EXPLOSIVE SEALING HEADS FOR CONTAINERS

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FIG. 2

FIG. 3

FIG. 4

FIG. 5

FIG. 6

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This invention relates to container sealing and
charging devices of the explosive sealing-head type.

Containers, particularly those of the fire-extinguisher type, are frequently sealed by an explosive discharge head including an explosion chamber in which a charge of explosive material is exploded to blow out a portion of the head and thereby provide a discharge opening through which the fire extinguishing substance, or other material, is discharged from the container.

The design of conventional explosive sealing heads used on fire extinguishers and other containers, requires complete replacement of the exploded head when the discharged container is turned in for recharging. This is due largely to the fact that the wall of the explosion chamber which is ruptured by explosion of the explosive material constitutes an integral part of the main body portion of the head so that rupture of said wall makes it impractical to repair the head for re-use, and the only feasible alternative is the expensive one of substituting an entirely new head.

A feasible and advantageous prior proposal for overcoming the foregoing objection consists in the provision of a separately formed blow-out plug assembly which is replaceably fitted in the main body portion of the head to provide an explosion chamber in which the explosion takes place, and provides a discharge opening by blowing out a portion of the replaceable plug assembly without damaging the more expensive main body portion of the head.

According to the above-mentioned prior proposal, the body of the head is provided with a cavity having a bottom opening serving both as a filling and discharge opening for the container, to which the head is applied. The replaceable blow-out plug assembly includes a stem comprising a solid portion and a cored out lower portion which are integrally joined together by a relatively thin frangible annular wall section. The stem is arranged in the cavity of the head with the cored out lower portion of the stem screwed into and closing said opening. A sleeve is screwed onto the solid upper portion of the stem so that the lower face of the sleeve forms the upper wall of an explosion chamber whose outer side wall is formed by the side wall of said cavity and whose remaining walls are formed by angularly related surfaces of said stem. The lower portion of the stem is cored out to provide a downwardly facing bore or cavity which is closed at the top by the solid upper portion of the stem and the frangible annular wall section which joins the two parts of the stem together. With this arrangement, the explosion of the explosive material contained in the explosion chamber results in the rupture of the thin wall section connecting the two parts of the stem and in the blowing out of the solid or upper part of the stem in such a manner that the lower or cored out part of the stem is left in place within said opening in the form of an open ended tube through which the contents of the container are discharged. This leaves the relatively more expensive body portion of the head in an undamaged condition and, when the container is turned in for recharging, that portion of the plug assembly which is left in the combined filling and discharge opening of the main body portion, may readily be removed to permit application of a new plug assembly to said body portion after the container has been recharged through said opening.

The above described proposal for combining a replaceable blow-out plug assembly with the main body portion of the head so that only the plug assembly is damaged by the explosion, has definite advantages over the conventional explosive head which is damaged beyond repair by fracture of the main body portion. However, as carried out in practice, this proposal for combining a replaceable blow-out plug assembly with the main body portion of the head, requires expensive manufacturing and assembly operations and has other disadvantages which the present invention proposes to eliminate by the provision of a simplified explosive sealing-head assembly having the same advantages as regards confining the destructive effects of the explosion to a plug assembly which is replaceably fitted in the main body portion of the head.

According to one feature of the present invention, the stem portion of the replaceable plug assembly associated with the main body portion of the head is redesigned to simplify manufacture thereof and to permit of its being more conveniently secured in place within the sealing head by means of a removable clamping nut.

According to another feature of the invention, the stem portion of the removable plug assembly associated with the main body portion of the head is redesigned to permit the detonator to be mounted in said stem portion instead of in the main body portion of the head as heretofore.

A further feature of the invention consists in redesigning the blow-out plug assembly of the head so that the explosion chamber is enclosed solely by component parts of said assembly in-
stead of being partly enclosed by the main body portion of the head, as provided for in said prior proposal.

