United States Patent

[11] 3,565,290

[72] Inventors **Sam Prussin**
Los Angeles, Calif.;
Jimmie L. Mason, Hacienda Heights, Calif.

[21] Appl. No. **778,451**
[22] Filed **Nov. 25, 1968**
[45] Patented **Feb. 23, 1971**
[73] Assignee **Dart Industries Inc.**

[54] **SHUTOFF VALVE MEANS FOR TWO PRESSURIZED SOURCES RESPONSIVE TO FAILURE OF ONE SOURCE**
11 Claims, 9 Drawing Figs.

[52] U.S. Cl. **222/57,** 222/66, 222/94; 137/111
[51] Int. Cl. **B67d 5/32**
[50] Field of Search ..... 222/52, 57, 66, 94, 136; 137/111 (Inquired)

[56] **References Cited**
UNITED STATES PATENTS

2,638,928	5/1953	Stadler	137/111X
2,952,209	9/1960	Scholin	222/66X
3,325,056	6/1967	Lewis	222/94
3,482,736	12/1969	Green	222/94

Primary Examiner—Stanley H. Tollberg
Assistant Examiner—H. S. Lane
Attorney—Harold R. Beck

ABSTRACT: An automatic shutoff valve for use with aerosol products containers, wherein two separate sources of fluid under pressure may be dispensed in a mixture; the valve of the invention comprising automatic shutoff means in response to a depletion of flow and/or pressure from one source which causes the flow of fluid from another source in the container means to be shut off to thereby prevent dispensation of any fluid from the valve, when one of the fluid sources is depleted.

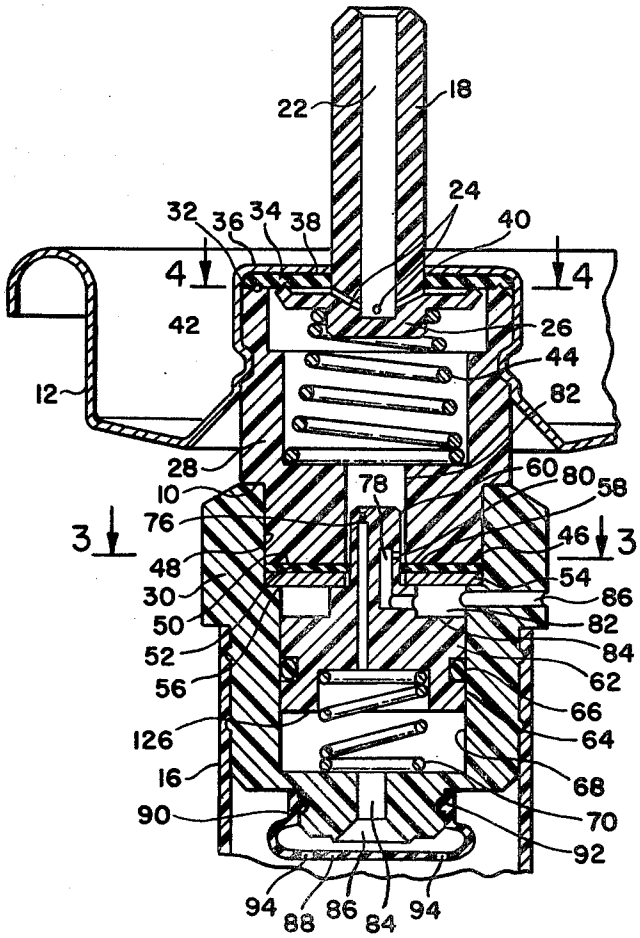


FIG. 1.

