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A. MOELLER

3,004,680

VACUUM WARE STOPPER

Filed March 27, 1959

Fig. 1

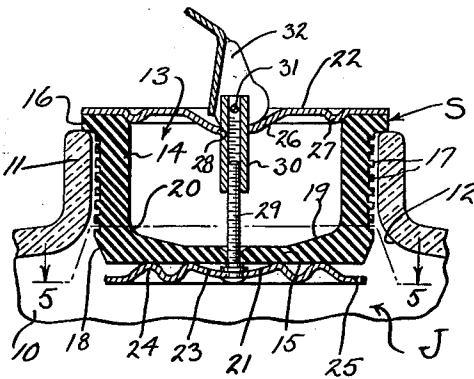


Fig. 2

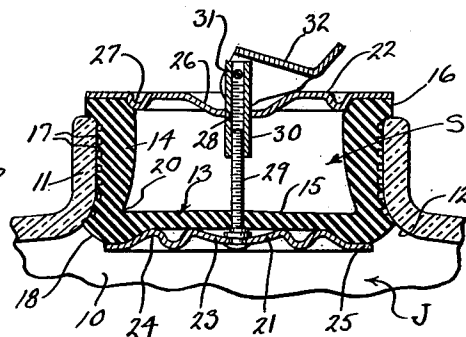


Fig. 3

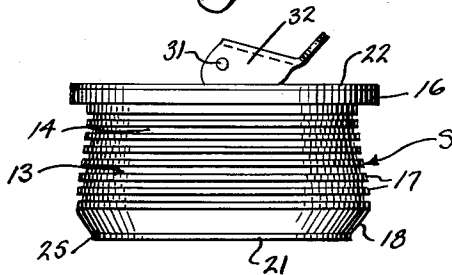


Fig. 4

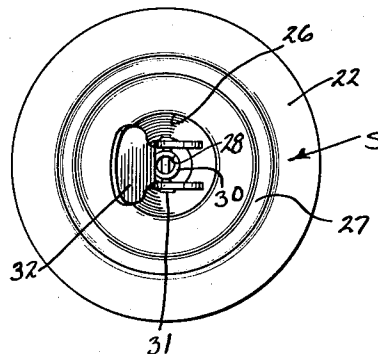
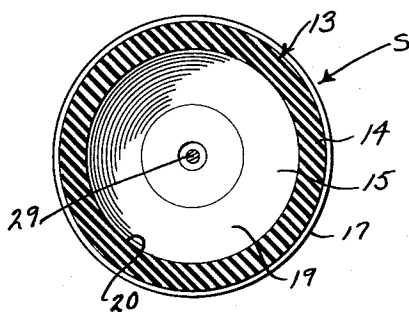


Fig. 5



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3,004,680

VACUUM WARE STOPPER

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1 Claim. (Cl. 215—53)

This invention appertains to stoppers and plugs and more particularly to a novel expansion stopper especially designed for use with vacuum ware, such as bottles and picnic jugs and the like, and is an improvement over my prior Patents Numbers 2,292,149; 2,315,538; 2,347,835 and 2,729,353 issued respectively on August 4, 1942; April 6, 1943; May 2, 1944 and January 3, 1956.

One of the primary objects of my invention is to provide novel means for forming the compressible stopper body and inner compression plate for insuring the bulging of the inner end of the body into proper sealing and gripping contact with the inner surface of the neck of the vessel at the point of juncture of the neck with the body of the vessel upon compression of the body longitudinally so as to not only insure proper sealing of the vessel but also positively prevent accidental withdrawal of the stopper from the vessel.

Another salient object of my invention is the provision of a hollow compression stopper body of a greater length than the height of the neck of the vessel and having a novel formation at the juncture of its bottom and side walls brought about by the gradual increase in thickness of the bottom wall toward the side wall with the merging of the walls on the inner surface of the body by an arcuate connecting portion, the outer surface of the stopper body gradually tapering inward toward the lower flat face of the bottom wall, the compression plate having a raised annular compression rib engaging the bottom wall inward of the juncture of the bottom and side stopper walls, whereby upon compression of the stopper body between the inner and outer compression plates, the lower end of the body around its periphery will be forced and guided outward into a desired bulge for gripping contour engagement with the vessel at the point of juncture of the vessel neck and body, the stopper body construction insuring sufficient material for gripping engagement with the vessel in a firm manner.

