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COMBINATION DISPENSING AND EXCESS PRESSURE RELIEF VALVE

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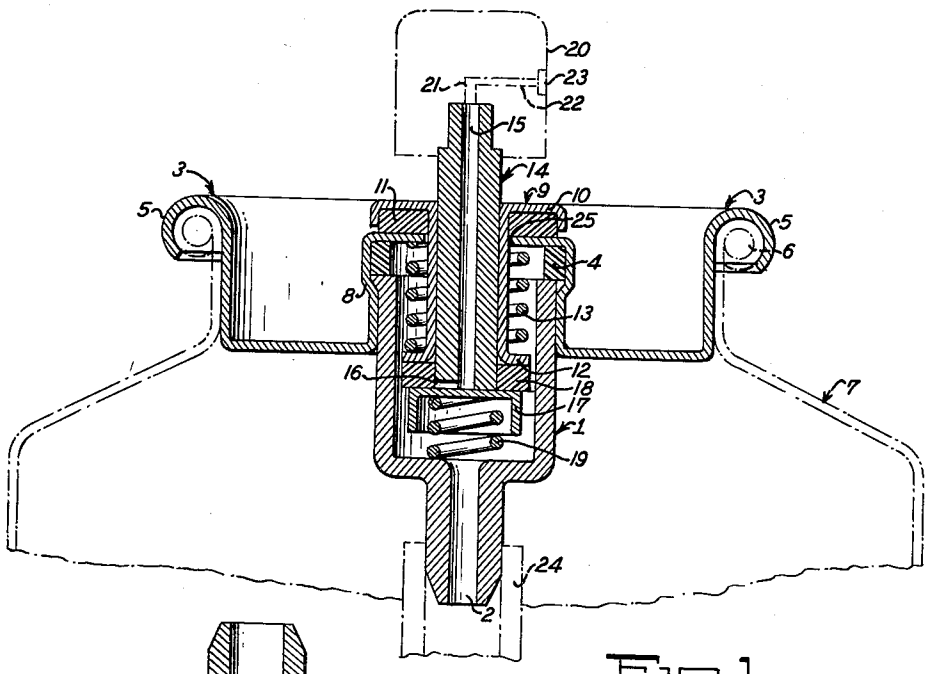

Fig. 1

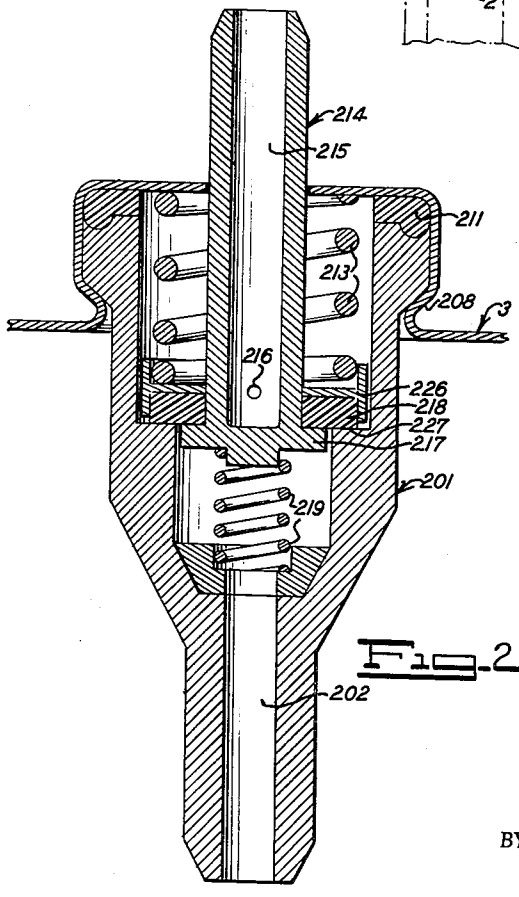

Fig. 2

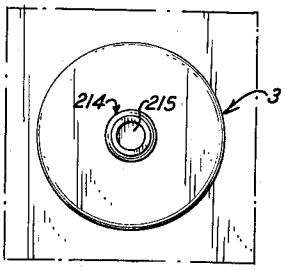

Fig. 3

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COMBINATION DISPENSING AND EXCESS PRESSURE RELIEF VALVE

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This invention relates to a combination dispensing and excess pressure relief valve. The invention more particularly relates to a dispensing valve for a pressurized fluid container such as an aerosol type dispensing valve which has a combined structure to enable the same to perform the dual function of an excess pressure relief safety valve.