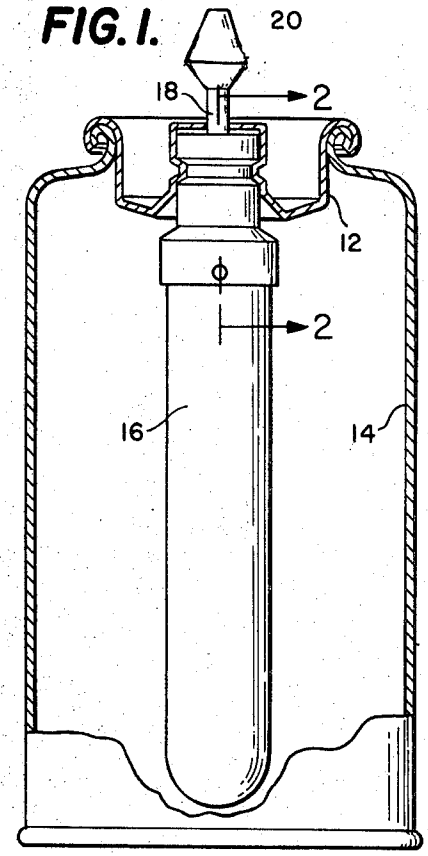
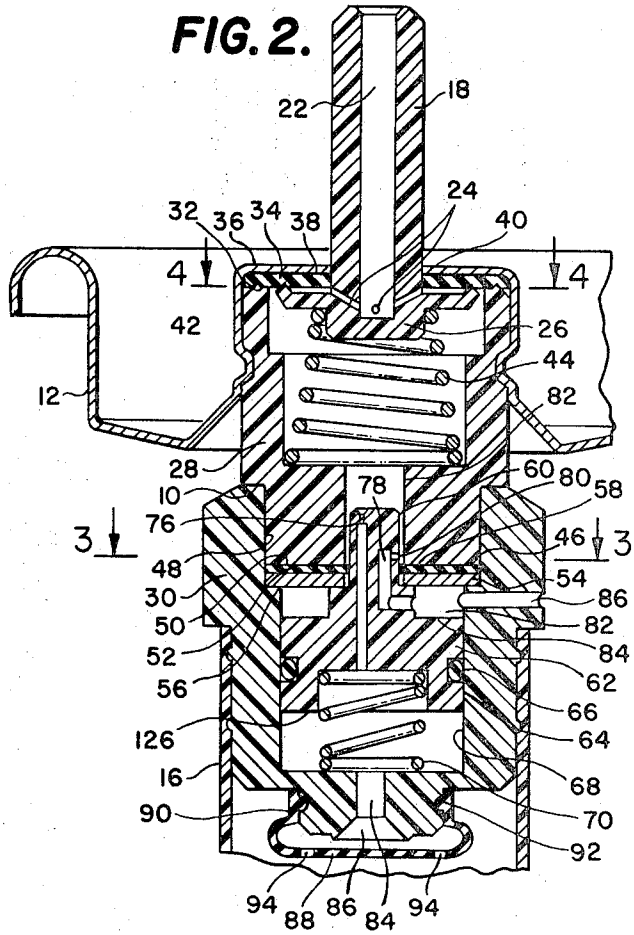


FIG. 2.



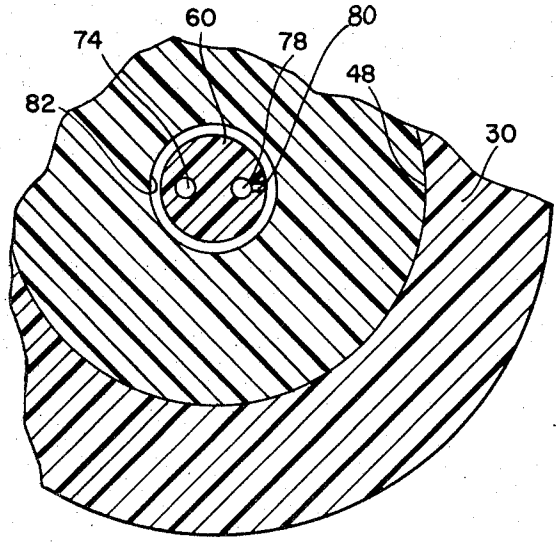


FIG. 3.

