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DRAWINGS ATTACHED

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(54) IMPROVEMENTS RELATING TO CLOSURES FOR CONTAINERS

(71) We, AMERICAN FLANGE & MANUFACTURING Co. Inc., a Corporation organised under the laws of the State of Delaware, United States of America, of 30, Rockefeller Plaza, New York 20, 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 closures for containers and is particularly concerned with such closure members comprising a tamper-proof closure adapted for sealing off a container wall opening and having an axial dispensing passage closed off by means of an integrally formed tear out panel which is advantageously weakened by a tearing zone to facilitate hand removability by tearing while retaining sufficient strength to prevent unintentional failure and is provided with an integrally connected pull member to facilitate tearing away of the panel.

Numerous types of container closure constructions have been brought forth to date embodying a dispensing passage closed off by an integrally formed sealing wall which ensures against the possibility of leakage during shipment and handling of the container and in addition makes unauthorized tampering readily detectible. A secondary closure member may also be provided, if desired, to effect reclosing of the dispensing passage after the initial seal has been broken and a portion of the container contents dispensed.

Some of these prior constructions have also included arrangements whereby the sealing wall may be readily broken or removed by the user to gain authorized access to the container contents. Among these arrangements are puncturing with a sharp instrument, cutting out with a knife or pulling a tearing ear with a pair of pliers,

all of which require the ready availability of some sort of tool or implement and in addition present the likelihood of damaging the closure to some extent during the severing operation. The desirability of tearing away all or a portion of the sealing wall by hand through the aid of a suitable integrally attached pull member has also long been recognized. However, attempts at achieving this degree of convenience have not, to date, been completely free of drawbacks.

According to the invention there is provided a container closure comprising a body member surrounding an axial dispensing passage, said body member including an annular container wall engaging portion for engagement about an opening in a container wall, a panel closing off said axial dispensing passage, a weakened tearing zone having a reduced cross-sectional thickness formed in said panel and a pull member integrally connected to said panel adjacent the periphery of said body member wherein said tearing zone has a starting portion in the immediate vicinity of said pull member, said starting portion being further reduced in cross-sectional thickness relative to the remainder of said tearing zone, and whereby the initial resistance to tearing of said panel along said tearing zone is diminished.

The problem to be overcome here is one of providing a closure construction wherein the sealing wall is sufficiently weakened to facilitate hand removal by tearing and still retains the necessary strength to perform its primary sealing function. This problem is particularly acute in plastics moulded closures, although the invention is by no means limited thereto, due to the initial resistance to tearing offered by synthetic plastics material such as polyethylene. Once initial rupturing of the sealing wall is effected by the commencement of the tear, continued tearing is achieved with comparative ease. Even though a tear out panel

may be provided which is bordered by a weakened tearing zone of reduced cross section or thickness to facilitate tearing, there still remains the problem that if the tearing zone is reduced in thickness to a sufficient extent to permit initial rupturing at the commencement of the tear with relative ease, the resulting section is too weak throughout its entirety to act as part of an effective seal. Accurately maintaining a tearing zone thickness of a few thousandths of an inch under production conditions is difficult at best and even if successful, introduces the possibility of unintentional rupturing of the tear out panel during subsequent handling and shipment of the closure and container to which it is applied.

Embodiments of the invention will now be described by way of example and with reference to the accompanying drawing, in which:

Figure 1 is a vertical section of a nozzle and captive cap type closure embodying a tear out panel formed in accordance with the invention;

Figure 2 is a top plan view of the nozzle in Figure 1;

Figure 3 is an enlarged fragmentary end view of the removed tear out panel showing the weakened tearing zone in the area of the pull member;

Figure 4 is an enlarged fragmentary section of the tearing zone remote from the pull member;

Figure 5 is a view similar to Figure 4 showing the tearing zone in the immediate vicinity of the pull member;

Figure 6 is a sectional view of a plug receiving closure member embodying a tear out panel formed in accordance with the invention;

Figure 7 is a top plan view of the closure member of Figure 6;

Figure 8 is an enlarged fragmentary section of the tearing zone in the immediate vicinity of the pull member as shown in Figure 6; and

Figure 9 is a view similar to Figure 8 showing the tearing zone remote from the pull member.