On various pressurized fluid containers, as for example, those containing LP gas, such as liquefied propane, in addition to the normal dispensing valve, a separate excess pressure relief safety valve is provided for safety reasons and in order to meet certain legal requirements. This excess pressure safety relief valve is usually separate and distinct from the normal dispensing valve and may be in the form of a valve which closes against the pressure in the container and which is held closed, as for example, by a spring with a predetermined force. When this predetermined force is exceeded, the valve is forced open by the pressure in the container, thus allowing the escape of the contents until this excess is relieved. This excess pressure relief valve serves to prevent building up of unsafe pressures in the interior of the container, which could be a fire or explosion hazard. The provision of the separate, excess pressure safety relief valve, though necessary and required, substantially increases the cost and difficulty in fabrication of the container as the same necessitates the provision of a separate opening through the container wall and the construction and insertion of a separate valve in this opening.

The ordinary "tin can" type aerosol container is generally only charged to a relatively low pressure, and therefore, is not generally provided with a separate, excess pressure relief valve. In connection with aerosol containers of a stronger construction and charged to a higher pressure, as for example those made of heavier gauge steel or of aluminum, the provision of an excess pressure relief safety valve is desirable and in certain instances necessary and required, but the provision of a separate and distinct valve to perform this function presents constructional difficulties and substantially increases the cost of the containers, which, in order for the the containers to be competitive, must be maintained at a minimum.

One object of this invention is a combined dispensing and excess pressure relief safety valve for a pressurized fluid container which provides all of the advantages and safety features of a separate, excess pressure relief valve while eliminating all the disadvantages, including the disadvantages involved in providing a separate valve for this purpose, positioned in a separate opening. These and still further objects will become apparent from the following description read in conjunction with the drawings in which:

FIG. 1 is a vertical section of an embodiment of a combined dispensing and excess pressure relief valve in accordance with the invention,

FIG. 2 is a vertical section of a further embodiment with a combined dispensing and excess pressure relief valve in accordance with the invention, and

FIG. 3 is a plan view of the valve shown in FIG. 2.

The combined dispensing and excess pressure relief valve in accordance with the invention has a valve housing which is preferably a hollow structure with an open inlet end which extends into the pressurized fluid container in connection with which the valve is used. A

dispensing passage extends through the housing and may, for example, be formed in part by a hollow stem coaxially positioned within the housing. A first moveable valve member which may, for example, be positioned on the end of the hollow stem and moveable therewith and a cooperative valve seat seal this dispensing passage. This first moveable valve member is moveable in a direction against fluid pressure from the inlet end of said housing to open the dispensing passage. A second moveable valve member and cooperative valve seat, which are substantially coaxial with the first moveable valve member, and preferably positioned around the hollow stem, seal the housing from the passage of fluid therethrough from the inlet opening. This second moveable valve member is moveable in a direction with the fluid pressure from the inlet end of the housing to open the housing for the flow of fluid therethrough from the inlet end. The second moveable valve member is resiliently urged, as for example, by a spring, to its closed position with a predetermined force so that the same will remain closed but may be forced open when the fluid pressure in the container interior in connection with which the valve is used, exceeds a certain pre-determined safe value.