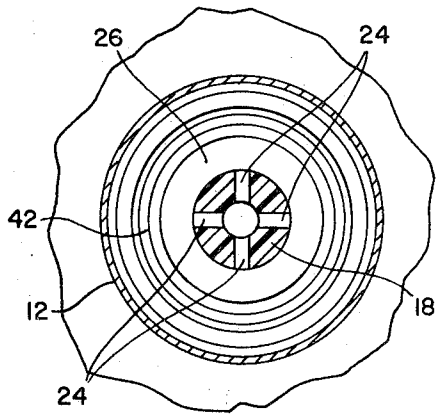


FIG. 4.

FIG. 5.

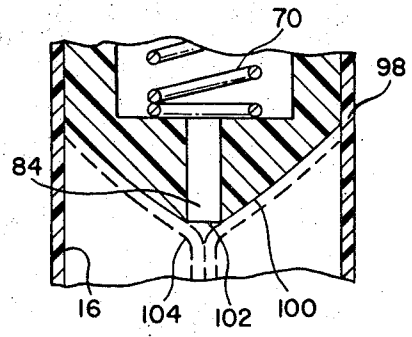


FIG. 8.

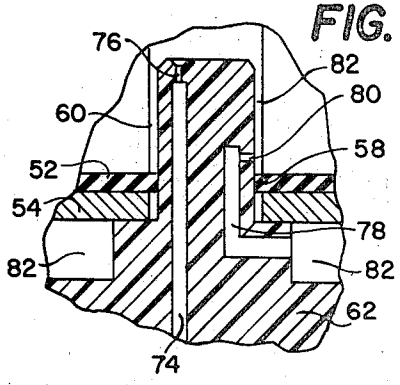


FIG. 6.

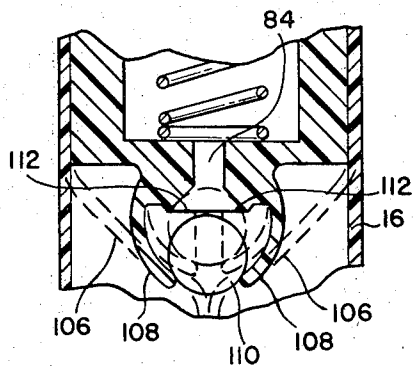
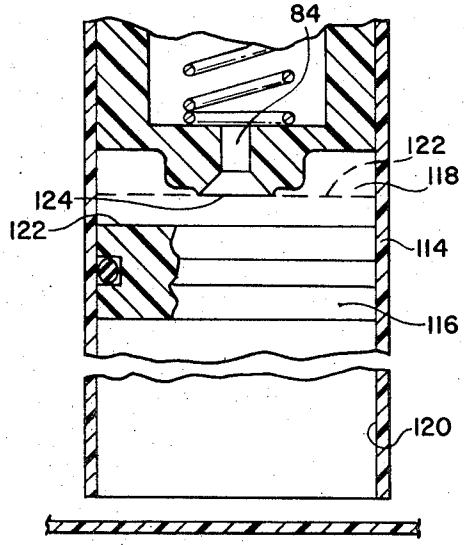


FIG. 7.



