April 30, 1957 F. A. HODGES ET AL 2,790,570

PRESSURE SEALING AND EXCESSIVE PRESSURE RELIEVING CLOSURE CAP FOR CONTAINERS

Filed July 29, 1954 2 Sheets-Sheet 1

Fig. 1

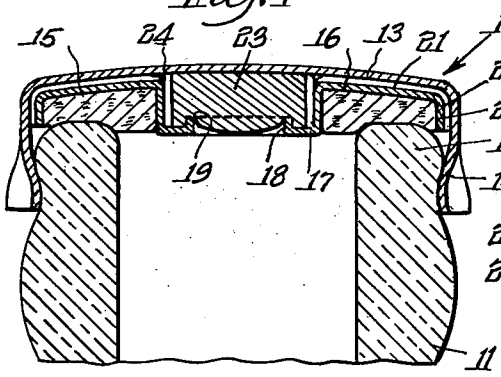


Fig. 2.

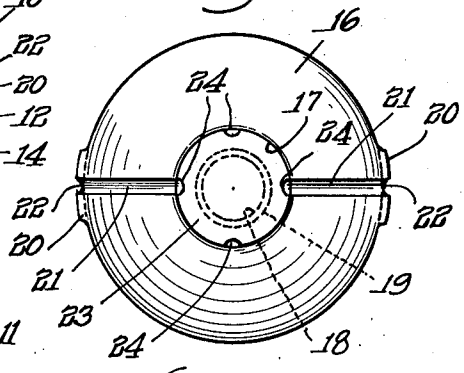


Fig. 4.

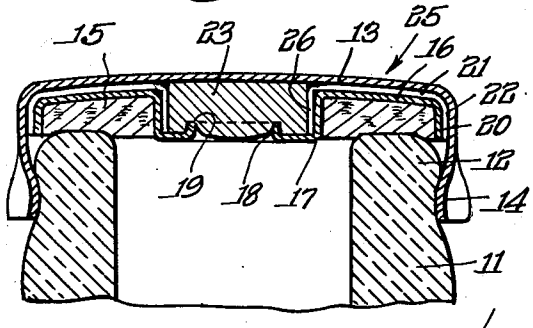


Fig. 3.

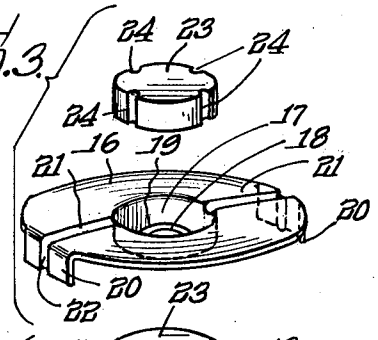


Fig. 6.

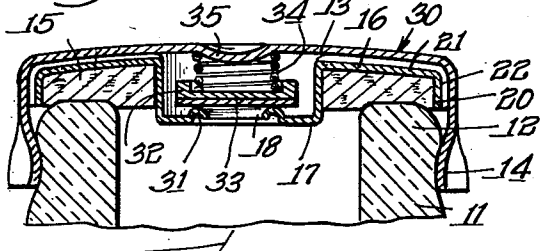


Fig. 5.

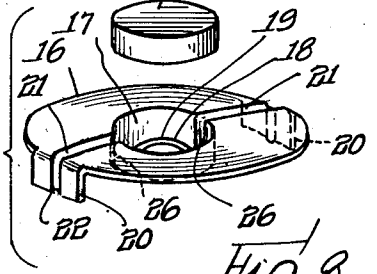


Fig. 8.

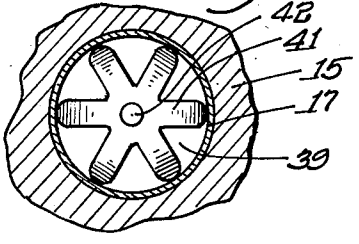
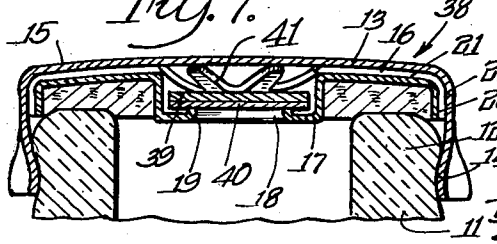


Fig. 7.



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Filed July 29, 1954 2 Sheets-Sheet 2

Fig. 9.

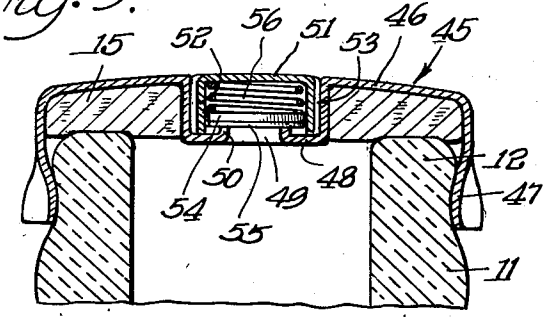


Fig. 12.

