CONVERTIBLE CONTAINER CLOSURE

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ABSTRACT

A convertible closure includes a lid and a lid-mover ring coupled to the lid. The lid is adapted to mate with a filler neck of a container to close an opening into the filler neck. The lid-mover ring can be used to rotate the lid in clockwise and counterclockwise directions to mate and unmate the lid and the filler neck. The convertible closure can be modified by a user to function in a child-resistant (CR) mode or a non-CR mode.
CONVERTIBLE CONTAINER CLOSURE

BACKGROUND

[0001] The present disclosure relates to container closures, and particularly to "child-resistant" container closures. More particularly, the present disclosure relates to "convertible" container closures that are configured to be used in a "child-resistant" (CR) mode or a "non-CR" mode at the option of a user.

SUMMARY

[0002] A convertible closure in accordance with the present disclosure is configured to mate with a container to close an opening in a filler neck included in the container. The convertible closure is configured to be modified in the field by a user to function either in a "child-resistant" (CR) mode or in an easy-to-open non-CR mode.

[0003] In illustrative embodiments, the convertible closure includes a lid mounted for movement in an interior region formed in a surrounding lid-mover ring. The lid includes a base, axially upwardly extending torque-receiving lugs coupled to a ring-shaped platform included in the base, and radially outwardly extending torque-receiving teeth coupled to an annular side wall of the base. The lid-mover ring includes a shell, several downwardly extending lid-mover tabs coupled to the underside of an annular top rim included in the shell, and several inwardly extending lid-mover flanges coupled to an interior surface of an annular side wall of the shell.

[0004] When the closure is in the non-CR mode, the lid-mover flanges of the lid-mover ring always mate with the torque-receiving teeth of the lid during installation of the convertible closure on the container filler neck and removal of the closure from the container filler neck. In such a non-CR mode, the lid has been moved by a user relative to the surrounding lid-mover ring to assume a "lowered" position to cause the torque-receiving teeth of the lid to mate with the lid-mover flanges of the lid-mover ring during both clockwise and counterclockwise rotation of the lid-mover ring about an axis of rotation relative to the container filler neck while the lid is mounted on the container filler neck.

[0005] When the closure is in the CR mode, the lid can be moved by a user relative to the surrounding lid-mover ring to assume either (1) a "raised" position (above the lowered position) to modify the closure so that the lid-mover ring can be rotated in a clockwise direction about the axis of rotation to cause the lid-mover tabs on the lid-mover ring to mate with the torque-receiving lugs on the lid during installation of the closure on the container filler neck or (2) an "elevated" position (above the lowered and raised positions) to modify the closure so that the lid-mover ring can be rotated in a counterclockwise direction about an axis of rotation to cause the lid-mover tabs to mate with the torque-receiving lugs during removal of the closure from the container filler neck. To remove the closure (in the CR mode) from the filler neck, it is necessary for the user first to apply an external "push-down" force to the lid-mover ring while the lid is mounted on the container filler neck to place the closure on the filler neck in the CR mode to cause the lid to move relative to the lid-mover ring from the raised position to the elevated position. Then the user rotates the lid-mover ring in the counterclockwise direction to cause the lid and lid-mover ring to rotate in unison about the axis of rotation in a closure-removal direction relative to the container filler neck. To install the closure (in the CR mode) on the filler neck, any rotation of the lid-mover ring by the user in the counterclockwise direction will cause the lid and lid-mover ring to rotate in unison about the axis of rotation in a cap-installation direction relative to the container filler neck.

[0006] Additional features of the present disclosure will become apparent to those skilled in the art upon consideration of the following detailed description of illustrative embodiments exemplifying the best mode of carrying out the disclosure as presently perceived.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The detailed description particularly refers to the accompanying figures in which:

[0008] FIG. 1 is a perspective view of a canister including a container and a convertible closure in accordance with the present disclosure;

[0009] FIG. 2 is a view similar to FIG. 1 showing an open mouth formed in a threaded filler neck of the container of FIG. 1 and showing the convertible closure of FIG. 1 ("top" illustration) in a "push-down-and-turn-to-open" child-resistant (CR) mode shown in greater detail in a sectional view provided in FIG. 9 wherein top exterior surfaces of a lid and a surrounding lid-mover ring lie substantially in the same plane and also showing the same convertible closure of FIG. 1 ("bottom" illustration) in an alternative easy "rotate-to-open" non-CR mode shown in greater detail in a sectional view provided in FIG. 12 wherein a downward external position-changing force (represented by a double arrow) has been applied by a user to the lid (when the closure has been separated from the container filler neck) to move the lid downwardly relative to the surrounding lid-mover ring from a raised position to assume a lowered position located below the top surface of the lid-mover ring;

[0010] FIG. 3 is an exploded perspective assembly view of the canister of FIG. 1 showing, in series, from top to bottom, a lid-mover ring, a lid that is configured to mate with the lid-mover ring in "raised" and "elevated" positions to establish a "child-resistant" closure and, alternatively, in a "lowered" position to establish an "easy-open" non-CR closure, and a container including a filler neck configured to mate with the lid to allow the lid to close the mouth of the filler neck;

[0011] FIG. 4 is an enlarged partial perspective view of the lid-mover ring of FIG. 3 showing a shell and three of six downwardly extending cantilevered lid-mover tabs that are appended to an interior wall of a top rim of the shell and configured to transmit rotary motion from the lid-mover ring to the lid during installation of the lid on the filler neck and removal of the lid from the filler neck when the closure is "modified" in the field by a user to assume the CR mode shown, for example, in FIGS. 9-11 and also showing four of the many radially inwardly extending lid-mover flanges that are appended to an interior surface of a lower portion of the annular side wall of the shell and configured to transmit rotary motion from the lid-mover ring to the lid during installation of the lid on the filler neck and removal of the lid from the filler neck when the closure is "modified" in the field by a user to assume the non-CR mode shown, for example, in FIGS. 12 and 13;

