Dec. 8, 1964 T. J. HEALY 3,160,303

CONTAINER CLOSURE

Filed Oct. 16, 1962

3 Sheets-Sheet 1

FIG. 1

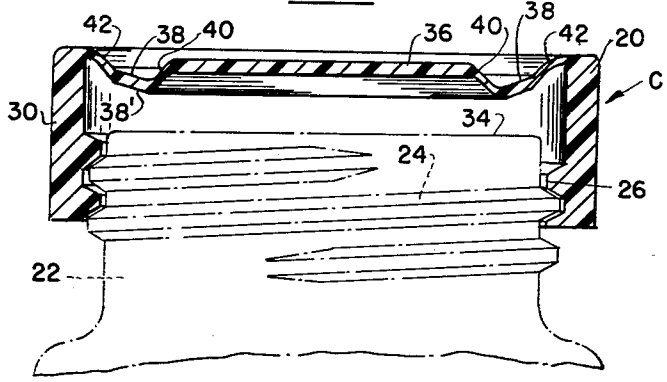


FIG. 2

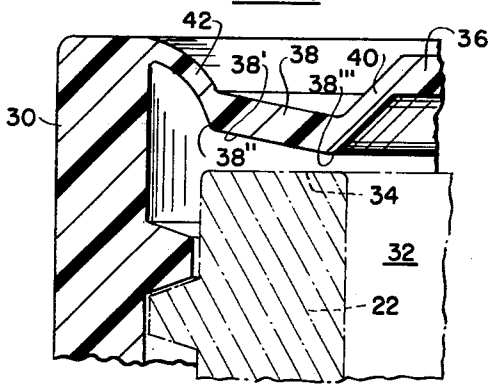


FIG. 3

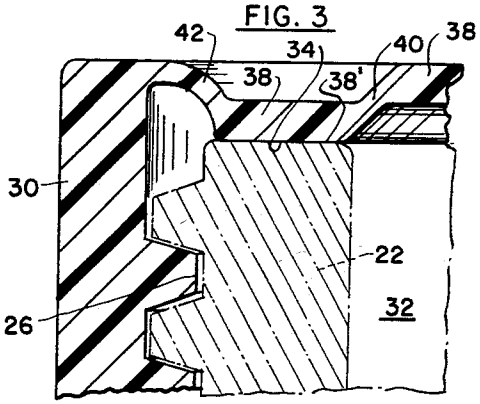


FIG. 4

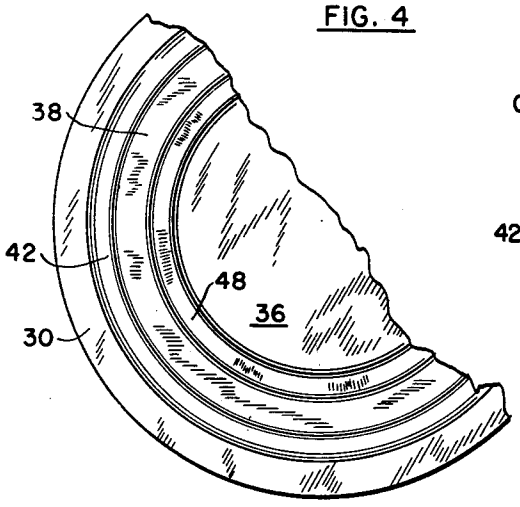
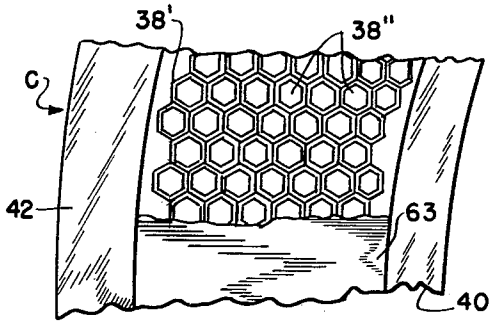


