RUPTURABLE SEALING MEANS FOR PRESSURE FLUIDS

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This invention relates to improvements in rupturable sealing means for containers of fluid media under pressure, and particularly to rupturable discs for releasing fire-extinguishing fluid, such as methyl bromide, carbon tetrachloride and carbon dioxide, from a discharge port.

It is among the objects of the present invention to increase the resistance of the disc to the pressure of the fluid medium at one side and to facilitate its rupture by force applied at the other side.

Another object of the invention is to provide the disc with an inner area that will separate more readily from a marginal edge of the disc, and in which the inner perimeter of the marginal edge substantially coincides with the periphery of the discharge port.

Another object of the invention is to provide shattering inner area which will break up into defined fragments of such size as not to interfere with the full free discharge of the medium.

Further objects, not specifically enumerated above, will be apparent as the invention is described in greater detail in connection with the accompanying drawing, wherein

Fig. 1 is a fragmentary view, in elevation, of an apparatus which employs the rupturable disc structure of the present invention, with certain of the parts broken away and shown in section.

Fig. 2 is an enlarged top plan view of the disc structure.

Fig. 3 is a sectional view taken along the line 3-3 of Fig. 2.

Fig. 4 is a perspective view of the disc structure of Fig. 2.

Fig. 5 is a side elevational view of a modified form of disc.

Fig. 6 is a bottom plan view of the disc structure of Fig. 5.

Fig. 7 is a side elevational view of another modified form of disc structure, showing pulling means connected therewith.

Fig. 8 is a bottom plan view of the disc structure of Fig. 7.

Fig. 9 is an enlarged cross-sectional view of still another modified form of disc.

The apparatus of Fig. 1 comprises, in general, a container or cylinder 10 adapted to contain a fluid medium, such as methyl bromide, under pressure. A neck member 12 is secured to the container 10 within an opening therein, by a welded joint 14, and has a shoulder 16 defining a circular bore 17. A yieldable sealing gasket 18 and a rupturable sealing element, such as a disc 20 of the present invention, are retained against the shoulder 16 by a screw ring 22. A discharge head body 24 is threadedly connected to the neck member 12 and has a discharge chamber 26, a bonnet portion 28, and a laterally-extendable outlet nipple 30 having an outlet passage 32. A cartridge 34 with a slug 36, is secured to the head 24 by a threaded coupling 38. A perforated basket 40 is located in the chamber 28 and around the cartridge 34 for preventing fragments of the disc 20 from entering the discharge passage 32.

An electrical connector 42 enters the head through the bonnet 28 for firing the cartridge 34.

Referring to Figs. 1, 2, 3 and 4, the disc 20 has a flat body 44 with a circular edge 46, and a groove 48 into which portions of gasket 50 are pressed to effect a better seal.

Axially-registering top and bottom grooves 59 and 52 define a rim or marginal edge portion 54 and a polygonal inner area 56 having sides 58.

When the inner area 56 is knocked out of the rim 54 by the slug 36, the bore 17 is left substantially fully open.

Radially-extending axially registering top and bottom side grooves 59 and 60, the grooves of each side of which intersect each other at the center of the disc, and intersect the marginal grooves 50 and 52, at the outer ends, divide the area 55 into defined fragmenting areas or sectors 62, each subtended by a side of the polygonal figure. The latter sides form, in effect, straight hinge or fulcrum axes about which the sectors 62 may pivot out of the plane of the rim 54 during rupture, more readily than with these sides formed on area of a circle.

Radially-extending webs 64, in this case respectively bisect every other sector 62 at the top side of the disc, and have inner ends 65 provided with shoulders 66 thereon spaced axially from the disc. A key plug 70 is nested within the webs 64 on the shoulders 66, and is held in place by small portions 72 peened over the plug, or the portions 72 may be omitted and the plug staked or otherwise held in place. It is sufficient to merely hold the plug 70 securely in position for handling, since, when pressure is applied to the top of the disc, it will be more securely held under compression by the web elements 64 with which it forms a truss, bridging the disc body and rendering the latter more highly resistant to rupture from forces at one side, in this case the top, than from the other or bottom side.

When force is applied to the bottom side, as by the impact of the slug 36, the slight backing afforded to the plug 70 by the small portions 72, or the staking mentioned, allow this force to readily displace the plug 70 from the arch or...
truss against the static pressure of the fluid medium in the container so that the disc is ruptured readily along the sides of the polygonal figure and breaks up into fragments at least as small as the sectors 62, no combination or spreading of which can clog the basket 40 to impede a full, entirely free flow of the released fluid medium.

Referring to Figs. 5 and 6, in which corresponding parts are indicated by corresponding reference numerals having the subscript a, the structure is similar to that previously described, with the exception that the truss is on the bottom of the disc body, and a groove 50a is circular whereby an inner area 66a may be equal to the cross section of the bore 17. In this case, shoulders 66a extend radially outwardly on the elements 64a. A member 70a surrounds the elements 64a and has sides 80 normally under straight tension between the corresponding elements 64a.