[0012] FIG. 5 is a sectional view taken along line 5-5 of FIG. 4 showing six cantilevered lid-mover tabs coupled to the interior wall of an annular top rim of the shell and arranged to
lie in spaced-apart relation to one another and to a surrounding cylindrical interior surface of the annular side wall of the shell;

[0013] FIG. 6 is an enlarged partial perspective view of one of the cantilevered lid-mover tabs shown in FIGS. 4 and 5 showing that the lid-mover tab includes an elastic shaft formed to include a “left-facing” lid-installation drive face and a root arranged to interconnect the elastic shaft and the annular top rim and formed to include a “right-facing” lid-removal drive face;

[0014] FIG. 7 is an enlarged partial perspective view of the lid of FIG. 3 showing a downwardly opening “cup-shaped” base and a helical internal thread provided on a cylindrical interior surface of an annular side wall of the base and configured to mate with a helical external thread (shown in FIG. 2) provided on the filler neck of the container and also showing four of the axially upwardly extending torque-receiving lugs appended to a ring-shaped platform included in the base and dozens of radially outwardly extending torque-receiving teeth appended to a bottom edge of the annular side wall of the base;

[0015] FIG. 8 is a top plan view of the lid of FIG. 7 showing a portion of the lid-mover ring surrounding the base of the lid and showing insertion of two of the radially inwardly extending lid-mover flanges included in the lid-mover ring into two separate flange-receiving channels defined by four of the radially outwardly extending torque-receiving teeth included in the lid;

[0016] FIGS. 9-11 show an illustrative “push-down-and-turn-to-open” technique of removing the convertible closure from the filler neck of the container when the closure has been modified by a user to assume the CR mode;

[0017] FIG. 9 is a sectional view taken along line 9-9 of FIG. 1 after the closure (in the CR mode) has been mounted on the filler neck of the container and showing the lid in the raised position relative to the lid-mover ring and showing engagement of the lid-installation drive face of a selected lid-mover tab depending from the top rim of the shell of the lid-mover ring with a companion vertical driven face on a first of the axially upwardly extending torque-receiving lugs included in the lid;

[0018] FIG. 10 is a sectional view similar to FIG. 9 showing downward movement of the lid-mover ring toward the container to begin to compress the elastic shafts of the cantilevered lid-mover tabs and to cause the lid to move (relative to the lid-mover ring) from the raised position shown in FIG. 9 to the elevated position shown in FIG. 11 while the lid remains in a fixed position relative to the filler neck in response to application of a “push-down” force (represented by a double arrow) to the lid-mover ring by a user;

[0019] FIG. 11 is a sectional view similar to FIGS. 9 and 10 showing the lid in the elevated position relative to the lid-mover ring and showing counterclockwise rotation of the lid-mover ring about a vertical axis relative to the lid (after “full” compression of the elastic shafts of the lid-mover tabs) in response to application of a counterclockwise “turn” torque to the lid-mover ring by the user to cause the angled lid-removal drive face on the root of the selected lid-mover tab to mate with an angled torque-transmission face provided on a second of the axially upwardly extending torque-receiving lugs included in the lid to cause the lid to rotate in a counterclockwise “lid-removal” direction in union with the lid-mover ring and relative to the filler neck of the container so that the closure can be removed from the container;

[0020] FIG. 12 is a sectional view taken along line 12-12 of FIG. 1 showing the lid in the lowered position relative to the lid-mover ring after the convertible closure has been “converted” by a user for use in the non-CR mode mounted on the filler neck of the container, and

[0021] FIG. 13 is a partial sectional view taken along line 13-13 of FIG. 12 showing mating engagement of three of the radially inwardly extending lid-mover flanges included in the lid-mover ring with six of the radially outwardly extending torque-receiving teeth included in the lid so that clockwise rotation of the lid-mover ring relative to the filler neck always transmits torque to the lid to cause the lid to rotate relative to the filler neck when installation of the closure in the non-CR mode on the filler neck and so that counterclockwise rotation of the lid-mover ring relative to the filler neck always transmits torque to the lid to cause the lid to rotate relative to the filler neck during removal of the closure in the non-CR mode from the filler neck.

DETAILED DESCRIPTION

[0022] A convertible closure 10 in accordance with the present disclosure includes a lid 12 and a lid-mover ring 14 as suggested in FIGS. 1 and 3. Convertible closure 10 is configured to be modified in the field at the option of a user to mate with a filler neck 16 included in a container 18 in either a CR ("child-resistant") mode 21 as suggested in FIGS. 2 and 9-11 or a non-CR mode 22 as suggested in FIGS. 2, 12, and 13. In CR mode 21, a “push-down-and-turn” motion must be applied by the user to lid-mover ring 14 to remove lid 12 from filler neck 16 while only a “turning” motion must be applied by the user to lid-remover ring 14 to mount lid 12 on filler neck 16 as suggested in FIGS. 9-11. In non-CR mode 22, only turning motions must be applied by the user to lid-mover ring 14 to mount lid 12 on filler neck 16 and remove lid 12 from filler neck 16 as suggested in FIGS. 12 and 13.

[0023] An illustrative container 18 is shown in FIGS. 2 and 3. Container 18 includes a filler neck 16 coupled to an underlying vessel 20. Filler neck 16 is formed to include a mouth 24 opening into a storage region 25 formed in vessel 20. An external thread 26 is provided on filler neck 16 to mate with an internal thread 28 (see FIG. 7) provided on lid 12 to retain lid 12 in a mounted position on filler neck 16 closing mouth 24. It is within the scope of the present disclosure to use any suitable retention means to retain lid 12 in the mounted position on filler neck 16 and to provide a container 18 having any suitable size and shape.

