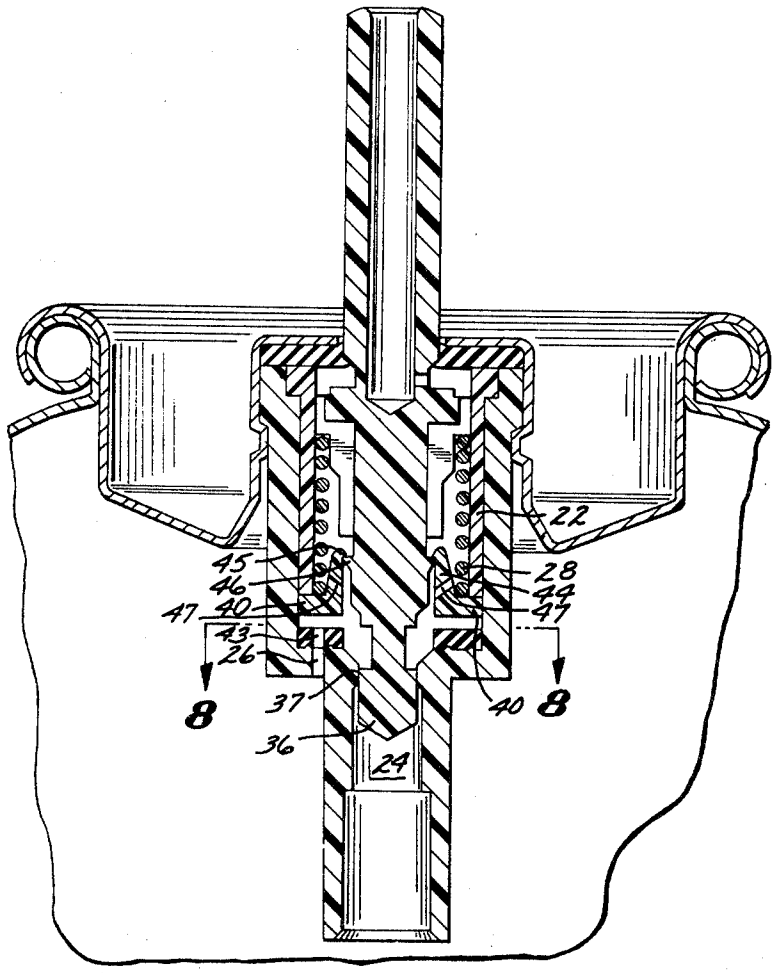
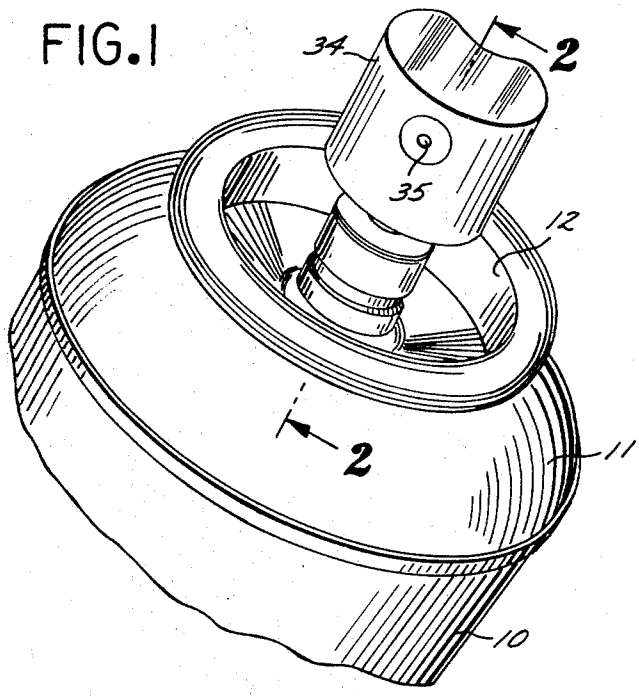