Referring to the embodiment as shown in FIG. 1 of the drawing, the combined dispensing and excess pressure relief valve shown has the valve housing 1 which has a circular cross sectional shape and which is formed of metal, plastic, or the like. This valve housing terminates in a cylindrical stem forming the open inlet end 2 which extends into the interior of the container in connection with which the valve is used. The housing 1 is sealed in place in the metallic cap or plug 3 by means of the resilient, as for example rubber, gasket 4. The cap 3 has the conventional construction used in connection with aerosol cans and has, for example, the turned edge 5 which is rolled or crimped in sealing engagement with the corresponding rolled or beaded edge 6 of the opening of the pressurized fluid container 7 in connection with which the valve is used. The housing 1 is maintained tightly in place in cap 3 by means of the shoulder 8. The cap 3 has a central opening into which the metallic sleeve 9, with a slightly smaller outer diameter, slidingly fits. The sleeve 9 has the bent over upper portion 10, which holds the resilient O ring or gasket 11 and forms a valve member. The lower end of the sleeve 9 is also bent over or flanged at 12 and the coil spring 13 is compressed between this flange 12 and the cap 3 so as to force the sleeve 9 downwardly and press the gasket 11 in sealing engagement with the upper portion of the cap 3. A hollow metal tube or stem 14 slides in the sleeve 9 and is provided with the central bore 15. A lateral bore or passage 16, extending through the side-wall of the stem 14, communicates with this passage 15. A cylindrical valve member 17 is secured to the bottom of the stem 14. This valve member seats against the corresponding valve seat 18 of resilient material, such as rubber or plastic, which is secured to the lower end of the flange 12. A spring 19 resiliently urges the valve member 17 and stem 14 upwardly so that the valve member 17 is in sealing engagement with the valve seat 18. A conventional push-button cap 20 is positioned on top of the stem 14. This cap has the central passage 21 in communication with the passage 15 and the lateral passage 22 terminating in the spray orifice 23.

The cap 3 is used to seal the opening of a container, such as the can 7, for pressurized fluid in the conventional manner. If the valve is to be used to dispense liquids from the container in aerosol form, a siphon tube 24 extends to the bottom of the container and may be connected to the inlet end 2 of the housing. With the valve in position and the container 7 containing a fluid under pressure, sealing will normally be effected by the

valve arrangement. The pressure of the fluid from the interior of the container, acting on the valve member 17, in addition to the pressure of the spring 19, will maintain the valve member tightly sealed against the valve seat 18.

When it is desired to dispense fluid, the cap 20 is depressed, as for example with a finger in the conventional manner. This forces the stem 14 to slide downwardly in the sleeve 9 and forces the valve member 17 downwardly compressing spring 19 and free from the valve seat 18. The lateral passage 16 thus becomes exposed and the fluid, under the influence of the pressure in the interior of the container, passes up through the tube 24, inlet 2, through the lateral passage 16, up through passage 15, and out through the passage 21, 22, and emerges in the form of an aerosol spray from the orifice 23. As soon as the finger pressure is released on the member 20, pressure in the interior of the container, acting on the valve member 17, and the force of the spring 19, quickly force the valve member and the connected stem 14 upwardly so that the valve member is again in sealing engagement with the seat 18, sealing communication of the passage 16 and the inlet 2.

It may be noted that the inlet 2 and lateral passage 16, and the bore passage 15 collectively define a dispensing passage through the housing.

If, with the valve normally shut, i.e., with no pressure applied to the cap 20, the pressure in the interior of the container 7 builds up, past an unsafe value, as for example after being subject to undue heat, fire, or the like, so that an explosion might result, this pressure acts on the valve member 17, forcing the same with the sleeve 9 upwardly against the pressure of the spring 13. The spring 13 is compressed and the sleeve 9 moves upwardly and the valve member 11 is lifted from sealing engagement with the cap 3 so that fluid from the interior of the container can flow outwardly through the clearance 25 between the sleeve 9 and central opening in the cap 3. This fluid will flow out until the pressure exerted on the member 17 is no longer greater than the counter-pressure of the spring 13 at which time the spring 13 will again push the sleeve 9 downwardly and force the member 11 into sealing engagement with the cap 3, interrupting further flow. The valve will, therefore, act as an excess pressure relief valve, releasing only that much of the excess pressure which is unsafe but will immediately close when this excess pressure is released without dispensing the entire contents of the container or rendering the container inoperable or useless. The pressure of the spring 13 is merely pre-determined so that the same will be compressed to release the excess pressure beyond the pressure which has been determined, for the interior of the container, to be the maximum safe pressure.