Considering first the captive cap type closure embodying the invention which is clearly shown in Figure 1 inserted within an opening in a container wall 1 after filling of the container therethrough, the basic components thereof are seen to comprise a nozzle or body member 2, an overlying snap cap 3 and a flexible hinge strap 4 connecting the cap and nozzle. The entire closure 1 is integrally moulded as a single unit from a suitable synthetic plastics material such as polyethylene. The nozzle 2 is a short tubular member surrounded by a radially outwardly extending circumferential flange 5. Extending above the flange 5

is a short cap receiving neck 6 terminating at its upper end in a circumferentially enlarged locking bead 7. The outer surface of the nozzle 2, has formed thereon below the flange 5, a radially outwardly opening concavely curved surface 8 which terminates at its lower end in a maximum diameter section 9. The lower end portion of the nozzle 2 then tapers radially inwardly and downwardly at 10 from the section 9 and terminates in a lowermost cylindrical pilot portion 11.

The interior surface or throat 12 of the nozzle is formed with a short radially inwardly extending shoulder 13 at its lowermost end and an inwardly tapering ledge 14 at an intermediate position. The uppermost end of the throat 12 is closed off by an integrally formed tear out panel 20. Integrally attached to the panel 20, adjacent its periphery, is a pull member 21 which joins the panel 20 in a base portion 22 and then extends upwardly and radially inwardly in a short neck 23 and terminates in a ring portion 24 adapted for reception of a person's finger. A weakened tearing zone 25 extends about the periphery of the panel 20 forming the juncture between the panel and the upper end of the nozzle throat 12. As seen in Figure 5 the upper surface 26 of the panel 20 lies flush with the top surface 27 of the bead 7. The tearing zone 25 includes a V-shaped groove defined by the inner surface 29 of the bead 7 and the outer tapered edge 30 of the panel 20. The remaining web of material 31 of reduced cross sectional thickness connecting the panel 20 and the nozzle throat 12 forms a path along which the tearing action can easily follow with the actual severance occurring at the apex 32 of the V-shape.

The particular form imparted to the tearing zone minimizes the pulling force required to effect removal of the tear out panel by concentrating that force and the resulting tearing action at the apex 32 of the tearing zone. This form has an additional advantage in that the severance occurs right at the surface of the throat 12 leaving a minimum residue of undesirable torn material extending into the throat after the panel is removed.

It has been found, however, that even given the tearing zone arrangement above described the inherent initial resistance to tearing is difficult to overcome if the web 31 of remaining material has an appreciable thickness as would be necessary to protect against accidental rupturing of the same. Of course, once this initial resistance has been overcome and the tearing action commences the pulling force required to continue with the tearing action is quite substantially diminished.

The above mentioned problem has been

overcome in this invention by compensating for the inherent initial resistance to tearing of the web 31. In Figure 2 the weakened tearing zone 25 is seen extending around the entire periphery of the panel 20 and Figure 4 shows the tearing zone 25 immediately adjacent the pull member 21 at which point the outer tapered edge 30 of the panel merges into the base portion 22 of the pull member. A starting portion is provided in the immediate vicinity of the pull member comprising an undercut surface 33 in the lower surface 34 of the panel 20. The undercut surface 33 has a chordal shape defined by a peripheral portion of the throat 12 and a shallow step 35 which joins the undercut surface 33 and the lower panel surface 34. The web of remaining material indicated at 36 in the starting portion between the apex 32 and the undercut surface 33 in this manner is substantially further reduced in cross sectional thickness relative to the web 31 of remaining material in the major portion of the tearing zone 25.

