A closure set within an aperture of a container end wall, such as a beverage container, whereby pressurized gasses within the container force bias a tapered sealing panel into gas tight sealing engagement within a complementary tapered rim seal. An enclosing cover, providing contamination protection, is rotated open, uncovering a vent hole, exhausting pressurized gasses prior to the tapered sealing panel being opened, such as to provide a pour opening. Rotation of the cover actuates co-joined levers that transfer a force to automatically open or close the tapered sealing panel. A space located on the inside surface of the cover is first available to a user, containing indicia and promotional messages on initial opening of the container.
AUTOMATIC OPENING, VENTING, AND CLOSING RE-SEALABLE CONTAINER CLOSURE

FIELD OF THE INVENTION

[0001] The present invention relates to an end member of a container, such as an aluminum beverage container, having an aperture defining a pour opening set in an end wall of a container. Such a container will be pressureize, caused by dissociating gasses released from the beverage product, resulting in high pressure gasses collecting within the container. Such gasses are required to be contained to protect the freshness of the product.

BACKGROUND OF THE INVENTION

[0002] A search of prior art reveals many patents issued that address the opening, venting and resealing of a container, such as an aluminum beverage can.

[0003] Once the can is open, if all the contents are not consumed, any remaining beverage could be resealed, and remain fresh for later consumption. This would eliminate the present practice of disposing of the unconsumed contents, which is wasteful, and can be inconvenient or inappropriate. Numerous U.S. patents such as, U.S. Pat. Nos. 4,442,950, 4,887,712, 5,011,037, 6,220,470, and 6,626,314, attest to the desire to provide the public with the aforementioned features.

[0004] In U.S. Pat. No. 6,626,314 McHenry, et al, describe a re-closable beverage container, utilizing pressure differential to force bias a sealing flap toward a dispensing port. A vent hole is uncovered to release internal pressure prior to the sealing flap being opened, providing a pour opening.

[0005] A dust cover prevents debris from contaminating surfaces that contact the contents.

[0006] Co-owned U.S. patent application Ser. No. 10/365,152 addresses the above concerns and provides a re-sealable closure that utilizes internal gas pressure to act on a sealing panel, co-operating with a tapered depending wall within a rim seal member describing a dispensing port. A vent hole is uncovered to exhaust pressurized gasses prior to opening a sealing panel. However this invention does not address the problem and health concerns caused by product contacting areas surrounding a pour opening that may be contaminated with dust and debris. To avoid this condition, a desirable feature would provide an all inclusive protective cover, encompassing both the aforementioned closure and a surrounding area interposed between the closure and an external peripheral rim of a typical aluminum beverage container. It would also be desirable to provide an automatic means of opening and closing a sealing panel, including unsealing and resealing a vent hole, thus eliminating the need for digital manipulation of a closure mechanism, avoiding further possible contamination.

PRIOR ART

[0007] Field of search.

[0008] Cl. 220-269, 272, 281, 339, 351.

SUMMARY OF THE INVENTION

[0009] The present invention provides a novel automatic re-closure device for a substantially liquid and gas tight sealing engagement, set within an aperture defining a pour opening in a container end wall. Such a container may contain carbonated beverages of various types. Dissociating gasses being released from the beverage product can result in high pressure within the container, such contained gasses are necessary to preserve the freshness of the product.

[0010] This present invention is designed to provide a sanitary cover encompassing an area defined by a re-sealable closure, set within an end wall of a container, such as an aluminum beverage can. Additionally to cover adjacent surrounding areas where drinking or pouring transfers beverage such that contact with the exterior of container parts occur. Heretofore such areas have been exposed to contamination from dust and debris, causing health concerns.

[0011] Eliminating or reducing contamination of these areas is desirable, resulting in safer, uncontaminated transfer of beverage contents.

[0012] It is an object of this present invention to provide a substantially liquid and gas tight seal, and that this sealing means be available for the initial sealing of a container, and for subsequent resealing of the container, as described within the body of this application.

