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Lined closure for containers of differing finish configurations

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(71) Applicant(s)
Owens-Illinois Closure Inc.

(72) Inventor(s)
James L. Gregory; Stephanie L. Kurtz-Rooney

(74) Agent/Attorney
BALDWIN SHELSTON WATERS,Level 21,60 Margaret Street,SYDNEY NSW 2000

ABSTRACT

A closure (14) that includes a shell (22) having a base wall (24) and a peripheral skirt (26) with an internal thread (28) for affixing the closure to a container finish (12, 13), and a resilient liner (36) secured to the base wall of the closure for sealing engagement with the sealing surface (18) of a container finish. The liner has a first axially extending lip (40) adjacent to the skirt with a radially inwardly facing concave first suface (42), a circumferentially continuous axially extending second lip (48) spaced radially inwardly from the first lip and having a radially outwardly facing concave second surface (50), and a flat axially facing third surface (52) extending between the first and second surfaces. When the closure is secured to a container, the axially facing third surface (52) sealingly engages the axially facing sealing surface of the container finish, and the first and second concave surfaces preferably engage either the outside edge or the inside edge of the finish sealing surface, or both, depending upon the finish configuration of the container. A single closure is thus usable in conjunction with containers having identical thread diameter but differing finish configurations.

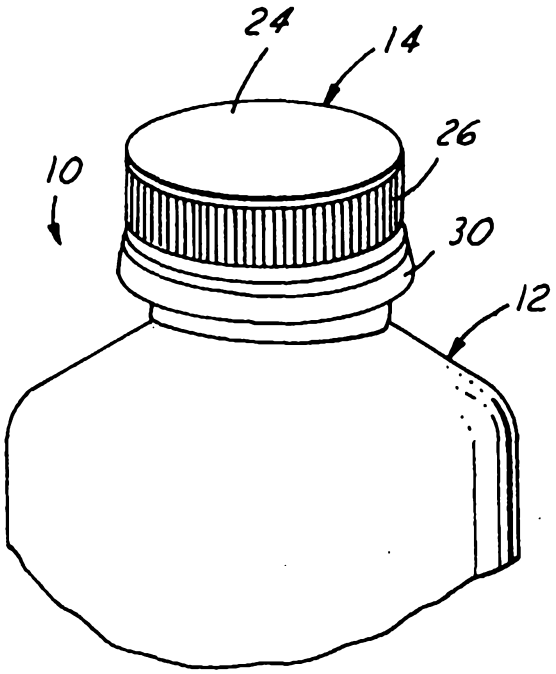

FIG. 1

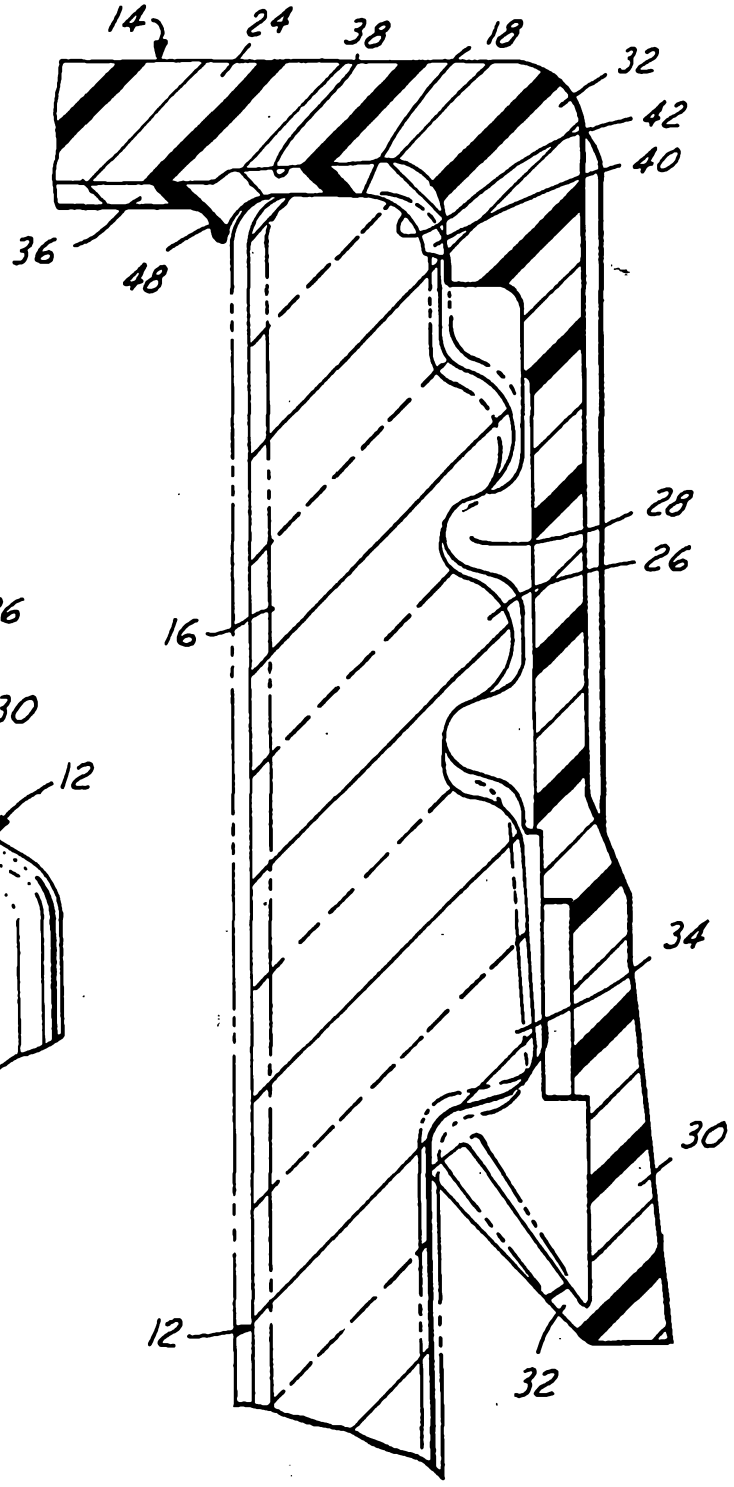

FIG. 2

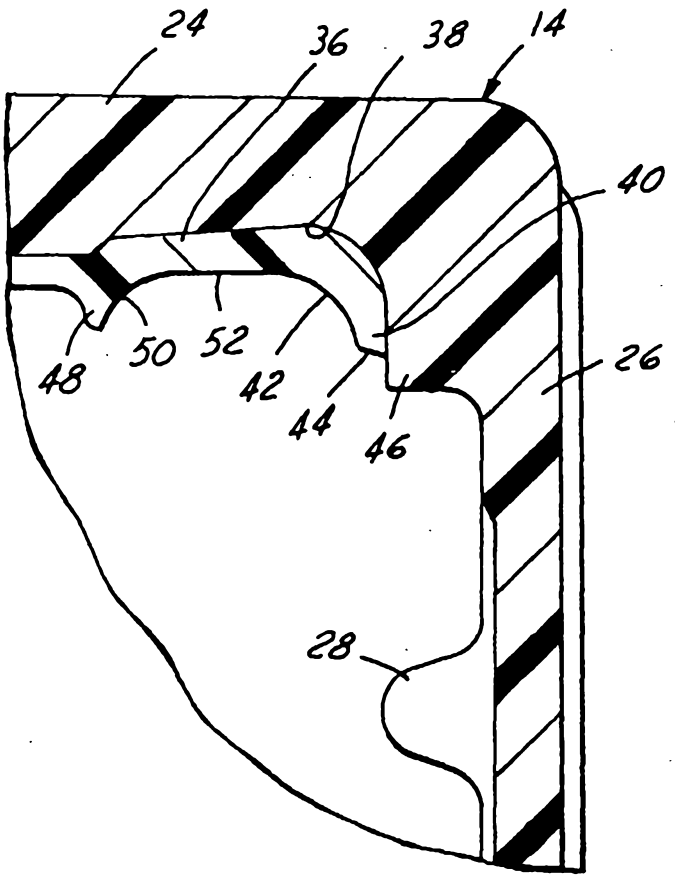
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FIG.4

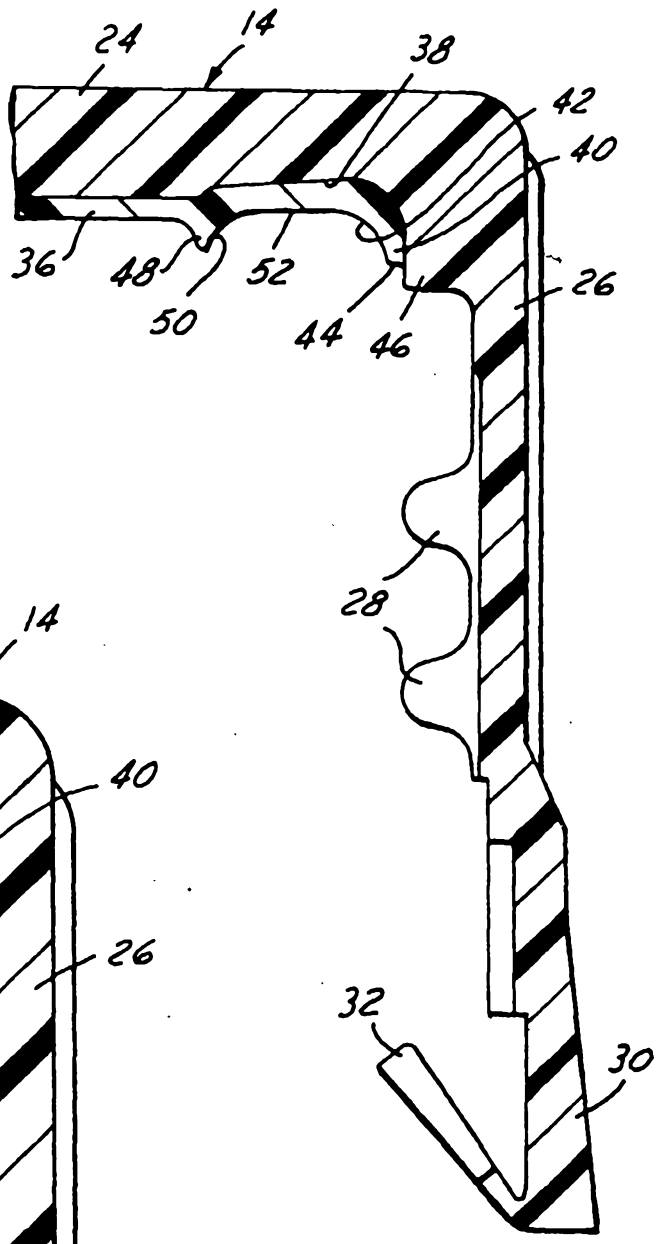
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FIG.3

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COMPLETE SPECIFICATION

FOR A STANDARD PATENT

ORIGINAL

Name of Applicant: Owens-Illinois Closure Inc.