FIG. 1



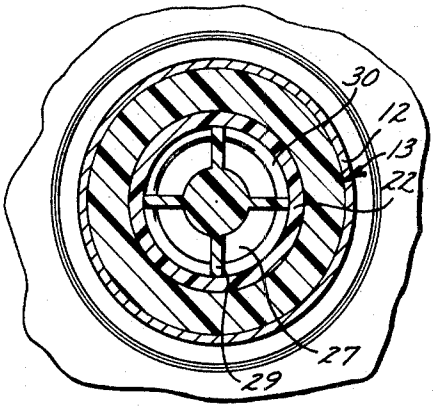


FIG. 3

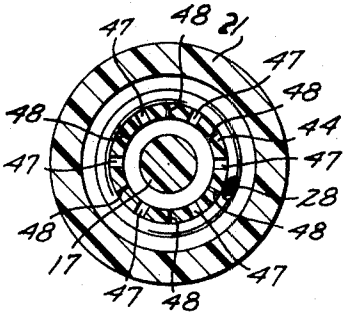
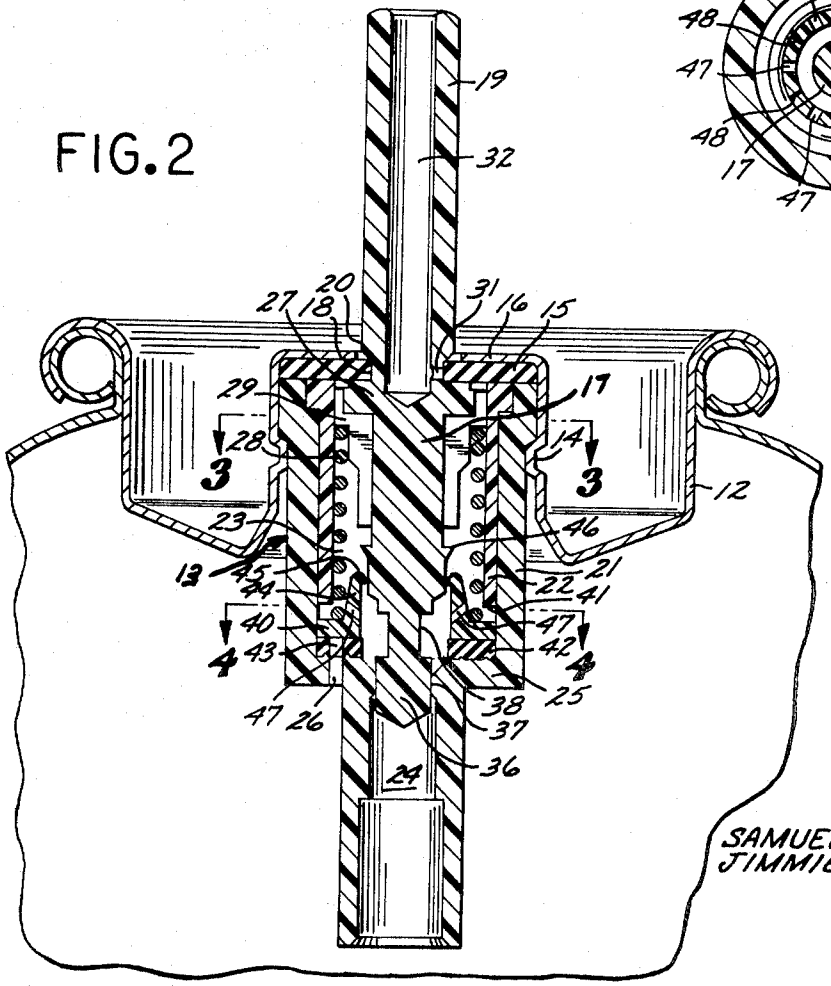