FIG. 5



INVENTOR
THOMAS J. HEALY

BY

ATTORNEY

Dec. 8, 1964 T. J. HEALY 3,160,303

CONTAINER CLOSURE

Filed Oct. 16, 1962 3 Sheets-Sheet 2

FIG. 6

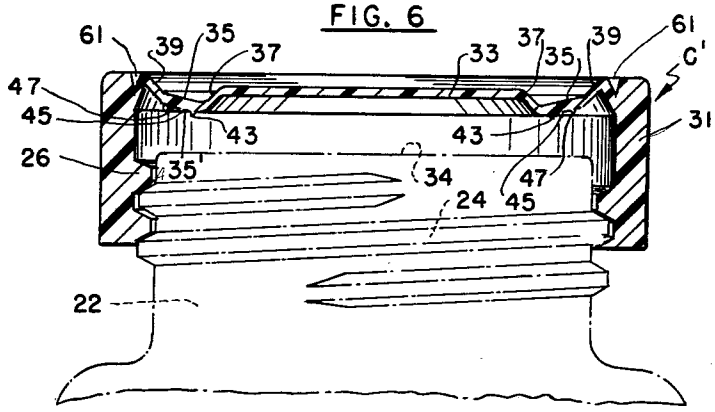


FIG. 7

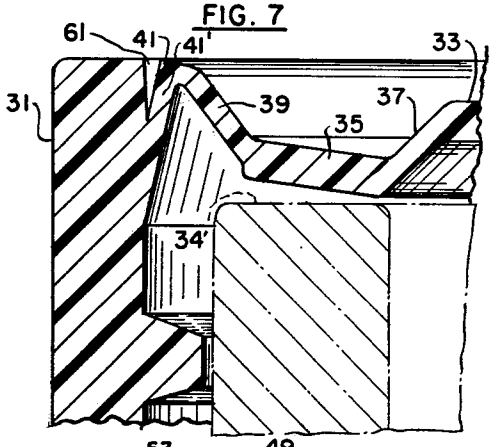


FIG. 8

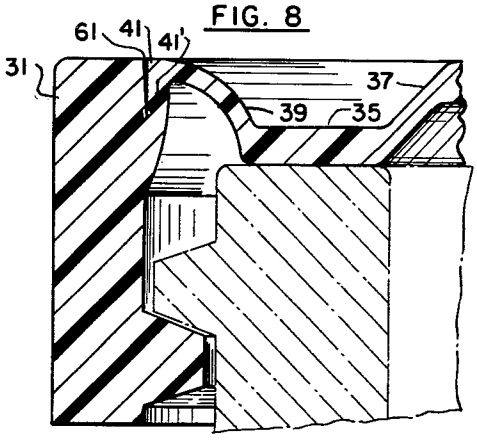


FIG. 9

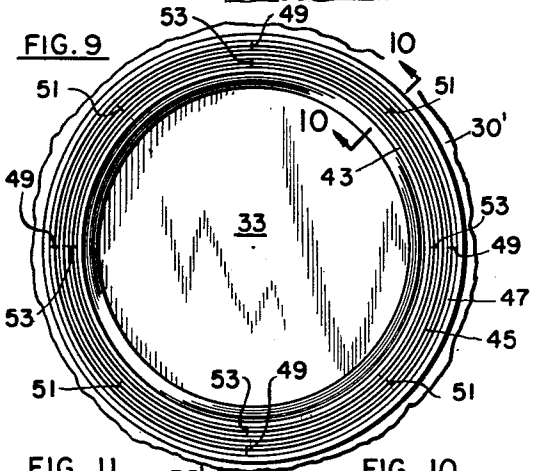


FIG. 12

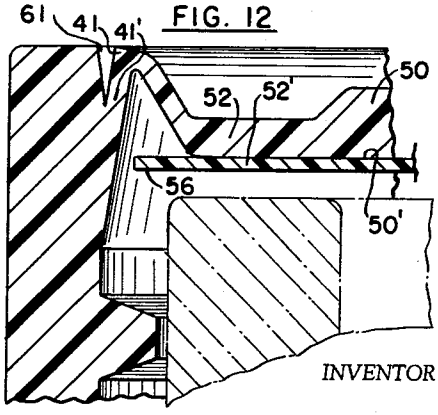


FIG. 11

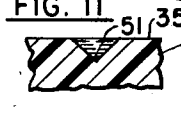
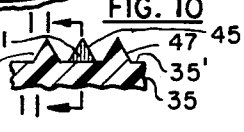