[0024] An illustrative embodiment of lid-mover ring 14 is shown, for example, in FIGS. 4-6. Lid-mover ring 14 includes a shell 30, lid-mover tabs 31-36 coupled to shell 30, and several lid-mover flanges 38 coupled to shell 30. Lid-mover tabs 31-36 are used to transmit rotary motion applied by a user from lid-mover ring 14 to lid 12 when closure 10 is in CR mode 21 as suggested in FIGS. 9-11. In contrast, lid-mover flanges 38 are used to transmit rotary motion applied by a user from lid-mover ring 14 to lid 12 when closure 10 is in non-CR mode 22 as suggested in FIGS. 13 and 13.

[0025] Shell 30 of lid-mover ring 14 is arranged to surround lid 12 as suggested in FIGS. 1 and 2 and rotate relative to lid 12 about an axis of rotation 39 extending through lid 12 as suggested in FIGS. 11 and 12. In an illustrative embodiment, shell 30 is formed to include an annular side wall 40 and a top rim 42. Annular side wall 40 is arranged to surround lid 12 as shown, for example, in FIGS. 2 and 9. Top rim 42 has an annular shape in the illustrated embodiment.
[0026] Top rim 42 is coupled to annular side wall 40 and arranged to overlie a portion of lid 12 as shown in FIGS. 9-12. Top rim 42 is formed to include an inner edge 44 defining a central aperture 46 opening into an interior region 48 of shell 30 bounded by annular side wall 40 and top rim 42 as shown, for example, in FIG. 4. Top rim 42 also has an outer edge 49 and annular side wall 40 depends from outer edge 49 of top rim 42 to form interior region 48 as suggested in FIG. 4.

[0027] Annular side wall 40 of shell 30 includes a lid mount 50 and a rim support 52 arranged to interconnect lid mount 50 and outer edge 49 of top rim 42 as suggested in FIG. 4. Rim support 52 is arranged to surround lid 12 as suggested in FIGS. 9-12 and lid mount 50 is arranged to mate with lid 12 when closure 10 is in non-CR mode 22 as suggested in FIGS. 12 and 13.

[0028] Lid mount 50 is formed to include a “direct-drive” annular channel 54, a “spin-free” annular channel 56, and a channel partition 55 located between channels 54 and 56 as suggested in FIGS. 4 and 9. Each channel 54, 56 is arranged to open inwardly toward lid 12 located in interior region 48 of shell 30. Channel partition 55 has an annular shape and is coupled to annular side wall 40 and arranged to extend radially inwardly toward lid 12 in the illustrated embodiment.

[0029] Rim support 52 has an annular shape as shown in FIGS. 4 and 9. Rim support 52 cooperates with top rim 42 to form a hub-receiving cavity 58 located between top rim 42 and spin-free annular channel 56 as suggested in FIGS. 4 and 9. Lid-mover tabs 31-36 coupled to top rim 42 are arranged to lie in hub-receiving cavity 58 as suggested in FIGS. 4, 5, and 12.

[0030] As suggested in FIGS. 4-6, each lid-mover tab 31-36 is coupled to an interior wall 60 of top rim 42. Interior wall 60 faces into interior region 48 of shell 30. Each lid-mover tab 31-36 is arranged to lie in spaced-apart relation to annular side wall 40 of shell 30 as shown best in FIGS. 4 and 5 to define a gap 62 therebetween. Owing to the presence of gap 62, none of lid-mover tabs 31-36 are connected to or located on annular side wall 40 of shell 30 of lid-mover ring 14. Lid-mover tabs 31-36 are configured to move in interior regions 48, 58 in shell 30 relative to annular side wall 40 of shell 30 in CR mode 21 of closure 10 as suggested in FIGS. 9-12.

[0031] Each lid-mover tab 31-36 includes a root 70 and an elastic shaft 72 as suggested in FIGS. 4-6. Root 70 is coupled to interior wall 60 of top rim 42 and is arranged to interconnect top rim 42 and elastic shaft 72. Root 70 is formed to include a lid-removal drive face 71 and elastic shaft 72 is formed to include a lid-installation drive face 73 as shown best in FIG. 6. In an illustrative embodiment, lid-mover ring 14 is a monolithic component made of an elastic plastics material to cause each elastic shaft 72 to be made of a deformable elastic material. As used herein, “elastic” means capable of recovering size and shape after deformation.

[0032] Each lid-mover flange 38 of lid-mover ring 14 is arranged to lie in direct-drive annular channel 54 formed in lid-mount 50 of annular side wall 40 as shown, for example, in FIG. 4. Lid-mover flanges 38 are coupled to annular side wall 40 and arranged to lie in circumferentially spaced-apart relation to one another in direct-drive annular channel 54 as suggested in FIGS. 4 and 13. In an illustrative embodiment, each lid-mover flange 38 is a thin, flat blade having an upper end coupled to channel partition 55 and a lower end coupled to a radially inwardly extending annular lip 74 coupled to a bottom edge of lid-mount 50 as shown, for example, in FIGS. 4 and 9-12. Lip 74 and channel partition 55 are arranged to lie in spaced-apart relation to one another to define direct-drive annular channel 54 therebetween.

[0033] An illustrative embodiment of lid 12 is shown, for example, in FIGS. 3, 7, and 8. Lid 12 includes a base 80, torque-receiving lugs 81-86 coupled to base 80, and dozens of torque-receiving teeth 88 coupled to base 80. Torque-receiving lugs 81-86 are arranged to mate with lid-mover tabs 31-36 included in lid-mover ring 14 to transmit rotary motion from lid-mover ring 14 to lid 12 when convertible closure 10 is modified by a user to operate in CR mode 21 as suggested in FIGS. 9-11. Torque-receiving teeth 88 are arranged to mate with lid-mover flanges 38 included in lid-mover ring 14 to transmit rotary motion from lid-mover ring 14 to lid 12 when convertible closure 10 is modified by a user to operate in non-CR mode 22 as suggested in FIG. 12 and 13.

