May 7, 1968 H. F. KUSSEROW 3,381,841

BUNG FOR BARREL

Filed Feb. 20, 1967 2 Sheets-Sheet 1

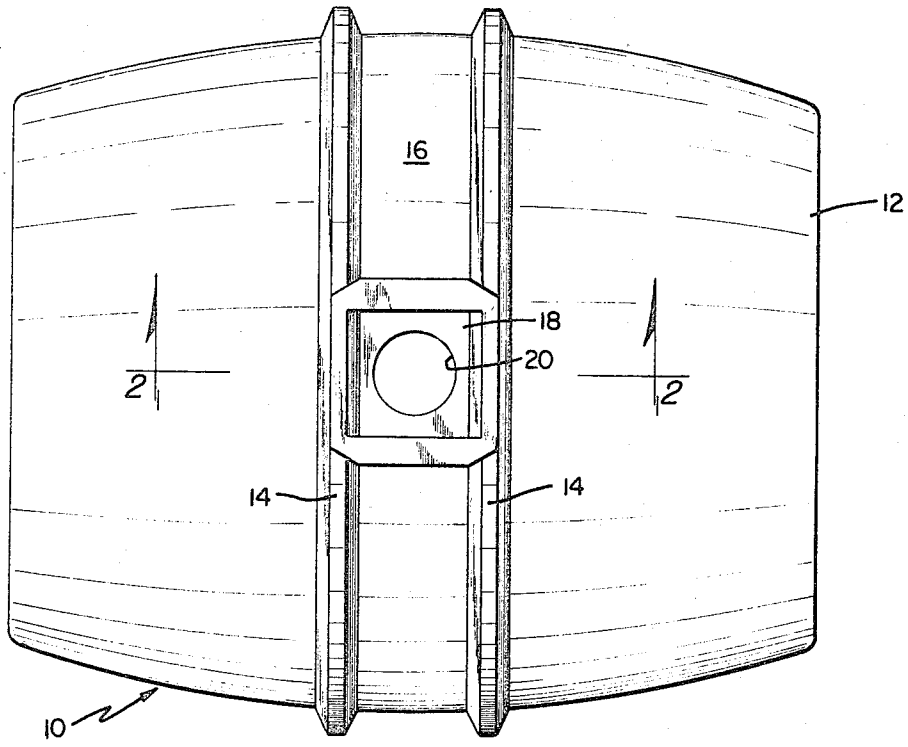

FIG. 1

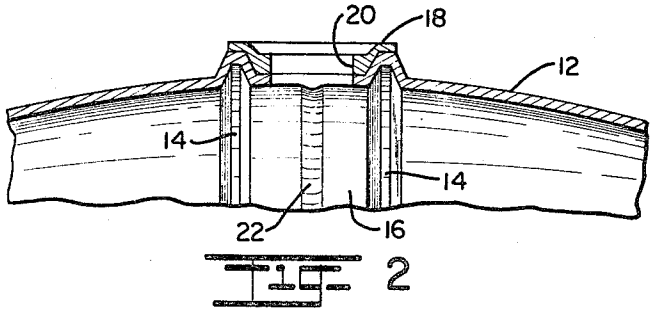

FIG. 2

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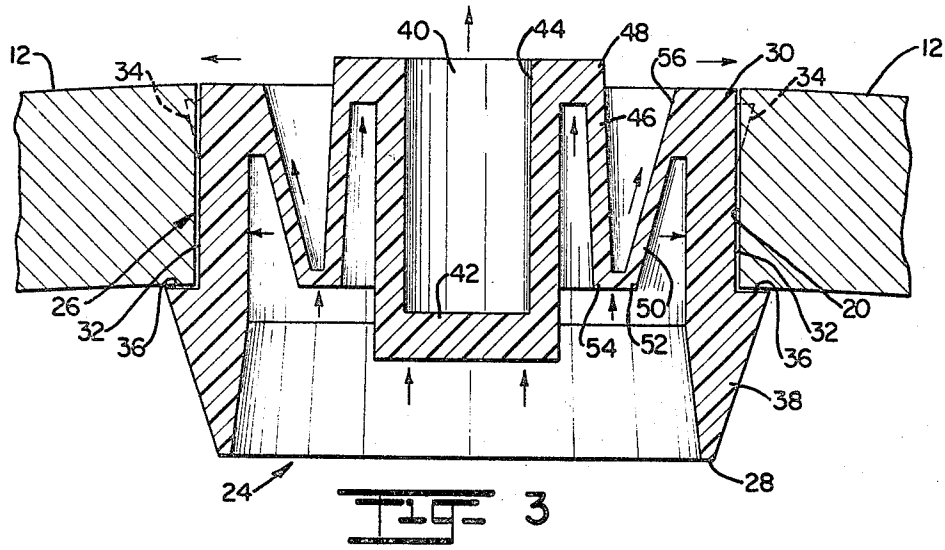

FIG. 3

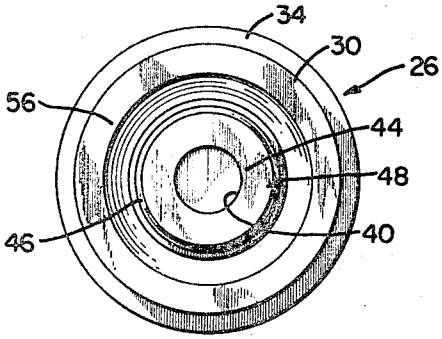

FIG. 4

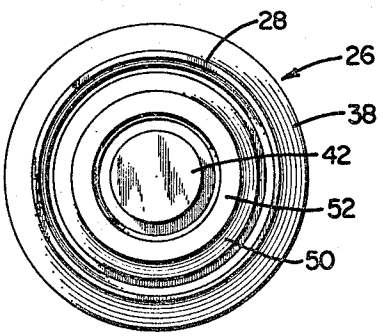

FIG. 5

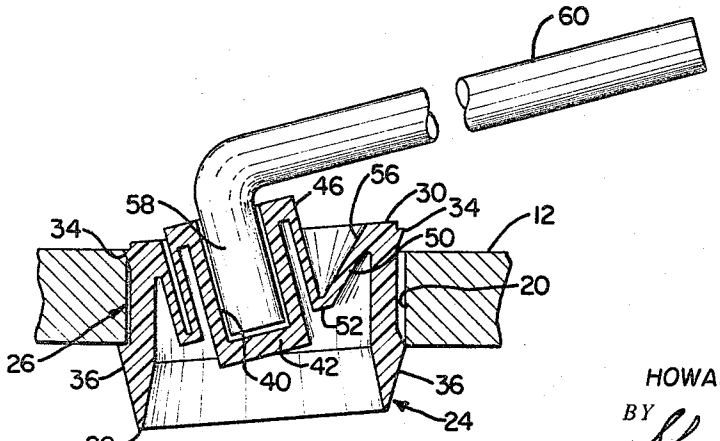

FIG. 6

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BUNG FOR BARREL

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Filed Feb. 20, 1967, Ser. No. 617,288
5 Claims. (Cl. 217—108)

This invention lies in the general field of container closures. It is directed to re-usable closures which may be readily applied and removed, and more particularly to bungs for beer barrels, although it is not limited to such use.

It has been common practice for many years to seal the bung holes of barrels, particularly beer barrels, with wooden plugs which were machined to a cork-like shape. These plugs, or bungs, had various disadvantages which could not be overcome. Chief among these was the tendency of the bungs to go out of round before use because of the grain of the wood and also because of its porosity, resulting in moisture absorption and warping. A warped bung will obviously leak both gas pressure and fluid, and the attempt to drive it in tightly enough to prevent leakage often results in damage.

A wooden bung is usually driven into a correspondingly shaped hole in a barrel until it is approximately flush with the outer surface. It is therefore difficult to grip it in any way for removal. If it is driven all the way in to the interior of the barrel to open the bung hole it cannot be removed, and this is undesirable. If it is drilled out, some wood cuttings enter the barrel and increase the difficulty of the cleaning operation.

Many efforts have been made to overcome these difficulties, and various types of solid and hollow bungs have been made of molded plastic, such as polyethylene, styrene compounds, and the like. These plugs, when properly molded, do not warp, shrink, or swell to any appreciable extent. They are clean and nonporous and do not affect the taste of the barrel contents. However, some difficulty has been experienced in adequately sealing high pressure contents. Because they can be readily cleaned and sterilized they can be re-used many times if they remain undamaged. Those which are presently available are difficult to insert and to remove and hence they tend to become damaged in the first few operations to such an extent that they must be scrapped.

The device of the present invention overcomes the difficulties mentioned above and provides a bung which is easy to insert and remove without damage, which seals well at high pressures, and may be readily cleaned for re-use any number of times. Generally stated, the bung is made of resiliently yieldable material, such as polyethylene or the like, which may be molded very accurately at a high production rate. It is a unitary article made up basically of a sealing section and a combined closure and actuator section.

