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CLOSURE DEVICE

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2 Sheets-Sheet 1

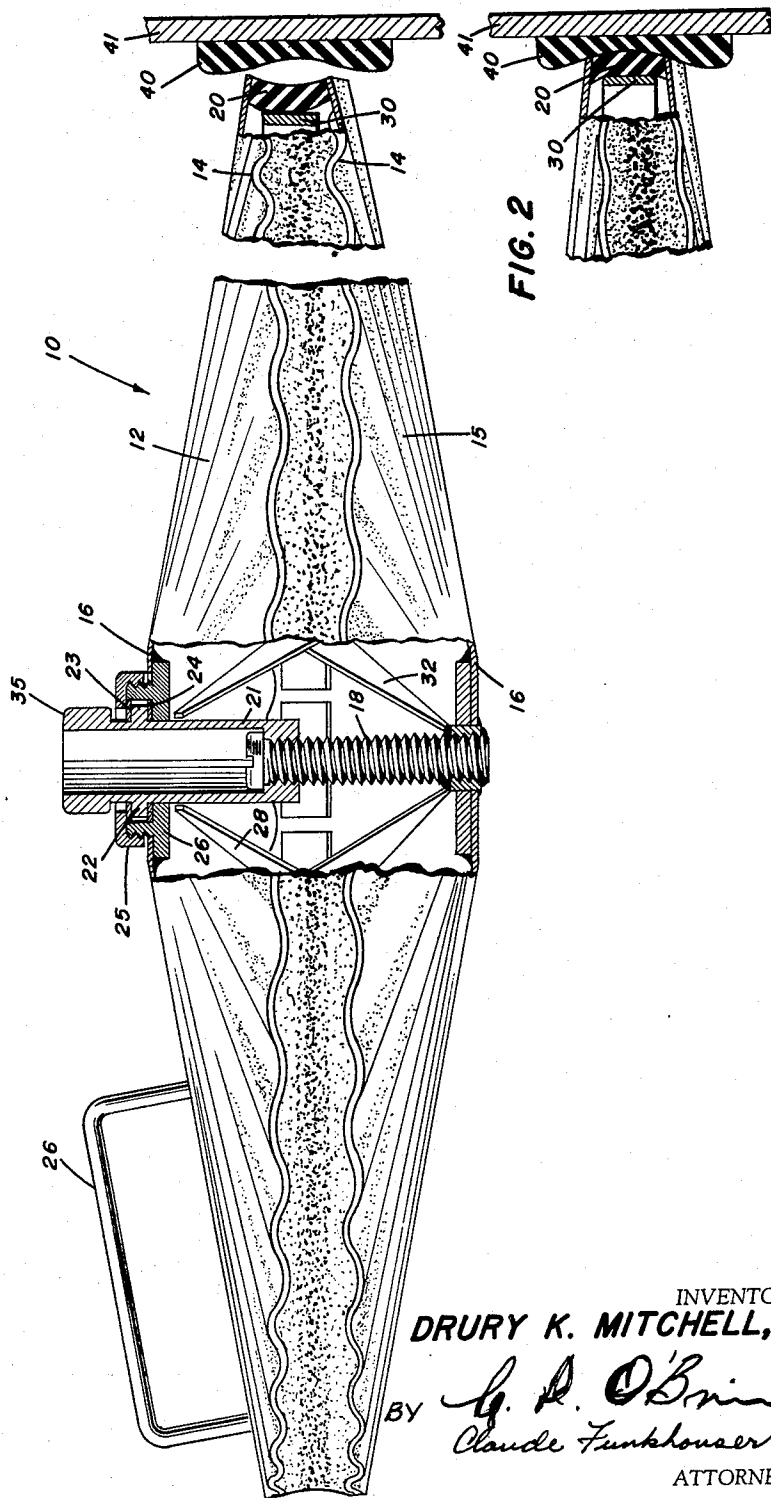


FIG. 1

FIG. 2

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FIG. 3

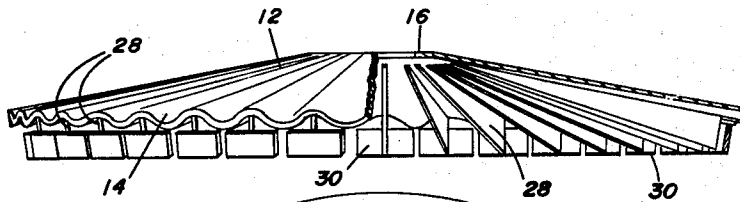


FIG. 4

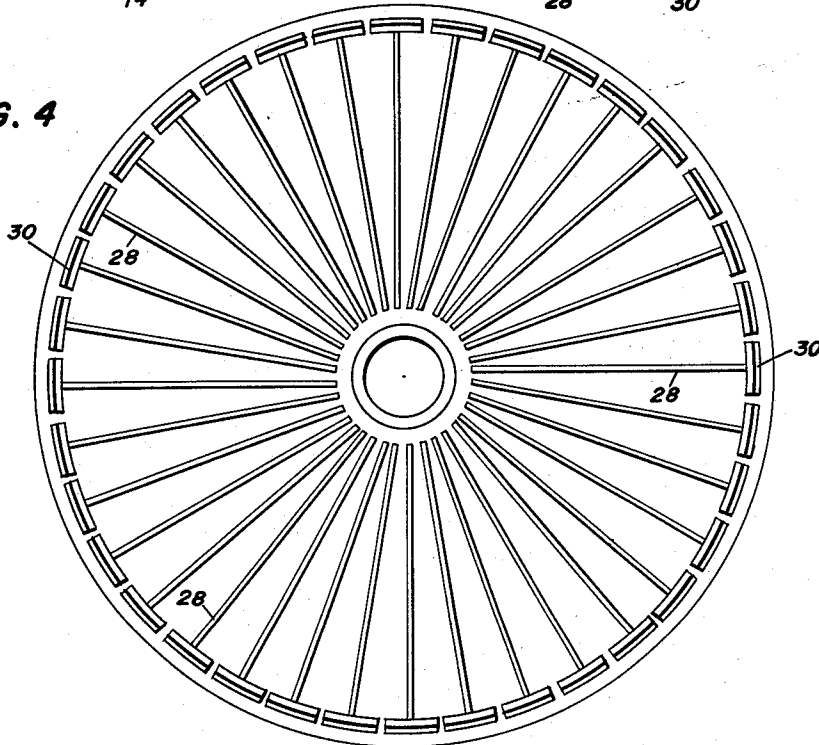
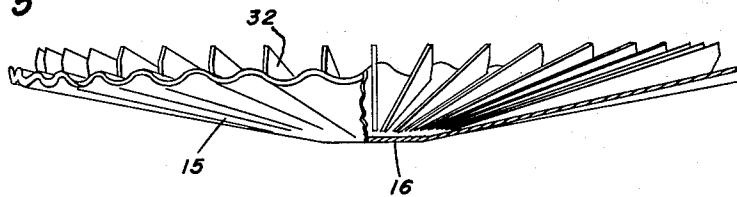


FIG. 5



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1 Claim. (Cl. 220—24.5)

This invention relates to closures and more particularly to an improved fluid and gastight closure.

The problem of closing a passageway at a point intermediate its length has always been fraught with difficulties. In the building trades, for example, where a vessel or canal with a diameter of several feet or more may have to be obturated to effect repairs, some effective way of closing that aperture is needed. Again, in sealing containers it is often necessary to insure that the closure will provide an airtight, watertight barrier between the interior of the container and the outside conditions of the atmosphere. Particularly in instances where the material being stored is susceptible to damage from either air or moisture, some closure must be used which will effectively isolate the interior of the container from the ambient atmospheric conditions. Preferably the closure used will provide an airtight and watertight seal, should be light enough for ready handling, strong enough to perform the necessary sealing function, and readily insertable into and removable from the container. Additionally, a practical closure should be rugged enough to withstand repeated use while still retaining its sealing characteristics. As is known, modern guided missiles are desirably stored as unassembled components in airtight and watertight containers. The instant invention, while possessing desirable characteristics which make it suitable for a great variety of uses, is particularly adaptable to the sealing of containers utilized for storage of guided missile components.