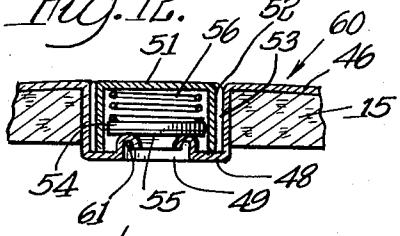


Fig. 10.

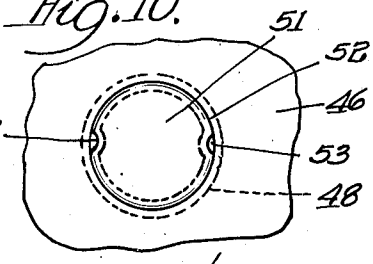


Fig. 13.

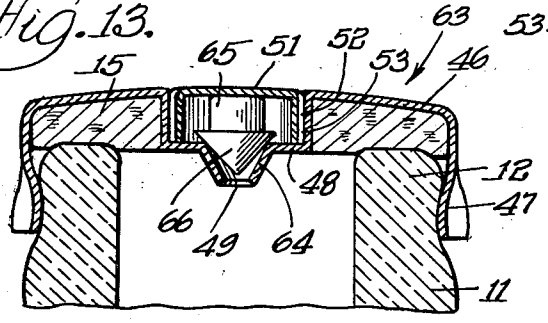


Fig. 11.

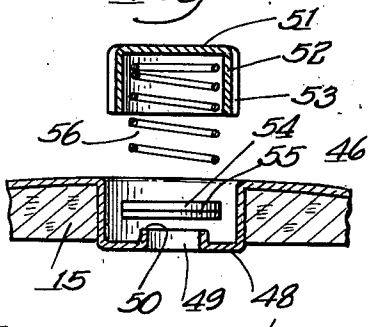


Fig. 14.

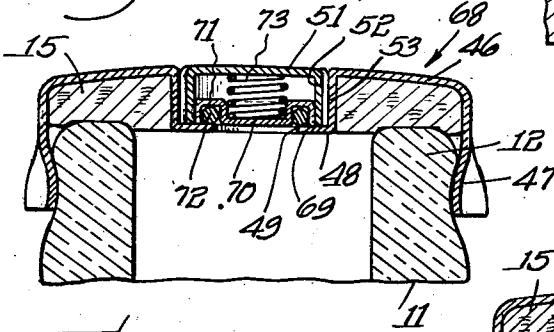


Fig. 16.

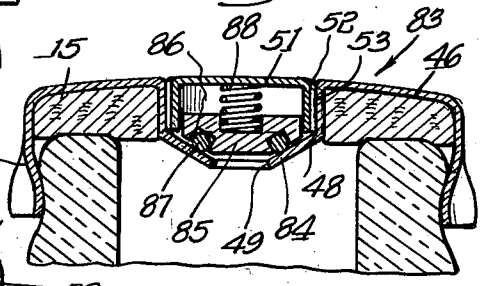
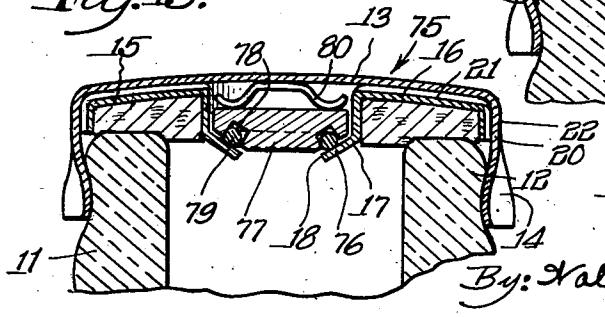


Fig. 15.



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PRESSURE SEALING AND EXCESSIVE PRESSURE RELIEVING CLOSURE CAP FOR CONTAINERS

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Application July 29, 1954, Serial No. 446,494

11 Claims. (Cl. 215—56)

This invention relates to closure caps for the mouths of containers and more particularly to closure caps for bottles, cans and the like containing carbonated and other beverages under pressure.

Carbonated beverages and the like are sealed under pressure in containers, such as bottles, cans and the like, for distribution and numerous instances have arisen where persons have been hurt by accidental explosions of such containers, such explosions being caused by the building up of excessive positive pressures within the containers. Numerous attempts have been made in the past to vent automatically excessive positive pressure from within the containers such as by providing the closure caps with frangible disks which rupture upon excessive positive pressure or by weakening or mutilating the sealing gaskets to allow the escape of excessive positive pressure between the container and the sealing gaskets. These attempts have been generally unsuccessful because they are not reliable and foolproof in operation and they do not reseal the container when the excessive positive pressure is relieved with the result that the positive pressures in the containers are reduced to atmospheric pressure, thus destroying the contents of the containers. They have also been complicated or tricky in construction and have not been generally useable in standard bottle capping machines.