[0034] Each torque-receiving lug 81-86 includes an angled torque-transmission face 87a and a substantially vertical torque-transmission face 87b as shown, for example, in FIGS. 7 and 8. For each torque-receiving lug 81-86, its angled torque-transmission face 87a is oriented to face in a first direction and its vertical torque-transmission face 87b is oriented to face in an opposite second direction. Angled torque-transmission face 87a of a torque-receiving lug 81-86 mates with a lid-removal drive face 71 on root 70 of a companion lid-mover tab 31-36 during removal of a closure 10 in CR mode 21 from container filler neck 16. Vertical torque-transmission face 87b of a torque-receiving lug 81-86 mates with a lid-installation drive face 73 on elastic shaft 72 of a companion lid-mover tab 31-36 during installation of a closure 10 in CR mode 21 on container filler neck 16.

[0035] Each pair of adjacent torque-receiving teeth 88 included in lid 12 cooperate to define a radially outwardly opening flange-receiving channel 88 therebetween. Each flange-receiving channel 88 is sized to receive one of lid-mover flanges 38 therein upon movement of lid 12 relative to lid-mover ring 14 to the lowered position as shown, for example, in FIGS. 12 and 13 when closure 10 is in non-CR mode 22.

[0036] Base 80 of lid 12 includes a ring-shaped platform 90 shown in FIGS. 3 and 7 and arranged to lie in spaced-apart confronting relation to interior wall 60 of annular top rim 42 of shell 30 of lid-mover ring 14 as suggested in FIGS. 9-12. Torque-receiving lugs 81-86 are coupled to ring-shaped platform 90 and arranged to extend upwardly toward interior wall 60 of top rim 42.

[0037] Base 80 of lid 12 also includes an annular side wall 92 depending from an outer perimeter edge 91 of ring-shaped platform 90 as shown in FIG. 7. Torque-receiving teeth 88 are coupled to annular side wall 92 of lid 12 and arranged to extend radially outwardly toward annular side wall 40 of shell 30. In an illustrative embodiment, annular side wall 92 of lid 12 includes a vertical cylindrical panel 94 and an annular chamfered panel 93 arranged to interconnect ring-shaped platform 90 and vertical cylindrical panel 94. Torque-receiving teeth 88 are coupled to a lower end of vertical cylindrical panel 94 and arranged to lie in vertically spaced-apart relation to chamfered panel 93 as suggested in FIG. 7. Internal thread 28 is coupled to an interior surface 29 of vertical cylindrical panel 94 of annular side wall 92 of base 80 of lid 12 as shown, for example, in FIG. 7.

[0038] Base 80 of lid 12 also includes a dome 96 coupled to an inner perimeter edge 89 of ring-shaped platform 90 as shown in FIG. 7. Dome 96 is arranged to extend from ring-shaped platform 90 in an upward direction away from annular
side wall 92 of base 80. Dome 96 includes a round top wall 97 exposed in central aperture 46 formed in top rim 42 as suggested in FIGS. 1, 2, and 7. Dome 96 also includes a cylinder-shaped wall 98 arranged to extend from an outer perimeter edge of top wall 97 to inner perimeter edge 89 of ring-shaped platform 90 as shown in FIG. 7. Ring-shaped platform 90 is arranged to surround dome 96 as suggested in FIGS. 3 and 7.

Lid 12 is mounted for movement in interior region 48 of lid-mover ring 14 between a "lowered" position shown in FIG. 12, a "raised" position shown in FIG. 9, and an "elevated" position shown in FIG. 11. Lid 12 is placed by a user in the lowered position to establish non-CP mode 22 of convertible closure 10. Alternatively, lid 12 is placed by a user in either the raised position or the elevated position to establish CR mode 21. The raised position is used during installation of closure 10 on a container filler neck 16. The elevated position is used during removal of closure 10 from container filler neck 16.

In non-CP mode 22, lid 12 is located in the lowered position as shown in FIGS. 12 and 13. This location causes torque-receiving teeth 88 included in lid 12 mate with lid-mover flange 38 to cause lid 12 to rotate with lid-mover ring 14 about axis of rotation 39 in response to rotation of lid-mover ring 14 about axis of rotation 39.

In CR mode 21, lid 12 can be located in the elevated position shown, for example, in FIG. 1 during removal of closure 10 from container filler neck 16. The elevated position is located above the raised and lowered positions as shown in FIGS. 9, 11, and 12. In the elevated position, a lid-removal drive face 72 included in each of lid-mover tabs 31-36 is arranged to engage a companion torque-receiving lug 12 during counterclockwise movement of shell 30 of lid-mover ring 14 about axis of rotation 39 in closure-removal direction. Also in CR mode 21, lid 12 can be a raised position located between the lowered and elevated positions as shown in FIG. 9. This causes a lid- installation drive face 73 included in each of lid-mover tabs 31-36 to be arranged to engage another torque-receiving lug included in lid 12 during clockwise movement of shell 30 of lid-mover ring 14 about axis of rotation 39 in a closure-installation direction.

Each lid-mover flange 38 is coupled to shell 30 and arranged to mate with a companion pair of first and second torque-receiving teeth 88 of lid 12 upon downward movement of lid 12 along axis of rotation 39 away from the raised position to a lowered position relative to shell 30 as suggested in FIGS. 12 and 13. Each lid-mover flange 38 is coupled to annular side wall 40 of shell 30 and arranged to extend inwardly toward base 80 of lid 12 and into a companion flange-receiving channel 88' to mate with first and second torque-receiving teeth 88 that are arranged in spaced-apart relation to one another to define that companion flange-receiving channel 88' therebetween. Each lid-mover flange 38 is coupled to base 80 to impart rotary motion to lid 12 in response to clockwise and counterclockwise movement of shell 30 about axis of rotation 39 only when lid 12 has been moved to assume the lowered position relative to shell 30 to cause convertible closure 10 to be placed in non-CP mode 22.