An eye nut 92 is mounted on a screw 94 in the member 70a to attach the disc to a cable. A head 88 of the screw 94 is spaced above inward projections 86 of the webs 64a.

When the member 70a is pulled from the webs 64a, the disc is weakened for outward displacement. The space between the screw head 88 and the projections 86 provides the head with lost motion, whereby it may impact the projections 86 when pulled and assist the fluid pressure in rupturing the disc.

Referring to Figs. 7 and 8, the structure is similar to that of Figs. 5 and 6, with the exception that the central area 50b is an octagon instead of a hexagon, also there are four webs 64b instead of three, and the element 70b is a rectangular ring under straight side tension. A pull wire 90 is secured at the perimetal point of the ring 70b, and extends through packing means 92 in a bonnet similar to the bonnet 28. The operation of this device is similar to that of the device of Figs. 5 and 6.

Referring to Fig. 9, the truss structure of the above-described figures is omitted, and instead, the sectors 62c are arched or trussed against the fluid pressure and weakened against the force of slug or pulling means for rupturing the disc.

Although registering top and bottom grooves are shown, it is to be understood that such grooves may be otherwise arranged, alternately at the top and bottom, or at one side only. Also, the fragmenting areas 62 may be of any desired shape.

From the foregoing description, it is apparent that a rupturable sealing disc element, of the character set forth, is provided, which is substantially stronger and ruptures with greater facility than prior discs, provides for greater latitude in the selection of fluid pressures to be employed, and is an improvement generally in its field.

As various changes may be made in the form, construction and arrangement of the parts hereinafter, without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in any limiting sense.

It is also to be understood that the following claims are intended to cover all the generic and specific features of the invention herein described, and all statements of the scope of the invention, which, as a matter of language, might be said to fall therebetween.

I claim:

1. In sealing means for a container of fluid medium under pressure, a rupturable sealing element, a plurality of substantially arch sections formed on said element rendering the same more resistant against being driven from force at one side than from the other, and displaceable compression means associated with said sections normally preventing movement of the sections under the pressure of the fluid medium in a direction to rupture the element.

2. In sealing means for a container of fluid medium under pressure, a rupturable sealing element having means projecting from one side operating substantially as a truss bridged over said side for rendering the element more highly resistant to rupture from force at one side than from the other, and including means normally maintaining said truss effective but displaceable to disrupt the same.

3. In sealing means for a container of fluid medium under pressure, a rupturable sealing element having a groove disposed inwardly from the periphery thereof and defining a peripheral rim about an inner area separable from the rim, grooves dividing said inner area into defined fragmenting areas, and means projecting axially from one side of said element operating substantially as a truss bridging said portion and forming a plurality of points about and adjacent to said first groove, and including means normally maintaining said truss effective but displaceable to disrupt the same.

4. In sealing means for a container of fluid medium under pressure, a rupturable sealing element having a groove disposed inwardly from the periphery thereof defining a peripheral rim about an inner area separable from the rim, radial grooves between said rim and the center of the disc forming defined fragmenting areas of the disc, webs on certain of said areas on one side of the disc body extending between said rim and the center of the disc and defining one of the elements of a substantially plug and socket device spaced axially from the disc body, and displaceable means constituting the other element of said device interfitting said one of said elements.

5. In sealing means for a container of fluid medium under pressure, a rupturable sealing disc body having groove means disposed inwardly from the perimeter thereof defining a disc peripheral rim, radial grooves between said rim and the center of the disc forming defined fragmenting areas of the disc, webs on certain of said areas at one side of the disc body extending between said rim and the center of the disc and defining one of the elements of a substantially plug and socket device spaced axially from the disc body, and displaceable means constituting the other element of said device interfitting said one of said elements.

6. In sealing means for a container of fluid medium under pressure, a rupturable sealing disc body having weakening means disposed inwardly from the perimeter thereof defining a rim about an inner area and displaceable compression means interfitting said rim and the center of the disc and forming defined fragmenting portions, webs on certain of said portions extending between the rim and the center of said area, and ring-like means cooperating with the webs to form a truss-like structure for forcing the disc body at one side thereof, and said ring-like means being displaceable to disrupt the effect of the truss.

7. In sealing means for a container of fluid medium under pressure, a rupturable sealing disc comprising a one-piece shatterable body including opposite-side registering groove means defining a disc margin and a polygonal central disc.
area, opposite-side registering radial grooves, the
grooves at each side of which intersect each
other and said first groove means and divide said
area into defined fragmentating sectors each sub-
tended by a side of the area, and radial webs bi-
secting certain of said sectors at one side of the
disc including inner ends spaced radially from the
center of the disc having holding means spaced
axially from the disc; and displaceable means co-
operating laterally between said holding means
and held thereby to normally prevent lateral
displacement thereof and rupture of the disc by
a force substantially normal thereto.
8. A rupturable sealing disc having radially
spaced ribs on one side thereof constructed and
arranged to provide a space between their inner
ends at the center of the disc, and a reinforcing
member disposed in said space and engaged by
the inner ends of said ribs.

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