A further feature of the invention consists in providing an explosive sealing-head comprising a main body casting provided with a transverse partition having a central opening and located below the top of the casting to form the bottom wall of a cavity in which a replaceable blow-out plug and detonator assembly is secured to seal the crack opening and assembly comprising a sealing plug including a flange-like marginal portion bearing on a gasket arranged on the solid portion of said partition and a central stem portion covering said opening and projecting above said flange-like marginal portion, a detonator fitted in a cavity which extends downwardly from the upper end of the stem and is connected by radial bores with an annular groove extending around the circumference of the stem above the flange-like marginal portion, a ring encircling the upwardly projecting portion of the stem and covering the groove to form therewith an enclosed explosion chamber which, together with the bores, is filled with explosive material, a flange projecting outwardly from the lower portion of the ring and resting on the flange-like marginal portion of the stem, and a ring-shaped clamping nut screwed into the upper portion of the main casting and into clamping engagement with the flange of said ring, the lower end of said stem being cored out to provide a downwardly opening recess whose upper outer corner portion is separated from the inner lower corner portion of said groove by a thin wall section which is fractured by explosion of the explosive material contained in said explosive chamber, the fracture of said thin wall section permitting blowing-out of the portion of the stem closing the top of said recess to thereby provide a clear discharge opening defined by the side wall of the recess.

Other characteristic features and advantages of the invention will become apparent from the following detailed description of the accompanying drawings, in which:

Figure 1 is a vertical sectional view of my improved sealing-head assembly as it appears applied to a container.

Figure 2 is a vertical sectional view of the main body portion of the sealing-head assembly shown in Figure 1.

Figure 3 is a vertical sectional view of an explosive sealing plug which is fitted in the main body portion of the sealing-head assembly to seal the discharge opening of the container.

Figure 4 is an elevational view of a sealing ring which is fitted over a stem portion of the sealing plug, shown in Figure 3, to close a groove therein and thereby provide an enclosed explosion chamber in which explosive material is exploded to blow out a portion of the plug to provide a discharge opening through which the contents of the container is discharged.

Figure 5 is a sectional view of a ring-shaped clamping ring by means of which the sealing plug, shown in Figure 3, and the ring, shown in Figure 4, are clamped in place within the body portion shown in Figure 3.

Figure 6 is a vertical sectional view of a cap member which is associated with the body portion of the sealing-head after the sealing plug and its groove-covering ring have been secured in place.

Referring more particularly to the drawings, 3

4

5 designates a container sealed by an explosive sealing-head assembly 6 embodying my invention. Assembly 6 includes a body member 7 comprising a lower internally threaded circumferential wall portion 6, an upper internally and externally threaded circumferential wall portion 8, and an intermediate inwardly directed annular flange 10 located just above the internal thread of wall portion 8. The inner edge of flange 10 defines a discharge opening 11 and is rounded off as indicated at 10a. The upper surface of flange 11 is provided with spaced circular sealing grooves 12 which are preferably V-shaped in cross section. The internal thread of wall portion 8 terminates an appreciable distance above flange 10, leaving a smooth wall surface 13 between said thread and said flange. Flange 10 provides, in effect, a centrally apertured partition extending transversely across the bore of member 7, and forming the bottom wall of a cavity in which a blow-out plug and detonator assembly A is replaceably fitted to seal the discharge opening 11.

The lower wall portion 6 of member 7 is screwed onto neck 16 of container 5, so that flange 10 is seated against the upper end of said neck. The upper wall portion 8 of member 7 is screwed into the internally threaded neck 16 into hollow cap 17. The internal cavity 16 of cap 17 is provided with a bottom inlet opening, bounded by neck 16, and with a lateral discharge opening bounded by a lateral extension 10 of the cap member.

A sealing gasket 21 is compressed between the upper surface of flange 10 and an overlying flange-like marginal portion 22 of a sealing plug 23. Portions of gasket 21 are forced downwardly into the sealing grooves 12 by circular V-shaped sealing ribs 24 depended from the afore-said marginal portion 22 of plug 23. The central portion of plug 23 comprises a piston-shaped stem 25 projecting above the flange-like marginal portion 22. The outer circumferential surface of stem 25 is provided with a circular groove 26 affording the top, bottom and inner side walls of an enclosed explosion chamber 26, the outer wall of which is formed by a ring 27 which is a close sliding fit on stem 25. Ring 27 is provided at its lower end with an outwardly directed flange 28 which is clamped against the upper surface of the flange-like marginal portion 22 of plug 23 by an externally threaded ring-shaped clamping nut 29, having threaded engagement with the internal thread of wall portion 6 of body member 7.