FIG. 4

FIG. 2



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FIG. 5

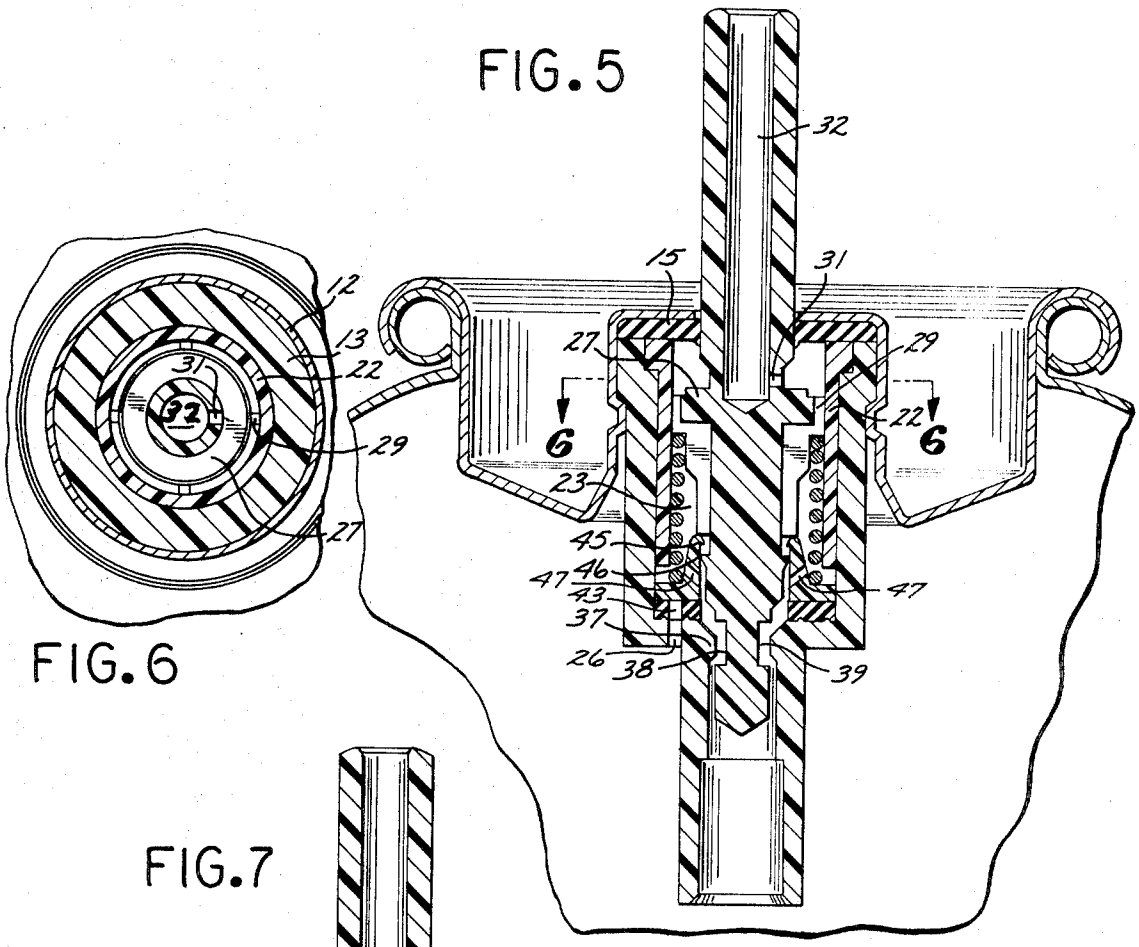
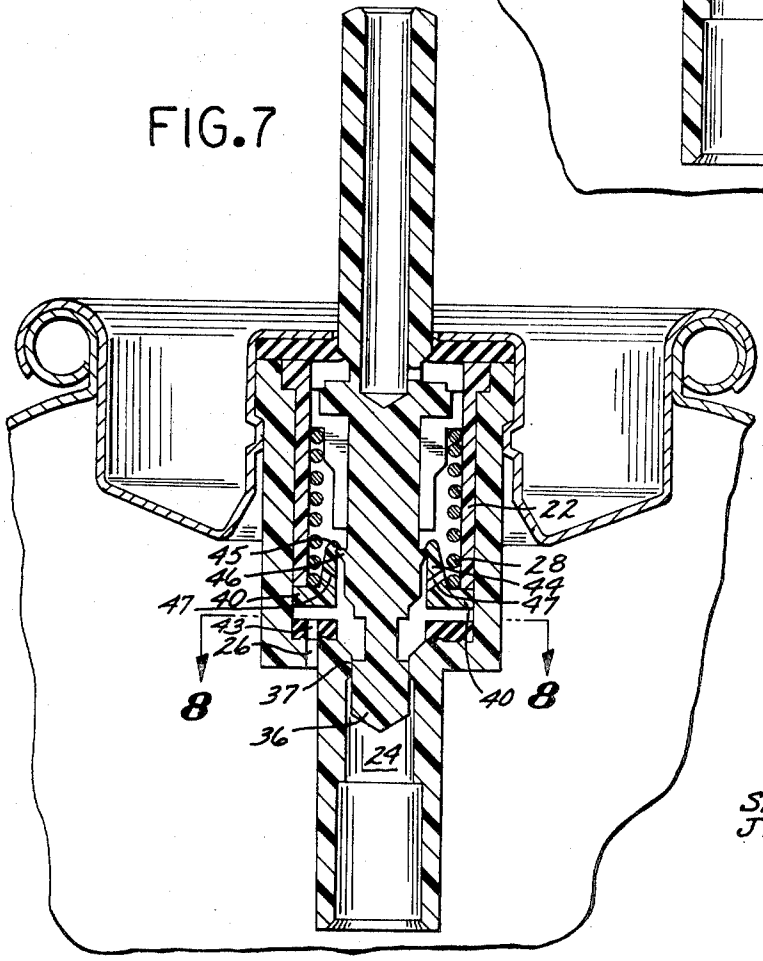


FIG. 6

FIG. 7



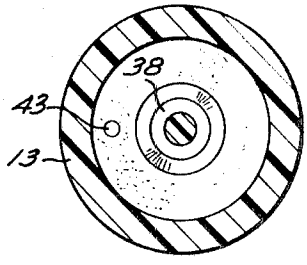


FIG. 8

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HIGH VOLUME CLEANING AEROSOL DISPENSING VALVE

The present invention relates to aerosol dispensing valves, particularly to automatically self-cleaning aerosol dispensing valves, and more particularly to such a valve capable of delivering a high volume of purging substance during the cleaning cycle to effect a thorough cleaning of the valve.

BACKGROUND

Aerosol dispensing valves have been used to dispense a great variety of substances. Some of these substances can be dispensed in existing valves without causing malfunctioning of the valve. Other substances, such as powders, starches and paints accumulate as a residue on the surfaces of the valve during dispensing. The accumulation of such residues on the surfaces of the respective valves ultimately causes clogging or malfunction of such valves, or impedes proper dispensation of the products through the valve.

It has heretofore been possible to purge various prior art valves. However, such purging has heretofore been somewhat incomplete due to an inability of such valves to permit the flow of a sufficient volume of purging substance, during the purging cycle, to adequately clean the internal valve parts. The prior art valves provide a cleaning cycle of such short duration that the volume of purging substance dispensed is hardly that of the chamber of the valve.

An object of the present invention, therefore, is to provide a sequentially operable automatically self-cleaning aerosol dispensing valve which will provide a purging cycle of sufficient duration to dispense a volume of purging substance equal to several times the volume of the chamber of the valve.

A further object of the present invention is to provide a sequentially operable automatically self-cleaning aerosol dispensing valve which, when dispensing substances which have a tendency to accumulate on surfaces of the valve, will not clog or be subject to malfunction after repeated uses.

Most prior art self-purging valves have placed a cleaning port at a position in the valve which does not assure that the purging substance will pass over all the internal valve parts or completely clean these parts in preparation for the valve's next use. Accordingly, a further object of the present invention is to provide a valve located in a position where cleaning of all internal parts of the valve, as the purging substance passes through the valve, can be assured.

SUMMARY OF THE INVENTION

The present invention is a novel sequentially operable aerosol dispensing valve comprising a valve housing, a valve means located within the housing, a primary and secondary opening in the housing, the latter of which comprises the purging port, and an operator means. The operator means functions with the valve means to open the secondary opening after the dispensing cycle, for a period of time longer than is presently possible with existing valves. This extended time period allows a greater volume of purging substance to pass through the valve during the purging cycle, and thus to completely clean the valve in preparation for its next dispensing cycle.

Specifically, the above function is accomplished by providing the valve housing with a secondary opening located in the wall of the housing such that when sufficient volume of purging substance is permitted to pass through the valve during the purging cycle the entire chamber of the valve and all parts therein will be completely cleaned. This function is further accomplished by providing the valve with an operator means which cooperates with the valve means to open the secondary opening as the valve means returns along a path of travel from a dispensing position to an inoperative position; which maintains the secondary opening in the open position substantially until the valve means reaches the end of a path of travel from the dispensing position to the inoperative position; which permits the secondary opening to remain open and permit passage of the purging substance for a duration of time which is longer than is possible with existing valves; and which permits a substantially larger volume of purging substance to pass through the valve than is possible in existing valves.

The above function is further accomplished by locating the secondary opening in the lower portion of the valve housing such that the purging substance travels through the entire length of the valve chamber and has substantial contact with all valve parts located therein as it passes through the valve.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top perspective view of an aerosol container in an inclined position, showing a valve according to the present invention mounted therein;

FIG. 2 is an enlarged fragmentary sectional view of the valve of the present invention, with dispensing head removed, taken on line 2–2 of FIG. 1;

FIG. 3 is a fragmentary sectional view taken from line 3–3 of FIG. 2;

FIG. 4 is a sectional view taken from line 4–4 of FIG. 2;

FIG. 5 is a view similar to FIG. 2, but showing the valve means in its dispensing position;

FIG. 6 is a fragmentary sectional view taken from the line 6–6 of FIG. 5;

FIG. 7 is a view similar to FIG. 2, but showing the valve means partly returned to its inoperative position during the time when the secondary opening is open, permitting passage of the purging substance.

FIG. 8 is a sectional view taken from line 8–8 of FIG. 7.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in FIG. 1 of the drawings, an aerosol container 10 is of conventional construction and is provided with a top 11 supporting a cup 12. The cup 12 supports the valve as shown in FIG. 2.

Referring to FIG. 2, the valve itself is composed of four members: a valve housing 13 which encloses and defines a chamber 23, a valve means 17, an operator means 40, and a spring 28.

The valve is held in place within the cup 12 by a crimp 14 placed in the cup 12 when the valve is mounted therein. In addition to the valve, a gasket member 15 is also mounted within the cup 12 above the housing 13 and immediately adjacent to the top 16 of the cup 12, such that when the crimp 14 is placed in the cup 12, the housing 13 is forced tightly against the gasket 15 which in turn, is forced tightly against the top 16 of the cup 12, thus effecting a seal between the cup 12 and the housing 13.

The gasket 15 is of flexible material, is annular with an internal opening having a diameter slightly smaller than the smallest diameter of the nozzle element 19 of the valve means 17, such that a slidable seal is effected between the nozzle and the gasket, and such that an opening 18 is provided within which the nozzle element 19 is positioned. The cup 12 is also provided with a central opening 20, through which the nozzle element 19 of the valve means 17 projects.

The valve housing 13 is composed of two members: An outer wall member 21 and an internal sleeve member 22. The internal sleeve member 22, like the outer wall member 21, is annular, is mounted within the outer wall member 21 such that it extends downward along inner face of the outer wall throughout a substantial portion of the chamber 23, and such that its lower end forms a shoulder 41 within the chamber.

The housing 13 is provided with a central bore forming the chamber 23 of the valve, a primary opening 24 in the wall of the housing which communicates with and is adapted to feed the material to be dispensed through a dip tube (not shown) attached thereto, in conventional manner, a secondary opening 26 in the wall of the housing which communicates with the purging substance in the head space of the aerosol container 10. This secondary opening is shown in the preferred embodiment to be located in a lower shoulder element 25 of the hous-

ing 13 but its position is not limited to that location. For example, it might also be placed in the side wall of the housing above its preferred location.

Within the bore of the housing, a unitary valve means 17 is mounted such that it is operable along a path of travel from an inoperative position as shown in FIG. 2, to a dispensing position as shown in FIG. 5, and from a dispensing position to an inoperative position. The valve means 17 is provided with a shoulder element 27 which is of greater diameter than the adjacent portions of the valve means 17, and which is of greater diameter than the opening 20 in the cup 12 and the opening 18 in the gasket member 15. When the valve means 17 is mounted in the valve housing 13, the shoulder element 27 is immediately adjacent to and below the gasket member 15, and in its inoperative position, and is held tightly against the gasket member 15 by a compression spring 28 which is mounted within the chamber 23. The compression spring 28 engages a multiplicity of radial projections 29, shown in FIG. 3, extending outward from the circumference of the valve means 17. The radial projections 29 extend beyond the shoulder 27 and guide the valve means within the chamber 23. Openings 30 between the projections provide passageways for the material to be dispensed and purging substance. Immediately above the shoulder 27 of the valve means 17 an opening 31 is provided in the valve means 17 which communicates with a passage 32 within the dispensing nozzle 19. Mounted over the dispensing aperture 35 communicating with the passage 32 of the dispensing nozzle 19. When valve means 17 is in its inoperative position, as shown in FIG. 2, the lower portion 36 of the valve means 17 is located below the upper level of the lower shoulder element 25 of the housing 13 and extends into the primary opening 24 of the housing 13. At the level of the lower shoulder element 25, the internal surface of the housing is provided with an annular lip 37 whose internal diameter is such that a slidable seal is formed between the lip 38 and the lower portion 36 of the valve means 17.

Immediately above the lower portion 36 of the valve means, the valve means 17 is provided with an area of reduced diameter 38. When the valve means is in its dispensing position, as shown in FIG. 5, the area of reduced diameter 38 is at the level of the annular lip 37 but is not in contact with the lip. Thus, a passageway 39 is provided for the material to be dispensed to pass into and through the chamber 23.

An operator means 40 is mounted in the chamber below the compression spring 28 and below the lower end of the sleeve 22. The sleeve 22 thus forms a shoulder 41 lying within the chamber 23 above the upper surface of the operator means 40. The operator means 40 is normally held in a closed position by the compression spring 28, as shown in FIG. 2, where it rests on a lower annular gasket 42 which is compressed between the operator means 40 and the lower shoulder element 25 of the housing 13.

The lower gasket member 42 is provided with an opening 43 immediately above, and communicating with the secondary opening 26 in the lower shoulder 25 of the housing 13. Thus, when the operator means 40 is in its closed position, it forms a seal over the secondary opening 26 and prevents escape of the purging substance from the container 10.

The operator means 40 is further provided, at its internal diameter, with a raised element 44 at the top of which is molded an inwardly directed lip 45. The internal diameter of the innermost point of the lip 45 is slightly larger than is the outer diameter of the valve means 17 at that level (when the valve means 17 is in its inoperative position).

The valve means 17 is also provided with an annular lip 46 extending outwardly from its outer circumference. When the valve means is in its inoperative position, the annular lip 46 is located above the level of the lip 45 of the operator means 40. The annular lip 46 of the valve means 17 is flexible and adapted such that when the valve means 17 moves along a path of travel from an inoperative position to a dispensing position, the lip element 46 of the valve means 17 passes through the opening defined by the internal circumference of the lip element 45 of the operator means 40 without engaging same, by deflecting said lip element 45 of said operator means outward. The flexibility to permit such passage is attained by providing the lip element 45 of the operator means with a multiplicity of slots 48 which extend through the lip and raised element 44 and downward from the top of said raised element.

Referring to FIG. 5, the position of the respective members and elements of the respective members is shown when the valve means 17 is in a dispensing position. The area of decreased diameter 38 of the valve means is lined up adjacent to the lip element 37 of the housing member 13, providing a passageway 39 between the two elements through which the material to be dispensed can pass into and through the chamber 23 of the valve. The shoulder element 27 of the valve means is below the upper gasket 15 allowing the material to be dispensed to pass through the passageways created by the multiplicity of the radial projections 29 of the valve means 17 and the inner wall of the sleeve 22; further allowing the material to be dispensed to enter the opening 31 and to pass to the exterior through the passage 32 and the valve head 34.

Referring to FIG. 7, as the valve is released and the valve means 17 begins its return along a path of travel from a dispensing position to an inoperative position, the lower portion 36 of the valve means 17 contacts the annular lip 37 of the housing 13 causing the primary opening 24 to be closed, preventing passage of the material to be dispensed.

Substantially, simultaneously with the closing of the primary opening, the lip 46 of the valve means 17 engages the lip 45 of the operator means 40, causing the operator means 40 to be lifted from its closed position over the secondary opening 26. The secondary opening is opened and maintained in an open position substantially until said valve means reaches the end of a path of travel from a dispensing position to an inoperative position. The raised element 44 of the operator means 40 is provided with a multiplicity of openings 47 through its wall which permit passage of the purging substance during the time when the two lips, 45 and 46, are so engaged.

As the valve means 17 continues along a path of travel from a dispensing position to an inoperative position, the operator means 40 continues to travel with it until, just prior to the time when the valve means 17 reaches its inoperative position, the operator means 40 is engaged by the lower end 41 of the sleeve 22 causing the lip element 45 of the operator means 40 to be deflected outwardly and to be disengaged from the lip element 46 of the valve means 17.

The valve means 17 is then forced into its closed position by the compression spring 28 and substantially, simultaneous therewith the operator means 40 is forced downward by the compression spring 48 to its closed position over the secondary opening, completing a full cycle of operation.

The present invention is capable of dispensing most substances which it is desirable to dispense. However, it is specifically adapted to dispense those substances which tend to settle out of solution and accumulate on surfaces, such as starch, powders and paint, since in most instances these substances are not freely soluble in propellants which are commonly used in aerosol technology.

We claim:

1. An aerosol dispensing valve comprising: a valve housing; a valve means located within said housing, said valve means being operable along a path of travel from a normally inoperative position to a dispensing position and returnable along a path of travel from said dispensing position to said inoperative position; a primary opening within said housing adapted to communicate with the material to be dispensed, said opening being opened by said valve means at a point along the path of travel to said dispensing position, and closed by said valve means at a point along the path of travel from said dispensing position to said inoperative position; a secondary opening in said housing adapted to communicate with a purging substance in the head space above the material to be dispensed; separate operator means functioning with said valve means between said dispensing position and said inoperative posi-

tion, said operator means adapted to open said secondary opening substantially with the closing of said primary opening as said valve means moves along said path of travel from said dispensing position to said inoperative position, said operator means maintaining said secondary opening in the open position substantially until said valve means reaches the end of said path of travel from said dispensing position to said inoperative position.

2. An aerosol dispensing valve as described in claim 1 wherein said secondary opening is located in the lower portion of the wall of said housing and substantially at the level of said primary opening such that when said purging substance commences its flow through said valve, it commences cleaning said valve parts from the lower aspect of the valve upward.

3. An aerosol dispensing valve as described in claim 2, wherein said secondary opening is located in the bottom wall of the valve chamber.

4. An aerosol dispensing valve as described in claim 3, wherein said secondary opening is adjacent to said primary opening.

5. An aerosol dispensing valve comprising: a valve housing; a valve means located within said housing, said valve means being operable along a path of travel from a normally inoperative position to a dispensing position and returnable along a path of travel from said dispensing position to said inoperative position; a primary opening within said housing adapted to communicate with the material to be dispensed, said opening being opened by said valve means at a point along the path of travel to said dispensing position, and closed by said valve means at a point along the path of travel from said dispensing position to said inoperative position; a secondary opening in said housing adapted to communicate with a purging substance in the head space above the material to be dispensed; operator means functioning with said valve means between said dispensing position and said inoperative position, said operator means adapted to open said secondary opening substantially with the closing of said primary opening as said valve means moves along said path of travel from said dispensing position to said inoperative position, said operator means maintaining said secondary opening in the open position substantially until said valve means reaches the end of said path of travel from said dispensing position to said inoperative position, said valve means being provided with a lip adapted such that as said valve means moves along said path of travel from said inoperative position to said dispensing position said lip passes by said operator means without engaging said operator means, and such that as said valve means moves along said path of travel from said dispensing position to said inoperative position, said lip engages said operator means substantially simultaneously with the closing of said primary opening thereby opening said secondary opening and maintaining said secondary opening in the open position substantially until said valve means reaches the end of said path of travel from said dispensing position to said inoperative position.

6. An aerosol dispensing valve as described in claim 5, wherein said lip of said valve means is annular and extends radially outward from the circumference of said valve means.

7. An aerosol dispensing valve as described in claim 6, wherein said lip is located above said operator means when said valve member is in an inoperative position.

8. An aerosol dispensing valve as described in claim 7, wherein said operator means is provided with a lip adapted such that as said valve means moves along said path of travel from said inoperative position to said dispensing position, said lip of said valve means passes through said lip of said operator means without engaging same, and such that as said valve means moves along said path of travel from said dispensing position to said inoperative position said lip of said valve means engages said lip of said operator means substantially simultaneously with the closing of said primary opening thereby opening said secondary opening and maintaining said secondary opening in said open position substantially until said valve means reaches the end of said path of travel from said dispensing position to said inoperative position.

9. An aerosol dispensing valve as described in claim 8, wherein said lip of said operator means is a discontinuous annular lip, its continuity being broken by a multiplicity of slits extending through said lip, said slits imparting to said lip sufficient flexibility to allow said lip of said valve means to pass through said lip of said operator means as said valve means moves along a path of travel from an inoperative position to a dispensing position by deflecting said lip of said operator means radially outwardly; said lip of said operator means further adapted such that as said valve means moves along said path of travel from said dispensing position to said inoperative position, said lip of said valve means engages said lip of said operator means, without deflecting said lip of said operator means radially outwardly thereby causing said operator means to open said second opening and to travel with said valve means along said path of travel substantially until said valve means reaches the end of said path of travel from said dispensing position to said inoperative position.

10. An aerosol dispensing valve as described in claim 9, wherein said housing is provided with an internal annular shoulder adapted such that as said operator means moves along said path of travel with said valve means from said dispensing position to said inoperative position such shoulder will engage said operator means and cause said operator means to be disengaged from said valve means such that said operator means returns to its closed position substantially simultaneously with the return of said valve means to said inoperative position.

11. An aerosol dispensing valve as described in claim 10, wherein said disengagement is accomplished, when said shoulder engages said operator means, said shoulder means stopping the travel of said operator means with said valve means and causing said lip of said operator means to be forced radially outward to permit said lip of said valve means to disengage from said lip of said valve means.