The principal object of this invention is to provide an improved positive pressure sealing and excessive positive pressure relieving closure cap for such containers having positive above atmospheric pressures therein wherein the aforementioned deficiencies are eliminated or minimized, wherein foolproof and reliable operation is obtained upon the occurrence of excessive positive pressure conditions, wherein the containers are resealed after escape of the excessive positive pressures to prevent total loss of positive pressure, wherein standard bottle capping machines may be utilized in applying the closure caps of this invention to the containers, and wherein the closure caps are simple in construction and inexpensive to manufacture and handle.

Briefly, the positive pressure sealing and excessive positive pressure relieving closure cap of this invention includes a metallic cap having a depending flange provided with means, such as flutes, for securing the cap about the mouth of the container. An annular compressible gasket, located in the cap, is secured by the cap in gas sealing position upon the mouth of the container. The metallic cap includes two engaging metallic parts with one of said metallic parts extending inwardly through the central opening in the sealing gasket, its inner side being exposed to the positive pressure within the container and its outer side forming a central chamber between it and the other metallic part. The inwardly extending metallic part has a central opening therethrough for establishing communication between the interior of the container and the central chamber and it is also provided with an annular valve seat in the central chamber about the central opening. A valve is interposed between the metallic parts

in the central chamber and is resiliently pressed with sufficient force against the annular valve seat for normally sealing the central chamber from the interior of the container against normal positive pressure therein, but is movable away from the valve seat upon the occurrence of excessive positive pressure in the container to relieve said excessive positive pressure into the central chamber. A vent passage is also provided for communicating the central chamber with the exterior of the closure cap to vent any pressures therein to atmosphere.

The positive pressure sealing and excessive positive pressure relieving closure cap of this invention may take various forms which differ mainly in the construction and location of the two metallic parts, the construction of the annular valve seat, the construction of the valve and the manner of venting the central chamber. Regardless of these differences in construction, the various forms of the closure cap operate in substantially the same way for producing substantially the same results.

Further objects of this invention reside in the details of construction of the pressure sealing and excessive pressure relieving closure cap for containers and in the cooperative relationships between the component parts thereof.

Other objects and advantages of this invention will become apparent to those skilled in the art upon reference to the accompanying specification, claims and drawings, in which:

Fig. 1 is a vertical sectional view through one form of the positive pressure sealing and excessive positive pressure relieving closure cap of this invention;

Fig. 2 is a top plan view of the closure cap of Fig. 1 with the outer metallic part removed;

Fig. 3 is an exploded perspective view of the inner metallic part and valve of the closure cap of Fig. 1;

Fig. 4 is a vertical sectional view through another form of the closure cap of this invention;

Fig. 5 is an exploded perspective view of the inner metallic part and the valve of the form of closure cap illustrated in Fig. 4;

Fig. 6 is a vertical sectional view through another form of the closure cap of this invention;

Fig. 7 is a vertical sectional view through a further form of a closure cap of this invention;

Fig. 8 is a horizontal sectional view through the closure cap of Fig. 7;

Fig. 9 is a vertical sectional view through still another form of the closure cap of this invention;

Fig. 10 is a top plan view of a portion of the closure cap illustrated in Fig. 9;

Fig. 11 is an exploded sectional view of the parts forming the closure cap of Fig. 9;

Figs. 12, 13, 14, 15 and 16 are vertical sectional views through further forms of the closure cap of this invention.

Referring first to Figs. 1, 2 and 3, one form of the positive pressure sealing and excessive positive pressure relieving closure cap for containers having a positive above atmospheric pressure therein is generally designated at **10**. It is shown as being applied to a container, such as a bottle **11** having a beaded mouth **12**. Carbonated and other beverages under positive pressure are contained in the container **11** and are sealed by the closure cap **10**. The closure cap **10** includes an outer metallic part **13** in the form of a crown cap having a depending fluted flange **14** for securing the cap to the beaded mouth **12** of the container **11**. The securing of the cap to the mouth of the container may be accomplished in conventional manner by conventional bottle capping machines. An annular compressible gasket **15**, such as a conventional cork gasket, is located in the cap and is secured by the cap in gas sealing position upon the mouth **12** of the container **11**. The closure cap also includes an inner metal-

lic part 16 in the form of an insert. This metallic part 16 is interposed between the sealing gasket 15 and the outer metallic part 13. The inner metallic part or insert 16 extends inwardly as indicated at 17 through the central opening in the sealing gasket 15. The inner or lower side of the inwardly extending portion 17 is exposed to the positive pressure within the container 11 and its outer side forms a central chamber between it and the outer metallic part 13. The inwardly extending part 17 of the metallic part 16 is provided with a central opening 18 therethrough for establishing communication between the interior of the container 11 and the central chamber. The inwardly extending portion 17 of the inner metallic part 16 is provided with an annular valve seat 19 in the central chamber about the central opening 18. This annular valve seat 19 is formed by bending the sheet metal about the opening 18 outwardly. Since the edge of the sheet metal forms the valve seat 19 it presents a thin annular valve seat. The inner metallic part or insert 16 is provided at its edges with a pair of depending skirts 20 which fit over the edges of the sealing gasket 15. The outer surfaces of the inner metallic parts 16 and the tabs 20 are provided with grooves 21 and 22 which communicate with the central chamber.