Stem 25 is provided with a detonator-receiving cavity 30 extending downwardly from the upper end thereof. Stem 25 is also provided with bores 31 extending outwardly from the lower portion of cavity 30 to the groove 26a formed in the outer circumference of said stem. A detonator 33 is threaded into stem cavity 30 and the bores 31 and groove 26a are filled with a suitable explosive material such, for example, as cordite.

Detonator 33 may be included in a detonating circuit in any suitable manner. In the present instance, I have shown a single wire 35 extended into the metal casting of the detonator but insulated therefrom by its insulation covering 36. This wire is connected to one terminal of a source of current (not shown) by means of an outlet fitting 37 secured in a socket 38 of cap 17 by fastening screws 37a. The insulation covering portion of wire 35 is passed to fitting 37 through a hole 39 provided in a wall portion of the cap separating socket 38 from the cap cavity 18. The
other terminal of the electrical circuit is grounded to the metal casing of the detonator in any suitable manner.

stem 23 is bored out to provide a central bottom recess 41 of a diameter slightly greater than the inside diameter of groove 25a but appreciably less than the outside diameter of stem 23 as measured above or below the groove. Recess 41 is formed with a relatively shallow central portion 41a and a relatively deep annular marginal portion 41b, the depth of the marginal portion of the recess being appreciably greater than the thickness of the flange-like marginal portion 21 of sealing member 21. Recess 41 is made shallow at its central portion to leave a sufficient section or thickness of metal below the detonator-receiving cavity 30 of stem 23. The diameter of recess 41 and the depth of the outer marginal portion 41a are such as to leave only a relatively thin and fragile annular wall section 20 between the lower inner corner portion of groove 25a and the upper outer corner portion of recess 41.

When the explosive material contained in explosion chamber 28 and in the communicating bores 31 of sealing member 23 is exploded by detonator 33, the thin wall section 42 of stem 43 is fractured and the upper portion of the stem, which normally forms the top of recess 41, is blown away, thereby leaving the sealing member with a clear discharge opening defined by the annular side wall of recess 41. The contents of the container are then discharged through this opening into cavity 18 and thence outward through the central discharge opening of cap 17.

From the foregoing, it will be seen that sealing plug 22 is the only element of the sealing-head assembly which is destroyed by the explosion. This element, with its detonator, may be replaced at a relatively small cost compared with replacement of the entire sealing-head assembly. The invention, therefore, has definite economic advantages over previous types of container-sealing explosion heads which are substantially completely destroyed by the explosion. Another advantage of the invention is that the sealing plug, having the detonator assembled therewith, may be furnished as a unitary replacement assembly for the sealing plug and detonator of a discharged container, since the body 1, clamping nut 28, and, in many cases, the ring 27 of the discharge container, are unmindred by the explosion. Whenever necessary, the ring 27 may be included as part of the replacement assembly furnished for discharged containers. The combination of detonator 33 with sealing member 22 has important advantages for use both in the manufacturing and replacement standpoint, as compared with prior types of container-sealing explosion heads in which the detonator is mounted in the main body portion of the sealing-head.

Having thus described the nature of my invention, and a preferred embodiment thereof, it will be understood that various modifications may be resorted to within the scope and spirit of the appended claims.

