

PATENT SPECIFICATION

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(54) PLUG CLOSURE FOR OPEN-MOUTHED CONTAINERS

(71) We, DART INDUSTRIES INC., a Corporation organised and existing under the Laws of the State of Delaware, United States of America, of 8480 Beverly Boulevard, Los Angeles, State of California 90054, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to container closures and to combinations of containers and said container closures in which the closures are formed from distortable materials. More particularly, the invention concerns distortable, reusable, preferably made from plastics material, container closures for open-mouthed containers.

According to the present invention there is provided a resilient distortable closure member for hermetically sealing an open-mouthed container when said closure is in use, which closure member comprises:

(a) a centre main wall including an area of corrugations radially extending from a central portion thereof to a periphery, such that upon application of pressure to said centre portion said corrugations tend to collapse upon one another and substantially uniformly displace said periphery until the closure member may be easily positioned on an open-mouthed container;

(b) an integral sealing means extending around said periphery of the centre main wall, which sealing means is displaceable in like manner with said periphery such that at least a portion of said sealing means is closely engageable with and sealable against the walls of an open-mouthed container, when the closure member is in use, due to the resilience of the

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closure member upon the discontinuance of applied pressure to said centre main wall;

(c) a closure top wall interconnected with said sealing means and said centre main wall, said closure top wall further including an integral and substantially centered upstanding bush-like guide; and

(d) an axially movable plunger positioned in said guide in such a manner that, when the closure member is in use, pressure applied thereto is transmitted to substantially the centre of said centre main wall.

As used herein the terms "corrugations" or "corrugated" are intended to cover true corrugations, flutes, pleats or folds.

Preferably said upstanding bush-like guide terminates at its upper extremity in a finger-grippable flange and said axially movable plunger is positioned in said guide in such a manner as to have a portion thereof exposed above said flange.

Preferably said plunger is secured to said centre main wall at substantially the centre thereof.

Advantageously the closure top wall and the integral sealing means include opposed locking means interconnectably overlapping to secure said top and main walls together.

The invention includes any combination of a closure member in accordance with the invention and an open-mouthed container.

The invention also includes a combination of an open-mouthed container and a closure member as described above in which said container includes a projecting wall construction forming the open-mouth thereof and including therein a pouring spout and venting slot approximately opposite one another, said projecting wall construction being such that said closure member is engageable with and sealable there-

against below said spout and slot and is engageable and sealable thereagainst with portions of said wall at positions proximate said spout and slot so that when the

5 closure member is engaged with said projecting wall in the latter mentioned positions, and when the combination is in use, the contents of the container may be easily poured therefrom.

10 Preferably said projecting wall also includes inwardly protruding means spaced from the upper edge of said projecting wall such that said portion of the sealing means is positionable therebetween, said protruding

15 means further providing a surface against which said closure member may be abutted and positioned to assure its proper placement within the container.

The invention also encompasses variable

20 construction parameters affecting the efficient operability of such closures. Therefore, the construction described in detail below has as its principal objectives to minimise both internal stresses within the

25 closure and the force required to assemble properly a closure and container, while at the same time to maximise the sealing pressure between the closure and container and the lateral contraction of the closure sealing

30 wall portion per unit of applied force. In these respects attention is directed to our copending application, No. 20829/71 (Serial No. 1352253), wherein a closure for sealing

35 open-mouthed containers is described which is of similar construction in some respects but makes no mention of the closure top wall, bush-like guide, and axially movable plunger of the present closure member.

A specific embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which:—

Figure 1 is a top view of a closure construction,

45 Figure 2 is an enlarged cross-section of the closure and a partial cross-section of a pitcher, the closure cross-section being taken along line 2-2 in Figure 3 and showing the closure in sealing relationship with

50 the container,

Figure 3 is a bottom view of the closure depicted in Figure 1,

Figure 4 is a partial cross-section of a typical closure and of another container,

55 and Figure 5 is a partial cross-section of a pitcher designed to accommodate the closure of this invention.

Referring now to Figures 1 to 4, it can be seen that a closure member 10 is composed of a plurality of separate parts which function together in the operation of the closure. These include a radially corrugated

65 centred substantially planar area 16 in the

centre and an upwardly extended side wall 26; a closure top wall 12 having an integral substantially central bush-like guide 13; and a plunger 15. Specifically, the corrugated areas are composed of a plurality of up-

70 standing tapered ridges 18, more fully described hereinafter, which extend from the substantially planar area 16 to terminate at the peripheral edge 24 of the centre main wall 14.