Actual Inventors: James L. Gregory and Stephanie L. Kurtz-Rooney

Address for Service: BALDWIN SHELSTON WATERS
60 MARGARET STREET
SYDNEY NSW 2000

Invention Title: 'LINED CLOSURE FOR CONTAINERS OF DIFFERING FINISH CONFIGURATIONS'

The following statement is a full description of this invention, including the best method of performing it known to me/us:-

File: 27827AUP00

LINED CLOSURE FOR CONTAINERS OF DIFFERING FINISH CONFIGURATIONS

The present invention is directed to plastic container closures for beverage (e.g., soft drink) applications, and more particularly to a lined closure designed for use in combination with containers having identical thread diameter but differing finish configurations.

Background and Objects of the Invention

It has heretofore been proposed to provide a plastic closure for a glass or plastic container, which comprises a plastic shell with a resilient interior liner for sealing engagement with the sealing surface of the container. For example, U.S. Patent 4,984,703 discloses a plastic closure that comprises a shell having a base wall with a peripheral skirt and an internal thread for securing the closure to a container, and a sealing liner compression molded in situ on the interior of the shell base wall. U.S. Patent 5,451,360 discloses a method and apparatus for compression molding the liner in situ within the shell. U.S. Patent 5,462,187 discloses a closure in which the liner periphery is contoured for sealing engagement with the axially oriented sealing surface and the outside or "E" diameter of the container finish.

It is currently conventional practice in the packaging industry to provide closures of differing design for each container finish configuration even when the containers have identical thread diameter. For example, differing closures are provided for PET containers of standard PCO and BPF finish configurations, and for glass containers having standard MCA-1, MCA-2,MCA-3, 1649, 1650, 1655 and MCA-7.5 finish configurations, even though all of such containers may have threads of identical diameter and pitch, such as for example 28 mm. Thus, a packager is required to stock a different closure for each finish configuration and each finish thread diameter. It is therefore a general object of the present invention to provide a closure that is usable in combination with containers of a given thread diameter, but having different

standardized finish configurations. A more specific object of the present invention is to provide a closure of the described character that can be utilized in combination with both returnable and single-use glass and PET containers of a given thread diameter and pitch. A further object of the present invention is to provide a closure of the described character in which the liner may be either permanently secured to the closure shell or peelable therefrom. Yet another object of the invention is to provide a method of manufacturing such a closure, and a container package that embodies such a closure.

Summary of the Invention

A closure in accordance with the present invention includes a closure shell having a base wall and a peripheral skirt with internal means for affixing the closure to a container finish, and a resilient liner secured to the base wall of the closure for sealing engagement with the sealing surface of a container finish. The liner has a first axially extending lip adjacent to the skirt with a radially inwardly facing concave first surface, a circumferentially continuous axially extending second lip spaced radially inwardly from the first lip and having a radially outwardly facing concave second surface, and a flat axially facing third surface extending between the first and second surfaces. When the closure is secured to a container, the axially facing third surface sealingly engages the axially facing sealing surface of the container finish, and preferably the first and second concave surfaces engage either the outside edge or the inside edge of the finish sealing surface, or both, depending upon the finish configuration of the container.

The present invention thus contemplates a closure for use in combination with containers having at least first and second configurations with identical thread diameters, a sealing surface and differing inside diameters and/or outside diameters at the finish sealing surface. The closure includes a shell having a base wall with a peripheral skirt and an internal

thread of a diameter to be received over the thread in either of the finish configurations. A resilient liner is disposed on the base wall, and has a radially inwardly facing concave peripheral first surface adjacent to the skirt at a diameter for sealing engagement with the outside sealing surface diameter of at least one of the finish configurations, a circumferentially continuous axially extending lip spaced inwardly from the skirt and having a radially outwardly facing concave second surface at a diameter for engagement with the inside sealing surface diameter of at least one of the finish configurations, and a flat axially facing third surface extending between the concave surfaces for sealing engagement with the container sealing surface of both of the finish configurations. In the preferred embodiment of the invention for 28 mm soft drink applications, the first and second concave surfaces have surface edges spaced from the third surface, and the radial spacing between such surface edges is in the range of 0.238 to 0.258 inches, preferably about 0.248 inches. The first surface has a radius of curvature of about 0.040 ± 0.007 inches, and the second surface has a radius of curvature of about 0.035 ± 0.007 inches. The first surface has an axial edge spaced from the third surface by an axial dimension of about 0.036 ± 0.007 inches, and the second surface has an axial edge spaced from the third surface by an axial dimension of 0.029 ± 0.005 inches. These preferred dimensional values and ranges are disclosed in conjunction with PET and glass containers having a 28 mm (nominal) thread diameter, and having PCO, BPF, MCA-1, MCA-2 and MCA-3 industry standard finish configurations, but also apply to other thread diameters and industry standard finish configurations such as glass 1649, 1650, 1655 and MCA-7.5 configurations.

