March 4, 1969 W. S. WILSON 3,430,825

DISPENSING CLOSURES

Filed Aug. 25, 1966

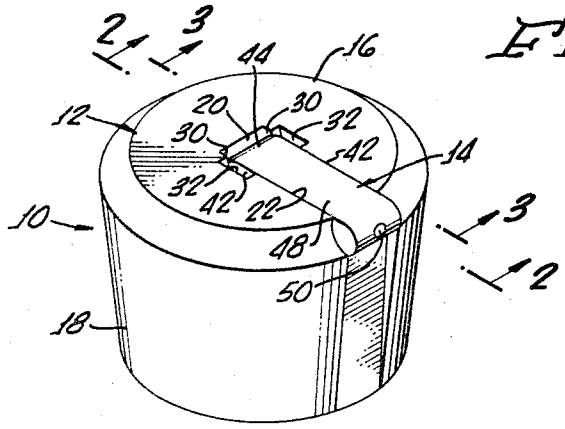


FIG. 1.

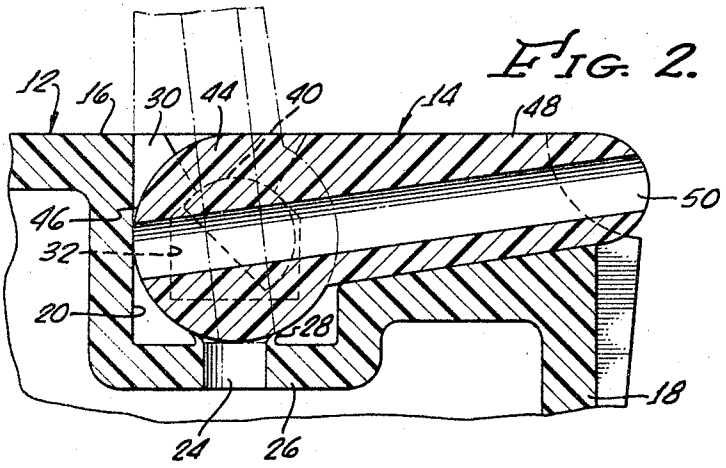


FIG. 2.

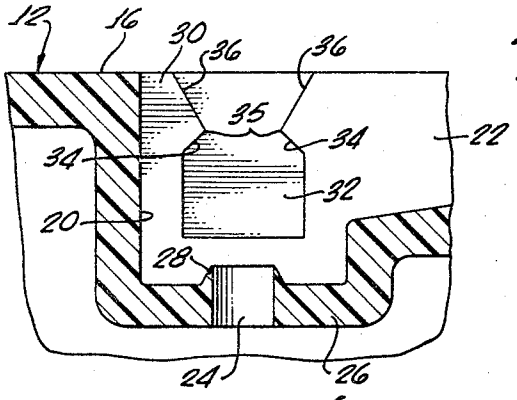


FIG. 4.

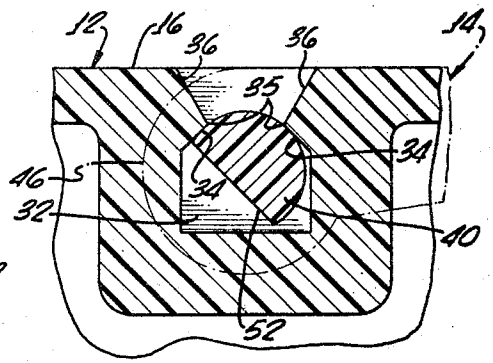


FIG. 3.

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DISPENSING CLOSURES

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U.S. Cl. 222—534 2 Claims
Int. Cl. B67d 3/04, 5/06

ABSTRACT OF THE DISCLOSURE

This invention pertains to new and improved dispensing closures of the rotatable spout type.