[0013] It is an object of this present invention is to provide an automatic opening, closing and resealing of a beverage container. Such a feature includes automatically releasing internal high pressure gasses to achieve equalization of pressure prior to a sealing panel being opened to provide a pour opening. Also to automatically return a sealing panel to resell a container enabling high pressure gasses to be contained. The foregoing being achieved without digital adjustment that could possibly compromise uncontaminated portions of the container end wall by digital manipulation.

[0014] It is a further object of this invention is to utilize the internal pressure within a sealed container to operate against the interior portion of a sealing member by placing complementary tapered members in compression, one cooperating within another, thereby providing a more effective gas tight seal. It is an object of this invention to release the internal pressure within a container prior to providing a pour opening in an end wall of such a container.

[0015] It is an object of this invention to provide a sanitary area defining a pour opening, and adjacent surrounding areas where drinking or pouring transfers beverage such that contact with the exterior of container parts occur, by providing an all enclosing cover that renders the aforementioned areas unaffected by dust or other contaminants that may accumulate over time.

[0016] Yet another object of this invention to provide a grasping portion of a member limiting digital contact, avoiding a possible source of contamination by touching or manipulating other portions of the device.

[0017] It is an object of this invention to make available an automatic method of opening and closing of a sealing panel, by lifting and rotating a cover.

[0018] It is a further object of this invention to provide an actuator device that acts as a mechanical means to secure a sealing panel in a closed position, or in an open position.

[0019] Yet another objective is to provide a tangible seal hermetically sealing a cover member and a rim seal member, also providing a tamper proof evidence of prior opening.
[0020] It is an object of this invention to utilize the space provided on the lower surface of the cover, to include indicia or promotional messages. These messages being first available to a user on the initial opening of the closure.

[0021] In a preferred embodiment, the closure device, manufactured of a suitable elastomeric material, includes a rim seal with an annular locking recess surrounding the marginal edges defining a pour opening, such as to provide a substantially liquid and gas tight sealing engagement. Such rim seal includes an internal narrow strip hinge, located on an internal aspect of the rim, and a means whereby a cover may be attached on an external position.

[0022] The rim seal includes a tapered inner wall, protruding within the container body, with the larger diameter open to the container interior.

[0023] A sealing panel, set within the aforementioned rim seal, connected to the rim seal by an internal narrow strip hinge, having a tapered outer wall with a like complementary taper to the rim seal inner wall, such that both elements cooperate in sealing engagement, one within the other.

[0024] Of note is the internal pressure acting to compress the internal area of the sealing panel, forcing the tapered walls into tighter engagement, providing a more efficient gas tight seal.

[0025] Notably, a small diameter gas vent hole is set within the rim seal, communicating between the exterior and interior of the container. An external hinge connects the rim seal to the all encompassing cover. With the cover in a closed, sealing position relative to the sealing panel, a gas vent cover is in place and seals the previously mentioned gas vent hole in a gas tight sealing engagement. Lifting and rotating the cover around the external hinge, separates the gas vent cover from a sealing position over the gas vent hole, allowing gas under high pressure to exhaust. Since the exhausting process occurs as the cover is only slightly open, any pressurized liquid that could erupt is contained under the cover, shielding the consumer, providing a dry venting feature.

[0026] Continued rotation activates co-joined levers that transfer force to a tapered sealing panel, which is automatically opened to provide a pour opening, or closed, by the aforementioned rotation direction.

BRIEF DESCRIPTION OF THE DRAWINGS
[0027] FIG. 1 is a top view of the embodiment of the re-sealable closure for beverage containers, with a cover member partially removed for clarity.

[0028] FIG. 2 is a cross sectional view taken along line 23–23, of FIG. 1.

[0029] FIG. 3 is an enlarged view of securing members location relative to the existing contours of an ordinary beverage container, and a placement of a frangible seal connection.

[0030] FIG. 4 is a cross sectional view of the device of this invention in an open position, taken through lines 23–23 as shown in FIG. 1.

[0031] FIG. 5 is a prospective partial view, showing linkage mechanism with connections illustrated in a closed, retracted position.

[0032] FIG. 6 is a geometrical view, showing linkage mechanism as located in a closed, retracted position, indicating an imaginary point on Activating Lever 14 relative to a position to Hinge (fulcrum) 18.