A valve 23 is interposed between the metallic parts 13 and 16 in the central chamber for engaging the valve seat 19. This valve 23 is in the form of a resilient and deformable plug valve and may be formed from rubber or the like. The valve plug 23 is compressed between the inner and outer metallic parts so that by its own resiliency it is resiliently pressed with sufficient force against the annular valve seat 19 for normally sealing the central chamber from the interior of the container against normal positive pressure therein. Because the annular valve seat 19 is thin and the resilient and deformable valve plug 23 drapes thereover as illustrated in Fig. 1, a tight seal is obtained. When, however, excessive positive pressure occurs in the container 11 the valve plug 23 is forced from the annular valve seat 19 to relieve the excessive positive pressure into the central chamber. The grooves 21 and 22 in the inner metallic part 16 form vent passages for communicating the central chamber with the exterior of the closure cap to vent any pressures therein to atmosphere. To assure escape to atmosphere of the relieved excess positive pressures from the container the valve plug 23 is preferably provided with grooves 24 in the edges thereof which grooves communicate with the grooves 21 in the inner metallic part. When the excess positive pressure is relieved, the valve plug 23 again seats against the annular valve seat 19 to again seal the container and prevent further loss of positive pressure in the container. The venting passages 21 and 22 open into the flutes in the depending fluted flange 14 and the excessive positive pressure is allowed to escape therethrough. The tabs 20 are provided to prevent lateral expansion of the sealing gasket from closing off the vent passages. In lieu of this venting arrangement the outer metallic part or cap 13 may be provided with a vent hole opening into the central chamber but for commercial reasons it is preferable to utilize the venting arrangement illustrated.

Another form of the closure cap of this invention is generally designated at 25 in Figs. 4 and 5. The construction of this closure cap 25 is very much like the closure cap 10 of Figs. 1 to 3 and like reference characters have been utilized for indicating like parts. The difference between the closure cap 25 and the closure cap 10 is that in the closure cap 25 there is provided a pair of grooves 26 in the inwardly extending portion 17 of the inner metallic part 16 communicating with the grooves 21 and the grooves are eliminated from the valve plug 23. In other words, Figs. 4 and 5 illustrate an alternative form for assuring venting of the central chamber to atmosphere. Outside of these changes the construction and operation of the closure cap 25 are the same as those of the closure cap 10.

The closure cap generally designated at 30 in Fig. 6 is very much like the closure caps 10 and 25 and here again like reference characters have been utilized for like parts. The closure cap 30 differs from the closure caps 10 and 25 in the construction of the annular valve seat and the valve seating thereagainst. Here, the valve seat is formed by also bending the sheet metal radially inwardly as well as outwardly or upwardly to provide a relatively wide and smooth annular valve seat 31. A metallic valve member 32 is located in the central chamber and it is provided with a resilient valve face 33 formed of rubber of the like suitably secured to the valve member 32. The valve surface 33 is resiliently urged against the annular valve seat 31 by a compression spring 34 interposed between the valve member 32 and the outer metallic part or cap 13. The outer metallic part 13 may be dished as indicated at 35 to form a seat for the compression spring 34. The spring 34 operates to resiliently hold with sufficient force the valve surface 33 against the annular valve seat 31 for sealing the positive pressure in the container 11. When, however, excessive positive pressure occurs within the container 11, the valve surface 33 is moved away from the annular valve seat 31 to relieve the excessive positive pressure in the manner generally described above. When the excessive positive pressure is relieved, the valve surface 33 again seats against the annular valve seat 31 to prevent loss of positive pressure within the container 11. Here the valve 32 presents a firmer surface 33 against the annular valve seat 31 and better sealing is obtained by the use of the relatively wide annular valve seat.

The closure cap generally designated at 38 and illustrated in Figs. 7 and 8 is very much like the closure caps 10, 25 and 30 and like reference characters have been utilized for like parts. As illustrated in Fig. 7 the closure cap 38 utilizes the thin annular valve seat 19 although it equally as well may utilize the relatively wide annular valve seat 31 as illustrated in Fig. 6. Here, the valve, located in the central chamber, includes a valve member 39 having a resilient valve surface 40 seating against the annular valve seat 19. The valve is urged against the annular valve seat 19 by a star type leaf spring 41 which may be suitably secured to the valve member 39 as by spot welding indicated at 42. The closure cap 38 operates in the same manner as the closure caps 10, 25 and 30 described above.

