Oct. 21, 1969 H. F. KUSSEROW 3,473,686

BUNG FOR BARREL

Filed May 2, 1968

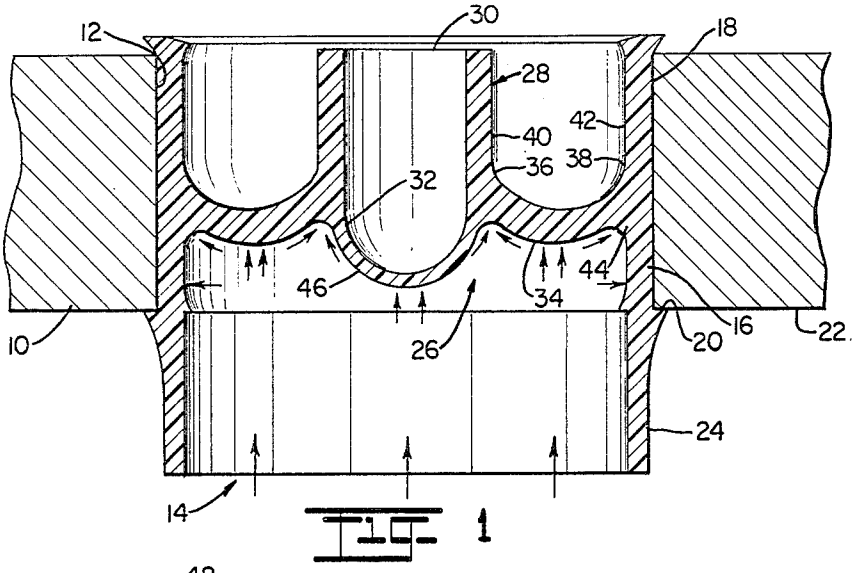


FIG. 1

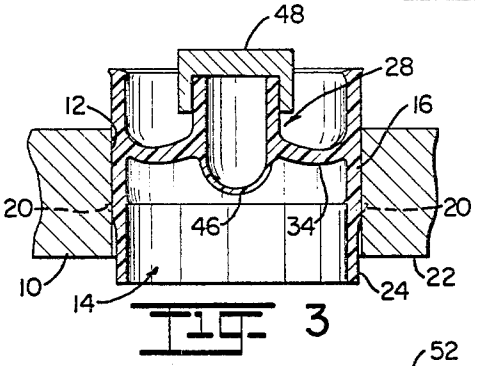


FIG. 3

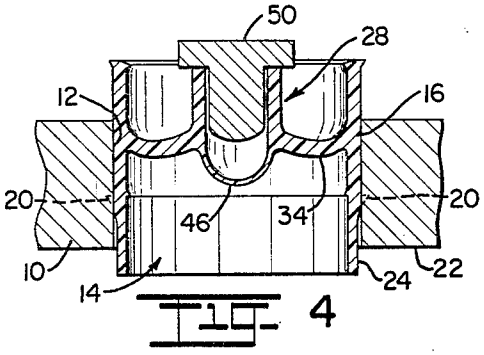


FIG. 4

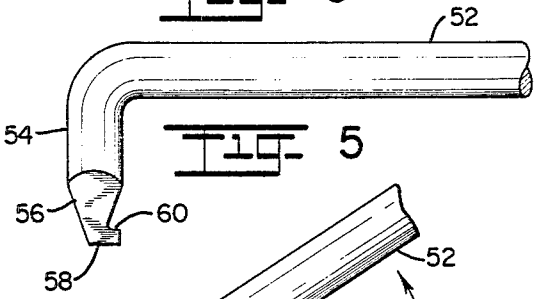


FIG. 5

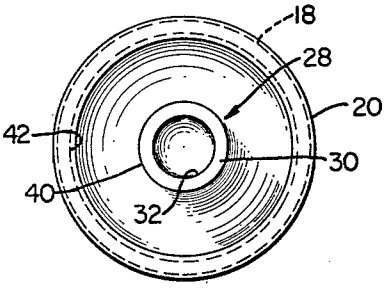


FIG. 2

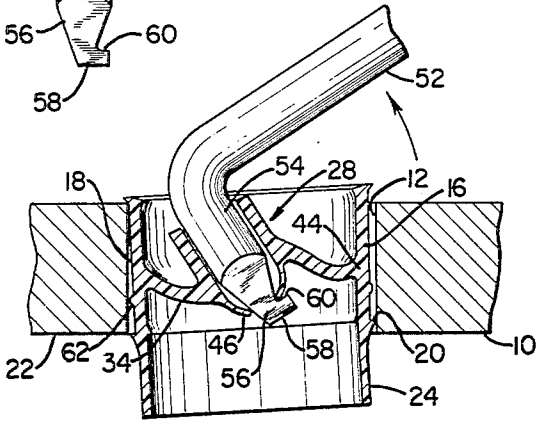


FIG. 6

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BUNG FOR BARREL

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ABSTRACT OF THE DISCLOSURE

Barrel bung of flexible material, such as polyethylene, includes cylindrical shell with outer wall to seal in bung hole, partition means in transverse plane intermediate ends to complete closure, and central hollow column for installing and removing. Partition includes annular web between column and shell, arcuate in cross section and inwardly convex, plus inwardly convex dome-shaped cap over inner end of hollow column. Internal pressure tends to flatten annular web to create radial force on shell wall and improve seal. Impact on hollow column drives bung into place. Removal tool has shank to enter hollow column and tilt laterally to pry bung out. Sharp end of shank pierces cap to weaken resistance to distortion during removal operation.

BACKGROUND OF THE INVENTION

This invention lies in the general field of container closures. It is directed to resiliently yieldable 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 expand unevenly because of non-uniformity in porosity. Further, in the event of warpage, a bung would obviously leak both gas pressure and fluid, and the attempt to drive it in tightly enough to prevent leakage often resulted 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 to facilitate rolling of the barrel and also to prevent damage or dislodgment of the bung by such rolling. 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 easily removed, and this is undesirable. If it is drilled out, some wood cuttings enter the barrel and must be removed during the cleaning operation. There is also the danger of damaging the sealing surface of the bung hole.

Many efforts have been made to overcome these difficulties, and various types of solid and hollow bungs have been made of molded plastics, such as polyethylene, and the like. They are clean and non-porous and do not affect the taste of the contents. However, many difficulties have arisen in manufacture and use. Solid bungs require a very large amount of material and hence are too expensive to compete in the market. Also they cool unevenly upon removal from the mold and tend to warp out of round. Since they are almost as hard as wood it is difficult to cause them to conform to the shape of the bung hole. Moreover, they are difficult to remove for the same reasons as the wooden bungs.

Hollow bungs cool more evenly and are more flexible, making far better sealing. However, most of those which are on the market have large differences in wall thickness and are provided with bracing ribs of many kinds so that

resultant difficulty in sealing. Moreover, they lack suitthey too have a strong tendency to warp in cooling, with able means for insertion and removal. Some of these bungs have been intended for re-use because they are easy to clean. However, it has been found that damage to such bungs during removal has not been noticed and subsequent use has resulted in leaky barrels. Even those with no obvious damage are worn to some extent each time and after a few uses they are too loose to seal properly. Any tests which would determine their suitability for further use are too costly and time consuming to be justified. A bung for single use must use a minimum quantity of material which will do a satisfactory job, must still be easy to insert and remove, and must be ruptured in removal to avoid any possibility of re-use by mistake.

SUMMARY OF THE INVENTION

The device of the present invention overcomes the various difficulties mentioned above and satisfies all of the requirements for a single use bung. Generally stated, the bung is made of resiliently yieldable material, preferably medium density polyethylene which is lower in cost than high density polyethylene and is also more conformable to the surface to be sealed. Such material may be molded very accurately at a high production rate. The bung is a unitary article made up basically of a sealing section and a combined closure and actuator section.

The sealing section is a generally cylindrical shell having an inner end and an outer end. The external wall of the outer portion provides sealing engagement with the wall of the bung hole. If the latter is tapered, as in old style barrels, then the shell has a corresponding taper. Detent means are formed on the external wall intermediate the ends and may be a plurality of individual projections to engage the inner wall of the barrel and resist removal or a complete annular shoulder which will also serve as a second seal. The inner portion of the shell serves as a guide sleeve to facilitate insertion.

The combined closure and actuator section comprises partition means extending transversely across the interior of the shell at a location intermediate the ends, and a hollow column unitary with the partition means and extending coaxially of the shell outward to a location approximately in the plane of the outer end of the shell. The partition means includes an annular web extending from the outer wall of the column to the inner wall of the shell. The web has an arcuate cross section which is inwardly convex. Although the column may extend inwardly beyond the annular web, it preferably terminates at the transverse plane in which the inner and outer margins of the web lie. The second portion of the partition means comprises a dome-shaped cap arranged to be inwardly convex and serves as a closure for the inner end of the column to complete the total closure of the shell.

Fluid pressure within the barrel tends to flatten the annular web and produce radial outward pressure against the wall of the shell to increase the sealing effect. The fluid pressure also tends to flatten the cap, producing radial pressure to stiffen the column against collapse or distortion under the pressure from the annular web.

BRIEF DESCRIPTION OF THE DRAWINGS

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

FIG. 1 is a sectional view in elevation of the device of the invention installed in the bung hole of a barrel;

FIG. 2 is a plan view of the outer end of the device;

FIG. 3 is a view similar to FIG. 1, showing a driving cap mounted in place;

FIG. 4 is a view similar to FIG. 3, showing a different form of cap;

FIG. 5 is a side elevational view of a removal tool; and

FIG. 6 is a view similar to FIG. 1, showing another embodiment of this invention in the initial stage of removal by the removal tool.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The nature of the invention is generally illustrated in FIG. 1, in which the wall of a barrel **10** is provided with a cylindrical bung hole **12**. The bung **14** includes a sealing section in the form of a cylindrical shell **16** having inner and outer ends, the external wall **18** of the shell being of a proper diameter to snugly engage the wall of hole **12** and form a seal. When the bung is in place, detent means **20** engage the inner wall **22** of the barrel to resist removal. While the detent means may be a plurality of individual projections it is preferably in the form of a complete annular shoulder on the external wall of the shell which will engage the inner wall of the barrel around the entire periphery of hole **12** and form a second seal. The inner portion **24** of the shell, which may be tapered, constitutes a guide skirt to facilitate insertion of the bung.

The combined closure and actuator section includes partition means **26** extending transversely of the interior of the shell at a location intermediate of the inner and outer ends and a hollow column **28** unitary with the partition means. The column is coaxial with shell **16** and its open outer end **30** is approximately in the plane of the outer end of the shell. It may extend inwardly to any desired distance but preferably its inner end **32** terminates in about the same transverse plane as the partition means, as shown in FIG. 1.

Partition means **26** includes an annular web **34** which is arcuate in cross section and inwardly convex, as shown. Its inner and outer margins **36** and **38** lies in the same transverse plane, which is normal to the axis of the shell, and are connected respectively to the outer wall **40** of the column and the inner wall **42** of the shell. In the preferred form, margin **36** connects at the inner end **32** of the column and margin **38** connects to an intermediate point **44** of the shell. The partition means is completed by dome-shaped cap **46** arranged to be inwardly convex and secured across the inner end **32** of column **28** to form a closure. All parts of the bung are molded as an integral unit. It will be noted that the wall thicknesses of the shell, column, and annular web are substantially identical, which produces uniform cooling and more accurate results. Cap **46** is thinner for a reason to be described but it is small and centrally located so its faster rate of cooling does not cause warping. The construction described accomplishes its purpose with a minimum amount of material because its walls can be made very thin. It has been found that the wall thickness of the various parts need be only about six percent or less of the outside diameter of the bung.

When the fluid pressure within the barrel is applied to the bung in a direction axially of the bung it tends to flatten the arc of annular web **34**. The toggle-like action applies very high radial outward pressure to the shell in the area of point **44** to produce a highly effective seal. This is in addition to radial pressure applied against the shell wall inwardly of the web. Fluid pressure on cap **46** acts in the same way to support the end **32** of column **28** against the collapsing force of web **34**. These forces are indicated by the arrows in FIG. 1. It will be seen that the web may be quite thin without failing because the fluid pressure produces compression forces in the web rather than tension or bending. The thinner cap **46** has a smaller radius of curvature and hence greater resistance to failure.

When the bung is driven into place by a mallet or the like, it is essential not to cock it in the hole and not to strike heavy blows on the thin margin of the shell. To this end a cap **48** is provided which fits over the outer end of column **28** as shown in FIG. 3 and extends axially outward a substantial distance beyond the plane of the outer end of shell **16**. Blows on the cap are automatically centered to avoid cocking. Moreover each blow momentarily drives column **28** inwardly with respect to shell **16**. The tension produced in web **34** tends to momentarily reduce the diameter of the shell and facilitate its insertion. Instead of an external cap, a plug-type cap **50** may be used as shown in FIG. 4. The operation and effect are the same.

A suitable removal tool is shown in FIG. 5. It comprises a handle **52** having an angled shank **54**, all of circular cross section. The free end of shank **54** is ground to a wedge or chisel form **56** having a sharp edge **58**, and a notch is ground at one side to form a hook **60**. The tool is used in the manner illustrated in FIG. 6.

As mentioned above, cap **46** is much thinner than web **34**, and is preferably about one half as thick. It is thus readily frangible by a sharp cutting tool and yet able to withstand high fluid pressures because of its small size and high degree of curvature. It will be observed in FIG. 6 that the shank **54** is inserted in column **28** and moved forcibly inward until its cutting edge **58** ruptures cap **46** and continues until its full diameter reaches the bottom of the column, at which time hook **60** is inward of web **34**. When the handle **52** is swung angularly as indicated, it tilts column **28** and distorts web **34** to such an extent that the right hand portion of the web as viewed in FIG. 6 is almost straight and inclined upwardly and placed in tension. This tension, acting at point **44**, pulls the shell away from wall **12** and moves part of shoulder **20** outwardly into the hole. Continued movement of handle **52** forces the bung entirely out of the hole.