Accordingly, it is an object of the instant invention to provide an improved gas and fluid tight closure seal for obturating a passage.

Another object of the instant invention is to provide a reusable closure which is rugged enough to withstand repeated usage while retaining its improved sealing properties.

Still another object of the instant invention is to provide an improved obturating device adapted to close large apertures but which, due to its unique construction, can be fabricated into a light, readily handled structure.

Still another object of the instant invention is to provide an improved airtight lid or cover which due to its unique arrangement of structural parts provides an improved sealing action for a missile container.

A further object of the instant invention is to provide an improved container sealing lid which is readily inserted into the container opening and easily removed when desired.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

Fig. 1 is an elevational view of the completely assembled cover of the instant invention with parts shown in section to more readily illustrate features of the construction showing a wall and bearing gasket of a con-

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tainer and the manner in which the cover is inserted thereto;

Fig. 2 is a fragmental view of the edge of the cover after it is tightened in position showing the sealing action of the cover gasket under pressure;

Fig. 3 is a reduced elevational view, with parts in section, of the outer plate of the improved container cover;

Fig. 4 is a view of the outer plate of the instant invention as seen from the interior of the container lid; and

Fig. 5 is an elevational view with parts broken away to illustrate the construction of the inner plate of the improved container lid.

While the illustrated embodiment is particularly adapted for the closure of a cylindrical container opening and will be described as such, it is to be understood at the outset that other shape containers and container openings may be sealed utilizing principles disclosed herein and this disclosure is intended to cover all such modifications within the scope of the appended claims.

Referring to Fig. 1, the watertight closure 10 of the instant invention comprises a pair of frusto-conical shape plates 12 and 15, arranged with the conical axes of the plates coincident and the bases of the conical plates adjacent each other. A resilient sealing ring or gasket 20 of neoprene rubber or a similar material may be positioned between the plates and may be cemented or otherwise suitably connected to either the outer plate 12, or the inner plate 15, or both of them adjacent their outer circumferences. In the embodiment illustrated the plates have their surfaces radially corrugated or deformed to form a plurality of radially extending alternating ridges and grooves or corrugations 14. In the illustrated embodiment approximately 10° has been left between the center line of each crown or trough, however no particular number of corrugations is required as long as the frequency of the ripples is substantially the same on the two plates. The corrugations 14 in each plate may extend from a flat circular area 16 surrounding the axis of the cover to the outer periphery of the plates gradually becoming wider and deeper as the periphery is approached. The corrugations, as arranged in the plates, perform an important sealing function, as will become clear as the description proceeds. In the illustrated embodiment the closure is assembled with the crowns of the corrugations of the outer plate 12, opposite the troughs of the corrugations of the inner plate 15, as shown in Fig. 1, so that the distance between the plates is substantially constant around the periphery of the closure and the sealing gasket 20 may be readily attached to both plates.

At the center of the completed assembly is an actuating mechanism which, in the illustrated embodiment, comprises a threaded stud 18 which may be welded or otherwise suitably mounted on the inner plate 15, and extends toward the outer plate. A sleeve nut 21 is rotatably mounted inside the outer plate 12 and is adapted to threadedly engage the stud. The sleeve nut 21 is secured in place by a flange 22 which runs between two bearing surfaces 23 and 24 and which are in turn secured by a locking collar 25 to a threaded boss 26 secured so as to be integral with outer plate 12. The arrangement of the actuating mechanism in the embodiment illustrated is such that the threaded stud 18 is rigidly secured to the inner plate 15, and the sleeve nut 21 is prevented from moving axially with relation to the outer plate 12, but is free to rotate. The sleeve nut may be made of proper length to form a mechanical stop effectively preventing the centers of the inner and outer plates from moving closer together than a pre-established distance. A handle 26 may be attached to one of the plates

to facilitate handling of the cover, as for example, to position it adjacent the bearing gasket 40 within a container 41 while the cover is tightened into sealing engagement.

