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T. H. RISK

2,498,345

CLOSURE

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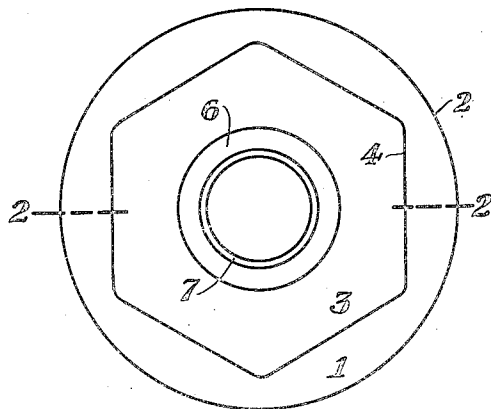


Fig. 1

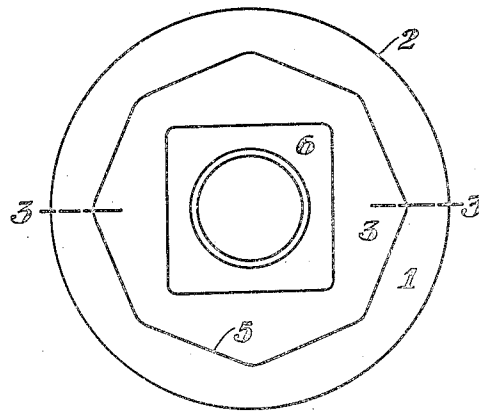


Fig. 4

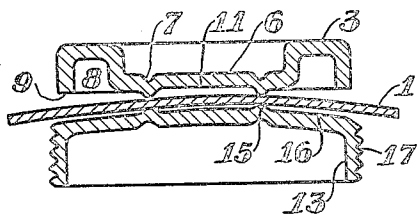


Fig. 2

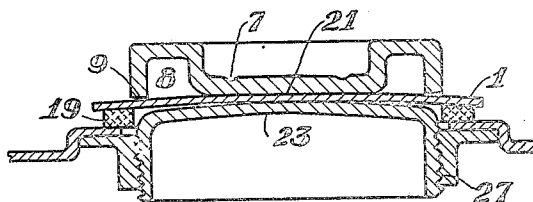


Fig. 5

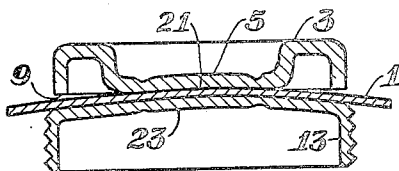


Fig. 3

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2,498,345

CLOSURE

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5 Claims. (Cl. 220-39)

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This invention relates to an improved bung or closure for receptacles such as drums, cans, and the like and is a continuation-in-part of my application Serial No. 583,596, filed March 19, 1945, now Patent Number 2,417,703.

One of the objects of the invention is to provide a bung or closure for receptacles that will prevent leakage of liquid from the receptacle.

Another object of the invention is to provide a bung or closure that can be easily applied to an opening in a receptacle and can be easily removed therefrom.

Still another object of the invention is to provide a closure of sufficiently great structural strength to withstand usage to which receptacles equipped therewith are subjected.

A further object of the invention is to provide a closure which does not destroy or render unuseable the gasket customarily used in conjunction with a removable closure.

A further object of the invention is to provide a closure, the function of which is not impaired by the accumulation of dirt particles between the parts thereof.

Other objects of the invention will become manifest from the following description and drawing of which

Figure 1 is a plan view looking at the top of one form of my closure;

Figure 2 is a vertical cross-sectional view of the closure taken on the line 2-2 of Figure 1, showing the manner in which the parts of the closure are assembled together prior to welding;

Figure 3 is a vertical cross-sectional view of the closure taken on the line 2-2 of Figure 1, showing the closure with the parts welded together in the finished closure;

Figure 4 is a plan view looking at the top of a slightly modified form of closure in accordance with my invention;

Figure 5 is a vertical cross-sectional view on the line 3-3 of Figure 4, showing the closure when screwed into the bung hole of a container in operative position.