A further important object of my invention is the provision of means for forming the stopper body, whereby the same will tightly grip the vessel neck at the extreme inner and outer ends thereof upon compression of the stopper body longitudinally and the expansion thereof radially, the outer end of the stopper body having an annular flange for engaging the outer surface of the lip of the vessel neck.

With these and other objects in view, the invention consists in the novel construction, arrangement and formation of parts, as will be hereinafter more specifically described and claimed, and illustrated in the accompanying drawing, in which drawing:

FIGURE 1 is a central vertical sectional view through my improved stopper and the upper end of a vacuum picnic jug, the stopper being shown in its released non-gripping sealing position;

FIGURE 2 is a view similar to FIGURE 1, but showing the stopper in its compressed sealing and gripping position with the inner and outer ends of the stopper body tightly sealing the jug neck at its inner and outer ends;

FIGURE 3 is a side elevational view of the stopper removed from the jug, the stopper body being shown in its compressed position to illustrate the bulge at the lower end of the stopper body;

FIGURE 4 is a top plan view of the stopper with the cam lever in its raised released position, and

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FIGURE 5 is a horizontal sectional view through the stopper taken on the line 5—5 of FIGURE 1, looking in the direction of the arrows.

Referring to the drawing in detail, wherein similar reference characters designate corresponding parts throughout the several views, the letter S generally indicates my improved stopper for sealing various types of vacuum ware. In the present instance, I have shown the stopper S associated with a large mouthed vessel, such as a vacuum bottle or picnic jug J.

The jug J forms no part of the present invention and may be considered of a type now in general use. It is to be noted, however, that the same includes a body 10 and a neck 11. The neck and body at their point of juncture define a gradual curve 12 which leads from the inner surface of the body to the inner surface of the neck 11.

The improved stopper S comprises a hollow resilient compressible body 13 having a cylindrical side wall 14 and a bottom wall 15. The upper end of the stopper body 13 is open. The outer surface of the body adjacent to its extreme outer end is provided with an outwardly extending annular flange 16 which is adapted to rest upon the lip of the neck 11 when the stopper S is inserted in the neck. The outer surface of the side wall 14 is provided with a series of equidistantly spaced compressible sealing ribs 17.

In accordance with the present invention the outer surface of the side wall 14 adjacent to its extreme inner end is gradually tapered inwardly, as at 18, toward the lower surface of the bottom wall 15. The lower surface of the bottom wall 15 is flat. However, the inner surface of the bottom wall is tapered upwardly and outwardly, as at 19, and hence the bottom wall gradually increases in thickness toward its side wall 14. It is to be also noted that the inner surface of the bottom wall 15 merges with the inner surface of the side wall 14 in an arcuate curve 20. Stress is laid on the formation of the bottom wall, the tapered lower end 18 and the curve 20. By increasing the thickness of the bottom wall toward its periphery in conjunction with the curve, I am enabled to strengthen the stopper body at its point of maximum flexing and to provide sufficient material to form a bulge when the stopper body is compressed, as will later appear. By referring to FIGURE 1, it can be seen that the stopper body 13 is of a greater length than the height of the neck 11. Hence, when the stopper body is inserted in the neck to its fullest extent, the lower end of the stopper body will protrude slightly below the neck and into the body 10.

The hollow compressible body 13 is confined between inner and outer compression plates or discs 21 and 22. These compression discs are preferably, but not necessarily, formed from stainless steel.

The inner compression plate 21 forms an important part of the invention and the same is of a generally flat circular shape. However, the axial center of the inner compression plate is of a concavo convex form, as indicated by the reference character 23 and this plate beyond the concavo convex portion is provided with an upstruck annular compression rib 24. This rib 24 leads down and outwardly to a flat radially extending peripheral lip 25. It is to be noted that this lip terminates substantially in a plane vertical with the lower tapered end 18 of the stopper body, but inward of the main portion of the side wall of the stopper body.