Referring more particularly to Figs. 3 and 4 a plurality of radially extending pressure transmission members in the shape of triangular gussets 28 may be mounted on the interior surface of the outer plate and may extend radially along a line slightly offset from the center line of the trough of the corrugations provided in the plate surface. The gussets preferably extend substantially from the flat circular area 16, surrounding the closure axis, to a position somewhat inside of the outer periphery of the plate 12. A segmental pressure shoe 30 is suitably fastened, as by welding, like a T across the outer edge of each gusset 28. These T-shaped pressure members 30 may be cemented or otherwise fastened to the inner surface of the sealing gasket 20.

Referring to Fig. 5, the triangular gussets 32 of the inner plate 15 are shown attached along a line slightly offset from the crowns of the corrugations of the inner plate and also may extend from the central flat surface 16 to a place near the periphery of the plate. The direction of the offset of the gussets 32 of the inner plate is opposite to that of the gussets 28 of the outer plate to an amount sufficient to allow both sets of gussets to lie side by side to act on the pressure shoes 30 when the center lines of the corrugations are aligned to assemble the closure, as shown in Fig. 1. The outer edges of the gussets 32 may be chamfered to provide an effective surface to exert a uniform radial pressure on the interior surface of pressure shoes 30.

When assembled, as shown in Fig. 1, the centers of the frustums of the cones formed by the inner and outer plates are moved toward and away from each other by the actuating mechanism. The outer extremity 35 of sleeve nut 21 is preferably shaped to cooperate with a wrench so that a rotational movement may be readily applied. This action increases and decreases the axial dimension of the cover and inversely affects the diameter of the assembly, i.e., as the axial dimension of the cover is decreased, the diameter of the cover is increased.

In use, the centers of the plates are forced apart the maximum distance, which, in the illustrated embodiment, will be determined by the length of the threaded stud and sleeve nut, and the device is moved into the position desired in the opening or passage to be closed. The centers of the inner and outer plates are then pulled together by rotating the sleeve nut and the gasket is forced out radially against the passage wall. In the illustrated application in Fig. 1, a container wall 41 is shown fitted with a U-shaped bearing gasket 40 into which the cover is inserted before tightening. Axial contraction of the closure causes an increase in its diameter. An interaction of the outer and inner plates causes a deformation of the corrugations tending to flatten out both the inner and outer plates and thus causes an increase in diameter of the complete assembly. Simultaneously with the deformation of the corrugated inner

and outer plates, the triangular shaped gussets fixed along the corrugations of both plates are pressed outwardly because of the flattening of the cones. This radially outward pressure is transmitted through the T-shaped pressure shoes to force the gasket band outwardly into a tight sealing engagement with the wall or bearing gasket, if the container is so equipped. Because of the unique construction of the sealing closure it should be noted that an increase in pressure on the face of either plate will automatically cause a further deformation of the corrugations with the resultant increase in sealing pressure around the entire periphery of the gasket thus enhancing the sealing action of the cover. This feature is important in that pressure differential across the closure in either direction serves to improve the seal.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claim the invention may be practiced otherwise than as specifically described.

What is claimed is:

A sealing closure comprising an outer compressible plate of frusto-conical shape having a plurality of ridges and grooves formed in the surface thereof, an inner compressible plate of frusto-conical shape having a plurality of ridges and grooves formed in the surface thereof, a resilient sealing ring secured to said outer and inner plates inwardly with respect to the peripheral edges of the plates, said ridges on the outer plate being opposite to the grooves on the inner plate so that the distance between the plates at said peripheral edges thereof is substantially constant, a plurality of gusset members connected to the outer plate and extending along the grooves therein, a plurality of gusset members connected to the inner plate and extending along the ridges thereon, a pressure shoe connected to the terminal end of each gusset member on the inner plate and to the sealing ring, an actuating member rotatably mounted on the outer plate, and a shaft secured to said inner plate and in threaded engagement with said actuating member and controlled thereby for axially compressing and circumferentially deforming the plates so that the sealing means is forcibly moved to a sealing position by the gusset members and pressure shoes in response to operation of the actuating member.

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