In Figures 2 and 3 it can be seen that the further reduced web 36 extends for a short distance around the diaphragm periphery at either side of the pull member base 22 thus weakening the starting portion of the tearing zone 25 sufficiently for its intended purpose but not so as to cause any appreciable structural weakening of the diaphragm. A moderate pulling force applied to the pull member 23 stretches the material in the very thin starting portion web 36 causing it to rupture and causing the tearing action to commence. Continued tearing of the relatively thicker web 31 along the tearing zone 25 is then quite easy.

The captive cap 3 is provided with a locking portion 40 for engaging the nozzle bead 1 in closed position. A storage compartment 41 is also provided in the cap 3 for housing the pull member 23 above the panel 20 within the cap prior to removal of the panel.

Another form of the invention is illustrated in Figures 6-9 embodying a plug receiving member 50 comprising a cylindrical wall 51 internally threaded at 52 and surrounded at its upper end by a securing lip 53 having an inverted U-shape configuration. The lip 53 is secured to a suitably formed container wall opening formation (not shown) by a metal crimping ring 54. A gasketing portion 55 is formed at the upper end of the thread 52 adjacent the ring 54. An integrally formed sealing wall 56 is provided at the lower end of the neck 51 and is formed with a central tear out panel 57 having a recessed pocket 57a. A ring shaped pull member 58 is connected to the periphery of the panel 57 and adapted to be pushed down in stored position within the panel pocket 57a upon insertion of a closure

plug (not shown). A tearing zone 59 surrounds the tear out panel 57 and, as seen in Figure 9, includes an annular upwardly opening V-shape groove 60 in the upper surface of the panel and a concentrically located downwardly opening channel 61 in the lower surface of the panel. The web of remaining material indicated at 62 between the apex 63 of the groove 60 and the channel 61 is sufficiently reduced in cross sectional thickness to permit easy tearing along the tearing zone 59. As in the principal embodiment of the invention the initial resistance to tearing is diminished through the provision of a starting zone adjacent the pull member 59. Looking at Figures 7 and 8 the upwardly opening V-shape groove 60 is seen extending around the entire periphery of the panel 57. The downwardly opening channel 61, however, is interrupted in the vicinity of the base of the pull member 58 by the provision of a deeper channel portion 62. This results in a web of remaining material 64 having a further reduced cross sectional thickness relative to the web 62. Thus though the arcuate starting zone is sufficiently weakened to reduce the initial resistance to tearing, the desired structural properties of the closure are effectively preserved by the relatively stronger remaining tearing zone which readily severs as the tearing continues.

WHAT WE CLAIM IS:—

1. A container closure comprising a body member surrounding an axial dispensing passage, said body member including an annular container wall engaging portion for engagement about an opening in a container wall, a panel closing off said axial dispensing passage, a weakened tearing zone having a reduced cross-sectional thickness formed in said panel and a pull member integrally connected to said panel adjacent the periphery of said body member, wherein said tearing zone has a starting portion in the immediate vicinity of said pull member, said starting portion being further reduced in cross-sectional thickness relative to the remainder of said tearing zone, and whereby the initial resistance to tearing of said panel along said tearing zone is diminished.

2. A closure as claimed in Claim 1, wherein said starting portion extends for a short distance at either side of said pull member.

3. A closure as claimed in Claim 1 or Claim 2 wherein said tearing zone is formed in one surface of the panel and said starting portion is formed in the opposite surface of the panel whereby the panel thickness remaining between said tearing zone and said starting portion is less than the panel thickness in the rest of the tearing zone.

4. A closure construction as claimed in Claim 3, wherein said connection of said

overcome in this invention by compensating for the inherent initial resistance to tearing of the web 31. In Figure 2 the weakened tearing zone 25 is seen extending around the entire periphery of the panel 20 and Figure 4 shows the tearing zone 25 immediately adjacent the pull member 21 at which point the outer tapered edge 30 of the panel merges into the base portion 22 of the pull member. A starting portion is provided in the immediate vicinity of the pull member comprising an undercut surface 33 in the lower surface 34 of the panel 20. The undercut surface 33 has a chordal shape defined by a peripheral portion of the throat 12 and a shallow step 35 which joins the undercut surface 33 and the lower panel surface 34. The web of remaining material indicated at 36 in the starting portion between the apex 32 and the undercut surface 33 in this manner is substantially further reduced in cross sectional thickness relative to the web 31 of remaining material in the major portion of the tearing zone 25.