In accordance with another aspect of the present invention , a package comprises a container having a finish of one of first and second finish configurations with identical thread diameters, and a closure having a shell with a base wall and a peripheral skirt with internal thread

at a diameter to be received over the finish external thread in either of the finish configurations. A resilient liner is disposed on the base wall, and has a radially inwardly facing concave peripheral first surface adjacent to the skirt at a diameter for sealing engagement with the sealing surface outside diameter of at least one of the finish configurations, a circumferentially continuous axially extending lip spaced radially inwardly from the skirt and having a radially outwardly facing concave second surface at a diameter for engagement with the sealing surface inside diameter of at least one of the finish configurations, and a flat axially facing third surface extending between the concave surfaces for axial sealing engagement with the container sealing surface of both finish configurations. A method of making a closure in accordance with a further aspect of the present invention contemplates either compression molding the liner in situ on the base wall of the closure shell, or compression or injection molding the liner separately and securing the same to the shell base wall. In this respect, the liner profile can be employed as a peelable liner by utilizing the inner lip or rib for grasping and removing the liner form the closure shell.

Brief Description of the Drawings

The invention, together with additional objects, features and advantages thereof, will be best understood from the following description, the appended claims and accompanying drawings in which:

FIG. 1 is a fragmentary perspective view of a container and closure package in accordance with one presently preferred embodiment of the invention;

FIG. 2 is a fragmentary sectional view on an enlarged scale showing the closure and finish of the package of FIG. 1;

FIG. 3 is a sectional view on an enlarged scale of the closure in FIGS. 1 and 2;

FIG. 4 is a sectional view on an enlarged scale of a portion of the closure illustrated in FIG. 3;

FIG. 5 is a fragmentary sectional view similar to a portion of FIG. 2 but showing the closure of FIGS. 1-4 in combination with a glass container of differing finish configurations; and

FIGS. 6 and 7 are fragmentary sectional views similar to that of FIG. 5 but showing the closure in combination with plastic containers of differing finish configurations.

Detailed Description of Preferred Embodiments

The disclosure of U.S. Patent 5,462,187 is incorporated herein by reference for purposes of background.

FIGS. 1-2 illustrate a package 10 that comprises a glass container 12 and a plastic closure 14. Container 12 has a finish 16 of industry standard so-called MCA-2 configuration. Container finish 16 has an axially facing generally flat sealing surface 18 with an inside diameter defined by the bore diameter of finish 16 and an outside diameter that defines the so-called "E" diameter of the container finish. Finish 16 also has an external thread 20 for securing closure 14 on the container finish. Thread 20 has a specified external diameter or "T" dimension, such as 28 mm. Closure 14 includes a one-piece integrally molded plastic shell 22 having a base wall 24 and a peripheral skirt 26. An internal thread 28 is formed on skirt 26 for engaging external thread 20 on container finish 16. In the preferred embodiments of the invention illustrated in the drawings, a tamper-indicating band 30 is secured by frangible means to the lower edge of skirt 26, and a stop flange 32 extends axially inwardly and upwardly from the lower edge of band 28 for engaging the bead 34 on finish 16. (Directional descriptors such as "downwardly" are taken with reference to the vertical orientation of the container and closure illustrated in FIGS. 1 and

2.) Flange 32 thus resists removal of closure 14 from container 12 absent fracture of the frangible means, by means of which separation of band 30 from skirt 26 indicates that the package has been opened. As will be apparent from the discussion to follow, the principles of the present invention can also be employed in conjunction with other types of tamper-indicating means, or with closures that do not have tamper-indicating means.

A resilient liner 36 is internally secured to closure base wall 24. Specifically, base wall 24 preferably, but not necessarily, has a peripheral depression 38 that receives the peripheral portion of liner 36. The peripheral portion of liner 36 has a first axially extending lip 40 adjacent to and engaging closure skirt 26, with a radially inwardly facing concave first surface 42. The axial edge of lip 40 remote from base wall 24 has a conical surface 44 that widens radially outwardly axially away from base wall 24, and extends to the enlarged shoulder 46 of skirt 26. A second circumferentially continuous axially extending lip 48 extends away from base wall 24 in general axial alignment with the radially inner ledge of base wall pocket 38. Lip 48 is thus concentrically spaced radially inwardly from lip 40, and has a radially outwardly facing concave second surface 50 opposed to concave surface 42 of lip 40. A flat axially facing third surface 52 extends between and interconnects surfaces 42, 50 at the points at which these concave surfaces are horizontal. Thus, surface 52 is tangential to and smoothly interconnects surfaces 42, 50. The central portion of liner 36 on base wall 24 - i.e., radially inwardly of lip 48 - may be of any suitable configuration. As best seen in FIG. 4, the axial edge of lip 48 is convex, and the radially inwardly facing surface of lip 48 is concave.

When closure 14 is secured onto finish 16 of container 12 (FIG. 2), the interengaged threads are tightened so as to bring sealing surface 18 of container finish 16 into opposed abutting engagement with flat surface 52 of liner 36. At this point, the outside sealing

surface edge or "E" diameter of finish 16 engages surface 42 of lip 40. Continued tightening of the closure onto the container finish compresses these liner surfaces, with a compression at surface 52 of about 0.005 inches being an accepted standard. (FIGS. 2 and 5-7 illustrate the surface configurations as the container contacts surface 52 and before further compression. The nominal container finish configuration is in solid lines, while the phantom lines illustrate the finish tolerance ranges.) In the configuration of FIG. 2, surface 42 of lip 40 is also engaged and compressed by the opposing outer diameter edge of the finish sealing surface. Thus, in use in conjunction with container 12 having an industry standard MCA-2 finish configuration, sealing engagement is made with sealing surface 18 and the outside diameter of sealing surface 18. The phantom lines in FIG. 2 (and in FIGS. 5-7) illustrate tolerance limits on the standard finish configuration.

FIG. 5 illustrates closure 14 used in conjunction with a 28 mm glass container 12a having an industry standard MCA-1 finish configuration. In this configuration, the E-wall of the container finish will contact lip 40 during further compression and at extreme tolerance conditions. FIGS. 6 and 7 illustrate closure 14 in conjunction with 28 mm PET containers 12b, 12c of industry standard PCO and BPF finish configurations respectively. Use in conjunction with a glass container of industry standard MCA-3 finish configuration would be similar to FIG. 2 in the sealing surface area. Thus, in each of these standard 28 mm finish configurations, liner 36 makes sealing contact with the container finish at axially oriented liner surface 52, and preferably either concave surface 42 or concave surface 50, or both. Thus, a single closure 14 is usable in conjunction with glass container 12, 12a having standard MCA-1, MCA-2 and MCA-3 finish configurations, and with PET containers 12b, 12c having standard PCO and BFP finish configurations.

In the presently preferred 28 mm embodiment of closure 14 illustrated in the drawings, the axial edges of surfaces 42, 50 - i.e., the edges spaced from surface 52 and base wall 24, have a radial separation in the range of 0.238 to 0.258 inches, preferably about 0.248 inches (i.e., 0.248 ± 0.010 inches). (All exemplary dimensions are nominal unless otherwise indicated.) Surface 42 has a radius of curvature in the range of 0.033 to 0.047 inches, preferably about 0.040 inches (i.e., 0.040 ± 0.007 inches), and surface 50 has a radius of curvature in the range of 0.028 to 0.042 inches, preferably about 0.035 inches (i.e., 0.035 ± 0.007 inches). The axial dimension of surface 48 from surface 52 is in the range of 0.029 to 0.43 inches, preferably about 0.036 inches (i.e., 0.036 ± 0.007 inches), and the axial dimension of surface 50 from surface 52 is in the range of 0.024 to 0.034 inches, preferably 0.029 inches (i.e., 0.029 ± 0.005 inches). Although these dimensions are illustrated in conjunction with various finish configurations having a 28 mm thread diameter, which is particularly prevalent in the soft drink market, these dimensions will also apply in conjunction with containers having the same finish configurations but of differing thread diameter. The diameter at the axial edge of surface 50 in the exemplary 28 mm closure is in the range of 0.713 to 0.723 inches, preferably 0.718 inches (i.e., 0.718 ± 0.005 inches), and the diameter at the axial edge of surface 42 is in the range of 0.961 to 0.971 inches, preferably 0.966 inches (i.e., 0.966 ± 0.005 inches). The circle of tangency between surfaces 42, 52 has a diameter in the range of 0.907 to 0.921 inches, preferably about 0.914 inches (i.e., 0.914 ± 0.007 inches).

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1.

A closure that comprises a closure shell having a base wall and a peripheral skirt with internal means for affixing the closure to a container finish, and a resilient liner secured to said base wall for sealing engagement with a container finish sealing surface,

characterized in that said liner has a first axially extending lip adjacent to said skirt with a radially inwardly facing concave first surface, a circumferentially continuous axially extending second lip spaced radially inwardly from said first lip and having a radially outwardly facing concave second surface, and a flat axially facing third surface extending between said first and second surfaces.

2.

A closure for use in combination with containers having at least first and second finish configurations with identical thread diameters, a sealing surface and differing inside diameters and/or outside diameters at the finish sealing surface, said closure comprising:

a shell having a base wall and a peripheral skirt with an internal thread of a diameter to be received over the finish thread in both of said finish configurations, and a resilient liner on said base wall,

characterized in that said resilient liner has a radially inwardly facing concave peripheral first surface adjacent to said skirt at a diameter for sealing engagement with the outside sealing surface diameter of at least one of said finish configurations, a circumferentially continuous axially extending lip spaced inwardly from said skirt and having a radially outwardly facing concave second surface at diameter for engagement with the inside sealing surface diameter of

at least one of said finish configurations, and a flat axially facing third surface extending between said concave surfaces for sealing engagement with the container sealing surface of both of said finish configurations.

3.

The closure set forth in claim 1 or 2 wherein said first surface has a radius of curvature of 0.040 ± 0.007 inches and said second surface has a radius of curvature of 0.035 ± 0.007 inches.

4.

The closure set forth in any preceding claim wherein said first surface has an axial edge spaced from said third surface by a dimension of 0.036 ± 0.007 inches.

5.

The closure set forth in any preceding claim wherein said second surface has an axial edge spaced from said third surface by a dimension in the range of 0.024 to 0.034 inches.

6.

The closure set forth in any preceding claim wherein said first and second surfaces have surface edges spaced from said third surface, and wherein radial spacing between said surface edges is 0.248 ± 0.010 inches.

7.

The closure set forth in any preceding claim wherein said first surface has a radius of curvature of 0.040 ± 0.007 inches and said second surface has a radius of curvature of 0.035 ± 0.007 inches.

8.

The closure set forth in any preceding claim wherein said skirt has an inside diameter of 28 mm nominal.

9.

The closure set forth in any preceding claim wherein said second lip has an axial edge with a convex surface.

10.

The closure set forth in claim 9 wherein said second lip has a radially inwardly facing concave surface.

11.

The closure set forth in claim 11 wherein said first lip has an axial edge with a conical surface.

12.

The closure set forth in any preceding claim in combination with a package that comprises a container having a finish of one of first and second finish configurations with identical thread diameters, an axially facing sealing surface and differing inside diameters and/or outside diameters at the sealing surface.

13.

A method of making a closure for sealingly closing at least two containers having differing finish configurations with the same thread diameter, said method comprising the steps of:

(a) providing a closure shell having a base wall and a peripheral skirt with an internal thread of a diameter to be received over the thread on either of said finish configurations, and

(b) securing to said base wall a resilient liner having a radially inwardly facing concave peripheral first surface adjacent to said skirt at a diameter for sealing engagement with an outside diameter of at least one of said finish configurations at said sealing surface, a radially outwardly facing concave second surface spaced from said skirt at a diameter for sealing engagement with an inside diameter of at least one of said finish configurations at said sealing surface, and a flat axially facing third surface extending between said concave surfaces for sealing engagement with the sealing surface of both of said finish configurations.

14.

The method set forth in claim 13 wherein said step (b) comprises the step of compression molding said liner in situ in each closure shell.

15.

A closure substantially as herein described with reference to any one of the embodiments of the invention illustrated in the accompanying drawings.

16.

A closure for use in combination with containers substantially as herein described with reference to any one of the embodiments of the invention illustrated in the accompanying drawings.

17.

A method of making a closure for sealingly closing at least two containers having differing finish configurations with the same thread diameter substantially as herein described with reference to any one of the embodiments of the invention illustrated in the accompanying drawings.

DATED this 27th day of April 2000
OWENS-ILLINOIS CLOSURE INC.
Attorney: STUART M. SMITH
Fellow Institute of Patent Attorneys of Australia
of BALDWIN SHELSTON WATERS

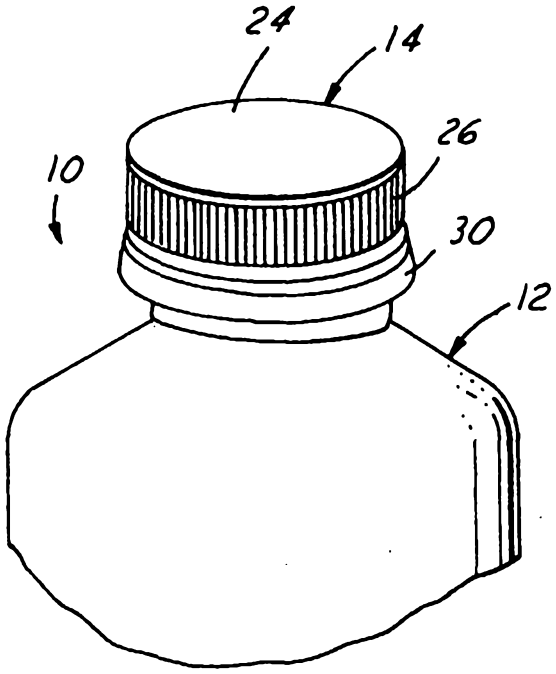

FIG.1

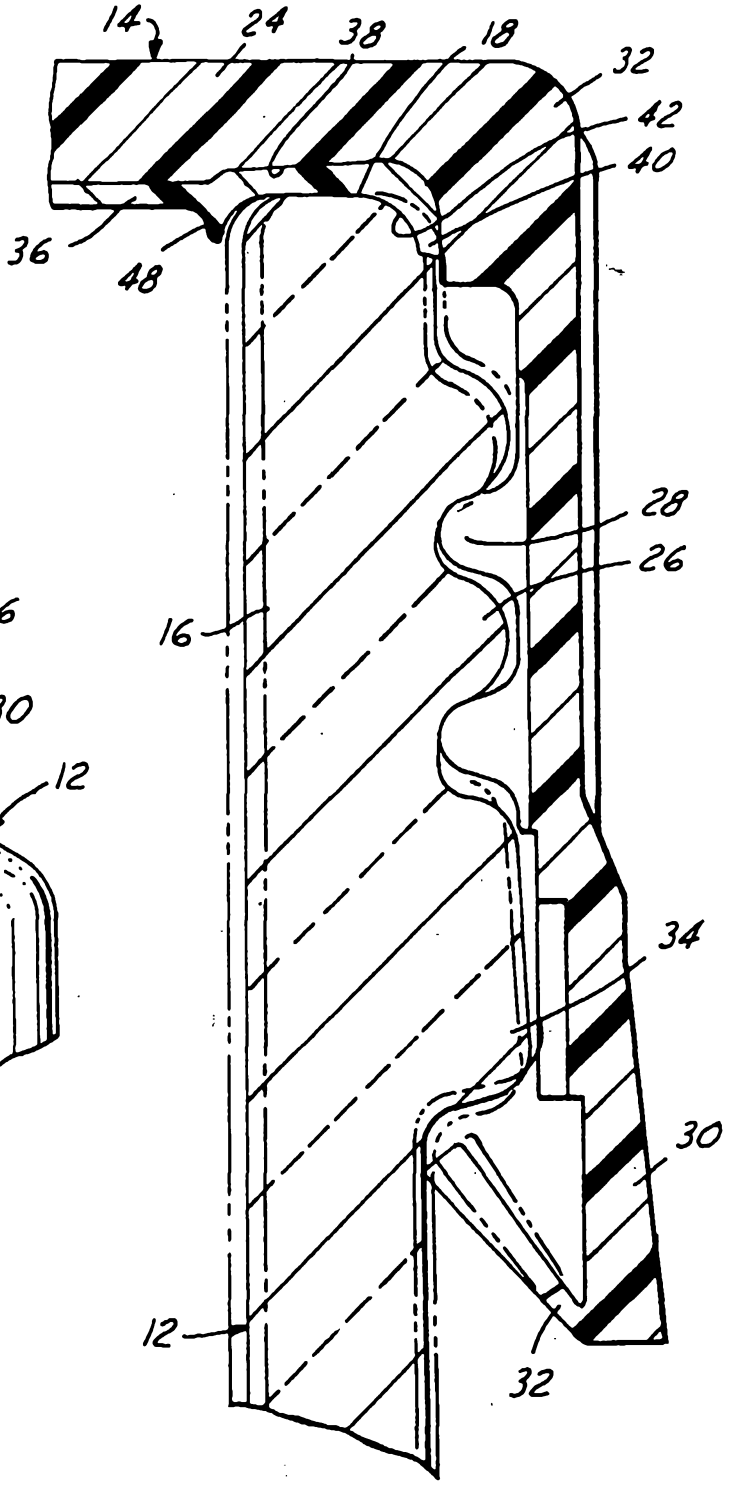

FIG.2

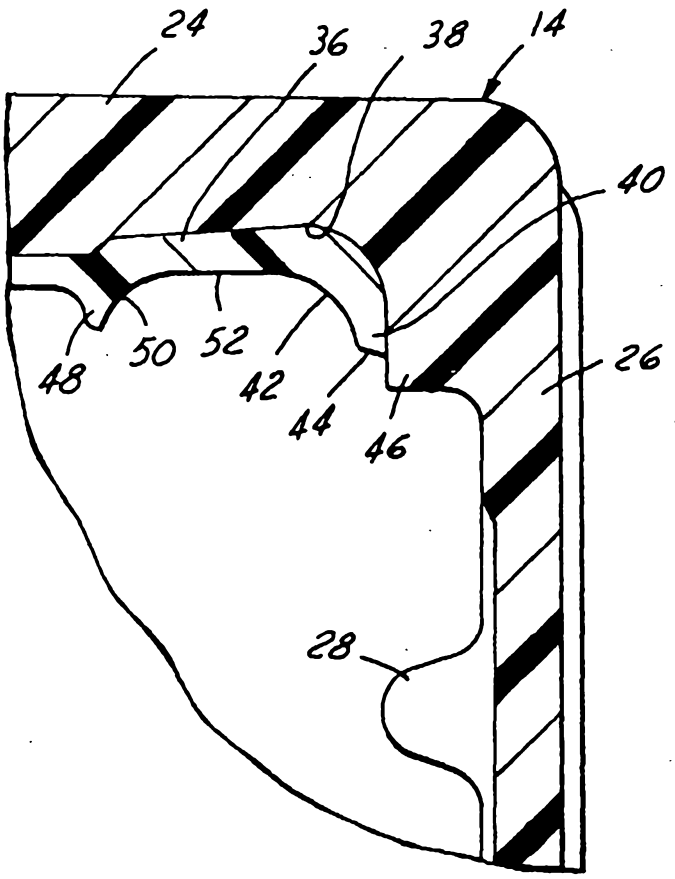
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FIG.4

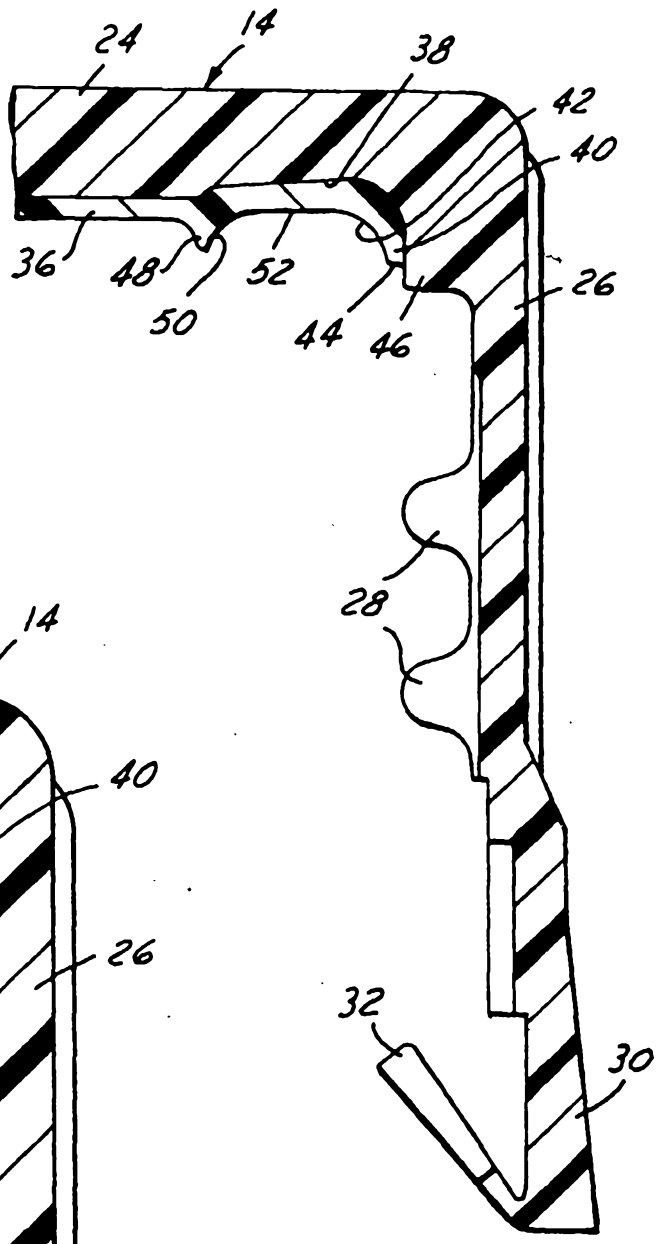
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FIG.3

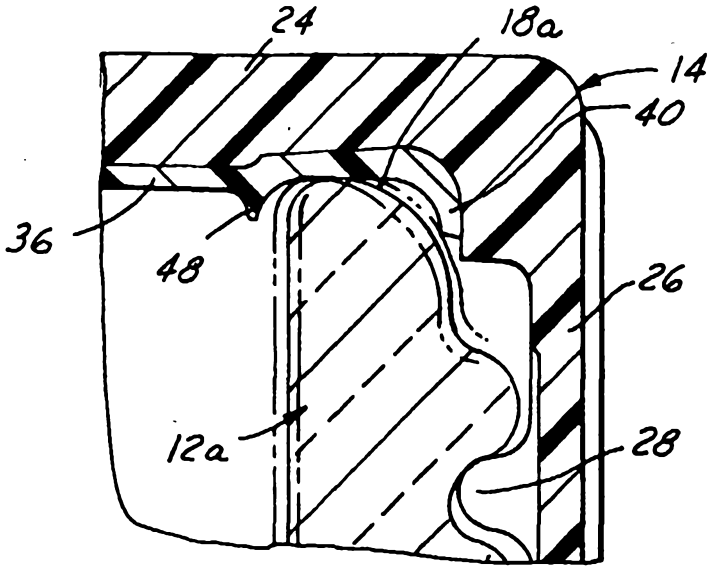

FIG.5

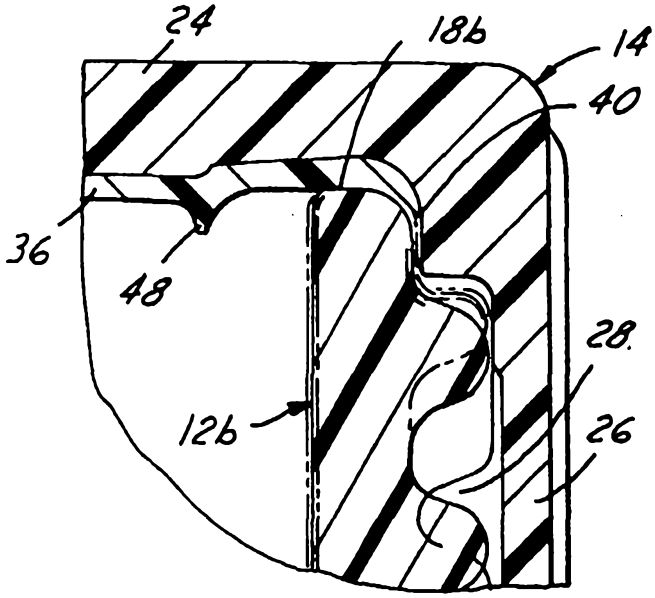

FIG.6

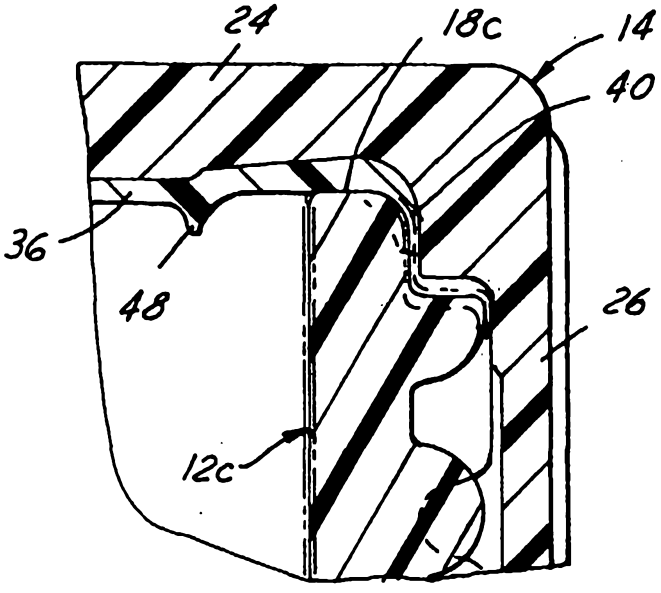

FIG.7