Referring to the drawings, particularly to Figures 1 to 3, the numeral 1 indicates a spring plate having a circular periphery 2 and a gentle curvature with the upper face thereof convex and the lower face thereof concave. The spring plate 1 is of sufficient thickness to withstand deflection unless a considerable pressure is applied to the outer edge thereof. I have found that a plate which requires a tightening torque of 25 to 60 pounds to bring the plate to its fully deflected position is satisfactory. A closure of the size

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shown and described with a three inch diameter spring plate will fit a standard fifty-five gallon steel drum. In a closure of this size, I prefer a plate having a thickness of about .0375 inch (20 gauge). It is apparent that the thickness of the spring plate may vary from this figure depending on whether a plate requiring greater or lesser torque to bring the closure into fully closed position is desired. For a closure having a spring plate of three inch diameter, I have found where the spring has a curvature such that it forms a section of the surface of a sphere having a radius of nine inches, satisfactory results are obtained. It will be understood, however, that the curvature of the plate may be greater or lesser than nine inches, and that the tightening torque will vary as a function of the curvature of the plate.

Although I have shown and described a plate which is the section of the surface of a sphere, it will be understood that a plate of somewhat different configuration as, for example, one which is frustro-conical in shape with a substantially circular edge may be used with satisfactory results.

Fixed to the top side of the plate adjacent their centers is a nut 3 which in the form of the closure shown in Figures 1 to 3, has a hexagonal periphery 4 and in Figures 4 and 5, has an octagonal periphery 5. The center portion 6 of the nut is formed with a slightly depressed circular ring 7 to form a surface for projection welding the nut to the top of the spring plate 1. The under surface of the portion 6 conforms closely to the contour of the upper surface of plate 1. The outer portion of the nut 3 is formed with an annular raised channel 8 open at the bottom for a purpose to be hereinafter described. The outer lower edge on lip 9 of the nut 3 is slightly lower than the middle bottom surface 11 of the nut 3. The nut 3 can be made by stamping a metal blank into the shape shown and described.

A screw plug 13 having a circular periphery, is fastened to the lower surface of the spring plate 1 adjacent the centers thereof and is formed with a circular slightly raised projection 15 on the top thereof which projection is adapted to register with the projection 5 of the nut 3. The purpose of the circular projection 15 is to permit the screw plug 13 to be projection welded to the bottom of the spring plate 1. The top surface 16 of the plug 13 has a curvature generally conforming to the curvature of the under surface of plate 1. The plug is formed with an outside thread 17 along the sides thereof, to enable it to be screwed into a threaded bung hole. Although I have

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shown a threaded plug, the plug may be of other well-known types which are adapted to fit into a hole and be pulled to a tight position by turning motion.

When the plate 1, nut 3, and plug 13 are projection welded, they form a unitary structure as shown in Figures 3 and 5, with the plate 1 lying snugly on the top of the plug 13 and the bottom center surface of the end 3 lying on the top center of the plate 1. As shown in the drawing, the circumference of the plate 1 is greater than the circumference of the plug 13 in order to provide a surface under which a gasket 19 (Figure 5) can be held when the plug is in operative position. In a closure having a plate with a diameter of three inches, the circumference of the plug may be approximately $2\frac{1}{4}$ " to $2\frac{5}{8}$ ", thereby providing an annular portion of the plate extending radially from approximately $\frac{1}{4}$ to $\frac{1}{8}$ of an inch beyond the lateral side of the plug.

In the preferred form of my invention, the nut 3 has a periphery smaller than the periphery of the spring plate in order to permit visible observation of the nut when in operative position and determine whether the plate is pulled up snugly against the lower edge of the nut. It is important that the lip of the nut be adjacent the periphery of the plate in order to prevent the plate from going over center when the closure is pulled tightly in operative position. As shown in the drawings, the distance between the opposite sides of the hexagonal or octagonal nut used in connection with a plate having a circumference of three inches, is approximately $2\frac{1}{4}$ ".

It is important that the lower outer edge 9 of the nut be slightly below the top center point 21 of the plate 1 so that when the spring is pulled up in operative position, the spring plate never quite reaches dead center. This structure insures that the tension of the spring will always be exerted against the gasket 19 and keep the closure tight when in operative position.

I have found that when the lip or lower outer edge 9 of the nut is approximately .002 to .007 of an inch below the top center of the spring plate, the closure operates satisfactorily.

In order to prevent the possibility of the closure failing to function properly because of accumulation of dirt between the top of the spring plate 1 and the bottom of the nut 3, the nut is formed with an annular channel 8 between lip 9 and center portion 6 of the nut 3. Particles of dirt which accumulate under the nut which might wedge between the lower surface of the nut and top surface of the plate and prevent the end from being tightened to its fully closed position if the under surface of the nut were substantially flat, are able to lodge in the channel 8 and do not interfere with the tightening of the closure.

The plug 13 may have radial ribs (not shown) extending along the bottom surface 23 from the center to the lateral side in order to reinforce and strengthen the plug.