The closure centre main wall 14 is formed from a distortable thermoplastic, for example, low density polyethylene; however, high density polyethylene, polypropylene, polyolefin blends or similar materials, 80 even light gauge metals may be suitably employed. Likewise, the open-mouthed containers 20 (Figures 2 and 4) with which these closures are primarily intended for use, are also generally formed from the same or similar materials. It should be pointed out, however, that such closures may well be adapted for use with containers of a diversified range of materials such as glass or metal.

Upon continued reference to Figures 2 and 4, it can be seen that at the peripheral edge 24 of the centre main wall, there is an integral upwardly extended side wall 26. The outer face 28 of wall 26 is shaped for engagement with the inner area of a projecting wall 30 which forms the open-mouth in container or pitcher 20. This engagement, of course, should create a hermetic seal and thus produce a highly desirable 100 storage container especially suited for the storage of foodstuffs and/or liquids.

These closure embodiments include an outwardly protruding bead 32 which extends around the periphery of outer portion 28 of wall 26 which bead presses against the container walls in sealing relationship with them. Figure 2 further shows a circumferential ledge 34 which is intended to act as a bottom stop member for the closure 10. As is readily apparent, the ledge is produced by a downwardly directed radially and inwardly sloping portion 36 of the pitcher wall 21. This terminates after a relatively short inward progression and the normal inner wall contour is resumed. This ledge tends to assist the user in the proper orientation of the closure on the container; however, as is evident from Figure 4, containers of other configurations may similarly employ this closure member. In fact, this type of closure may be used to "chase" a diminishing amount of foodstuff or liquid down into the container. This operation would minimise the amount of air trapped 125 in contact with the remaining foodstuff in the container and thereby lengthen the time of preservation of the remaining contents.

Again with particular reference to the 130

pitcher 20 in Figures 2 and 5, it is apparent that a small interrupted bead 23 partially extends around the inside of wall 21, adjacent the upper edge 27 of the pitcher.

5 This bead functions as an upper stop or position indicator so that the user may accurately reposition the closure 10 immediately below this bead. In this elevated position, the closure will not contact the wall 21 in the area of pour spout 25. The closure 10 will remain securely engaged with the pitcher, yet the spout 25 will be open to the container interior enabling the easy discharge of fluids or the like while the closure is so attached. To assist in this discharge, a tapered venting slot 17 is disposed on the inside surface of wall 30 approximately opposite spout 25 so that when the closure is positioned in its elevated position, air may bleed into the pitcher at that point. For complete sealing of the pitcher 20, however, it is only necessary to reposition the closure again adjacent ledge 34 which is below the pour spout 25. Thus, sealing will be effected all around the pitcher 20 between protruding bead 32 and wall 21.

Referring now to Figure 3, in particular, the locally distortable closure member is distortably and resiliently constructed so that in operation the wall 26 will be displaceable with the peripheral edge 24 of corrugated centre main wall 14. In accomplishing this, the resilience and elastic memory of the particular materials used in the construction must be considered and, in particular, the centre main wall shape should be carefully constructed to take advantage of the physical characteristics of the materials employed. Therefore, the radially extending corrugated centre main wall 14 which extends between the centre portion or substantially planar area 16 to periphery 24 is of considerable importance. In essence, the centre main wall 14 tends to collapse or fold upon itself upon the application of pressure to centre portion 16. This collapse substantially uniformly displaces the periphery 24 inwardly and thus draws the wall 26 inwardly.

The corrugated centre main wall 14 includes a plurality of upwardly and outwardly tapered ridges 18. As can be readily seen in Figures 2 and 3, the upper portions 38 of these corrugations or ridges are angularly directed with respect to planar area 16 and therefore their respective periphery portions 24 lie in a plane removed from that of area 16. Similarly, the bottom portions 40 of these corrugations lie in a substantially parallel plane approximate to that of area 16 when the closure is in a relaxed or as moulded condition. However, when the closure is in place upon a container, even the bottom portions 40 will be at least

slightly angularly directed with respect to planar area 16; this being the result of oversizing the closure with respect to the container which assures a proper seal between the components.

The corrugation height at periphery 24, i.e., the point of connection to the integral upwardly extended side wall 26, is such that the uppermost ridge portion 38 is approximately opposite or above the protruding bead 32. Thus, even though the lateral dimensions of the outer portion 28 at bead 32 are slightly greater than that of the inside diameter of the container, the application of pressure to the centrally positioned substantially planar area 16 will cause sufficient inward lateral displacement of the side wall 26 such that the closure slips easily onto the container.

As is best apparent from Figure 2, the side wall 26 also includes a plurality of inwardly and upwardly extending projections 29 which are integrally moulded at spaced points around the wall. These projections 29 terminate at points adjacent an upper edge 35 of the wall and below the inwardly directed undercut 37 that is formed at the upper edge. Similarly, a socket 39 framed by wall 41 projects upwardly from the planar area 16 such that it cooperates with the plunger 15 hereinbelow described.