FIG. 10



INVENTOR

THOMAS J. HEALY

BY

ATTORNEY

Dec. 8, 1964 T. J. HEALY 3,160,303

CONTAINER CLOSURE

Filed Oct. 16, 1962 3 Sheets-Sheet 3

FIG. 13

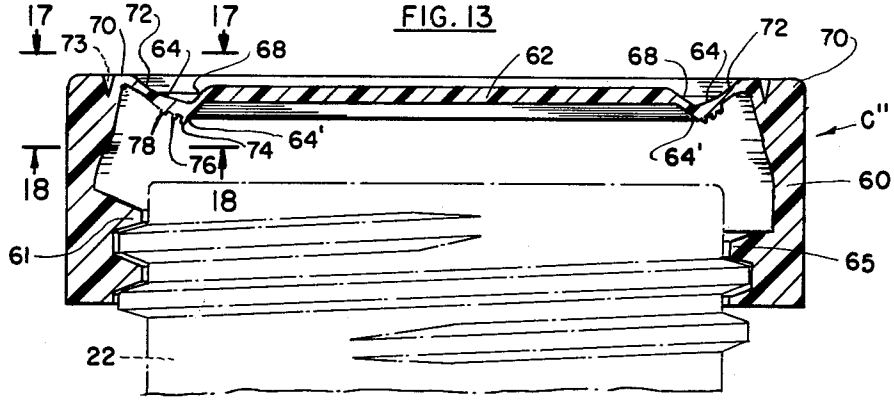


FIG. 14

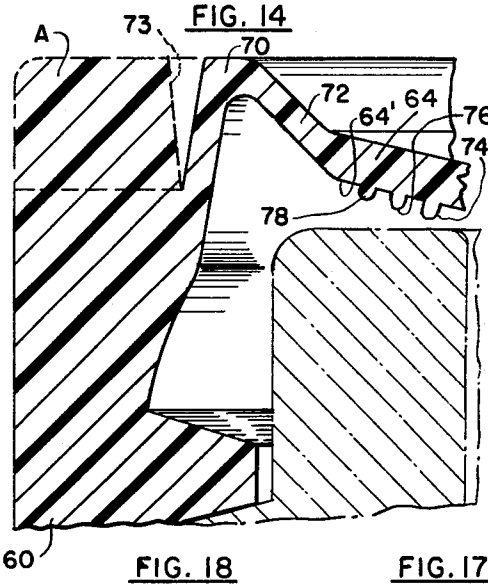


FIG. 15

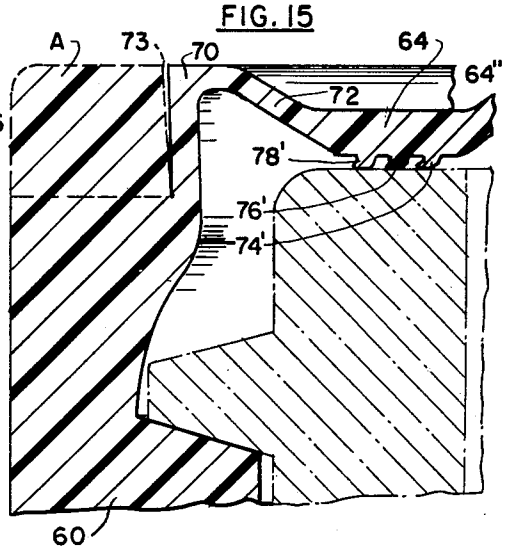


FIG. 18

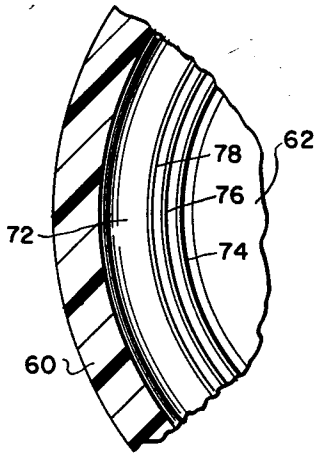


FIG. 17

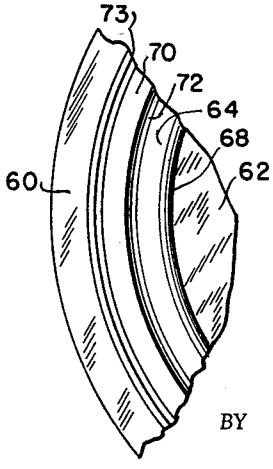
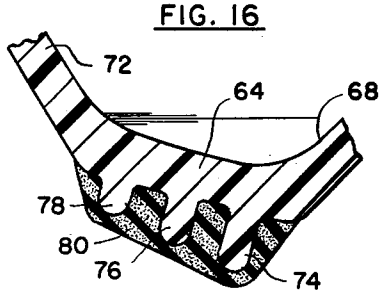