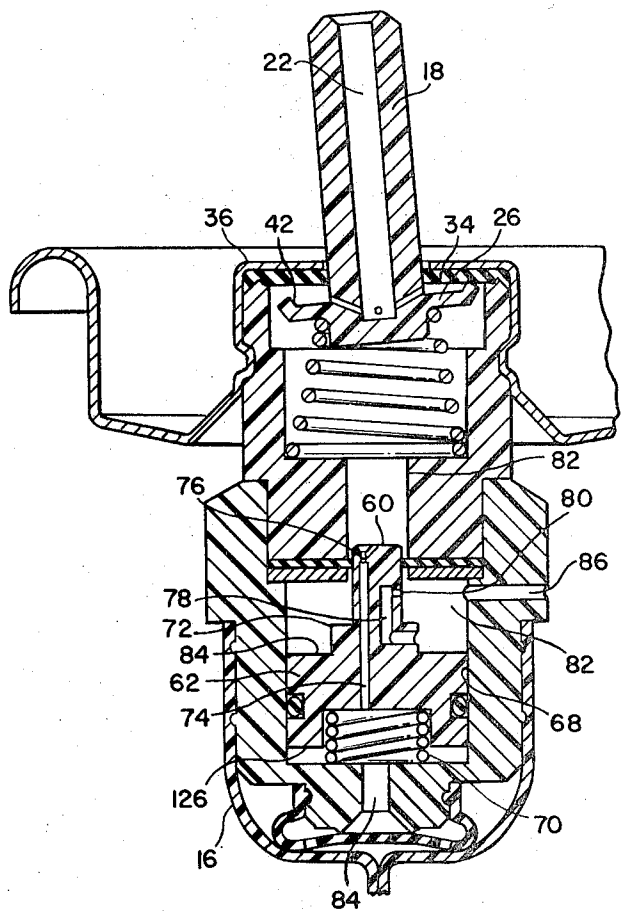


FIG. 9.

SHUTOFF VALVE MEANS FOR TWO PRESSURIZED SOURCES RESPONSIVE TO FAILURE OF ONE SOURCE

This invention relates to an automatic shutoff valve for use with aerosol products, and more particularly, to an automatic shutoff valve for use with aerosol products, such as oxidation hair dyes, and shaving creams, or the like, so as to insure the mixture of a plurality of fluids in the valve before dispensation and to prevent the harmful dispensation of only one active fluid ingredient from the valve.

BACKGROUND OF THE INVENTION

In the aerosol dispensation of products, such as oxidation hair dye, it has been a problem to dispense a reliable mixture of dye and peroxide so as to prevent the harmful effects of dispensing either one of the active ingredients separately. Likewise, the dispensation of other products, such as some aerosol shaving creams which include soap and peroxide pose similar problems.

While there are valves for use in dispensing aerosol products, and particularly for use in dispensing a plurality of fluids from common container means control of the commonly reactive fluids may not be efficiently accomplished by some of the prior art valves, and particularly in an automatic fashion without particular attention of the operator. In many of the aerosol dispensers of the prior art, one source of a plurality of fluid sources may become exhausted prematurely or failure and exhaustion of one of the other sources of fluids, and thus cause an undesirable dispensing condition of the valve which may allow only a concentrated hydrogen peroxide to be dispensed, for example. In other situations, other active ingredients might be dispensed separately due to preliminary exhaustion of fluids which are normally utilized to mix with the active ingredients before being dispensed from the aerosol containers.

SUMMARY OF THE INVENTION

The foregoing problems related to operation of prior art aerosol-dispensing valves are alleviated by operation of the present invention, wherein an automatic shutoff valve automatically prevents any one of several fluids from being dispensed separately, and particularly when it is desired to dispense a mixture of such active materials as dye and hydrogen peroxide in an oxidation hair dye. The present invention employs an automatic shutoff valve which is responsive to depletion of fluid from one source or pressure of fluid from one source in order to provide complete and automatic shutoff of a plurality of fluids which are normally dispensed in a mixture from the valve, thus preventing individual dispensation of any one of the active fluids.

The automatic shutoff valve of the invention comprises a movable valve element movably mounted in a valve housing; the valve element having opposed pressure-sensing surfaces responsive to a pressure differential between two sources of fluid communicating with the valve housing, such that when fluid in one source is depleted, a pressure differential is created relative to fluid pressure in other source, and thereby causing the valve to shut off the source of fluid, wherein substantial material remains.

Accordingly, it is an object of the present invention to provide a very simple and economical automatic shutoff valve for use with aerosol products containers from which a plurality of active fluids may be dispensed.

Another object of the invention is to provide a very simple automatic shutoff for aerosol containers comprising one valve structure which is operable by a collapsing container, under pressure, so as to create a pressure differential with respect to another source of fluid, and to thereby actuate the shutoff valve of the invention.

Another object of the invention is to provide an automatic shutoff valve having one manually operable valve with which two sources of fluid, under pressure, normally communicate; the invention comprising a second valve means responsive to a fluid pressure differential and normally disposed to conduct fluids from a plurality of sources to said first valve; said second valve being operable in response to the depletion of one of the sources of fluid under pressure automatically to shut off communication of another of the sources of fluid under pressure to said first manually operable valve.