Shell 30 of lid-mover ring 14 is arranged to surround lid 12 and rotate relative to lid 12 about an axis of rotation 39 extending through base 80 of lid 12 as suggested in FIGS. 2 and 3. Each lid-mover tab 31-36 is coupled to shell 30 and arranged to mate with a companion pair of first and second torque-receiving lugs 81-86 of lid 12 upon upward movement of lid 12 along axis of rotation 39 to the raised position relative to shell 30. Each lid-mover tab 31-36 is coupled to top rim 42 of shell 30 and arranged to extend downwardly toward base 80 to mate with a companion first torque-receiving lug coupled to base 80 to impart clockwise rotary motion to lid 12 in response to clockwise movement of shell 30 about axis of rotation 39 only when lid 12 has been moved to assume the raised position relative to shell 30 as suggested in FIG. 9. As suggested in FIGS. 10 and 11, each lid-mover tab 31-36 is arranged to mate with a companion second torque-receiving lug coupled to base 80 to impart counterclockwise rotary motion to lid 12 in response to (1) application of an external push-down force 100 to shell 30 to move top rim 42 of shell 30 downwardly toward base 86 to deform elastically lid-mover tabs 31-36 and to place lid 12 in the elevated position above the raised and lowered positions relative to shell 30 and (2) counterclockwise movement of shell 30 about axis of rotation 39 in lid-removal direction 101 only when lid 12 has been moved to assume the elevated position relative to shell 30.

Lid-mover tabs 31-36 are coupled to interior wall 60 of top rim 42 and arranged to lie in circumferentially spaced-apart relation to one another as suggested in FIG. 5 and extend downwardly into interior region 48 of shell 30 as suggested in FIG. 4 to mate with lid 12 when lid 12 has been moved to assume one of the raised and elevated positions relative to shell 30. Each lid-mover tab 31-36 includes an elastic shaft 72 formed to include a lid-installation drive face 73 and a root 31-36 arranged to interconnect top rim 42 and elastic shaft 72 and formed to include a lid-removal drive face 71. Lid-installation drive face 73 of each elastic shaft 72 is arranged to engage one of torque-receiving lugs 81-86 on base 80 of lid 12 during clockwise movement of shell 30 of lid-mover ring 14 about axis of rotation 39 when lid 12 has been moved to assume the raised position relative to shell 30 in CR mode 21. Lid-removal drive face 71 of root 70 is arranged to engage another one of torque-receiving lugs 81-86 on base 80 of lid 12 during counterclockwise movement of shell 30 of lid- mover ring 14 about axis of rotation 39 and elastic deformation of elastic shaft 72 when lid 12 has been moved to assume the elevated position relative to shell 30 also in CR mode 21.

As suggested in FIG. 9, elastic shaft 72 of lid-mover tab 31 is arranged to lie at an angle to interior wall 60 of top rim 42 when lid 12 has been moved to assume the raised position relative to shell 30. As suggested in FIG. 11, elastic shaft 72 of lid-mover tab 31 is arranged to lie in an about a spaced-apart parallel position to interior wall 60 of top rim 42 when lid 12 has been moved to assume the elevated position relative to shell 30 owing to elastic deformation of elastic shaft 72 in a space provided in interior region 48 of shell 30 between top rim 42 of shell 30 and base 80 of lid 12.

Base 80 of lid 12 includes a ring-shaped platform 90 arranged to lie in spaced-apart confronting relation to interior wall 60 of top rim 42 as suggested in FIGS. 9-12. Torque-receiving lugs 81-86 are coupled to ring-shaped platform 90 and arranged to extend upwardly toward interior wall 60 of top rim 42 as suggested in FIGS. 3 and 9-12. Elastic shaft 72 of lid-mover tab 31 is arranged to lie at an angle to ring-shaped platform 90 of base 80 of lid 12 as suggested in FIG. 9 when lid 12 has been moved to assume the raised position relative to shell 30 and lid-installation face 73 of elastic shaft 72 is arranged to mate with torque-receiving lug 81. Elastic shaft 72 of lid-mover tab 31 is arranged to mate along a length thereof with ring-shaped platform 90 of base 80 as suggested in FIG. 11 when lid 12 has been moved to assume the elevated position relative to shell 30 and lid-removal face 71 of root 70.
is arranged to mate with torque-receiving lug 86 owing to elastic deformation of elastic shaft 72.

Lid-removal drive face 71 is oriented to cooperate with interior wall 60 of top rim 42 to define an obtuse included angle therebetween as suggested in FIGS. 4, 6, and 9-12. Each torque-receiving lug 81-86 includes a substantially vertical torque-transmission face 87b oriented to mate with a lid-installation drive face 73 of a companion lid-mover tab 31-36 during counterclockwise movement of shell 30 about axis of rotation 39 when lid 12 has been moved to assume the raised position. Each torque-receiving lug 81-86 also includes an angled torque-transmission face 87a oriented to mate with lid-removal drive face 71 of a companion lid-mover tab 31-36 during counterclockwise movement of shell 30 about axis of rotation 39 when lid 12 has been moved to assume the elevated position. Angled torque-transmission face 87a of second torque-receiving lug is oriented to cooperate with ring-shaped platform 90 to define an included angle therebetween that is about equal to said obtuse included angle as suggested in FIG. 11.