FIG. 16



INVENTOR

THOMAS J. HEALY

BY

ATTORNEY

United States Patent Office 3,160,303 Patented Dec. 8, 1964

3,160,303

CONTAINER CLOSURE

Thomas J. Healy, Baltimore, Md., assignor to The Poly-Seal Corporation, New York, N.Y., a corporation of New York

Filed Oct. 16, 1962, Ser. No. 230,824
3 Claims. (Cl. 215—41)

The present invention relates to an improved plastic closure for both rigid and semi-rigid containers, including collapsible tubes.

The primary object of the invention is to provide a closure having certain improved features and which is designed for unitary molding. The closure is so constructed as to set up one or more very definite and efficient hinge stress areas in certain parts of the closure which are adapted to supply a maximum of movement in reaction to the movement of the sealing area of the closure relative to the cylindrical side portion of the container when the seat area of the container has been moved by pressure exerted between the seat area of the container and the seat engaging area of the closure when the closure is screwed, or clipped tightly upon the container. The number and type of hinge stress areas depend upon the size of the opening to be closed, materials being carried in the container and whether the sealing is a straight contact seal or a vacuum seal. The closure may be used with or without gaskets, or liners as they are sometimes called, depending upon the above circumstances.

Plastic closures, of which there are many, have in recent years created favorable acceptance in the trade; however, these materials have some drawbacks which have limited their usefulness. Some of these limitations being environmental stress cracking and back-offs. These conditions occur when the molding material is subjected to an unrelieved and continuous stress load for a long period of time. The effect of the continuing load is to cause a stretching of the molecular chain as well as a re-orienting of the molecular structure of the plastic material. This results in creep or cold flow of the thermoplastic material and a subsequent loosening or back-off of the sealing surface from the seat of the container and it is a further object of the improved closure to provide a structure that will minimize this environmental stress cracking, and back-off between the container seat and the sealing area of the closure.

Containers whether rigid or semi-rigid have a substantially rigid seat and are not given to conforming with the closure. This is particularly true in glass and similar materials. Therefore, the closure must take care of certain irregularities that occur in the container seat. Again, when containers are provided with a threaded neck for receiving a closure having an internally threaded side wall, there is normally provided a certain amount of play or tolerance between the threads carried on the container and the closure. If this play is too great, the threads on the closure may engage more of the thread on one side of the container than it does no the opposite side. This will result in a slight cocking of the closure on the container and likewise a cocking of the seat engaging area carried by the closure. If the closure is of rigid construction, this will cause the sealing between the seat of the container and the sealing area of the closure to be held at different pressures in different areas. That is, the sealing would be tighter on the side where the threads of the container and the closure are more engaged than they would be in the opposite side where the threads are less engaged. Therefore, it is a further object of the present closure to provide a structure that will allow for a greater amount of angular adjustment of the top relative to the side wall, in that the stress hinge areas will allow the side of the seat engaging area having the greater

pressure to move upwardly and the opposite side of the closure to become engaged with the container seat sufficiently top revent leakage.

While the principal objects have been set forth, other objects, uses and advantages may be apparent to those skilled in the art; however, in general, the invention consists in its novel construction and the arrangement of the several parts as described in detail in the specifications to follow, and illustrated in the accompanying drawings, in which:

FIGURE 1 is a vertical sectional view of the closure illustrating its position on a container.

FIGURE 2 is an enlarged fragmentary sectional view of the closure similar to FIGURE 1 showing the closure in a position on the container with its sealing area out of sealing engagement with the container seat.

FIGURE 3 is a fragmentary sectional view similar to that shown in FIGURE 2 showing the closure in sealing relationship with the container seat.

FIGURE 4 is a fragmentary top plan view of the closure.

FIGURE 5 is a fragmentary view of the seat engaging portion of the closure looking through the open end of the closure.