Further objects and advantages of the invention may be apparent from the following specification, appended claims, and accompanying drawings:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of an aerosol container means showing portions thereof broken away and in section, and illustrating an automatic shutoff valve of the invention mounted in connection with the cap of the container means, and further showing a second container means communicating with and carried by the valve housing of the invention;

FIG. 2 is an enlarged fragmentary sectional view taken from the line 2–2 of FIG. 1;

FIG. 3 is an enlarged fragmentary plan sectional view taken from the line 3–3 of FIG. 2;

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

FIG. 5 is a fragmentary sectional view taken substantially on the same plane as that shown in FIG. 2, but showing a modification of the invention;

FIG. 6 is another view similar to FIG. 5, but showing a further modification of the invention;

FIG. 7 is another view similar to FIGS. 5 and 6, and showing a further modification of the invention;

FIG. 8 is an enlarged fragmentary sectional view taken on the same plane as FIG. 2, and showing on enlarged scale details of the shutoff valve mechanism of the invention; and

FIG. 9 is a view similar to FIG. 2, but showing the manually operable nozzle actuated valve of the invention in open position and the shutoff valve of the invention in closed position such as it would be when one source of fluid in the container means, shown in FIG. 1, has been depleted.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in FIG. 1 of the drawings, a valve housing 10 of the invention is carried in a conventional aerosol container cap 12 in connection with a substantially rigid cylindrical container 14.

Carried by the valve housing 10 is a collapsible container 16 adapted to contain a source of fluid. The container 14 is also adapted to contain a source of fluid and a pressurizing material so that the collapsible container 16 and its contained fluid may be maintained under pressure by external forces of the pressurizing fluid in the container 14.

Projecting from the valve housing 10 is a hollow nozzle member 18 having manually operable dispenser head 20 in connection therewith.

As shown in FIG. 2 of the drawings, the hollow manually operable nozzle 18 is provided with a dispensing bore 22 which communicates with radially disposed ports 24 in an integral poppet valve structure 26 which is disposed in the housing 10.

The housing is composed of two sections 28 and 30 which are telescopically pressed together, as will be hereinafter described in detail.

The housing 28 at one end 32 is engaged with an annular elastic valve seat washer 34 held in clamped position against an end 36 of the container cap 12. The end 36 is provided with an opening 38 through which the hollow nozzle member 18 extends and the seal washer 34 is provided with a central opening 40 intimately and sealingly engaged around the nozzle stem 18.

An annular seat-engaging portion 42 of the poppet valve 26 engages the elastic seal washer 34 radially outward from the ports 24, such that when the annular seat-engaging portion 42 of the poppet valve 26 is moved away from the seal washer 34, fluid may flow around the annular poppet valve portion 42 and through the ports 24 and into the bore 22 of the nozzle 18.

A coil spring 44 is disposed under compression in the housing section 28 of the valve housing 10, and this spring 44 tends to maintain the annular seat-engaging portion 42 of the poppet valve 26 firmly and sealingly seated against the seal washer 34.

The housing section 28 is provided with a reduced diameter portion 46 pressed in a bore 48 of the housing section 30, and a normally lower end 50 of the reduced diameter portion 46 of the housing portion 28 engages an annular seal washer 52 and holds it against a backup plate 54 which is seated on an annular ledge 56 in the housing section 30. The seal ring 50 is provided with a central opening 58 which intimately and sealingly engages a small diameter portion 60 of shutoff valve piston 62.

The piston 62 is provided with a peripheral portion 64 having an O-ring seal 66 engaged sealingly in a bore 68 of the valve housing section 30.

A compression spring 70 is abutted in the valve housing section 30 and forces a shoulder portion 72 of the piston 62 against the backup plate 54, all as shown best in FIGS. 2 of the drawings.

The piston is provided with a passage 74 which extends therethrough. This passage is provided with a restricted orifice 76 adapted to meter flow of fluid from the collapsible container 16, as will be hereinafter described in detail.