The closure cap generally designated at 45 and illustrated in Figs. 9, 10 and 11 is somewhat different from the closure caps described above. Here the metallic cap 46 having the fluted depending securing flange 47 extends inwardly as indicated at 48 through the central opening in the sealing gasket 15, and forms the inner metallic part. The inwardly extending portion 48 of the inner metallic part or cap 46 is provided with a central opening therethrough as indicated at 49. Arranged around the central opening 49 is an annular valve seat 50 which is formed by bending the sheet metal outwardly to provide a relatively thin annular seat. A metallic cup 51 having a side wall 52 forms the outer metallic part and it is secured in the inwardly extending portion 48 of the metallic cap 46 by a pressed fit. Thus, the inner and outer metallic parts form a central chamber which communicates through the central opening 49 with the interior of the container 11. The metallic cup 51 is preferably exteriorly provided with grooves 53 in the side walls 52 thereof, which grooves communicate the central chamber with the exterior of the closure cap so as to provide a vent passage for the central chamber to vent any pressures therein to atmosphere. Located within this central chamber is a valve including a valve member 54 provided with a resilient valve surface 55 formed of rubber or the like, the valve surface 55 seating against the annular valve seat 50. A spring 56 is interposed between the outer metallic member or metal cup 51 and the valve member 54 for resiliently urging the valve surface 55 against the annular

valve seat 50. While the construction of the metallic parts 46 and 51 is somewhat different from the construction of the metallic parts 13 and 16 described above, the manner of operation of the closure cap 45 is the same as that described above in connection with the closure caps 10, 25, 30 and 38. Here also a vent hole may be provided in the metallic cup 51 for venting the central chamber to atmosphere in lieu of the venting grooves 53. For commercial reasons, however, the venting grooves 53 are preferable.

The closure cap generally designated at 60 in Fig. 12 is the same as the closure cap 45 of Figs. 9, 10 and 11 with the exception that a relatively wide annular valve seat 61 is utilized in lieu of the relatively thin annular valve seat 50 of Fig. 9. Here the relatively wide annular valve 61 may be formed by bending the sheet metal radially inwardly as well as bending it outwardly. The valve seat arrangement, therefore, corresponds to the valve seat arrangement illustrated in Fig. 6.

The closure cap generally designated at 63 in Fig. 13 is very much like the closure cap 45 illustrated in Fig. 9 and like reference characters have been utilized for like parts. The closure cap 63 differs from the closure cap 45 in the construction of the valve seat and the valve. Here the inwardly extending portion 48 of the inner metallic part or cap 46 is provided with an inwardly extending frusto conical portion 64 terminating in the central opening 49. The valve located in the central chamber comprises a valve plug 65 formed of resilient deformable material such as rubber or the like. The valve plug 65 is formed with a conical portion 66 which has a greater cone angle than the cone angle of the frusto-conical projection 64. The valve plug 65 is arranged under compression in the central chamber 65 and resiliently presses against the frusto-conical valve seat 64. In so doing, the greatest pressure is exerted at the wider portion of the valve plug and this pressure decreases gradually inwardly. The conical surfaces 66 and 64, therefore, seal the interior of the container 11 from the central chamber against normal positive pressures existing within the container. When, however, the positive pressure in the container becomes excessive the conical portion 66 of the valve plug 65 is progressively moved away from the frusto-conical seat 64 to relieve excessive positive pressure in the container into the central chamber where the excessive positive pressure escapes through the vent passages 63. This valve arrangement including the diverging conical surfaces affords a very effective seal which is positive in its excessive positive pressure relieving operation. When the excessive positive pressure in the container is reduced to its normal value, the valve plug reseats itself against the frusto-conical valve seat 64 to prevent further loss of positive pressure in the container.

The closure cap generally designated at 68 in Fig. 14 is very much like the closure caps 45 and 63, it differing therefrom in the construction of the valve seat and valve. Here the inwardly extending portion 48 of the inner metallic part or cap 46 is provided with a flat annular valve seat 69. The valve within the central chamber includes a valve member 70 which is provided with an annular groove 71 which receives a resilient O-ring 72 formed of rubber or the like. The O-ring 72 is resiliently urged against the annular valve seat 69 by a compression spring 73 interposed between the valve member 70 and the outer metallic part or cup 51. The resilient O-ring 72 seating against the annular flat valve seat 69 forms an effective seal for sealing the container but yet permitting escape of excessive positive pressures from the container. The manner of operation of the closure cap 68 is the same as that described above in connection with the other closure caps.

The closure cap generally designated at 75 in Fig. 15 is very much like the closure caps illustrated in Figs. 1, 4, 6 and 7, it utilizing substantially the same inner and outer metallic parts 16 and 13. Here, however, a different form of valve seat and valve is utilized. Here the inwardly extending portion 17 of the inner metallic part 16 is provided with a frusto-conical projection 76 forming a frusto-conical annular valve seat. The valve within the central chamber includes a valve member 77 having a frusto-conical surface provided with a groove 78 in which is located a resilient O-ring 79 formed of rubber or the like. The O-ring 79 is resiliently urged against the frusto-conical annular valve seat 76 by a star shaped leaf spring 80 interposed between the valve member 77 and the outer metallic part or cap 13. The O-ring 79 seating against the frusto-conical annular valve seat 76 forms a very good seal for sealing the positive pressures within the container 11 and it is very positive in its positive pressure relieving action when excessive positive pressures occur in the container. Here also, when the excessive positive pressures in the container are relieved, the O-ring 79 positively seats against the frusto-conical annular valve seat 76 to reseal the container and prevent further decrease in the positive pressure in the container.