FIGURE 6 is a vertical sectional view of a modified form of the closure similar to FIGURE 1.

FIGURE 7 is an enlarged fragmentary sectional view of the modified form shown in FIGURE 6 showing the sealing area out of sealing engagement with the container seat.

FIGURE 8 is a fragmentary sectional view similar to FIGURE 7 showing the closure in sealed relationship with the container seat.

FIGURE 9 is a view of the sealing surface of the seat engaging portion of the closure as illustrated in FIGURE 6.

FIGURE 10 is a fragmentary sectional view taken on line 10—10 of FIGURE 9.

FIGURE 11 is a fragmentary sectional view taken on the line 11—11 of FIGURE 10.

FIGURE 12 is a vertical fragmentary sectional view of a still further modified form of the closure.

FIGURE 13 is a vertical sectional view of the closure similar to that shown in FIGURES 1 and 6 of a still further modified form.

FIGURE 14 is an enlarged fragmentary sectional view of the closure of the form shown in FIGURE 13 showing the sealing area out of sealing engagement with the container seat.

FIGURE 15 is an enlarged sectional view similar to that shown in FIGURE 14 showing the closure in sealed engagement with the container seat.

FIGURE 16 is an enlarged fragmentary modified sectional view of the seat engaging area 64 shown in FIGURE 14.

FIGURE 17 is a partial top plan view of the closure as shown in FIGURE 13.

FIGURE 18 is a fragmentary partial view of the closure shown in FIGURES 13 to 15, showing the seat engaging area looking into the open end of the closure.

Referring to FIGURES 1 to 6, any one of the closures C, C′ and C″ is appliable to a neck of a container 22. The neck is provided with a thread 24, or other means, for engaging a corresponding means carried by the closures, and is adapted to hold the closure downwardly upon the neck. While threads have been shown as a holding means between the container and the closure, other conventional means may be used.

The closure is of unitary construction and is formed by a single molding operation.

Referring more particularly to FIGURES 1 to 4, the closure is provided with a side portion 30, having threads

26 for engaging similar threads 24 carried on the neck of the container. The neck is provided with an opening 32, and about the outer end of the opening is a seat 34.

The closure is further provided with a top formed integral with the side wall and above the threads 26. The top is provided with a substantially rigid central portion 36 and a substantially rigid seat engaging portion 38. The seat engaging portion is connected to the central portion by a resilient portion 40 and to the side wall by a web like resilient portion 42. This portion 42 is in the form of frusto-conical cone which is flared upwardly and outwardly at the top. The seat engaging surface 38' is formed at an angle to a horizontal plane passing through the outer edge 3''' thereof, as best shown in FIGURE 2. The seat engaging portion 38 is adapted to take a horizontal position when drawn in sealed relationship with the horizontal seat 34, as shown in FIGURE 3. The seat engaging surface 38' may be provided with a plurality of recessed configurations 38'' which may function as small confined areas over the container seat to form a more conformable surface. The surface area 38' may also be covered with a flowed-on gasket 63 wherein the recesses will trap and hold the gasket in position thereon.

In operation, the closure C, as illustrated, is screwed downwardly on the neck of the container by the cooperation of the threads 24 and 26. As the closure is moved downardly on the neck, the edge portion 38''' of the seat engaging portion 38' will first come in contact with the seat 34. By continuing the downward movement of the closure the edge 38''' will be moved upwardly until the entire surface 38' comes in contact with the seat 34. By continuing slightly further the downward movement of the closure, the elastic portion 42 will be deformed to set up a stress area in this web-like section to hold the seat engaging portion downwardly toward the container seat. Likewise, the portion 40 will also be deformed to set up a stress area and will also operate to hold the seat engaging area 38 in contact with the seat. These stress areas are adapted to move the seat engaging portion downwardly in contact with the seat to offset any setting or stretching of the material which is prevalent in solidly constructed closures.

Referring to FIGURES 6 to 12, the side wall 31 is quite similar to the side wall 30 in FIGURE 1. The top is also of substantially the same construction as that shown in FIGURES 1 to 3, such as a substantially rigid top portion 33, a resilient portion 37, a seat engaging portion 35 and a resilient web-like portion 39. This modified form of closure includes a portion 41 separated from the remainder of the side wall portion by a recess or groove 61. This groove is preferably of cross-sectional V form extending about the upper surface and beyond the seat engaging area of the closure. However, this, or another type groove, may be positioned at any convenient place in the side wall where a portion of the side wall would act as a stress hinge to act to urge the seat engaging area toward the container seat when in sealed engagement therewith.