The small diameter portion 60 of the piston 62 is provided with another fluid-conducting passage 78 therein terminating in an orifice 80. This orifice 80 communicates with a bore portion 82 which is substantially larger than the piston portion 60 to permit flow of fluid upwardly toward the poppet valve 26.

Communicating with the passage 78 is an annular chamber 82 which is disposed adjacent to one pressure-sensing surface 84 of the piston 62. The annular chamber 82 is adapted and disposed to receive fluid, under pressure, through a port 86 in the sidewall of the valve housing section 30, all as shown best in FIGS. 2 and 8 of the drawings.

Communicating with the piston bore 68 is a passage 84 which terminates in a valve seat 86 adjacent to a flexible diaphragm element 88 which is generally cup-shaped and provided with a skirt 90 engaged on a short neck portion 92 at a normally lower end of the valve housing section 30. The diaphragm valve element 88 is provided with fluid passages 94 extending therethrough, and this diaphragm valve element 88 is surrounded by the walls of the flexible and collapsible container 16.

This collapsible container 16, when fluid is depleted therefrom, tends to collapse around and compressively engage the valve element 88 to force it into the position, as shown in FIG. 9, wherein the diaphragm valve portion 88 engages the seat 86 and shuts off flow of fluid through the passage 84, the passage 74, the orifice 76, and upwardly around the annular portion 42 of the poppet valve 26, when in open position.

A modification of the invention, as shown in FIG. 5 of the drawings, illustrates the collapsible bag 16 in connection with a portion 98 of the valve housing section 30. This portion 98 corresponds with the portion 92, shown in FIG. 2 of the drawings. The portion 98 is provided with a downwardly converging conical portion 100 terminating in an open end 102 of the passage 84. When the collapsible container 16 collapses to a position, as indicated by broken lines 104, the open end 102 of the passage 84 is closed off, and thereby shuts down or shuts off a source of fluid under pressure in the collapsible container 16, all as will be hereinafter described in detail.

In the modification, as shown in FIG. 6 of the drawings, the collapsible container 16 collapses to a broken line position 106, and engages resilient fingers 108 surrounding a ball check valve 110 which is forced onto a valve seat 112, when the collapsible container moves to the broken line collapsed position 106. Thus, the modification shown in FIG. 6, operates to shut off the flow of a source of fluid in the collapsible container 16 upwardly through the passage 84 which terminates in a ball check valve seat 112.

In the modification, as shown in FIG. 7, the rigid hollow cylindrical container 114 is substituted for the collapsible container 16 and a piston 116 is reciprocally mounted in the container 114 with a source of fluid 118 thereabove.

As aerosol pressure in the container 114 forces the piston upwardly in the bore 120 of the container 114, fluid under pressure, in the container 114 is forced upwardly through the passage 84 and is ultimately shut off when a top portion 122 of the piston engages a valve seat 124 at the terminus of the passage 84.

OPERATION OF THE INVENTION

When separate fluids are disposed in the container 14 and the collapsible container 16, as hereinbefore described, and when the manually operable nozzle 18 is tilted to the position, as shown in FIG. 9 of the drawings, the poppet valve portion 42 is displaced from an inner surface of the seal ring 34, thus allowing fluid to pass from a first source internally of the collapsible container 16 upwardly through the openings 94 in the diaphragm valve member 88 and through the passage 84 to the passage 74 and through it, and the restricted orifice 76. The fluid then passes upwardly through and around the poppet valve 26 and inwardly through the ports 24, and is then dispensed through the bore 22 of the nozzle 18. Concurrently, fluid also flows from a second source internally of the container 14 through the port 86, annulus 82, passage 78 and orifice 80, and upwardly through the valve body, poppet valve 26, ports 24 and passage 22.