Torque-receiving teeth 88 of lid 12 are arranged to lie in spin-free annular channel 56 formed in lid-mover ring 14 to avoid mating engagement with lid-mover flange 38 during clockwise and counterclockwise movement of shell 30 about axis of rotation 39 relative to lid 12 when lid 12 has been moved to assume one of the raised and elevated positions relative to shell 30 as suggested in FIGS. 9 and 10. Torque-receiving teeth 88 are arranged to lie in direct-drive annular channel 54 to mate with lid-mover flanges 38 during clockwise and counterclockwise movement of shell 30 about axis of rotation 39 relative to lid 12 when lid 12 has been moved to assume the lowered position relative to shell 30 as suggested in FIG. 11.

Channel partition 55 is configured to provide means for normally retaining torque-receiving teeth 88 included in lid 12 in spin-free annular channel 56 formed in annular side wall 40 of shell 30 until a downward external position-changing force 102 (see FIG. 2) has been applied to lid 12 to cause torque-receiving teeth 88 to move relative to shell 30 to spread portions of annular side wall 40 of shell 30 in radially outward directions so that torque-receiving teeth 88 are moved downwardly from spin-free annular channel 56 past channel partition 55 and into direct-drive annular channel 54. Such a position when closure has been removed from container filler neck 16 and placed on a flat surface (not shown) and then downward external position-changing force 102 is applied to lid 12 while lid-mover ring 14 is “at rest” on the flat surface.

Top wall 97 of dome 96 has an upwardly facing top exterior surface 103 exposed in central aperture 46 formed in top rim 42 as suggested in FIGS. 1, 2, and 9-12. Top rim 42 has an upwardly facing top exterior surface 104. Upwardly facing top exterior surfaces 103, 104 are arranged to lie in substantially coplanar relation one to another when lid 12 has been moved to assume the raised position as shown, for example, in FIGS. 1 and 9.

In use, in CR mode 21, lid-mover ring 14 is rotated about axis of rotation without downward pressure to effect threaded engagement of lid 12 and container filler neck 16. Elastic shafts 72 included in lid-mover tabs 31-36 cooperate to provide means for separating lid 12 and lid-mover ring 14 to place lid 12 normally in a raised position relative to lid-mover ring 14 as shown in FIG. 9. When lid-mover ring 14 is rotated in a counterclockwise direction without downward pressure, lid-installation drive face 73 on elastic shaft 72 of each lid-mover tab 31-36 included in lid-mover ring 14 mates with a vertical torque-transmission face 87b of a companion torque-receiving lug 81-86 included in lid 12 to rotate lid 12 to mate with container filler neck 16. When lid-mover ring 14 is pressed downwardly toward lid 12 while being rotating in a counterclockwise direction about axis of rotation 39, lid-removal drive face 71 on root 70 of each lid-mover tab 31-36 included in lid-mover ring 14 mates with angled torque-transmission face 87a of a companion torque-receiving lug 81-86 include in lid 12 to allow transfer of torque from lid-mover ring 14 to lid 12 to rotate lid 12 to unmate from container filler neck 16. When lid-mover ring 14 is rotated in the counterclockwise direction, lid-removal drive faces 71 and angled torque-transmission faces 87a do not mate owing to the separation of lid-mover ring 14 and lid caused by elastic shafts 72 of lid-mover tabs 31-36 to block transfer of torque from lid-mover ring 14 to lid 12 and such counterclockwise rotation of lid-mover ring 14 does not cause lid 12 to rotate relative to container filler neck 16.

1. A convertible closure comprising
a lid including a base adapted to be mounted on a container to close a mouth opening into a storage region formed in the container, first and second torque-receiving lugs coupled to the base and arranged to lie in spaced-apart relation to one another, and first and second torque-receiving teeth coupled to the base and arranged to define a flange-receiving channel therebetween, and
a lid-mover ring including a shell arranged to surround the lid and rotate relative to the lid about an axis of rotation extending through the base of the lid, a lid-mover tab coupled to the shell and arranged to mate with the first and second torque-receiving lugs of the lid upon upward movement of the lid along the axis of rotation to a raised position relative to the shell, and a lid-mover flange coupled to the shell and arranged to mate with the first and second torque-receiving teeth of the lid upon downward movement of the lid along the axis of rotation away from the raised position to a lowered position relative to the shell, wherein the shell is formed to include an annular side wall surrounding the lid and a top rim coupled to the annular side wall to overlie a portion of the lid and formed to include a central aperture opening into an interior region of the shell bounded by the top rim and annular side wall to expose the base of the lid, the lid-mover flange is coupled to the annular side wall of the shell and arranged to extend inwardly toward the base of the lid and into the flange-receiving channel to mate with the first and second torque-receiving teeth coupled to the base to impart rotary motion to the lid in response to clockwise and counterclockwise movement of the shell about the axis of rotation only when the lid has been moved to assume the lowered position relative to the shell, and the lid-mover tab is coupled to the top rim of the shell and arranged to extend downwardly toward the base to mate with the first torque-receiving lug coupled to the base to impart clockwise rotary motion to the lid in response to clockwise movement of the shell about the axis of rotation only when the lid has been moved to assume the raised position relative to the shell and to mate with the second torque-receiving lug coupled to the base to impart counterclockwise rotary motion to the lid in response to application of an external push-down force to the shell to move the top rim of the shell down-
wardly toward the base to deform elastically the lid-mover tab and to place the lid in an elevated position above the raised and lowered positions relative to the shell and counterclockwise movement of the shell about the axis of rotation only when the lid has been moved to assume the elevated position relative to the shell.

2. The convertible closure of claim 1, wherein the top rim has an outer edge, the annular side wall depends from the outer edge of the top rim, the lid is arranged to lie in the interior region of the shell, the lid-mover tab is coupled to an interior wall of the top rim facing into the interior region, and the lid-mover tab is arranged to lie in spaced-apart relation to the annular side wall of the shell to define a gap therebetween.