The outer compression plate 22 is of a generally flat circular shape and includes a central inwardly depressed concavo convex portion 26. This plate inward of its outer edge is provided with an in-struck annular rib 27 which is adapted to engage the inner surface of the side wall 14 of the stopper body. The outer compression plate completely overlies the upper end of the stopper body and extends substantially to the peripheral edge of the flange

16. The axial center of the plate is provided with a bearing opening 28.

Rigidly secured to the axial center of the inner compression plate 21 is a threaded stem 29. This stem extends through an axial opening in the bottom wall 15 of the stopper body and extends inwardly of the stopper body toward the outer compression plate 26. Rotatably mounted in the bearing opening 28 in the outer compression plate is a sleeve nut 30, which is threaded on the stem 29. Rockably mounted on the pivot pin 31 is the adjusting cam lever 32. When the lever 32 is in its raised position, as shown in FIGURE 1, the throws of the lever are in a raised position. By turning the lever and sleeve nut 30, the sleeve nut can be adjusted inward or outward on the threaded stem 29, so as to initially bring the inner and outer compression plates toward or away from one another as may be desired to initially adjust the body to the approximate interior diameter of the neck 11.

With the stopper properly adjusted so as to permit easy movement of the stopper within the neck 11, the same is inserted in the neck until the flange 16 is in firm engagement with the lip of the neck 11. At this time, if necessary, the lever 32 and the nut 30 can be threaded down on the stem 29 to bring the compression plates 21 and 22 toward one another, and thus bring about an initial compression of the body into engagement with the inner surface of the neck. The cam lever 33 can now be swung down to its lowered position, as shown in FIGURE 2, with its throws into engagement with the upper compression plate 22. This will complete the movement of the inner and outer compression plates toward one another and the longitudinal compression of the body 13 with the consequent radial expansion thereof. As the compression plates 21 and 22 move toward one another, the annular compression rib 24 on the inner compression plate 21 will lift up the bottom wall 15 of the stopper body 13 and force and guide the extreme lower end of the body at its periphery radially outward to form a bulge which will conform to the configuration of the vessel at the point of the juncture of the neck 11 and the body 10. Again, this is permitted owing to the formation of the inner compression plate 21. As the stopper body 13 is compressed longitudinally, the inner and outer ends thereof are brought toward one another and hence the annular flange 16 of the stopper body will be forced into sealing contact with the lip of the neck 11, while the lower end of the body is forced into gripping sealing contact with the inner lower end of the neck. Thus, the vessel is effectively sealed at the upper and lower ends of its neck portion. It is to be also understood that the outer surface of the main portion of the side wall 14 of the stopper body is also forced outwardly into radial sealing contact with the neck.

From the foregoing description, it can be seen that I have provided an expansion stopper especially designed for wide mouthed vessels and that an efficient means is provided for insuring the sealing of such a vessel at the opposite ends of its neck.

Changes in details may be made without departing from the spirit or the scope of this invention but what I claim as new is:

The combination with a vacuum vessel including a body and a neck, of a closure plug for the neck including a hollow compressible body having an annular side wall and a bottom wall, the outer end of said side wall having an outwardly projecting annular flange engaging the lip of the neck, said stopper body of a greater length than the width of the neck whereby upon insertion of the stopper body into the vessel with the flange in engagement with the lip, the stopper body projects into the vessel body inward of the neck, said annular side wall having inner and outer surfaces substantially parallel for the greater length of said stopper body, inner and outer compression plates engaging the opposite ends of the stopper body, an adjustable means for bringing said plates toward one another to compress the stopper body longitudinally and to expand the stopper body radially, said outer compression plate having a depending annular rib engaging the inner surface of the side wall at the outer end thereof to support the side wall with its annular flange on the lip of the neck, said inner compression plate having an annular upstruck rib disposed inwardly of the side wall of the stopper body and engaging the bottom wall of the stopper body and a peripheral lip disposed in a plane below the upstruck rib, said upstruck rib upon movement of the compression plates toward one another lifting said bottom wall adjacent to the side wall and guiding the lower end of the stopper body outward onto the lip and into a bulge and into gripping contour sealing engagement with the vessel at the point of juncture of the neck and vessel body, the compression of the stopper body moving the opposite ends of the body into sealing contact with the neck.

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