The sealing section, which provides the sealing engagement with the container, comprises a generaly cylindrical shell having an inner end and an outer end. The external wall of the outer portion of the shell is cylindrical to match the wall of the bung hole. The latter is made cylindrical for use with modern closures, but in cases where the bung hole has a slight taper, the external wall of the bung may be molded with a taper to correspond. At an intermediate point in its length, an external annular shoulder is formed on the shell wall which engages the inner wall of the barrel around the bung hole when the bung has been driven home. This shoulder serves as a second seal and also as a detent to prevent the bung from being driven out by the pressure of the contents. From the shoulder to the inner end of the shell tapers, converging inwardly to form a guide skirt and facilitiate insertion.

The combined closure and actuator section includes a central or coaxial inwardly extending hollow column which is closed at its inner end and open at its outer end to form a socket to receive the shank of an operating tool. A first, generally cylindrical sleeve surrounds the column in slightly spaced relation and the outer end of this sleeve is integrally united to the outer end of the column. The first sleeve is spaced radially inwardly a substantial distance from the shell, and the gap is spanned by a second sleeve which is frusto-conical in shape, diverging outwardly. The inner end of the second sleeve is integrally united to the inner end of the first sleeve and its outer end is integrally united to the outer end of the shell to complete the closure of the bung. Because of the substantial angle of the frusto-conical wall, the second sleeve applies substantial radial outward forces to the shell in response to the axial forces imposed on the column and the first sleeve by fluid pressure within the barrel, these axial forces being transmitted by the connection between the two sleeves. The added radial pressure enhances the sealing contact of the shell with the wall of the bung hole.

Various other advantages and features of novelty will become apparent as the description proceeds in conjunction with the accompanying drawings, in which:

FIG. 1 is a plan view of a conventional metal beer barrel having a bung hole in its side wall;

FIG. 2 is a sectional view taken on line 2—2 of FIG. 1;

FIG. 3 is an elevational view in section of the device of the invention located in place in a barrel;

FIG. 4 is a top plan view of the device of the invention;

FIG. 5 is a bottom plan view of the device of the invention; and

FIG. 6 is a view similar to FIG. 3, showing the device in the initial stage of removal by an operating tool.

The barrel **10** shown in FIG. 1 has a side wall **12** with two circumferential outwardly directed ribs **14** forming a trough **16** between them. In order to provide adequate depth to form a suitable bung hole a patch or pad **18** is provided which fits in the trough and is welded to the trough and ribs. As can be seen in FIG. 2, a bung hole **20** of generally cylindrical shape is formed through the trough **16** and pad **18**. The weld bead **22** may be spot faced around the bung hole to form a smooth seat for sealing engagement with the bung but is sometimes left in its original state.

The bung **24** of this invention is shown in FIG. 3 mounted in place in the bung hole **20** formed in the wall **12** of the barrel. As previously stated, it may be considered to be composed of a sealing section and a combined closure and actuator section which are integrally united as a result of the molding process. The sealing section comprises a generally cylindrical shell **26** having an inner end **28** and an outer end **30**. The outer portion has an external wall **32** which is generally cylindrical to match the cylindrical wall of bung hole **20**. If the bung hole is formed with a taper, then of course the bung may be tapered to match it. To increase the sealing effect, the bung is provided adjacent its outer end with an annular auxiliary sealing lip **34** which is pressed into the shell wall by the bung hole wall, thus making an extremely tight seal. The lip **34** also makes the bung universal in its application because its radial extent is sufficient to compensate for the angularity of the walls of tapered bung holes. Thus the one bung may be utilized with all barrels.

The shell is formed intermediate its ends with an external annular shoulder **36** which is adapted to engage the inner surface of wall **12** of the barrel and serve the dual purpose of a secondary seal and a detent to prevent the bung from being blown out by the pressure of the contents of the barrel. Because of the resilient yieldability

of the material, the shoulder can accommodate itself to the weld bead **22**, although it is preferable to spot face the area to produce a completely flat seat. The inner portion of the shell converges inwardly from shoulder **36** to form a tapered guide skirt **38** which facilitates the insertion of the bung.

The combined closure and actuator section includes a central or coaxial hollow column **40** which essentially extends inwardly of the bung and is provided with a closed inner end **42** while the outer end **44** is wide open to permit insertion of the shank of an operating tool. The column is surrounded by a first sleeve **46** which is generally cylindrical although it may be slightly tapered as shown, the sleeve being in spaced relation to the column and being integrally united at its upper end **48** to the upper end **44** of the column. It will be seen that there there is a substantial gap between the first sleeve and the shell, and this gap is spanned by a second sleeve **50** which is frusto-conical in shape and diverges outwardly. The inner end **52** of the second sleeve is integrally united to the inner end **54** of the first sleeve, and its outer end **56** is integrally united to the outer end **30** of the shell to complete the closure.