The closure cap generally designated at 83 in Fig. 16 is very much like the closure caps illustrated in Figs. 9, 12, 13 and 14, this closure cap also utilizing the inner and outer metallic parts 46 and 51. Here the valve seat and valve arrangement is very much like that illustrated in Fig. 15. In this connection the inwardly extending portion 48 of the inner metallic part or cap 46 is provided with a frusto-conical annular valve seat 84. The valve within the central chamber includes a valve member 85 having a frusto-conical surface provided with a groove 86 which receives a resilient O-ring 87 formed from rubber or the like. The resilient O-ring 87 is urged against the frusto-conical annular valve seat 84 by a compression spring 88 interposed between the valve member 85 and the outer metallic part or cup 51. The manner of operation of the closure cap 83 is the same as that described above in connection with the closure cap 75 and the other closure caps.

While for purposes of illustration several forms of this invention have been disclosed, other forms thereof may become apparent to those skilled in the art upon reference to this disclosure and, therefore, this invention is to be limited only by the scope of the appended claims.

We claim as our invention:

1. A positive pressure sealing and excessive positive pressure relieving closure cap for the mouth of a container having a positive above atmospheric pressure therein comprising a metallic cap having a depending flange provided with means for securing the cap about the mouth of the container, an annular compressible gasket in the cap and secured by the cap in gas sealing position upon the mouth of the container, said metallic cap including two engaging metallic parts with one of said metallic parts extending inwardly through the central opening in the sealing gasket and exposed on its inner side to the positive pressure within the container and forming a central chamber between its outer side and the other metallic part, said inwardly extending part having a central opening therethrough for establishing communication between the interior of the container and the central chamber and provided with an annular valve seat in the central chamber about the central opening, a resilient and deformable valve plug interposed under compression between the metallic parts in the central chamber and pressed with sufficient force by its resiliency against the annular valve seat for normally sealing the central chamber from the interior of the container against normal positive pressure therein but movable away from the valve seat upon the occurrence of excessive positive pressure in the container to relieve said excessive positive pressure into the central chamber, and means forming a vent passage for communicating the central chamber with the exterior of the closure cap to vent any pressures therein to atmosphere.

2. A positive pressure sealing and excessive positive

pressure relieving closure cap for the mouth of a container having a positive above atmospheric pressure therein comprising a metallic cap having a depending flange provided with means for securing the cap about the mouth of the container, an annular compressible gasket in the cap and secured by the cap in gas sealing position upon the mouth of the container, said metallic cap including two engaging metallic parts with one of said metallic parts extending inwardly through the central opening in the sealing gasket and exposed on its inner side to the positive pressure within the container and forming a central chamber between its outer side and the other metallic part, said inwardly extending part having a central opening therethrough for establishing communication between the interior of the container and the central chamber and provided with an annular valve seat in the central chamber about the central opening, a resilient and deformable valve plug interposed under compression between the metallic parts in the central chamber and pressed with sufficient force by its resiliency against the annular valve seat for normally sealing the central chamber from the interior of the container against normal positive pressure therein but movable away from the valve seat upon the occurrence of excessive positive pressure in the container to relieve said excessive positive pressure into the central chamber, means forming passages between the inwardly extending part and the sides of the valve plug to assure escape of said excessive positive pressure into the central chamber, and means forming a vent passage for communicating the central chamber with the exterior of the closure cap to vent any pressures therein to atmosphere.

3. A positive pressure sealing and excessive positive pressure relieving closure cap for the mouth of a container having a positive above atmospheric pressure therein comprising a metallic cap having a depending flange provided with means for securing the cap about the mouth of the container, an annular compressible gasket in the cap and secured by the cap in gas sealing position upon the mouth of the container, said metallic cap including two engaging metallic parts with one of said metallic parts extending inwardly through the central opening in the sealing gasket and exposed on its inner side to the positive pressure within the container and forming a central chamber between its outer side and the other metallic part, said inwardly extending part having an inwardly extending frusto-conical portion terminating in a central opening, the central opening establishing communication between the interior of the container and the central chamber and the frusto-conical portion forming an annular tapered valve seat in the central chamber about the central opening, a valve interposed between the metallic parts in the central chamber and resiliently pressed with sufficient force against the annular valve seat for normally sealing the central chamber from the interior of the container against normal positive pressure therein but movable away from the valve seat upon the occurrence of excessive positive pressure in the container to relieve said excessive positive pressure into the central chamber, and means forming a vent passage for communicating the central chamber with the exterior of the closure cap to vent any pressures therein to atmosphere.