The presence of hook **60** and the rupture of cap **46** serve several purposes. Since the cap is ruptured, the damage is obvious and the bung will not be re-used by mistake. Rupture of the cap allows the hook to move inwardly of web **34** and if the shank should tend to slide out of column **28** the hook will prevent it. Moreover, as the angle of tilt increases, the hook will engage web **34** and increase the withdrawing force. In addition, when cap **46** is ruptured, it no longer gives any support to column **28**. Thus the resistance to distortion is decreased and it is much easier to remove the bung. It will be noted that the bung of FIG. 6 also incorporates an annular rib **62** formed about the surface **18** intermediate the shoulder **20** and the annular web **34**.

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.

I claim:

1. A bung of resiliently yieldable material for sealing a generally cylindrical bung hole in a pressurized barrel or the like, comprising: a sealing section and a combined closure and actuator section for the sealing section; said sealing section 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; the inner portion of said shell comprising a guide skirt to initially enter and pass through the bung hole to the interior of the barrel and provided with resilient detent means on its outer surface to engage the inner wall of the barrel and resist outward movement of the bung; said closure and actuator section including a central, axially extending, hollow column having an open outer end located in approximately the plane of the outer end of said shell and an inner end terminating intermediate the axial length of said bung and closed by a dome-shaped web arranged to be inwardly convex; and an annular web surrounding said column and integrally secured thereto and to the inner wall of said shell at an intermediate point thereof;

said annular web being arcuate in cross section and inwardly convex and having its inner and outer margins lying substantially in a transverse plane normal to the axis of the bung; the flattening tendency of the annular web in response to fluid pressure within the barrel serving to apply substantial radial outward forces to said shell to increase the sealing effect of said bung; and the flattening tendency of the dome-shaped web in response to said fluid pressure serving to assist said column in resisting the radial forces exerted by the annular web.

2. A bung as claimed in claim 1; the inner end of said column being in substantially the same transverse plane as the inner and outer margins of the annular web.

3. A bung as claimed in claim 1; said detent means being in the form of an external annular shoulder intermediate the ends of said shell to sealingly engage the inner wall of the barrel around the bung hole.

4. A bung as claimed in claim 1; the walls of said shell, column, and annular web being of substantially the same thickness to reduce the liability of distortion during manufacture.

5. A bung as claimed in claim 4; said wall thickness being about six percent or less of the outside diameter of the bung.

6. A bung as claimed in claim 1; the material of said bung being a medium density polyethylene to provide maximum resilient sealing qualities.

7. 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; said dome-shaped web being frangible in response to force exerted by said removal tool to reduce resistance of the bung to distortion during removal.

8. A bung of resiliently yieldable material for sealing a generally cylindrical bung hole in a pressurized barrel or the like, comprising: a generally cylindrical shell having an inner end and an outer end; the external wall of said shell being adapted for sealing engagement with the wall of the bung hole; a central, axially extending, hollow column having an open outer end and having an inner end terminating intermediate the axial length of said

bung; partition means extending in a generally transverse plane from the inner end of said column across the interior of said shell and connected to the inner wall of the shell intermediate its ends; and a cap across the inner end of said column; said shell, column, cap, and partition being integral to form a seal for the contents of the barrel; the wall of said cap being substantially thinner than the wall of said partition to facilitate piercing by a removal tool and reduce the resistance of the bung to angular distortion for removal purposes.

9. A bung for a barrel comprising: a generally cylindrical shell having an inner end and an outer end; partition means extending in a generally transverse plane across the interior of the shell at a locus spaced substantially inwardly of the outer end of the shell and being constructed to remain at all times well spaced inwardly of said outer end; a substantially rigid column located coaxially of the shell and having its inner end secured to said partition means and its outer end substantially at the plane of the outer end of the shell; the connection of said column means to said partition means substantially preventing movement of the outer end of the column outward beyond the outer end of the shell; and a discrete driving cap removably mounted on and overlying the outer end of the column to intercept and centralize driving impacts and prevent cocking of the bung during an insertion operation; said cap having sufficient axial length to insure that its impact receiving outer surface will at all times be outward of the outer end of the shell.

References Cited

UNITED STATES PATENTS

2,487,635	11/1949	Carpenter	215—52 XR
2,723,041	11/1955	Hart-Still	215—52
2,886,203	5/1959	Goll	217—110 XR
2,969,161	1/1961	McCulloch	215—52 XR

RAPHAEL H. SCHWARTZ, Primary Examiner

U.S. Cl. X.R.

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