The closure top wall 12 includes a conical upper wall 46 substantially in the centre of which there is positioned the bush-like guide 13. This guide extends above the upper wall 46 and is aligned with the socket 39. A peripherally disposed depending skirt 47 is positioned adjacent the outermost periphery of upper wall 46 so as to create a lip 42 around the periphery thereof. This lip then is positioned between the undercut 32 and terminal points of projections 29 and is securely held therebetween by these elements.

The plunger 15 is received in the bushing-like guide 13 for axial movement therein and is further received by the socket 39. The socket includes a plurality of inwardly extending ribs 44 which pressingly engage the plunger and secure it in the socket and to the centre main wall 14. The plunger 15 also includes a ledge area 48 intermediate of its extremities which ledge area is arranged to engage with the under surface of wall 46 adjacent bushing 13 and to function thereby as a stop to arrest the upward movement of the plunger and centre main wall 14. Thus, axially applied pressure is transmitted by the plunger 15 to the planar area 16 of the centre main wall 14 and the displacement of periphery 24 of wall 26 results as discussed above. The upper portion of guide 13 also includes a finger-grippable flange 45 above which the plunger is arranged to protrude. In operation the

guide may be gripped between the finger digits below flange 45 while the plunger is depressed with the thumb, thus creating the axial pressure.

- 5 One objective of the construction according to this example is to obtain a maximum of sealing pressure using minimum force and creating minimum stresses.

Other similar top wall and plunger constructions may be employed. For example, a sleeve and plunger might be suitably inserted and retained within the bush-like guide in such a manner as to render socket 39 redundant. Similarly, the plunger might be made integral with the centre main wall 14 thereby reducing the number of separate parts included in the construction.

In operation, the closures of this example tend to experience a lateral displacement within the conical, corrugated area 18 as pressure is applied to the planar area 16. The conical corrugated construction accentuates this displacement as the corrugations fold upon themselves in an accordion-like fashion. This similarly tends to draw the side wall 26 inwardly, thereby facilitating entry of the central surface wall area 14 into the open-mouth end of the container or pitcher 20. After insertion and upon release of the applied pressure, the resilient closure material attempts to assume its relaxed orientation and thus expands the side wall 26 against the inner portion of the container wall and hermetically seals the container. To remove the closure, it is only necessary to similarly depress the plunger 15 and remove the closure from the pitcher or container.

This new closure further includes several distinctive constructional features which enhance its applicability for use in a food storage capacity as well as in other related fields. Among these is a corrugated or similar centre main wall arrangement that effectively and easily enables the contraction and recovery of the centre main wall peripheral edge to a relaxed or as moulded position. This edge, of course, includes as an integral part a sealing wall portion which functions to produce a sealed relationship between closure and container, thus physically retaining the contained materials therein.

WHAT WE CLAIM IS:—

- 55 1. A resilient distortable closure member for hermetically sealing an open-mouthed container when said closure is in use, which closure member comprises:

(a) a centre main wall including an area of corrugations radially extending from a central portion thereof to a periphery, such that upon application of pressure to said centre portion said corrugations tend to collapse upon one another and substantially uni-

formly displace said periphery until the closure member may be easily positioned on an open-mouthed container;

- (b) an integral sealing means extending around said periphery of the centre main wall, which sealing means is displaceable in like manner with said periphery such that at least a portion of said sealing means is closely engageable with and sealable against the walls of an open-mouthed container, when the closure member is in use, due to the resilience of the closure member upon the discontinuance of applied pressure to said centre main wall;
- (c) a closure top wall interconnected with said sealing means and said centre main wall, said closure top wall further including an integral and substantially centered upstanding bush-like guide; and
- (d) an axially movable plunger positioned in said guide in such a manner that, when the closure member is in use, pressure applied thereto is transmitted to substantially the centre of said centre main wall.

2. A closure member as claimed in claim 1, wherein said upstanding bush-like guide terminates at its upper extremity in a finger-grippable flange and said axially movable plunger is positioned in said guide in such a manner as to have a portion thereof exposed above said flange.

3. A closure member as claimed in claim 1 or claim 2, wherein said plunger is secured to said centre main wall at substantially the centre thereof.

4. A closure member as claimed in any one of claims 1 to 3, wherein the closure top wall and the integral sealing means include opposed locking means interconnectably overlapping to secure said top and main walls together.

5. A closure member substantially as hereinbefore described with reference to and as illustrated in Figures 1 to 4 of the accompanying drawings.