Having the elastic web extending upwardly and outwardly and connected with the side wall, or an element carried by the side wall, provides a diaphragm action for the top including the seal engaging area.

This construction is provided to set up a stress hinge particularly in the area 41' of the member 41 when the seat engaging portion 35 is moved upwardly by the container seat when the closure is applied under pressure to the container. FIGURE 7 shows the closure in position on the neck of the container and out of contact with the seat 34. In FIGURE 8 the closure is shown in sealed engagement with the seat. It will be noted that the seat 34 moves the seat engaging area of the top slightly upward relative to the side wall 31. By doing this the portion 41 is moved outwardly and at the same time its diameter is slightly increased. The area 41 is bent to form a stress area for urging the seat contacting area downwardly upon the container seat. At the same time the web portion 39 is also bowed, as shown in FIGURE 8. This also provides a stress area for urging the seat engaging member 35 downwardly upon the seat. In addition to the stress areas 39 and 41' there is also a stress area set up on the area 37, that is, between the seat engaging portion 35 and the rigid top area 33 when the portion 35 is moved to a horizontal plane when in sealing engagement with the container seat 34. The seat engaging surface 35' may be provided with a plurality of rings 43, 45 and 47 extending outwardly from the bottom of the surface 35'. These rings are spaced apart to provide a groove therebetween to first engage the seat 34 for aiding in creating a seal between the closure and the seat. It is preferable to have a number of these rings such as shown at 43, 45, and 47 in FIGURE 9.

In some instances there is created with certain products a gas pressure which is not satisfactory, or safe, to be carried in the container, and for this purpose these rings are provided with openings through their walls from one groove to the other and in spaced relation to each other. For example, in the rings 43 there are provided openings 53, and in rings 45 there are provided openings 51, and in rings 47 there are openings 46. These are spaced from each other in order that when gas is permitted through extension 43 it must travel around in the groove between the rings for some distance before it passes through rings 45 to the next groove and about the second groove and finally out to the atmosphere through the opening 49 in the ring 47.

Referring to the form of the invention shown in FIGURE 12, the central portion 50 of the top and the seat engaging area 52 are substantially rigidly connected and the inner surface 52' of the portion 52 and the inner surface 50' are preferably in the same plane. This form is particularly adapted for use with a gasket 56, if one is desired.

Referring to FIGURES 13 to 18, the closure is substantially the same as that shown in FIGURES 6 to 12, the modification being in the rings on the contacting face of the seat engaging portion of the closure. The closure "C" comprises a side portion 60 having a substantial rigid central portion 62 and a seat engaging area 64. The seat engaging area 64 is connected through an annular resilient area 68 to the central rigid portion 62, and to a resilient section 70 by a resilient web portion 72. The resilient section 70 has its lower portion connected with the wall 60 above the threads 65 and is positioned adjacent the inner and upper edge of the side wall. There is also a space or groove 73, preferably of V form, similar to the groove 61 shown in FIGURES 6, 7, 8, and 12.

The portion A of the side wall shown in dotted lines in FIGURES 14 and 15 may be eliminated, if desired. However, the groove or space has the advantage of gauging the tightness of the closure by the amount the opening is closed, as shown at 73 in FIGURE 15. This particular modification also shows rings 74, 76 and 78. These rings vary in height beginning with the shorter of the rings at the outside of the seat contacting surface 64' and gradually increasing in height as they extend toward the inner edge thereof. This construction is adapted to better seal against vacuum sealing but is not limited thereto. It has the advantage of creating more concentrated pressure adjacent the inner edge of the container seat and to form a valve type lip, as shown at 74', 76' and 78' in FIGURE 15, when the rings are brought forcibly into contact with the container seat.

FIGURE 16 shows a flowable gasket 80 about the rings 74, 76 and 78 which is substantially more pliable than the rings themselves. The rings retain the gasket and prevent it from being forced out of position when brought forcibly into contact with the seat. The seat engaging portion 64 is preferably of a more rigid construction than the elastic connecting portion 70 and 68. While the seat engaging area is shown in its preferred form of approximately one-

half of the thickness of the rigid central portion, it may be altered to suit the particular sealing conditions.