Referring to the embodiment as shown in FIGS. 2 and 3, the combined dispensing and excess pressure relief valve has a valve housing 201 of circular cross-sectional shape, which corresponds to the housing 1 of FIG. 1 and may, for example, be produced of metal or preferably hard plastic material, such as nylon. Housing 1 has the open inlet end 202 in the form of a stem or nipple extension. The housing 201 is positioned in a cap 3 of identical construction to the cap 3 of FIG. 1 and sealed in the pressure-tight manner to the cap by means of the crimped in shoulder 208 and the resilient gasket 211. Coaxially extending into the housing 201 and through a central hole in the cap 3, of slightly larger diameter than its outer diameter, is the hollow metallic stem 214 provided with the central bore 215. Communicating with the central bore 215 is the lateral passage 216 extending through the side-wall of the stem 214. The lower end of the stem 214 is provided with the valve member 217 in the form of a disc or flange. Loosely surrounding the stem 214 is the metallic bushing 226 which is freely positioned in the housing 201. Fitted in the lower portion of this bushing is the rubber seal 218. A coil spring 213 is compressed between the lower surface of the top of the cap 3 and the bushing 226 so that the resilient seal or seat 218 is normally pressed in sealing engagement with the internal shoulder 227 of the housing which forms a valve seat. A coil spring 219 forces the stem 214 and valve member 217 upwardly so that the valve member 217 is maintained in sealing engagement with the lower side of seal 218 which forms a valve seat for the member 217. The spring 219 is much smaller than the spring 213 so that its pressure cannot compress the spring 213. With the cap 3 sealing a container with a pressurized fluid in the identical manner as described in connection with the embodiment of FIG. 1, fluid cannot leave the container due to the sealing engagement of the seal 218 against the shoulder 227 and the sealing engagement of the valve member 217 against the seal 218. When, however, the stem 214 is depressed, the spring 219 is compressed and the member 217 moves away from the seal 218 so that the fluid from the interior of the container may pass through the inlet opening 202, through lateral passage 216, and out through passage 215, as for example through the openings and orifices on a cap corresponding to cap 20 of FIG. 1 but not shown. As soon as the pressure on the member 214 is released, the internal pressure from the container and the force of the spring 219 force the stem 214 upward again so that the valve member is forced again in sealing engagement with the seal 218.

Thus, the open inlet 202 and lateral passage 216 and the passage 215 form a dispensing passage-way extending through the housing. With this passage-way normally shut, i.e. with the stem 214 in its normal position and not depressed, the pressure in the interior of the container will normally act on member 217 and seal 218 tending to force the seal 218 away from contact with the shoulder 227, compressing spring 213. The spring 213 is so chosen that the pressure of the same is normally sufficient to hold the seal 218 in sealing engagement with the shoulder 227 against this normal pressure. When excess pressure builds up, however, the spring 213 will become compressed as this excess pressure acts on the valve member 217 and seal 218 and bushing 226. As the spring 213 is compressed, the seal 218 will move away from sealing engagement with the shoulder 227 so that fluid from the interior of the container may flow through the open inlet 202 around the seal 218, out through the lateral passage 216 and passage 215 and also out through clearance between the cap 3 and stem 214. This will allow relief of the excess pressure until the point where the pressure of the spring 213 can again force the seal 218 in sealing engagement with the shoulder 227, thus preventing further flow. The valve will, therefore, act as an excess pressure relief safety pressure and, depending on the construction of the spring 213, will relieve pressure above a pre-determined maximum safe value until the pressure is again reduced to below maximum, pre-determined safe value. This pressure relief automatically occurs without dispensing the entire contents.