3. The convertible closure of claim 2, wherein the top rim has an annular shape, the lid-mover ring further includes a plurality of other lid-mover tabs, the lid-mover tabs are coupled to the interior wall of the top rim and arranged to lie in circumferentially spaced-apart relation to one another and extend downwardly into the interior region of the shell to mate with the lid when the lid has been moved to assume one of the raised and elevated positions relative to the shell, and the lid further includes a plurality of other torque-receiving lugs coupled to the base and arranged to mate with the lid-mover tabs.

4. The convertible closure of claim 3, wherein each lid-mover tab includes an elastic shaft formed to include a lid-installation drive face and a root arranged to interconnect the top rim and the elastic shaft and to include a lid-removal drive face, the lid-installation drive face of each elastic shaft is arranged to engage one of the torque-receiving lugs on the base of the lid during clockwise movement of the shell of the lid-mover ring about the axis of rotation when the lid has been moved to assume the raised position relative to the shell, and the lid-removal drive face of the root is arranged to engage one of the torque-receiving lugs on the base of the lid during counterclockwise movement of the shell of the lid-mover ring about the axis of rotation and elastic deformation of the elastic shaft when the lid has been moved to assume the elevated position relative to the shell.

5. The convertible closure of claim 2, wherein the lid-mover tab includes an elastic shaft formed to include a lid-installation drive face and a root arranged to interconnect the top rim and the elastic shaft and to include a lid-removal drive face, the lid-installation drive face is arranged to engage the first torque-receiving lug on the base of the lid during clockwise movement of the shell of the lid-mover ring about the axis of rotation when the lid has been moved to assume the raised position relative to the shell, and the lid-removal drive face of the root is arranged to engage the second torque-receiving lug on the base of the lid during counterclockwise movement of the shell of the lid-mover ring about the axis of rotation and elastic deformation of the elastic shaft when the lid has been moved to assume the elevated position relative to the shell.

6. The convertible closure of claim 5, wherein the elastic shaft of the lid-mover tab is arranged to lie at an angle to the interior wall of the top rim when the lid has been moved to assume the raised position relative to the shell and is arranged to lie in about a spaced-apart parallel position to the interior wall of the top rim when the lid has been moved to assume the elevated position relative to the shell owing to elastic deformation of the elastic shaft in a space provided in the interior region of the shell between the top rim of the shell and the base of the lid.

7. The convertible closure of claim 5, wherein the base of the lid includes a ring-shaped platform arranged to lie in spaced-apart confronting relation to the interior wall of the top rim, the first and second torque-receiving lugs are coupled to the ring-shaped platform and arranged to extend upwardly toward the interior wall of the top rim, the elastic shaft of the lid-mover tab is arranged to lie at an angle to the ring-shaped platform of the base of the lid when the lid has been moved to assume the raised position relative to the shell, and the elastic shaft of the lid-mover tab is arranged to mate along a length thereof with the ring-shaped platform of the base when the lid has been moved to assume the elevated position relative to the shell and the lid-removal face of the root is arranged to mate with the second torque-receiving lug owning to elastic deformation of the elastic shaft.

8. The convertible closure of claim 7, wherein the lid-removal drive face is oriented to cooperate with the interior wall of the top rim to define an obtuse included angle therewith, the first torque-receiving lug includes a substantially vertical torque-transmission face oriented to mate with the lid-installation drive face of the lid-mover tab during clockwise movement of the shell about the axis of rotation when the lid has been moved to assume the raised position, the second torque-receiving lug includes an angled torque-transmission face oriented to mate with the lid-removal drive face of the lid-mover tab during counterclockwise movement of the shell about the axis of rotation when the lid has been moved to assume the elevated position, and the angled torque-transmission face of the second torque-receiving lug is oriented to cooperate with the ring-shaped platform to define an included angle therebetween that is about equal to said obtuse included angle.

9. The convertible closure of claim 1, wherein the annular side wall of the shell is formed to include a direct-drive annular channel and a spin-free annular channel located between the direct-drive annular channel and the top rim, the lid-mover flange is arranged to lie in the direct-drive annular channel and the torque-receiving teeth are arranged to lie in the spin-free annular channel to avoid mating engagement with the lid-mover flange during clockwise and counterclockwise movement of the shell about the axis of rotation relative to the lid when the lid has been moved to assume one of the raised and elevated positions relative to the shell, and the torque-receiving teeth are arranged to lie in the direct-drive annular channel to mate with the lid-mover flange during clockwise and counterclockwise movement of the shell about the axis of rotation relative to the lid when the lid has been moved to assume the lowered position relative to the shell.

10. The convertible closure of claim 9, wherein the shell includes a channel partition coupled to the annular side wall and located between the direct-drive annular channel and the spin-free annular channel and configured to provide means for normally retaining the torque-receiving teeth included in the lid in the spin-free annular channel formed in the annular side wall of the shell until a downward external position-changing force has been applied to the lid to cause the torque-receiving teeth to move relative to the shell to spread portions of the annular side wall of the shell in radially outward directions so that the torque-receiving teeth are moved from the spin-free annular channel past the channel partition and into the direct-drive annular channel.

11. The convertible closure of claim 10, wherein the channel partition is ring-shaped and arranged to extend in a radi-
ally inward direction from the annular side wall of the shell into the interior region of the shell.

12. The convertible closure of claim 10, wherein the annular side wall of the shell includes a lid mount formed to include the direct-drive annular channel and the spin-free annular channel and a rim support arranged to interconnect the top rim and the lid mount, the top rim and the rim support cooperate to form a tab-receiving cavity located between the top rim and the spin-free annular channel, and the lid-mover tab is located in the tab-receiving cavity.