I claim:

1. An explosive sealing head for containers comprising a main body casting provided with a transverse partition having a central opening and located below the top of the casting to form the bottom wall of a cavity in which a replaceable sealing assembly is secured to seal said opening, said assembly comprising a sealing plug including a flange-like marginal portion seated on said partition and a central stem portion covering the central opening in said partition and projecting above said flange-like marginal portion, said stem portion being formed with an outer circumferential groove located above said flange-like marginal portion and affording the top, bottom, and inner side walls of an explosion chamber, a ring encircling the upwardly projecting part of the stem portion and covering said groove to form the outer wall of said explosion chamber, a flange projecting outwardly from the lower portion of said ring and resting on the flange-like marginal portion of the sealing plug, a ring-shaped clamping nut screwed into the upper portion of the main casting and into clamping engagement with the flange of said ring, said explosion chamber containing a charge of explosive material and the lower end of said stem being bored out to provide a downwardly opening recess whose upper outer corner portion is separated from the inner lower corner portion of said groove by a thin wall section which is fractured by explosion of said explosive charge and means for exploding said explosive charge.

2. An explosive sealing head for containers as set forth in claim 1, in which the means for igniting said charge of explosive material comprises a detonator fitted in a cavity which extends downwardly from the upper end of the stem portion of the sealing plug and is connected by radial bores with said explosion chamber.

3. An explosive sealing head assembly as set forth in claim 1, including a sealing gasket interposed between the upper surface of said transverse partition and the lower surface of the flange-like marginal portion of said sealing plug, said flange-like marginal portion being provided with depending annular sealing ribs serving to depress portions of said gasket into underlying annular sealing grooves provided in said partition.

4. The combination with a container having an externally threaded neck portion of an explosive sealing head comprising a body member including upper and lower internally threaded circumferential wall portions and an intermediate, inwardly directed annular flange, said lower internally threaded wall portion being screwed onto said neck and said flange being seated against the end of said neck, a sealing plug fitted within the upper internally threaded wall portion of said body member to seal the opening defined by the inner edge of said flange, said plug including a flange-like marginal portion supported on said flange and a central stem portion projecting upwardly from said flange-like marginal portion and covering said opening, said stem-like portion being provided with an outer circumferential groove located above the flange-like marginal portion and forming the top, bottom and inner side walls of an explosion chamber, a ring encircling the upwardly projecting part of the stem portion of the plug and covering said groove to form the outer side wall of said explosion chamber, a flange projecting outwardly from the lower portion of the ring and resting on the flange-like marginal portion of the plug, a ring-shaped clamping nut screwed into the upper, internally threaded, circumferential wall of the body member and into clamping engagement with the flange of said ring, the lower end of the stem-like portion of the sealing plug being bored out to provide a downwardly opening recess whose upper outer corner portion is separated from the inner lower corner portion of said groove by a thin annular wall section, a
charge of explosive material contained in said explosion chamber and means for igniting said charge, the arrangement being such that the explosion of said charge in said explosion chamber serves to fracture said thin annular wall section and to blow-out the portion of the stem closing the top of said recess thereby provide a clear discharge opening defined by the side wall of the recess.

5. A sealing plug assembly comprising a sealing plug including a flange-like marginal portion and a central stem portion projecting above said flange-like marginal portion, said stem portion being provided with an outer circumferential groove located above said flange-like marginal portion and having its lower end cored out to provide a downwardly opening recess whose upper outer corner portion is separated from the inner lower corner portion of said groove by a thin annular wall section, a ring fitted on the upwardly projecting part of said stem portion and covering said groove, a flange projecting outwardly from said ring and resting on the flange-like marginal portion of the plug, said groove and ring conjointly defining an explosion chamber containing an explosive charge and means for igniting said charge, the arrangement being such that the explosion of said charge in said explosion chamber is effected to disrupt the said thin annular wall section separating the inner lower corner portion of the groove from the upper lower corner portion of the recess.

6. A sealing plug assembly as set forth in claim 5, in which the means for igniting said explosive charge comprises a detonator fitted in a detonator receiving cavity extending downwardly from the upper end of said stem portion, said detonator cavity being connected with said groove by radial bores formed in said stem portion and containing charges of explosive material.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,408,774</td>
<td>Goddard et al</td>
<td>Oct. 8, 1946</td>
</tr>
</tbody>
</table>

FOREIGN PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Country</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>328,158</td>
<td>Italy</td>
<td>July 30, 1935</td>
</tr>
<tr>
<td>435,219</td>
<td>Germany</td>
<td>Oct. 11, 1926</td>
</tr>
</tbody>
</table>