In Figures 2 and 3 it can be seen that the further reduced web 36 extends for a short distance around the diaphragm periphery at either side of the pull member base 22 thus weakening the starting portion of the tearing zone 25 sufficiently for its intended purpose but not so as to cause any appreciable structural weakening of the diaphragm. A moderate pulling force applied to the pull member 23 stretches the material in the very thin starting portion web 36 causing it to rupture and causing the tearing action to commence. Continued tearing of the relatively thicker web 31 along the tearing zone 25 is then quite easy.

The captive cap 3 is provided with a locking portion 40 for engaging the nozzle bead 1 in closed position. A storage compartment 41 is also provided in the cap 3 for housing the pull member 23 above the panel 20 within the cap prior to removal of the panel.

Another form of the invention is illustrated in Figures 6-9 embodying a plug receiving member 50 comprising a cylindrical wall 51 internally threaded at 52 and surrounded at its upper end by a securing lip 53 having an inverted U-shape configuration. The lip 53 is secured to a suitably formed container wall opening formation (not shown) by a metal crimping ring 54. A gasketing portion 55 is formed at the upper end of the thread 52 adjacent the ring 54. An integrally formed sealing wall 56 is provided at the lower end of the neck 51 and is formed with a central tear out panel 57 having a recessed pocket 57a. A ring shaped pull member 58 is connected to the periphery of the panel 57 and adapted to be pushed down in stored position within the panel pocket 57a upon insertion of a closure

plug (not shown). A tearing zone 59 surrounds the tear out panel 57 and, as seen in Figure 9, includes an annular upwardly opening V-shape groove 60 in the upper surface of the panel and a concentrically located downwardly opening channel 61 in the lower surface of the panel. The web of remaining material indicated at 62 between the apex 63 of the groove 60 and the channel 61 is sufficiently reduced in cross sectional thickness to permit easy tearing along the tearing zone 59. As in the principal embodiment of the invention the initial resistance to tearing is diminished through the provision of a starting zone adjacent the pull member 59. Looking at Figures 7 and 8 the upwardly opening V-shape groove 60 is seen extending around the entire periphery of the panel 57. The downwardly opening channel 61, however, is interrupted in the vicinity of the base of the pull member 58 by the provision of a deeper channel portion 62. This results in a web of remaining material 64 having a further reduced cross sectional thickness relative to the web 62. Thus though the arcuate starting zone is sufficiently weakened to reduce the initial resistance to tearing, the desired structural properties of the closure are effectively preserved by the relatively stronger remaining tearing zone which readily severs as the tearing continues.

WHAT WE CLAIM IS:—

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2. A closure as claimed in Claim 1, wherein said starting portion extends for a short distance at either side of said pull member.

3. A closure as claimed in Claim 1 or Claim 2 wherein said tearing zone is formed in one surface of the panel and said starting portion is formed in the opposite surface of the panel whereby the panel thickness remaining between said tearing zone and said starting portion is less than the panel thickness in the rest of the tearing zone.

4. A closure construction as claimed in Claim 3, wherein said connection of said



pull member to said panel merges directly into said reduced cross-sectional thickness of said tearing zone.

5. A closure as claimed in any one of Claims 1 to 4, wherein said body member is moulded of synthetic plastics material.

6. A closure as claimed in any one of Claims 1 to 5, wherein said axial dispensing passage includes a cylindrical interior surface, said tearing zone being formed about the periphery of the panel and forming the juncture between the panel and said surface.

7. A closure as claimed in any one of Claims 1 to 6, wherein means are formed on

said body member for engagement by a reusable closure member.

8. A closure as claimed in any one of claims 1 to 7, wherein said tearing zone, except for said starting portion, has a uniform cross-sectional thickness throughout. 20

9. A container closure substantially as hereinbefore described with reference to the accompanying drawings.

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