13. The convertible closure of claim 9, wherein the shell includes several other lid-mover flanges and the lid-mover flanges are arranged to lie in the direct-drive annular channel in circumferentially spaced-apart relation to one another.

14. The convertible closure of claim 1, wherein the base of the lid includes a ring-shaped platform and an annular side wall depending from an outer perimeter edge of the ring-shaped platform, the first and second torque-receiving lugs are coupled to the ring-shaped platform and arranged to extend upwardly away from the annular side wall of the base and toward the top rim of the shell, and the first and second torque-receiving teeth are coupled to the annular side wall of the lid and arranged to extend radially outwardly toward the annular side wall of the shell.

15. The convertible closure of claim 14, wherein the annular side wall of the lid includes a vertical cylindrical panel and a chamfered panel arranged to interconnect the ring-shaped platform and the vertical cylindrical panel and the first and second teeth are coupled to a lower end of the vertical cylindrical panel and arranged to lie in vertically spaced-apart relation to the chamfered panel.

16. The convertible closure of claim 14, wherein the lid-mover tab includes an elastic shaft formed to include a lid-installation drive face and a root arranged to interconnect the top rim and the elastic shaft and formed to include a lid-removal drive face, the lid-installation drive face is arranged to engage the first torque-receiving lug on the ring-shaped platform of the base of the lid during clockwise movement of the shell of the lid-mover ring about the axis of rotation when the lid has been moved to assume the raised position relative to the shell, and the lid-removal drive face of the root is arranged to engage the second torque-receiving lug on the ring-shaped platform of the base of the lid during counterclockwise movement of the shell of the lid-mover ring about the axis of rotation when the lid has been moved to assume the elevated position relative to the shell, the shell further includes several other lid-mover flanges coupled to the annular side wall of the shell and arranged to lie in circumferentially spaced-apart relation to one another and extend inwardly toward the annular side wall of the lid, and the lid further includes a plurality of other torque-receiving teeth that are coupled to the base and arranged to extend radially outwardly to mate with the lid-mover flanges coupled to the annular side wall of the shell.

17. The convertible closure of claim 14, wherein the base of the lid further includes a dome coupled to an inner perimeter edge of the ring-shaped platform and arranged to extend from the ring-shaped platform in an upward direction away from the annular side wall of the lid, the dome includes a top wall exposed in the central aperture formed in the top rim and a cylinder-shaped wall arranged to extend from an outer perimeter edge of the top wall of the dome to the inner perimeter edge of the ring-shaped platform, and the ring-shaped platform is arranged to surround the dome.

18. The convertible closure of claim 14, wherein the lid includes a helical internal thread coupled to an interior surface of the annular side wall of the lid.

19. The convertible closure of claim 17, wherein the top wall of the dome has an upwardly facing top exterior surface exposed in the central aperture formed in the top rim, the top rim has an upwardly facing top exterior surface, and the upwardly facing top exterior surfaces are arranged to lie in substantially coplanar relation one to another when the lid has been moved to assume the raised position.

20. A convertible closure comprising:

a lid-mover ring including a shell formed to include an interior region, a lid-mover tab made of an elastic material and coupled to the shell and arranged to extend into the interior region, and a lid-mover flange coupled to the shell and arranged to extend into the interior region, and a lid mounted for movement in the interior region of the lid-mover ring between a lowered position wherein torque-receiving teeth included in the lid mate with the lid-mover flange to cause the lid to rotate with the lid-mover ring about an axis of rotation in response to rotation of the lid-mover ring about the axis of rotation, an elevated position above the lowered position wherein a lid-removal drive face included in the lid-mover tab is arranged to engage a torque-receiving lid included in the lid during counterclockwise movement of the shell of the lid-mover ring about the axis of rotation, and a raised position located between the lowered and elevated positions wherein a lid-installation drive face included in the lid-mover tab is arranged to engage another torque-receiving lug included in the lid during clockwise movement of the shell of the lid-mover ring about the axis of rotation.

21. The convertible closure of claim 20, wherein the shell of the lid-mover ring includes a top rim and an annular side wall coupled to the top rim to form a boundary of the interior region and the lid-mover tab is arranged to lie in spaced-apart relation to the annular side wall to form a gap therebetween.

22. The convertible closure of claim 21, wherein the lid-mover tab includes an elastic shaft formed to include the lid-installation drive face and a root arranged to interconnect the top rim and the elastic shaft and formed to include the lid-removal drive face.

23. The convertible closure of claim 22, wherein the lid-installation drive face is arranged to face in a first direction and the lid-removal drive face is arranged to face in an opposing second direction.

24. The convertible closure of claim 22, wherein the elastic shaft of the lid-mover tab is arranged to lie at an angle to the interior wall of the top rim when the lid has been moved to assume the raised position relative to the shell and is arranged to lie in about a spaced-apart parallel position to the interior wall of the top rim when the lid has been moved to assume the elevated position relative to the shell owing to elastic deformation of the elastic shaft in a space provided in the interior region of the shell between the top rim of the shell and the base of the lid.

25. The convertible closure of claim 22, wherein the lid includes a ring-shaped platform arranged to lie in spaced-apart confronting relation to the interior wall of the top rim, the first and second torque-receiving lugs are coupled to the ring-shaped platform and arranged to extend upwardly toward the interior wall of the top rim, the elastic shaft of the lid-mover tab is arranged to lie at an angle to the ring-shaped
platform of the lid when the lid has been moved to assume the raised position relative to the shell, and the elastic shaft of the lid-mover tab is arranged to mate along a length thereof with the ring-shaped platform of the lid when the lid has been moved to assume the elevated position relative to the shell and the lid-removal face of the root is arranged to mate with the second torque-receiving lug owning to elastic deformation of the elastic shaft.