4. A positive pressure sealing and excessive positive pressure relieving closure cap for the mouth of a container having a positive above atmospheric pressure therein comprising a metallic cap having a depending flange provided with means for securing the cap about the mouth of the container, an annular compressible gasket in the cap and secured by the cap in gas sealing position upon the mouth of the container, said metallic cap including two engaging metallic parts with one of said metallic parts extending inwardly through the central opening in the sealing gasket and exposed on its inner side to the positive pressure within the container and forming a central chamber between its outer side and the other metallic part, said inwardly extending part having an inwardly extending frusto-conical portion terminating in a central opening, the central opening establishing communication between the interior of the container and the central chamber and the frusto-conical portion forming an annular tapered valve seat in the central chamber about the central opening, a resilient and deformable valve plug interposed under compression between the metallic parts in the central chamber and having a conical valve portion of greater cone angle than that of the annular frusto-conical tapered valve seat which is pressed with sufficient force by its resiliency against the tapered valve seat for normally sealing the central chamber from the interior of the container against normal positive pressure therein but progressively moved away from the valve seat upon the occurrence of excessive positive pressure in the container to relieve said excessive positive pressure into the central chamber, and means forming a vent passage for communicating the central chamber with the exterior of the closure cap to vent any pressures therein to atmosphere.

5. A positive pressure sealing and excessive positive pressure relieving closure cap for the mouth of a container having a positive above atmospheric pressure therein comprising a metallic cap having a depending flange provided with means for securing the cap about the mouth of the container, an annular compressible gasket in the cap and secured by the cap in gas sealing position upon the mouth of the container, said metallic cap including two engaging metallic parts with one of said metallic parts extending inwardly through the central opening in the sealing gasket and exposed on its inner side to the positive pressure within the container and forming a central chamber between its outer side and the other metallic part, said inwardly extending part having an inwardly extending frusto-conical portion terminating in a central opening, the central opening establishing communication between the interior of the container and the central chamber and the frusto-conical portion forming an annular tapered valve seat in the central chamber about the central opening, a valve member interposed between the metallic parts in the central chamber and having an inwardly facing frusto-conical face provided with an annular groove, an O-ring carried in the annular groove, spring means interposed between the outer metallic part and the valve member for resiliently pressing with sufficient force the O-ring against the annular tapered valve seat for normally sealing the central chamber from the interior of the container against normal positive pressure therein but movable away from the valve seat upon the occurrence of excessive positive pressure in the container to relieve said excessive positive pressure into the central chamber, and means forming a vent passage for communicating the central chamber with the exterior of the closure cap to vent any pressures therein to atmosphere.

6. A positive pressure sealing and excessive positive pressure relieving closure cap for the mouth of a container having a positive above atmospheric pressure therein comprising a metallic cap having a depending flange provided with means for securing the cap about the mouth of the container, an annular compressible gasket in the cap and secured by the cap in gas sealing position upon the mouth of the container, said metallic cap including two engaging metallic parts with one of said metallic parts extending inwardly through the central opening in the sealing gasket and exposed on its inner side to the positive pressure within the container and forming a central chamber between its outer side and the other metallic part, said inwardly extending part having a central opening therethrough for establishing communication between the interior of the container and the central chamber and provided with an annular valve seat in the central chamber about the central opening, a valve member interposed between the metallic parts in the central chamber and provided with an annular groove in its inner face, an O-ring carried in the annular groove, spring means in-

terposed between the outer metallic part and the valve member for resiliently pressing with sufficient force the O-ring against the annular valve seat for normally sealing the central chamber from the interior of the container against normal positive pressure therein but movable away from the valve seat upon the occurrence of excessive positive pressure in the container to relieve said excessive positive pressure into the central chamber, and means forming a vent passage for communicating the central chamber with the exterior of the closure cap to vent any pressures therein to atmosphere.

7. A positive pressure sealing and excessive positive pressure relieving closure cap for the mouth of a container having a positive above atmospheric pressure therein comprising a metallic cap having a depending flange provided with means for securing the cap about the mouth of the container, an annular compressible gasket in the cap and secured by the cap in gas sealing position upon the mouth of the container, said metallic cap including two engaging sheet metal parts with one of said sheet metal parts extending inwardly through the central opening in the sealing gasket and exposed on its inner side to the positive pressure within the container and forming a central chamber between its outer side and the other metallic part, said inwardly extending sheet metal part having a central opening therethrough for establishing communication between the interior of the container and the central chamber and being formed outwardly adjacent the opening to provide an outwardly projecting annular valve seat in the central chamber about the central opening, a resilient and deformable valve plug interposed under compression between the metallic parts in the central chamber and pressed with sufficient force by its resiliency against the annular valve seat for normally sealing the central chamber from the interior of the container against normal positive pressure therein but movable away from the valve seat upon the occurrence of excessive positive pressure in the container to relieve said excessive positive pressure into the central chamber, and means forming a vent passage for communicating the central chamber with the exterior of the closure cap to vent any pressures therein to atmosphere.