A dispensing closure of the type to which this invention pertains has:

A closure top of a material permitting the parts of the closure to be snapped together, an opening leading into and through the closure top, two aligned bearing means located above and on opposite sides of the opening, and slots leading to the extremities of the bearing means remote from said opening;

A spout member having a base, a portion of which is shaped as a surface of revolution, two aligned trunnion means extending from the base, the axes of the trunnion means being aligned with the axis of said portion, a spout extending from said base and a passage extending from said portion through the spout;

Each of the trunnion means being held by one of the bearing means so that said portion engages portions of closure top adjacent said opening in such a manner that the spout member may be rotated between a closed position in which said portion seals off the opening and an open position in which the passage is in communication with the opening,

Wherein the improvement comprises

Bearing means of larger dimensions than the trunnion means and which effectively contact the trunnion means adjacent to the tops of the bearing means,

The only parts of said spout member being so contacted by said cap means being the parts of said trunnion means engaged by the tops of said bearing means and said portion of said base engaged by portions of closure top adjacent said opening, and

Said closure top and said spout member applying pressures to the portions of said closure top adjacent to said opening which are equal on both sides of an imaginary plane passing through the axis of the opening and the axes of said portion and the trunnion means,

Said closure top and said spout member also applying pressures to the portions of said closure top adjacent to said opening which are equal on both sides of an imaginary plane passing perpendicular to the axes of the trunnion means and said portion through the center of said opening.

Background

This invention principally pertains to the crowded art of two or more piece rotatable spout type dispensing closures. It is primarily directed to closures having pieces which are adapted to be snapped together. The various closures of the type to which this invention pertains are primarily used in packaging and dispensing a number of different types of goods. Because of the fact that they are frequently used by manufacturers as essentially throw-away type items in packaging goods, the cost of these closures is a matter of important significance.

Such closures must not only be inexpensive, but they must also be reliable. In other words, when used on a package containing a fluid, there should be substantially no chance of these closures leaking. To a degree this is

interrelated with cost considerations. The more careful and expensive the manufacturing processes used in making a dispensing closure, obviously the greater the cost of the closure, and normally the higher the reliability of such a closure against leakage. The converse situation also prevails.

As a result of these factors, consideration has been given to the problem of producing inexpensive, reliable closures utilizing injection molded, thermoplastic parts. Most of this consideration has been directed to providing closures which are reliable even if high standards of due care are not exercised by the manufacturer. However, consideration should also be given to closures which can be used and reused over prolonged periods.

In these fields a number of factors are considered to be significant. One of these is the problem of shape changes resulting from "cold flow" of various common thermoplastic materials. Another is the problem of wear of various parts or portions of parts in a closure. Consideration should be and has been directed to the construction of reliable rotatable spout dispensing closures in which the parts will seal satisfactorily in spite of the presence of slightly undesirably shaped parts in such closure. Such undesirable shapes may result from substantially uncontrollable material shrinkage, die wear, improper molding conditions, or the like.

It is to be emphasized that the problems outlined in the preceding discussion have tended to be minimal with certain types of closures such as closures as are shown in the Wilson et al. U.S. Patent 2,793,795, Kubiliunas U.S. Patent 2,936,934, and the Gustafson U.S. Patent 3,023,939, even though it is believed that such problems may be material with other different types of dispensing closures of a related, two-piece, snap-together variety. In this field, however, sealing reliability is important, and it is considered that even a fraction of a percentage difference in sealing reliability between two different closures is of practical commercial importance.

Another factor which has been determined to be related to all of the above relates to the amount of force necessary to use these closures so as to move the spout members in them between open and closed positions. With prior closures it has been considered that comparative "firmness" or ruggedness of a construction was related to obtaining a satisfactory seal. Thus, in prior related structures such as the Mart U.S. Patent 2,727,658 it was considered necessary to specifically disclose that the spout member had to be snugly embraced by the portions of the cap surrounding it. This, of course, resulted in frictional forces tending to make it relatively difficult to move the spout member between open and closed positions.

Description

Broad objectives of the present invention are to provide new and improved dispensing closures of the rotatable spout type which overcome problems of prior related closures as are indicated in the preceding discussion. Thus, in its more limited aspects this invention is intended to provide easy to use, relatively inexpensive, two-part closures which are relatively reliable as far as their sealing characteristics are concerned, even if the parts employed in these closures may not be exactly as desired or intended.