While the improved closure has been shown and described in several of its modified forms, it is not intended as a limitation as other forms of the invention may present themselves to those skilled in the art; therefore, the scope of the invention is best defined in the appended claims.

I claim:

1. A unitary closure for sealing an opening in a container in which the container is provided with a substantially flat annular seat about the opening having means adjacent the opening capable of engaging corresponding means on the closure for holding the closure in position thereon, comprising:

(*a*) a cylindrical side portion having means carried thereon for engaging the holding means carried on the container for holding the closure in sealed engagement with the seat;

(*b*) a continuous top portion formed integral with the side portion and positioned in a plane above the holding means carried by the side portion of the closure;

(*c*) the top having a substantially rigid center portion, a substantially rigid continuous annular seat engaging portion including an inner seat contacting surface extending about the central top portion engaging the annular seat about the container opening, and connected to the rigid center portion by an elastic flexible portion, the inner surface of the annular seat engaging portion being angled downwardly from a horizontal plane passing through the lower outer edge thereof, the said inner surface of the seat engaging portion being provided with a plurality of raised circular rings of different heights of rings progressively increasing in height in the direction of the center of the closure;

(*d*) a continuous resilient flexible hinge portion of less rigidity than the annular seat engaging portion extending upwardly and outwardly at an angle from the outer edge of the rigid seat engaging portion and out of position to contact the annular seat about the container opening, the flexibility of the hinge portion being of such resistance as to prevent leakage between the container seat and the seat engaging portion of the closure, the upper outer edge of the flexible hinge portion being connected to the cylindrical portion along a line which is in a plane above the plane of the seat engaging portion, the flexible hinge being moved upwardly forms a resilient stress area between the seat engaging portion and the cylindrical portion when the top portion is moved upwardly relative to the cylindrical portion;

whereby the seat engaging portion is urged downwardly and in sealed engagement with the seat about the container opening when the seat engaging area is moved upwardly by the container seat to place the flexible hinge under stress.

2. A unitary closure for sealing an opening in a container in which the container is provided with an annular seat about the opening having means adjacent the opening capable of engaging corresponding means on the closure for holding the closure in position thereon, comprising:

(*a*) a rigid cylindrical side portion having means carried thereon for engaging the holding means carried on the container for holding the closure in sealed engagement with the seat and having;

(*b*) an elastic side portion formed from the rigid side wall and spaced therefrom, the space between the side wall and the elastic portion being in the form of an annular groove for permitting movement of the said spaced portion to the extent of the width of the groove, said elastic side portion being positioned above the side wall portion carrying the holding means;

(*c*) a continuous top portion positioned in a plane above the holding means carried by the side portion of the closure;

(*d*) the top of the closure having a substantially rigid center and a continuous annular seat engaging area surrounding the center portion and joined integral therewith, a resilient flexible hinge portion, connecting the seat engaging area with the elastic portion carried by the side portion, the flexible hinge portion extending upwardly and outwardly from the outer edge of the seat engaging portion to the elastic portion carried by the rigid side portion, the upper edge of the flexible hinge portion being connected to the elastic side portion along a line in a plane above the plane of the attachment of the resilient side portion with the rigid side portion, the resilient side portion carried by the rigid side wall is flexed laterally when the flexible hinge is moved upwardly relative to the cylindrical side portion;

whereby the seat engaging portion is urged downwardly by the resilient hinge area and the elastic portion carried by the rigid side portion in sealed engagement with the seat about the container opening when the top has been moved upwardly by the container seat by the cooperation of the engaging means carried by the container and the cylindrical portion of the closure.

3. In a closure as claimed in claim 2 wherein the annular groove extending about the top of the closure between the resilient portion and the remaining portion of the side wall is of V form in cross section.

References Cited in the file of this patent

UNITED STATES PATENTS

2,689,665	Martin	Sept. 21, 1954
2,914,206	Lowen	Nov. 24, 1959

FOREIGN PATENTS

168,207	Australia	Mar. 17, 1954
552,737	Belgium	Dec. 15, 1956
782,574	Great Britain	Sept. 11, 1957
823,993	Germany	Dec. 6, 1951