8. A positive pressure sealing and excessive positive pressure relieving closure cap for the mouth of a container having a positive above atmospheric pressure therein comprising a metallic cap having a depending flange provided with means for securing the cap about the mouth of the container, an annular compressible gasket in the cap and secured by the cap in gas sealing position upon the mouth of the container, said metallic cap including two engaging sheet metal parts with one of said sheet metal parts extending inwardly through the central opening in the sealing gasket and exposed on its inner side to the positive pressure within the container and forming a central chamber between its outer side and the other metallic part, said inwardly extending sheet metal part having a central opening therethrough for establishing communication between the interior of the container and the central chamber and being formed outwardly adjacent the opening to present an outwardly projecting annular edge of the sheet metal part for providing an outwardly projecting thin annular valve seat in the central chamber about the central opening, a resilient and deformable valve plug interposed under compression between the metallic parts in the central chamber and pressed with sufficient force by its resiliency against the annular valve seat for normally sealing the central chamber from the interior of the container against normal positive pressure therein but movable away from the valve seat upon the occurrence of excessive positive pressure in the container to relieve said excessive positive pressure into the central chamber and means forming a vent passage for communicating the central chamber with the exterior of the closure cap to vent any pressures therein to atmosphere.

9. A positive pressure sealing and excessive positive pressure relieving closure cap for the mouth of a container having a positive above atmospheric pressure therein comprising a metallic cap having a depending flange provided with means for securing the cap about the mouth of the container, an annular compressible gasket in the cap and secured by the cap in gas sealing position upon the mouth of the container, a metallic insert interposed between the metallic cap and the sealing gasket and extending inwardly through the central opening in the sealing gasket and exposed on its inner side to the positive pressure within the container and forming a central chamber between its outer side and the metallic cap, said metallic insert having a central opening therethrough for establishing communication between the interior of the container and the central chamber and provided with an annular valve seat in the central chamber about the central opening, a valve interposed between the metallic cap and insert in the central chamber and resiliently pressed with sufficient force against the annular valve seat for normally sealing the central chamber from the interior of the container against normal positive pressure therein but movable away from the valve seat upon the occurrence of excessive positive pressure in the container to relieve said excessive positive pressure into the central chamber, and said metallic insert where it contacts said metallic cap being provided with a groove for forming a vent passage for communicating the central chamber with the exterior of the closure cap to vent any pressures therein to atmosphere.

10. A positive pressure sealing and excessive positive pressure relieving crown cap for the beaded mouth of a container having a positive above atmospheric pressure therein comprising a metallic cap having a depending fluted flange for securing the cap about the beaded mouth of the container, an annular compressible gasket in the cap and secured by the cap in gas sealing position upon the beaded mouth of the container, a metallic insert interposed between the metallic cap and the sealing gasket and extending inwardly through the central opening in the sealing gasket and exposed on its inner side to the positive pressure within the container and forming a central chamber between its outer side and the metallic cap, said metallic insert having a central opening therethrough for establishing communication between the interior of the container and the central chamber and provided with an annular valve seat in the central chamber about the central opening, a valve interposed between the metallic cap and insert in the central chamber and resiliently pressed with sufficient force against the annular valve seat for normally sealing the central chamber from the interior of the container against normal positive pressure therein but movable away from the valve seat upon the occurrence of excessive positive pressure in the container to relieve said excessive positive pressure into the central chamber, and said metallic insert where it contacts said metallic cap being provided with a groove for forming a passage between the metallic cap and insert extending from the central chamber to the fluted flange of the cap for providing a vent passage communicating the central chamber through the fluting of the fluted flange to the exterior of the closure cap to vent any pressures therein to atmosphere.

11. A positive pressure sealing and excessive positive pressure relieving crown cap for the beaded mouth of a container having a positive above atmospheric pressure therein comprising a metallic cap having a depending fluted flange for receiving the cap about the beaded mouth of the container, an annular compressible gasket in the cap and secured by the cap in gas sealing position upon the beaded mouth of the container, a metallic insert interposed between the metallic cap and the sealing gasket and extending inwardly

through the central opening in the sealing gasket and exposed on its inner side to the positive pressure within the container and forming a central chamber between its outer side and the metallic cap, said metallic insert having a central opening therethrough for establishing communication between the interior of the container and the central chamber and provided with an annular valve seat in the central chamber about the central opening, a valve interposed between the metallic cap and insert in the central chamber and resiliently pressed with sufficient force against the annular valve seat for normally sealing the central chamber from the interior of the container against normal positive pressure therein but movable away from the valve seat upon the occurrence of excessive positive pressure in the container to relieve said excessive positive pressure into the central chamber, a tab extending from the outer edge of the metallic insert between the fluted flange of the metallic cap and

the edge of the sealing gasket, the outer faces of said metallic insert and tab where they contact the metallic cap being provided with a groove for providing a vent passage communicating the central chamber through the fluting of the fluted flange to the exterior of the closure cap to vent any pressures therein to atmosphere.

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