Various other advantages of this invention will be more fully apparent from a detailed consideration of the remainder of this specification, the appended claims and the accompanying drawing in which:

FIG. 1 is an isometric view of a dispensing closure of this invention;

FIG. 2 is a cross-sectional view taken at line 2—2 of FIG. 1;

FIG. 3 is a cross-sectional view taken at line 3—3 of FIG. 1; and

FIG. 4 is a cross-sectional view of the closure top with the spout member removed, this view being taken in the same direction as line 2—2 of FIG. 1.

The accompanying drawing is primarily intended so as to clearly illustrate for explanatory purposes a presently preferred embodiment or form of a dispensing closure of this invention. Those skilled in the dispensing closure field will realize that a number of different changes or modifications may be made in the precise closure illustrated through the exercise of routine engineering and/or design skill without departing from the essential concepts of this invention as defined by the appended claims.

In FIG. 1 there is shown a complete, assembled dispensing closure **10** of this invention having two pieces, a closure top **12** and a spout member **14**. Preferably the closure top is formed out of a somewhat resilient, somewhat deformable material capable of being temporarily deformed and returning to an initial configuration when present in relatively thin parts or members. Common linear and nonlinear polyethylenes exhibit these desired characteristics. The same characteristics are also found in other common thermoplastic polymers and other compositions. The spout member **14** may be formed of the same material as the closure top **12**; it may also be formed out of other more rigid materials substantially incapable of temporary deformation.

The closure top **12** includes a top **16** proper and a conventional skirt **18** used in attaching the entire closure top **12** to a container. If desired the skirt **18** may be omitted and the top **16** may be formed directly as an integral part of a container. When the skirt **18** is used preferably it contains means (not shown) for attaching the skirt to a container such as threads or the like. Within the top **16** there is located a centrally located cavity **20** of generally rectilinear configuration. From one side of the cavity **20** a slot **22** extends to the periphery of the top **16** adjacent to the juncture of this top **16** and the skirt **18**. Within the bottom of the cavity **20** an opening **24** passes through a bottom wall into the interior of the skirt **18**. This opening **24** is used for dispensing purposes as hereinafter indicated.

Within the cavity **20** the wall **26** preferably carries an integrally formed, projecting sealing ring **28** capable of temporary deformation during the assembly and use of the complete dispensing closure **10**. This sealing ring may be formed in the general manner indicated in the Gustafson U.S. Patent 3,023,939 or it may be formed as shown in a manner as indicated in the Akers U.S. patent application Ser. No. 439,515, filed Mar. 2, 1965, entitled Sealing Structure for Valves. The particular sealing ring **28** shown extends in a circular path coaxially around the opening **24**. In cross-section it has the appearance of an inverted V, the centermost wall of which is aligned with and forms a continuation of the wall of the opening **24**. In the embodiment **10** this sealing ring **28** is a portion of the top **12** adjacent the opening **24**.

The opening **24** and the sealing ring **28** are located midway between side walls **30** of the cavity **20**. From these side walls **30** there extends within the top **20** identical bearing openings **32**, the walls of which may be loosely termed bearing means. In the embodiment of the invention shown these bearing openings **32** are shown as having a generally rectilinear, box-like configuration. With the present invention the configuration of all except the upper walls of the openings **32** is considered to be substantially immaterial.

These walls **34** are intersected along lines **35** by tapered walls **36** at the sides of slots **38** leading from the exposed surface of the top **16**. At the intersection of the walls **36** with the upper walls **34** these lines **35** define restrictive entrances into the bearing openings **32**. These restrictive entrances are of smaller dimension than trunnions **40** extending from sides **42** of a base **44** of the

spout member **14**. These trunnions **40** are preferably identically formed and are axially aligned with one another. The principal portion **46** of the base **44** is shaped as a surface of revolution—specifically a cylinder in the embodiment shown. The axis of this portion **46** coincides with the axis of the trunnions **40**. The base **44** also carries a rectilinear spout **48**. A passage **50** extends from the portion **46** through the spout **48** in the spout member **14**.