The pressure of the barrel contents is applied in an axial direction to the entire cross sectional area of the bung, and this total pressure is resisted by shoulder **36** to prevent blowout. The fluid pressure is also applied radially outwardly to the outer portion of the wall of shell **26**, which increases the sealing effect and also assists shoulder **36** in maintaining its detent position. The axial pressure on column **40** and sleeve **46** is applied axially to the inner end **52** of the second sleeve **50**. Because of the angularity of its wall, sleeve **50** produces a radially outward force component of substantial magnitude against the outer end of the shell and thus greatly increases the sealing effect of lip **34** in both cylindrical and tapered bung holes.

One of the problems encountered in driving bungs into place with a mallet is "cocking" or tilting of the bung which results from applying the mallet off-axis so that it strikes the margin of the bung at one side. The present bung is formed to overcome this difficulty. It will be noted that the outer ends **44** and **48** of the column **40** and the first sleeve **46** extend axially outward a substantial distance beyond the outer end **30** of shell **26**. Because of this construction they receive the impacts of the mallet and the resultant force is directed substantially axially. In addition, the inward force is transmitted to the second sleeve **50** which now produces radially inward forces on the shell to momentarily reduce its diameter and facilitate insertion.

The construction of the bung as outlined above serves the further purpose of facilitating removal. As can be seen in FIG. 6, an angular removal tool having a shank **58** and a handle **60** may be used for extraction or removal of the bung without damage. Shank **58** is inserted in the socket of column **40** and an upward pull on handle **60** cocks or tilts the column to the attitude shown in FIG. 6. This results in a strong upward force on a small portion of the margin of shell **26** at the right side as viewed in FIG. 6. The force is sufficient to bend a small portion of shoulder **36** as shown so that it can slip by the corresponding margin of the bung hole and begin to move outward. Continued application of pressure to handle **60** readily tilts the bug to an increasing degree until it comes entirely free of the bung hole.

It will be apparent to those skilled in the art that various changes may be made in the construction and arrangement of parts as disclosed without departing from the spirit of the invention, and it is intended that all such changes shall be embraced within the scope of the following claims.

I claim:

1. A bung of resiliently yieldable material for sealing a generally cylindrical bung hole in a barrel or the like, comprising: a sealing section and a combined closure and actuator section for the sealing section; the latter comprising a generally cylindrical shell having an inner end and an outer end; the external wall of the outer portion of said shell being adapted for sealing engagement with the wall of the bung hole; an external annular shoulder formed intermediate the ends of said shell to engage the inner wall of the barrel around the bung hole; the inner portion of said shell comprising a guide skirt converging inwardly from said shoulder to facilitate insertion of said bung; said closure and actuator section including a central, inwardly extending hollow column closed at its inner end and open at its outer end; a first, generally cylindrical, sleeve surrounding said column in spaced relation and connected at its outer end to the outer end of the column; and a second, outwardly diverging, frusto-conical, sleeve surrounding said first sleeve and connected at its inner end to the inner end of the first sleeve and connected at its outer end to the outer end of said shell to complete the closure of said bung; the frusto-conical shape of said second sleeve serving to apply substantial radial outward forces to said shell in response to the axial forces imposed on said column and first sleeve by fluid pressure within the barrel, and thus to increase the sealing effect of said bung.

2. A bung as claimed in claim **1**; said column and first sleeve being adapted to be driven inwardly in applying said bung and to develop tension in said second sleeve; and the latter serving to exert radially inward forces on the outer end of the shell in response to said tension to reduce the diameter of said shell and facilitate its insertion.

3. A bung as claimed in claim **1**; said outwardly open hollow column being adapted to receive the shank of a removal tool and to be tilted out of its axial attitude to apply outwardly directed forces to a marginal portion of said shell and initiate a tilting removal of said bung from the bung hole.

4. A bung as claimed in claim **1**; the outer end of said column and first shell extending outwardly an appreciable distance beyond the outer end of said shell to intercept and centralize driving impacts and prevent cocking of the bung during an insertion operation.

5. A bung as claimed in claim **1**; and an annular auxiliary sealing lip formed on the external wall of said shell adjacent the outer end of the latter and adapted to be forced into tight sealing engagement by the radial outward forces applied by said second sleeve.

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