During concurrent flow of the fluids from the two sources in the containers 16 and 14, respectively, the fluids mix in the valve housing and are dispensed from the dispensing head 20, as desired. When oxidation hair dye preparations are dispensed from the nozzle 20, the separate sources of fluids may include dye and hydrogen peroxide, either of which might be very detrimental if dispensed alone. Accordingly, in accordance with the present invention, the supply of fluid, under pressure, in the container 14 may constitute a second source of fluid, under pressure, and this source may be charged to a substantially greater extent or amount than the fluid in the collapsible container 16 so that on a predetermined basis, the fluid in the container 16 will be exhausted first. Thus, in normal operation, both fluids will be dispensed concurrently until fluid in the container 16 becomes substantially depleted, at which time, the collapsible container 16 will assume a position substantially as shown in FIG. 9, wherein the external pressure acting on the collapsible container will force it to depress the diaphragm valve 88 into engagement with the seat 86 and to shut off flow of fluid from the first source through the passage 84. In this manner, pressure of fluid decreased at a normally lower side 126 of the piston 62. This side 126 is a pressure-sensing surface opposing the hereinbefore described pressure-sensing surface 84.

Thus, when the diaphragm valve 88 is closed, and when the manually operable poppet valve 26 is in the open position, as shown in FIG. 9 of the drawings, pressure through the orifice 76 and passage 74 is reduced to a level near atmospheric pressure which communicates with the dispensing head 20. Such low pressure also then communicates with the pressure-sensing surface 26 of the piston 62.

At this time, full pressure of the fluid in the container 14 communicates through the port 86 with the annulus 84 which acts as a pressure-sensing surface of the piston 62, and since this pressure is greater acting on the surface 84, the piston 62 is moved to the position shown in FIG. 9 of the drawings, against compression of the spring 70, and in this manner, the orifice 80 communicating with the passage 78 in the reduced diameter piston portion 60 is retracted to a position beyond the seal washer 50 and out of communication with the bore 82. Thus, the source of fluid communicating through the port 86 and the interior of the container 14 is shut off and prevented from flowing upwardly through the bore 82. It will be seen that the passage 78 is provided with an inlet communicating with the annulus or chamber 82 and an outlet constituted by the orifice 80, these inlet and outlet portions of the passage 78 are normally at opposite sides of the seal washer 50, but when a source of fluid in the collapsible container 16 is depleted, the piston is moved to the position shown in FIG. 9,

wherein the orifice 80 is prevented from delivering fluid from the second source or interior of the container 14 to the bore 82, and thus both sources of fluid, under pressure, are shut off and prevented from passing outwardly through the nozzle 18.

It will be seen that the modification, shown in FIGS. 5, 6 and 7, serve to provide shutoff valve structures for the passage 84. The structure shown in FIG. 5 merely uses the collapsible bag 16 to shut off the open end 102 of the passage 84. The collapsible bag 16, as shown in FIG. 6, deflects the fingers 108 to seat the ball valve 110 and the seat 112 to shut off the passage of fluid through the passage 84, and in the modification, as shown in FIG. 7, the hollow cylindrical container body 114 is substituted for the collapsible container and the piston 116 movable in this hollow cylindrical container 114 engages a valve seat 124 and shuts off flow to the passage 84. Thus, all of these modifications are operable to initiate the establishment of a pressure differential acting on opposed surfaces 84 and 126 of the piston 62 to cause it to move under force of the pressure differential against compression of the spring 70 and to the position shown in FIG. 9, which is the shutoff position of the valve of the invention.

It will be recognized that either fluid in either of the containers 14 or 16 may be harmful if dispensed individually, and therefore when one of the sources is depleted, the other source is automatically shut off, and this is accomplished in accordance with the present invention by the simple expedient of one source of fluid, under pressure, being overcharged with respect to the other so that it may be predetermined which source will be depleted first.

It will be obvious to those skilled in the art that various modifications may be resorted to within the spirit of the invention.

I claim:

1. In an automatic shutoff valve for use with an aerosol product container, the combination of a container adapted to separately contain a plurality of fluid sources, under pressure therein; a valve housing; a manually operable nozzle; first valve means in said valve housing and operable by said nozzle and adapted to dispense a mixture of said fluids from said source to a location outwardly from said container; first resilient means tending to hold said first valve means closed; and second valve means in said housing responsive to a reduction of pressure of fluids from a first one of said sources relative to remaining fluid pressure in a second one of said sources; said second valve means automatically responsive to said reduction in pressure to move from an open position to a closed position, and to shut off flow of fluid from said second one of said sources, and to prevent flow of fluid therefrom outwardly through said first valve means; and second resilient means tending to hold said second valve means in open position.