This construction is designed so that the spout member **14** may be inserted within the closure top **12** by merely locating the trunnions **40** generally upon the upper areas of the tapered walls **36**, and then by applying pressure to the spout member **14** so as to cause temporary deformation of the portion of the top **16** adjacent to the slots **38**. This enables the trunnions **40** to pass the lines **35** of intersection of the walls **34** and **36** to within the bearing openings **32**. As this occurs the portion **46** engages and deforms the sealing ring **28** by contact with it. As it is contacted in this manner the inherent characteristics of this sealing ring **28** will tend to apply an upwardly directed force to the spout member **14** which will bias the trunnions **40** into contact with the lines of intersection between the wall **34** and **36**.

The inherent strength of the material within the closure top **12** is sufficient so that contact along the lines **35** is adequate to hold the trunnions **40** downwardly in place so that a seal is constantly maintained between the sealing ring **28** and the portion **46**. This seal exists when the spout member **14** is in a closed position as indicated in FIGS. 1 and 2 of the drawing as well as when the spout member **14** is in an open position as indicated in phantom in FIG. 2 of the drawing. The spout member **14** may be rotated easily and conveniently between these two positions when assembly is completed with a minimum of frictional contact tending to oppose such rotation since the only parts of the spout member **14** contacted by the closure top **12** are the portions of the trunnions **40** engaged by the lines **35** of intersection of the walls **34** and **36** and that area of the portion **46** engaged at any one time by the sealing ring **28**.

The effectiveness of the sealing ring **28** in the embodiment shown or in the area where a seal is formed in forming a seal with respect to the spout member **14** is related to the "balance" of forces achieved with this structure. It will be observed that the dispensing closure **10** is bilaterally symmetrical about an imaginary plane passing midway between the sidewalls **30** and passing through the spout member **14** perpendicularly to the axes of the trunnions **40** and the portion **46** through the center of the opening **24**. Thus, with this structure "holddown" forces exerted by the closure top **12** through the trunnions **40** are equal and balanced on opposite sides of the opening **24** where a seal is formed. These forces are also balanced about an imaginary plane passing through the axis of the opening **24** and the axes of the portion **44** and of the trunnions **40**. Thus, equal pressures are applied to the sealing ring **28** along two different imaginary planes located at right angles to one another and intersecting along the axis of the opening **24**. This balance of forces in two directions is considered significant and important in forming a seal inasmuch as it corresponds to the principal directions to which forces are applied to the sealing ring **28** during the use and operation of the complete dispensing closure **10**. If the trunnions **40** should accidentally touch the walls surrounding them, no significant alteration of the results achieved will occur.

The trunnions **40** may be "cut off" by flat walls or sides **52** extending parallel to the axes of the trunnions **40** the length of these trunnions **40** in order to save a minor amount of material and, in certain instances, to simplify or facilitate the insertion of them within the slots **38** into the bearing openings **32** by providing sloping walls (the walls **52**) on the trunnion **40** permitting more gradual deformation and entry of the trunnions **40** into the bearin openings **32** than if the sole contact was with respect to

conventional cylindrical trunnions. With this structure the walls **52** are located on the trunnions **40** as an area where they are never contacted during use by the lines **35**.

In the closure **10** a short wall **54** may be extended over the portion of the cavity **20** not occupied by the spout **14** in open and closed positions. A number of other similar modifications may be made. It is possible to have the entire structure supporting and holding the spout member **14** exposed on the top **16** in a dispensing closure falling within the scope of this invention instead of within it as shown, although this is not considered preferable for esthetic as well as practical or utilitarian reasons.