While the invention has been described in detail, with respect to specific aerosol valves, the same is, of course, applicable to other dispensing valves used with pressurized fluid containers and various changes and modifications which fall within the spirit of the invention will become apparent to the skilled artisan. The invention is, therefore, only intended to be limited by the appended claims or their equivalents wherein I have endeavored to claim all inherent novelty.

I claim:

1. A combination dispensing and excess pressure relief valve comprising a valve housing with an open inlet end, means defining a dispensing passage-way extending through said housing, a first moveable valve member and cooperative valve seat sealing said dispensing passage-way, said first moveable valve member being moveable in a direction against fluid pressure from said inlet end of said housing to open said dispensing passage-way, a second moveable valve member and cooperative valve seat sub-

stantially coaxial with said first moveable valve member, and sealing said housing from the flow of fluid therethrough from said inlet end, said second moveable valve member being moveable in a direction with fluid pressure from said inlet end of said housing to open said housing for the flow of fluid therethrough from said inlet end, and means resiliently urging said second valve member closed with a pre-determined force.

2. A valve according to claim 1, including spring means resiliently urging said first valve member in sealing engagement against its cooperative seat.

3. A valve according to claim 2 in which said means for resiliently urging said second valve member is a spring.

4. A valve according to claim 3 including a hollow stem having said first valve member at the end thereof and said second valve member coaxially surrounding it, said dispensing passage-way at least partially being defined through said hollow stem.

5. A combination dispensing and excess pressure relief valve comprising a hollow valve housing with an open inlet end, a stem defining a fluid passage-way therethrough extending coaxially into said housing opposite said inlet end and being positioned for limited axial movement, a first valve member positioned at the end of said stem in said housing and a cooperative valve seat sealing said fluid passage-way from said inlet end, said first valve member being moveable with said stem in a direction towards said inlet end away from said seat to allow fluid communication between said inlet end and said fluid passage-way, a second valve member and a cooperative seat coaxially surrounding said stem and sealing said housing from the flow of fluid therethrough from said inlet end, said second valve member being moveable in a direction away from said inlet end and its cooperative seat to open said housing for the flow of fluid therethrough, and spring means resiliently urging said second valve member in a direction towards said inlet end against said cooperative seat.

6. A valve according to claim 5 including a spring urging said first valve member away from said inlet and against its cooperative seat.

7. A valve according to claim 6 including a sleeve surrounding said stem, the end of said sleeve adjacent said inlet end, having said cooperative seat for said first valve member attached thereto, the opposite end of said sleeve defining said second valve member, said first-mentioned spring means surrounding said sleeve axially urging the same toward said inlet end.

8. A valve according to claim 5 including an annular bushing surrounding said stem, said bushing containing a seal defining said second valve member, said cooperative seat for said second valve member being in the form of an internal shoulder defined in said housing, said seal additionally defining said seat for said first valve member.

9. A combination dispensing and excess pressure relief valve comprising a hollow valve housing of substantially circular cross-section shape with an open inlet end, a stem defining a fluid passage-way therethrough extending coaxially into said housing opposite said inlet end and being positioned for limited axial movement, a first valve member positioned at the end of said stem in said housing, a second valve member coaxially surrounding said stem and defining a cooperative seat for said first valve member, a cooperative seat for said second valve member defined by an internal shoulder in said housing, said stem and first valve member being moveable in a direction toward said inlet end away from its cooperative seat to allow flow communication between said inlet end and fluid passage-way, said second valve member being moveable in a direction away from said inlet end and its cooperative seat to open said housing for the flow of fluid therethrough, first spring means positioned in said housing resiliently urging said first valve member and stem axially away from said inlet end, second stronger spring means coaxially surrounding said stem and resiliently urging said second valve member toward said inlet end against its seat.

10. A valve according to claim 9 in which said fluid passage-way extends coaxially through said stem to the end portion adjacent said valve member and then laterally through the side-wall of said stem on the side of said second valve member opposite said inlet end.

11. A valve according to claim 10 including a push button top with aerosol spray orifice positioned on the end of said stem opposite said first valve member.

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