6. A combination of a closure member as claimed in any one of the preceding claims and an open-mouthed container.

7. A combination as claimed in claim 6, wherein said container includes a vertically projecting wall construction forming the open-mouth thereof and including therein a pouring spout and venting slot approximately opposite one another said projecting wall construction being such that said closure member is engageable with and sealable thereagainst below said spout and slot and is engageable and sealable thereagainst with portions of said wall at positions proximate said spout and slot so that



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guide may be gripped between the finger digits below flange 45 while the plunger is depressed with the thumb, thus creating the axial pressure.

5 One objective of the construction according to this example is to obtain a maximum of sealing pressure using minimum force and creating minimum stresses.

10 Other similar top wall and plunger constructions may be employed. For example, a sleeve and plunger might be suitably inserted and retained within the bush-like guide in such a manner as to render socket 39 redundant. Similarly, the plunger might
15 be made integral with the centre main wall 14 thereby reducing the number of separate parts included in the construction.

In operation, the closures of this example tend to experience a lateral displacement
20 within the conical, corrugated area 18 as pressure is applied to the planar area 16. The conical corrugated construction accentuates this displacement as the corrugations fold upon themselves in an accordion-like
25 fashion. This similarly tends to draw the side wall 26 inwardly, thereby facilitating entry of the central surface wall area 14 into the open-mouth end of the container or pitcher 20. After insertion and upon
30 release of the applied pressure, the resilient closure material attempts to assume its relaxed orientation and thus expands the side wall 26 against the inner portion of the container wall and hermetically seals
35 the container. To remove the closure, it is only necessary to similarly depress the plunger 15 and remove the closure from the pitcher or container.

This new closure further includes several
40 distinctive constructional features which enhance its applicability for use in a food storage capacity as well as in other related fields. Among these is a corrugated or
45 similar centre main wall arrangement that effectively and easily enables the contraction and recovery of the centre main wall peripheral edge to a relaxed or as moulded position. This edge, of course, includes as
50 an integral part a sealing wall portion which functions to produce a sealed relationship between closure and container, thus physically retaining the contained materials therein.

WHAT WE CLAIM IS:—

55 1. A resilient distortable closure member for hermetically sealing an open-mouthed container when said closure is in use, which closure member comprises:

60 (a) a centre main wall including an area of corrugations radially extending from a central portion thereof to a periphery, such that upon application of pressure to said centre portion said corrugations tend to collapse upon
65 one another and substantially uni-

formly displace said periphery until the closure member may be easily positioned on an open-mouthed container;

(b) an integral sealing means extending
70 around said periphery of the centre main wall, which sealing means is displaceable in like manner with said periphery such that at least a portion
75 of said sealing means is closely engageable with and sealable against the walls of an open-mouthed container, when the closure member is in use, due to the resilience of the closure member upon the discontinuance of
80 applied pressure to said centre main wall;

(c) a closure top wall interconnected with said sealing means and said
85 centre main wall, said closure top wall further including an integral and substantially centered upstanding bush-like guide; and

(d) an axially movable plunger positioned
90 in said guide in such a manner that, when the closure member is in use, pressure applied thereto is transmitted to substantially the centre of said centre main wall.

2. A closure member as claimed in
95 claim 1, wherein said upstanding bush-like guide terminates at its upper extremity in a finger-grippable flange and said axially movable plunger is positioned in said guide in such a manner as to have a portion
100 thereof exposed above said flange.

3. A closure member as claimed in
105 claim 1 or claim 2, wherein said plunger is secured to said centre main wall at substantially the centre thereof.

4. A closure member as claimed in any
one of claims 1 to 3, wherein the closure top wall and the integral sealing means include opposed locking means inter-
110 connectably overlapping to secure said top and main walls together.

5. A closure member substantially as
hereinbefore described with reference to and as illustrated in Figures 1 to 4 of the
115 accompanying drawings.

6. A combination of a closure member
as claimed in any one of the preceding
120 claims and an open-mouthed container.

7. A combination as claimed in claim
6, wherein said container includes a
125 vertically projecting wall construction forming the open-mouth thereof and including therein a pouring spout and venting slot approximately opposite one another said projecting wall construction being such that
130 said closure member is engageable with and sealable thereagainst below said spout and slot and is engageable and sealable thereagainst with portions of said wall at positions proximate said spout and slot so that

when the closure member is engaged with said projecting wall in the latter mentioned positions, and when the combination is in use, the contents of the container may be easily poured therefrom.

8. A combination as claimed in claim 7, wherein said projecting wall also includes inwardly protruding means spaced from the upper edge of said projecting wall such that said portion of the sealing means is positionable therebetween, said protruding means further providing a surface against which said closure member may be abutted

and positioned to assure its proper placement within the container.

9. A container and closure member combination substantially as hereinbefore described with reference to and as illustrated in Figure 1 of the accompanying drawings, or as modified in accordance with Figure 5 of the accompanying drawings.

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