I claim:

1. A dispensing closure of the rotatable spout type having two parts adapted to be snapped together, said closure having:

a closure top of a material permitting the parts of the closure to be snapped together, an opening leading into the closure top, a resilient sealing ring located around said opening, two aligned bearing means located above and on opposite sides of the opening and the sealing ring, and slots having walls leading to the extremities of the bearing means remote from said opening;

a spout member having a base, a portion of which is shaped as a surface of revolution, two aligned trunnions extending from the base, the axes of the trunnions being aligned with the axis of said portion, a spout extending from said base and a passage extending from said portion through the spout;

each of the trunnions being accommodated by one of the bearing cavities so that said portion engages portions of the closure top adjacent said opening, in such a manner that the spout member may be rotated between a closed position in which said portion seals off the opening and an open position in which the passage is in communication with the opening,

wherein the improvement comprises:

said bearing cavities of larger dimensions than the trunnions so that the closure top effectively contacts the trunnions only along the lines of intersection of the upwardly and downwardly converging walls above each bearing cavity,

the interiors of said bearing cavities being otherwise spaced from said trunnions,

two aligned bearing cavities located above and on opposite sides of said opening, each bearing cavity being partially bounded at its top by two upwardly converging walls, a pair of slots formed in said closure top, one above each bearing cavity, each slot being defined by a pair of downwardly converging walls each of which intersects one of the upwardly converging walls of the associated bearing cavity,

said closure top and said spout member applying pressures to the portions of said closure top adjacent said opening which are equal on both sides of an imaginary plane passing through the axis of the opening and the axes of said portion and the trunnions,

said closure top and said spout member also applying pressures to the portions of said closure top adjacent said opening which are equal on both sides of an imaginary plane passing perpendicular to the axes of the trunnions and said portion through the center of said opening, and

said sealing ring applying a force to said spout member so as to bias said spout member so that said trunnions are in contact with said lines of intersection.

2. A dispensing closure as defined in claim **1** wherein:

said trunnions are cylinders with flat sides extending their lengths, which sides are not engaged by said lines of intersection during the use of said dispensing closure.

References Cited

UNITED STATES PATENTS

2,828,895	4/1958	Mart	222—536
3,265,256	8/1966	Chaber et al.	222—534
3,283,967	11/1966	Akers	222—536

ROBERT B. REEVES, *Primary Examiner.*

FREDERICK R. HANDREN, *Assistant Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,430,825 March 4, 1969

Woodrow S. Wilson

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 5, line 14, beginning with "1. A dispensing" cancel all to and including "lines of intersection." in line 27, column 6, and insert instead:

1. A dispensing closure of the rotatable-spout type having two parts adapted to be snapped together, said closure having:

a closure top of a material permitting the parts of the closure to be snapped together, an opening leading into the closure top, a resilient sealing ring located around said opening, two aligned bearing cavities located above and on opposite sides of said opening, each bearing cavity being partially bounded at its top by two upwardly converging walls, a pair of slots formed in said closure top, one above each bearing cavity, each slot being defined by a pair of downwardly converging walls each of which intersects one of the upwardly converging walls of the associated bearing cavity;

a spout member having a base, a portion of which is shaped as a surface of revolution, two aligned trunnions extending from the base, the axes of the trunnions being aligned with the axis of said portion, a spout extending from said base and a passage extending from said portion through the spout;

each of the trunnions being accommodated by one of the bearing cavities so that said portion engages portions of the closure top adjacent said opening, in such a manner that the spout member may be rotated between a closed position in which said portion seals off the opening and an open position in which the passage is in communication with the opening;

wherein the improvement comprises:

said bearing cavities of larger dimensions than the trunnions so that the closure top effectively contacts the trunnions only along the lines of intersection of the upwardly and downwardly converging walls above each bearing cavity,

the interiors of said bearing cavities being otherwise spaced from said trunnions

said closure top and said spout member applying pressures to the portions of said closure top adjacent said opening which are equal on both sides of an imaginary plane passing through the axis of the opening and the axes of said portion and the trunnions,

said closure top and said spout member also applying pressures to the portions of said closure top adjacent said opening which are equal on both sides of an imaginary plane passing perpendicular to the axes of the trunnions and said portion through the center of said opening, and

said sealing ring applying a force to said spout member so as to bias said spout member so that said trunnions are in contact with said lines of intersection.

Signed and sealed this 31st day of March 1970.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents