May 28, 1957 W. S. WILSON ET AL 2,793,795

DISPENSING CLOSURES

Filed Dec. 11, 1956

FIG. 1.

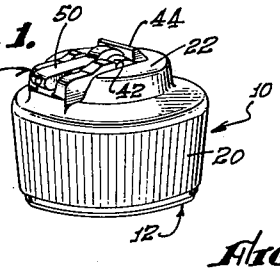


FIG. 3.

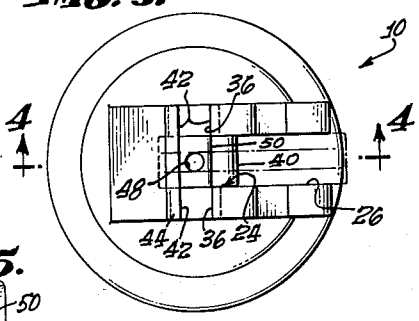


FIG. 5.

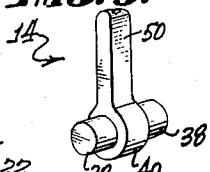


FIG. 2.

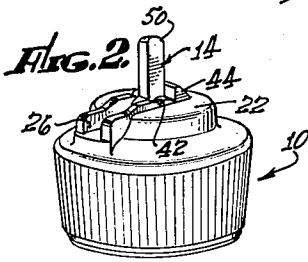


FIG. 4.

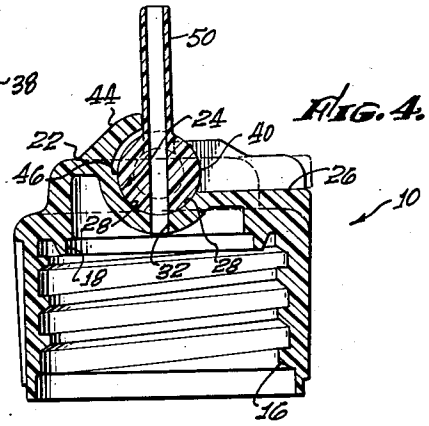


FIG. 6.

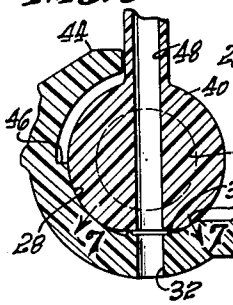


FIG. 7.

FIG. 8.

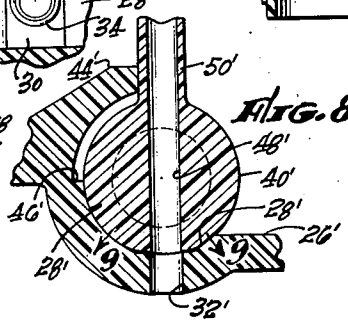


FIG. 12.

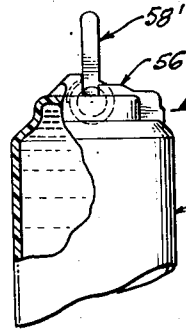


FIG. 10.

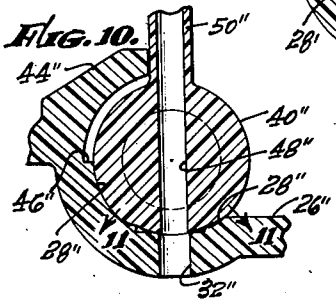


FIG. 11.

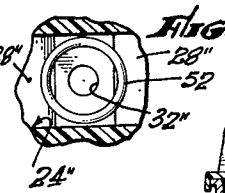


FIG. 13.

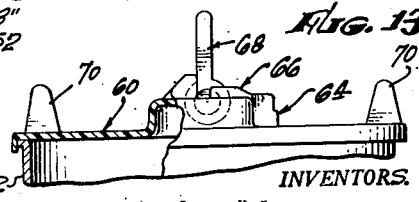
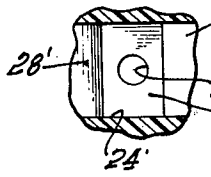


FIG. 9.



INVENTORS.

DELL M. MALICK,
WOODROW S. WILSON,
MORTON A. CARABEL,

By

ATTORNEY.

United States Patent Office 2,793,795 Patented May 28, 1957

2,793,795

DISPENSING CLOSURES

Woodrow S. Wilson, Pasadena, Morton A. Carabel, Los Angeles, and Dell M. Malick, Whittier, Calif.

Application December 11, 1956, Serial No. 627,677

5 Claims. (Cl. 222—536)

This invention relates to new and improved dispensing closures. This application is a continuation-in-part of the co-pending application Serial No. 555,491 filed December 27, 1955 entitled container structures.

The term "dispensing closures" is commonly employed at the present time to designate closures for containers, which closures are capable of being manipulated so that the contents of a container sealed by one of these closures may be removed without removing the particular closure involved from the container. Literally hundreds of differently constructed dispensing closures have been developed; some of these closures are specifically designed so as to be formed integrally with a container. More frequently, however, dispensing closures have been designed so as to be secured to a container in order to cover an opening.

Practically all of the prior dispensing closures have been designed in such a manner that the principal parts of these structures are formed of rigid materials such as, for example, various metals, thermosetting plastics or the like. Further, all prior dispensing closures formed with parts of such rigid materials are manufactured so as to include at least one part which may be moved with respect to another part in order to obtain a sealing action. Unfortunately, rigid materials cannot normally be manufactured by large scale mass production techniques at a comparatively low cost to the tolerances necessary so that satisfactory seals against leakage can be obtained in such dispensing closures. In order to remedy this difficulty, many of the prior dispensing closure structures utilizing rigid parts have been designed so as to include leather, rubber or the like sealing members. Such separate sealing means add to the cost of dispensing closures and increase the complexity of such devices.

In order to provide dispensing closures in which a satisfactory seal may be obtained without using extra parts, such as sealing means, a number of dispensing closures have been designed in which one or more of the principal parts involved are created from a somewhat resilient material. With this type of construction it is intended that a part in a dispensing closure serves two or more functions simultaneously. Dispensing closures utilizing resilient parts serving two or more purposes simultaneously have been widely utilized in spite of the fact that they suffer from certain limitations or drawbacks affecting their commercial acceptability.

To understand many of these limitations and drawbacks it is necessary to understand something of the unique physical and other related properties of resilient materials such as are employed in dispensing closures of this type. Normally polyethylene is utilized in this type of construction since this polymer is relatively inexpensive and is capable of being easily formed to virtually any desired shape at a minimum cost by simple injection molding techniques. Although polyethylene is the principal polymer utilized, a number of related thermoplastic resins can also be employed; thus, virtually any polymer of the polyolefin class or any vinyl composition can be used. Such thermoplastic resins generally tend to change shape and form when subjected to tension or compression for a prolonged period; also they tend to shrink as a result of cooling after being molded. As a result of these and other related factors the manufacture of dispensing closures out of thermoplastic resins has almost become more of an art than an engineering science. The prior structures utilizing such thermoplastic resins appear to have been designed so as to take into consideration only certain of the inherent properties of these thermoplastic resins.

This can be illustrated by specifically discussing one type of common dispensing closure used with containers for lighter fluid and the like at the present time. This type of dispensing closure structure is designed so as to include a cap having a centrally located cavity formed therein, and a hole leading from the bottom of this cavity through the cap. The cavity in this type of structure is important; it corresponds in shape to more than half of a surface revolution so that a spout member having corresponding configuration may be snapped into it and held against the hole referred to in order to obtain a seal at all times. In order to obtain a satisfactory seal with this type of prior construction it is necessary to make the internal cavity comparatively large so that sufficient holding area is available to hold the spout against the hole so as to prevent leakage. Since a comparatively large area is required to develop sufficient force for this purpose, and since sufficient space is required so that a spout may be snapped into place, a dispensing closure formed in this manner is comparatively large. These size requirements result in an ungainly appearing structure which cannot be satisfactorily stacked and which extends from a container a comparatively large distance. Also, because of the size of the parts involved in this type of construction, the shrinkage in the individual parts after they have been molded tends to be very important, and makes it difficult to satisfactorily design a structure of the category.

It is a broad object of the present invention to provide new and improved dispensing closures which overcome the principal limitations and disadvantages of the above noted and other related prior dispensing closures. A more specific object of the invention is to provide dispensing closures in which one or more of the operative parts are formed out of resilient, resinous materials. Another related object of the invention is to provide dispensing closures in which the individual parts utilize comparatively thin or small wall and body sections so as to make allowances for substantially the shrinkage and other physical properties of polyethylene and other related thermoplastics. A still further object of the invention is to provide dispensing closures having a neat, flat-like appearance which may be stacked with a minimum of difficulty. Another object of the invention is to provide dispensing closures of the class indicated in the preceding discussion incorporating various novel sealing means as will hereinafter be described in more detail.

Because of the nature of this invention still further objects and advantages of the invention itself will be fully apparent to those skilled in the art to which the invention pertains from a detailed consideration of the remainder of this description, including the appended claims and the accompanying drawing in which:

Fig. 1 is a perspective view of a dispensing closure of this invention in a closed position;

Fig. 2 is a perspective view of the dispensing closure shown in Fig. 1 in an open position;

Fig. 3 is a top elevational view of the dispensing closure shown in Fig. 2;

Fig. 4 is a cross-sectional view taken at line 4—4 of Fig. 3;

Fig. 5 is a perspective view of a spout employed with the closure illustrated in the preceding figures;

Fig. 6 is a partial enlarged cross-sectional view taken along the same plane as Fig. 4 showing a part of the sealing means employed;

Fig. 7 is a cross-sectional view taken at line 7—7 of Fig. 6;

Fig. 8 is a partial enlarged cross-sectional view similar to Fig. 6 illustrating a modified sealing structure of the invention;

Fig. 9 is a cross-sectional view taken at line 9—9 of Fig. 8;

Fig. 10 is a partial cross-sectional view similar to Fig. 6 showing a second modified sealing structure of this invention;

Fig. 11 is a cross-sectional view taken at line 11—11 of Fig. 10; and

Figs. 12 and 13 are side elevational views, partially in section, showing the use of dispensing closures of the present invention with different containers.

In all figures of the drawing like numerals are used to designate like parts wherever convenient for purposes of illustration and explanation. It is to be understood that the accompanying drawing is not to be taken as limiting this invention in any respect. Those skilled in the art to which this invention pertains will realize that it is possible to design a wide variety of differently appearing dispensing closure utilizing the essential features of this invention.

As an aid to understand this invention it may be stated in essentially summary form that it involves dispensing closures having two parts, at least one of which parts is formed of a somewhat resilient material. The first of these parts may be formed integrally with the wall of a container or as a separate cap. In either case it is manufactured so as to include a central cavity from the sides of which project what may be termed bearing openings. The second of these parts is manufactured so as to include a body section which is adapted to be rotatably held within the central cavity by means of shafts which project from the sides of this body section so as to be held with the bearing openings. Within this construction an opening is provided so as to lead from the central cavity in the first part and a corresponding passage is provided in the second part; by rotating the second part this opening and this passage may be aligned with one another. The shafts employed serve to hold at all times the body section against the portions of the central cavity around this opening so as to form a seal in this area.

Because of the nature of this invention, it is best more fully explained by referring directly to the accompanying drawing. In Fig. 1 there is shown a dispensing closure **10** of the present invention which is formed so as to include a first member or cap **12** which is adapted to hold a second member or spout **14** by various means as will hereinafter be described. The cap **12** itself is preferably formed so as to include a conventional type of internally threaded cylindrical cavity **16** so that it may be readily attached to a container (not shown) in the obvious manner. If desired a small flange **18** may be located within the cavity **16** so as to act essentially as a sealing washer in forming a seal against the portion of the container upon which the cap **12** is mounted. It is frequently desired to provide the exterior **20** of the cap **12** with various serrations as shown in Figs. 1 and 2 of the drawing so as to improve the aesthetic appearance of the cap and so as to aid in attaching this cap to a container.

The construction of the top **22** of this cap **12** is important. As can be seen from an examination of Figs. 3 and 4 of the drawing, this top **22** is formed so as to have an internal cavity **24** from which there extends parallel to the top **22** a groove **26** leading to the edge of the cap **12** itself. The cavity **24** has two wall sections **28**, each of which extends completely across the width of the cavity **24**, and is formed so as to have the shape of a small part of the same surface revolution; preferably this shape is that of a cylinder. These two sections **28** are connected to one another by means of a flat section **30** which also extends completely across the width of the cavity **24**. Within the center of this flat section **30** there is located a small hole or opening **32** which extends from the cavity **24** into the interior portion of the cap **12**; around this opening **32** there is located a comparatively small circular flange **34** having a rounded cross-sectional configuration.

From the sides of the cavity **24** there extend circular bearing openings **36**. The axes of these bearing openings **36** are aligned with one another and with the axes of the cylindrical wall sections **28** in such a manner that small shaft-like extensions **38** upon the spout **14** may be secured within these bearing openings so that the entire spout may be held by them when it is rotated from either a closed position shown in Fig. 1 to an open position shown in Fig. 2 or back again. During such rotation a central body section **40** upon the spout **14** having an external surface corresponding to at least a partial surface of revolution is rotated so that this body section **40** engages with the wall sections **28**, the circular flange **34**, and the flat section **30** so as to form a double seal around the opening **32**. With the closure **10** the surface of the body section **40** preferably has the cylindrical shape. This double seal is a result of the flat section **30** being engaged by the body section **40**, and is the result of circular flange **34** being engaged by the body section **40**. The pressure necessary to obtain a seal at these points is obtained by means of the shafts **38** being securely held within the bearing openings **36** with respect to the cap **12**.

An important feature of the preferred construction of this invention lies in the fact that small slots **42** extending the length of the bearing openings **36** are formed within the top **22** of the cap **12**. Preferably the entrance walls to these slots **42** are curved as indicated in the drawing so that the spout **14** may be securely snapped into position by temporary deformation of the portions of the top **22** adjacent to these slots **42**. It will be realized that during such an operation that only the shafts **38** are, in effect, directly attached to the cap **12**. It is not necessary with the dispensing closure **10** that the sides of the cavity **22** engage the body section **40** of the spout **14**. Part of this body section does engage only the bottom side of the cavity **24** as indicated in the preceding; such engagement does not serve to hold the spout **14** into position.

Because of the precise shaft and bearing opening structure involved with this construction, it is possible to adjust the lengths and diameters of the shafts **38** to virtually any desired extent so as to obtain sufficient holding area to obtain any necessary amount of pressure required to produce a seal by forcing and/or holding the body section **40** of the spout **14** against the wall and other parts of the cavity **24** within the cap **12**. This is quite advantageous from a commercial standpoint inasmuch as it means that it is comparatively easy to design a dispensing closure having a relatively flat top construction in which any required amount of pressure can be obtained. Further, because of the fact that the shafts **38** and the bearing openings **36** are, as shown, of a bilaterally symmetrical construction the force applied to the body section **40** in order to obtain a seal is equally distributed within the cavity **24**. From an examination of the drawing it will be further seen that nowhere in this construction is a comparatively thick wall or body section utilized. Thick or large wall, or body sections will tend to distort as by shrinkage when formed from many resins, and such change in dimensions will, of course, affect the nature of the seal obtained in a dispensing closure.

In order to complete the dispensing closure **10** it is normally preferred to incorporate within this dispensing closure a comparatively small dust shield **44** which extends from the top **22** so as to cover a portion of the cavity **24** immediately above the body section **40**. This

dust shield serves to tend to prevent dust particles or the like from coming in contact with part of the surface of the body section **40**. Any dust particles or other contaminants getting to the body section **40** beneath the shield **44** will be wiped off of the surface of the body section by an end **46** of one of the wall sections **28** when the spout **14** is rotated. Those contaminants not removed by this end **46** in this manner will be removed through engagement of the circular flange **34**. Thus, the structure shown provides a double type of protection against the entrance of particles which would tend to destroy a seal within the dispensing closure **10**.

The dust shield **44** also serves essentially as a stop as illustrated in Figs. 2 and 4 of the drawing so as to limit the rotation of the spout **14** so as to guarantee that a passage **48** formed within the spout **14** so as to extend through the body section **40** and out through a projecting arm **50** is aligned with the opening **32** when the spout **14** is rotated to an open position. The arm **50** normally rests within the groove **26** when in a closed position as indicated in Fig. 1. When the arm **50** is located within this closed position, it does not extend from the cap **12** to any material extent. Hence, it cannot be damaged by engagement during handling, stacking and the like. Further, it does not interfere with such operations since it lies essentially within the confines of the top **22**.

It is possible to modify the dispensing closure **10** in various manners as indicated in Fig. 8 through 11 of the drawing so as to utilize other sealing means than are specifically indicated in Figs. 1 through 7. In Figs. 8 and 9 of the drawing there is shown a structure which is identical with that described in the preceding figures except for the fact that the circular flange **34** previously described is omitted. The fact that a construction of this category is operative is considered to demonstrate the fact that a double seal is obtained in the preferred construction of the dispensing closure, **10**. A double seal is normally preferred with the invention in order to prevent any possibility of leakage. In Figs. 10 and 11 of the drawing, there is shown a second modified construction which is identical with the construction of the dispensing closure **10** except for the fact that the circular flange **34** is omitted and is replaced by another circular flange or bead **52** which extends around the opening **32''**, on to the portions of the wall sections **28''** adjacent to a flat section **30''**. The mechanism by which this construction operates is essentially identical to the mechanism by which a seal is obtained in the dispensing closure **10**; in it both the flanges **34** and the flat section **30''** act in forming a seal.

In order for a dispensing closure of the present invention to be operative, either the cap **12** or the spout **14** employed must be formed out of a material having some degree of resiliency. Presently, both of the parts of dispensing closures such as the dispensing closure **10** are being commercially manufactured out of polyethylene. These can, however, be also manufactured out of various related thermoplastic materials such as any related polyolefins, polyvinyl compositions or the like. All such resins possess some degree of resiliency and are capable of some deformation at the part of the dispensing closure of the invention where a seal is created. Such deformation is necessary from a practical standpoint, although theoretically no deformation is required, in forming a seal. With the preferred construction of the invention both the cap **12** and the spout **14** are preferably formed of such resilient materials so that both the surface of the body section **40** and the corresponding adjacent parts of the cap **12** and the opening **32** give or are deformed slightly during use of the dispensing closure **10**. This is believed to promote an effective sealing action. It is at least theoretically possible to obtain an operative structure in which either the cap **12** or the spout **14** is formed out of more rigid material such as, for example, polystyrene.

If desired, a dispensing closure of the invention may be formed out of any of these materials during the manufacture of a container so that what corresponds to the cap **12** previously described is formed integrally with the wall of a container. This is illustrated in Fig. 12 of the drawings where there is shown a container **54** having a top **56** formed as the top **22**, so as to hold a spout **58** corresponding to the spout **14**. If desired a dispensing closure of this invention can be formed as an integral part of a comparatively large snap-on type of closure. Such a closure **60** is indicated in Fig. 13 of the drawing upon a wide mouth container **62**. This closure **60** has a central boss-like section **64** carrying a top **66** such as the top **22**. Within the top **66** there is located a spout **68** which is substantially identical to the spout **14**. As an aid to stacking there are provided on the closures **60** a series of bumps **70** designed to engage the bottom of an adjacent container (not shown).

It will be obvious to those skilled in the art to which this invention pertains that a number of modifications may be made in the structures shown and described, and that dispensing closures as herein indicated can even be formed integrally with the wall sections of various types of containers so as to be completely disposed adjacent to or beneath the surfaces of such containers. In this connection it is to be noted that the term "cavity" employed herein is not to be considered as limiting the invention. From an analysis of the aforegoing, it will be apparent that an operative structure can be created in which the wall sections **28** are omitted and in which the body section **40** of the spout **14** is suspended in a continuous groove or essentially "in the open" between separate bearing means so as to bear against sealing means surrounding an opening as herein described. Such a groove or essentially open space is essentially a cavity, and hence is to be considered as being defined by this term in the accompanying claims. Because of the fact that this invention is capable of a great many modifications, it is to be considered as being limited only by the appended claims, and these claims are to be interpreted in the light of the doctrine of equivalents wherever the same is applicable. Wherever the term "means" is employed in these claims, this term is to be interpreted as defining the corresponding structure set forth in this specification or the equivalent of the same.

We claim:

1. A dispensing closure having two parts, each of said parts being formed of a resilient material, the first of said parts being formed so as to include a cavity open at the top of said first part, said cavity having sides, a flat bottom and cylindrical wall sections extending from opposite sides of said flat bottom, means defining an opening leading to the center of said flat bottom means defining aligned bearing openings leading from said sides, slots extending the length of said bearing openings and leading into said bearing openings from the top of said first part, and a groove open at the top of said first part leading from said cavity, the other of said parts being formed so as to include a body section located within said cavity, aligned shafts extending from said body section into said bearing openings, said shafts being adapted to be snapped through said slots into said bearing openings by temporary deformation of said first part, said shafts being held by engagement with the walls of said bearing openings so as to rotatably mount said other part with said body section against said flat bottom so as to cause deformation of said flat bottom, the portion of said body section adapted to engage said flat bottom during rotation of said other part being of a cylindrical shape, said other part also including an arm extending from said body section and a passage extending through said body section and said arm, said other part being adapted to be rotated so as to align said passage with said opening, said arm being adapted to be positioned within said groove in one position of said other part.

2. A dispensing closure as defined in claim 1 including a circular flange formed around said opening on said flat bottom, said flange being engaged by said body section so as to be deformed thereby.

3. A dispensing closure as defined in claim 1 including a circular flange found in said cavity so as to extend across said flat bottom and across the adjacent portion of said cylindrical wall sections, said opening being in the center of said flange, said flange being engaged by said body section so as to be deformed thereby.

4. A dispensing closure as defined in claim 1 including combined dust shield and stop means formed on said first part so as to extend over part of said cavity, said combined means being adapted to limit rotation of said other part by engagement with said arm.

5. A dispensing closure having two parts, at least one of said parts being formed of resilient material, the first of said parts being formed so as to include a top, means defining aligned bearing openings formed on said top, said bearing openings being spaced from one another, means defining an opening leading through said top from

the space between said bearing openings, and sealing means located around said opening, the other of said parts being formed so as to include a body section located between said bearing openings, aligned shaft means extending from said body section into said bearing openings so as to be rotatably held thereby, and a passage extending through said body section, said body section being held by said shaft means in engagement with said sealing means and being capable of rotation so as to place said passage in communication with said opening.

References Cited in the file of this patent

UNITED STATES PATENTS

1,283,906	Riebel	Nov. 5, 1918
1,726,315	Rose	Aug. 27, 1929
2,124,385	Gauss	July 19, 1938
2,701,668	Zayan	Feb. 8, 1955
2,717,726	Mart	Sept. 13, 1955
2,727,658	Mart	Dec. 20, 1955