2. The invention, as defined in claim 1, wherein third valve means is disposed in said housing and is operable in response to a substantial depletion of fluid at said first one of said sources; said third valve means disposed to shut off fluid flow from said first one of said sources to said first valve means when said third valve means operates in response to substantial depletion of said fluid at said first one of said sources.

3. The invention, as defined in claim 1, wherein said second valve means is provided with opposed fluid pressure-sensing surfaces, one of said surfaces communicating with said first valve means, and said first one of said sources, the other of said opposed surfaces communicating with said second one of said sources.

4. The invention, as defined in claim 2, wherein said second valve means is provided with opposed fluid pressure-sensing surfaces, one of said surfaces communicating with said first valve means, and said first one of said sources, and the other of said opposed surfaces communicating with said second one of said sources.

5. The invention, as defined in claim 4, wherein said third valve means comprises a flexible container for said first one of said sources, said flexible container adapted to collapse under pressure, and thereby exhaust fluid therefrom, and to substantially deplete said first source of fluid, under pressure.

6. The invention, as defined in claim 4, wherein said third valve means comprises a cylindrical container in said first container, said cylindrical container adapted to contain said first source of fluid under pressure; a piston movably mounted in said cylindrical container to force fluid therefrom and toward said first valve means; and a shutoff seat engageable by said piston near one end of said cylindrical container for causing shut off of fluid flow from said cylindrical container toward said first valve means.

7. The invention, as defined in claim 4, wherein said third valve means comprises a collapsible container for said first one of said sources; a ball check valve adjacent said housing and adapted, when in shutoff position, to shut off flow of fluid from said first one of said sources to said first valve means, said collapsible container disposed to collapse around said ball check valve and to move it to said shutoff position, when fluid in said collapsible container is substantially depleted.

8. The invention, as defined in claim 4, wherein said third valve means comprises a valve seat communicating with said first one of said sources and said first valve means; a diaphragm valve element normally spaced from said seat; a collapsible container in said first container for containing fluid of said first one of said sources, said collapsible container adapted to collapse in response to external pressure, and when collapsed, to force said diaphragm to engage said seat and to shut off fluid flow from said first one of said sources to said first valve means.

9. The invention, as defined in claim 3, wherein said second valve means comprises a piston movably mounted in said housing, said piston having a first passage extending therethrough and intercommunicating with said first one of said sources and said first valve means; a seal through which said piston is slidably and sealingly disposed; a second passage in said piston, said second passage having an inlet and an outlet, said inlet, when in open position, being disposed at an opposite side of said seal from said outlet, said inlet communicating with said second one of said sources, said outlet communicating with said first valve means, whereby, when said piston moves against force of said second resilient means in response to a pressure differential acting on said opposed surfaces, said outlet is retracted toward and beyond said seal to thereby shut off communication of said outlet with said first valve means, and thereby moving said second valve means to said closed position.

10. The invention, as defined in claim 1, wherein said first valve means is a poppet valve carried by said manually operable nozzle.

11. In an automatic shutoff valve for use with aerosol product containers, the combination of a first container means adapted to contain a plurality of fluid sources, under pressure therein; a valve housing; a manually operable nozzle carried thereby; first valve means in said valve housing and operable by said nozzle, said first valve means adapted to dispense a mixture of said fluids from said sources to a location outwardly from said container; said first container means comprising inner and outer compartments; said inner compartment having a movable wall adapted to respond to pressure of the fluid in said outer compartment to pressurize fluid in said inner compartment; and a second valve means operable in response to movement of said movable wall to a position corresponding with depletion of a fluid source from the interior of said inner compartment, whereby said second valve is closed by said movable wall when the fluid source in said inner container is substantially exhausted; and passage means disposed to conduct fluid, under pressure, from said outer compartment to said first valve means for dispensation therethrough.