The nut 3 and the plug 13 are made from sufficiently heavy stock so that they will withstand the torque to which the closure is subjected in opening and closing the closure and shock to which it is subjected. In a closure of the size hereinbefore described and shown in the drawings, 12 gauge steel having a thickness of .109 inch, will be satisfactory. The circumference of the weld on the closure described and shown is $\frac{7}{8}$ inch. The distance from the lip or lower outer edge 9 of the nut 3 to the top thereof is approximately $\frac{1}{4}$ inch. In the closure shown in Figures

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1 to 3, the diameter of the central circular portion 6 of the nut 3 is $1\frac{1}{4}$ inches. In the closure shown in Figures 4 and 5, the portion 6 is in the form of a square with each side having a length of approximately $1\frac{1}{4}$ inches.

As shown in Figure 5, the closure is adapted to be screwed into a threaded opening 27 of a barrel, can or other container with a suitable gasket 19 plated between the top of the container and the outer portion of the plate 1. A suitable wrench can be applied to the periphery of the nut 3 to turn the closure until the upper face of the plate abuts the lip 9 of the nut. At this point, the torque required to turn the nut increases greatly, thereby indicating that the closure is in closed position. Whether or not the closure is in fully closed position can also be visually observed.

Although any type of commercial gasket such as those made of cork and synthetic rubber, or plain synthetic rubber work satisfactorily with my closure, I prefer to use a hard type gasket such as asbestos fiber impregnated with graphite since gaskets of this type do not deteriorate over long periods of time when used in conjunction with my closure.

It will be apparent that nuts having different shapes from those shown and described may be used as a part of the closure, so long as they provide a surface to which a wrench can be applied for opening and closing the closure, and so long as a bottom surface is provided against which the spring plate can abut in operative position to prevent the plate from going over dead center. It will also be apparent that the periphery of the nut can be greater or less with relation to the periphery of the spring plate than shown and described. A closure in accordance with my invention will function satisfactorily if the lip 9 extends out to substantially the periphery of the plate 1. As previously pointed out, the periphery of the nut 3 should not be so small as to permit the plate to go over dead center when pressure is applied to the under outer edge portion thereof.

The plug 13 may also be larger or smaller with relation to the periphery of the plate than shown and described, depending on the width of the gasket it is desired to use in connection with the closure and the size of the bung hole in which the closure is to be fitted.

Although I prefer to weld the cap, nut and plug together in a unitary structure, the closure may be formed in other ways, as for example, by riveting.

Where larger or smaller closures than those shown and described are to be made, I prefer to keep the relationship between the parts as to size, approximately the same as those previously described, although this relationship may be departed from without losing the benefits of the invention.

The spring plate 1 must be made of a material having a high degree of elasticity such as spring steel. I prefer to make the entire closure of steel, although the portions of the closure other than the spring plate may be made of other metals or materials, such as brass or plastic, possessing sufficient strength to prevent breakage during opening and closing or during shipping of the receptacle or container to which the closure is applied.

It is claimed:

1. A closure comprising a plug adapted to be tightened in an opening of a container by turn-

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ing motion, a spring plate and a nut all fastened together as a unit adjacent the centers thereof in face contacting relation with the plate between said plug and nut, the peripheral unfastened portion of the plate being normally in spaced relation to the nut throughout the peripheral portion of the nut, said spring plate having a circular periphery extending beyond the periphery of said plug to provide a surface under which a gasket can be accommodated, the peripheral portion of said plate sloping away from the nut toward said plug, said nut having a lower edge portion, extending below the center of the upper face of said plate, adapted to contact said plate in operative position as a result of said plate being flexed toward said lower edge of said nut, said nut also having an annular inverted channel adjacent said edge, the relation between the peripheral portion of said plate and said lower edge portion of said nut being such as to prevent said plate from going over center when in operative position.

2. A closure in accordance with claim 1 in which said edge portion of said nut is adjacent to but spaced inwardly from the periphery of said plate and said annular channel is immediately adjacent to said edge portion.

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3. A closure in accordance with claim 1 in which the spring plate is a solid area portion of the surface of a sphere and the nut has a multi-sided periphery.

4. A closure in accordance with claim 1 in which the plate and nut are welded together a short distance from the centers thereof and said channel is formed between said weld and said edge portion immediately adjacent the latter.

5. A closure in accordance with claim 1 in which said nut has a center portion below the top of said channel and which is adapted to lie snugly on the upper middle surface of and be rigidly fastened to said plate, said channel being formed between and immediately adjacent said center and said edge portions.

THOMAS H. RISK.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
2,417,703	Risk	Mar. 18, 1947