[0033] FIG. 6a is a geometrical view, showing linkage mechanism as located in an open, extended position, indicating an imaginary point on Activating Lever 14 relative to a position to Hinge (fulcrum) 18.

[0034] FIG. 7 is a view through linkage mechanism in an approximate midrange position being rotated toward an extended, pour open position, using solid arrows to indicate movement.

[0035] FIG. 7a is a view through linkage mechanism in an approximate midrange position being rotated toward a retracted, closed position, using solid arrows to indicate movement.

[0036] FIG. 8 is a view as described in FIG. 1, illustrating an alternative embodiment.

[0037] FIG. 9 is a cross sectional view taken along line 23–23, of FIG. 8.

[0038] FIG. 9a is a perspective view of a separated portion of cover 10, showing the termination of the separation of a frangible seal line 11.

[0039] FIG. 10 is cross section of a mechanism sliding forward in the direction of major arrows, applying a force to open a sealing panel 8, through connecting strip 30. Minor broken arrow indicating the reciprocal direction to close the stated sealing panel.

[0040] FIG. 11 is a cross sectional view taken through line 38–38 in FIG. 8.

DETAILED DESCRIPTION OF THE DRAWINGS
[0041] FIG. 1 illustrates a plan view of a container 1, and end wall 2, such as an aluminum beverage container, with a major portion of a cover 10, removed for clarity, having a permanently attached resealable device, manufactured of a suitable elastomeric components, incorporating the principles of this invention.

[0042] Referring to FIGS. 1, FIG. 2, a preferred embodiment of this invention is shown positioned and attached to a beverage container 1 having an end wall 2, and aperture 3.

[0043] Into aperture 3, is inserted, in circumferential sealing engagement, rim seal 5, having a depending wall engaging the marginal edge defining aperture 3, in an annular locking recess 4.

[0044] The inwardly open circumference of rim seal 5 is formed to incorporate a taper 21, dimensioned such as to have one diameter open toward the exterior of container 1, and the larger diameter open to the interior of container 1. A small diameter gas vent hole 9, communicates between the interior and exterior of container 1, located in rim seal 5 positioned toward the central axis of container 1.

[0045] Rim seal 5 is provided with exterior hinge 18, and interior hinge 6, of which more details will follow. Sealing panel 8 defines a sealing panel dimensioned to fit in resealable engagement within rim seal 5, having a depending outer wall with a like taper 21, to engage within tapered inner wall of rim seal 5. Sealing panel 8 is connected to rim
Cover 10 is positioned to overlay rim seal 5 and sealing panel 8, and extends to a portion of container end wall 2, and a portion of a rim of container 1, this area being adjacent to aperture 3, providing a preferred drinking position to a user. Thus, cover 10 provides a sanitary area free from dust and debris that may accumulate providing a user with a clean area from which to transfer the beverage contents of container 1.

Cover 10 is attached to rim seal 5 by hinge connection 18, located proximate to the central axis of end wall 2. The distal end of cover 10 incorporates a lip extension 19, and a finger lift 20, together with securing members 20-1 and 7, of which more will be described later. Cover 10 is connected to the periphery of rim seal 5 by flange seal 11, (best seen in FIG. 5). This provides an hermetically sealed closure, in an initial sealing position. Cover 10 has an outer surface positioned toward the exterior of container 1, and an inner surface positioned toward the interior of container 1. The underside of cover 10 includes stiffening ribs 13, located from an edge proximate a side of container 1, and terminating at a distal end near exterior hinge 18. Gas vent hole 9, having one end open toward the exterior and one end open toward the interior of container 1, is covered in a seal tight engagement in a first sealing position, by gas vent cover 12 positioned to contact rim seal 5.

Gas vent cover 12 is positioned close to external hinge 18, and is distanced from securing members (20-1, 7) mentioned above, providing a mechanical advantage assisting in multiplying forces compressing the cooperating surfaces of gas vent cover 12 and rim seal 5, providing a gas proof seal at gas vent hole 9, thereby containing the high pressure gasses within container 1.

Hinge 18 provides a means whereby cover 10 may be rotated approximately 170 degrees, from a first, closed sealed position into a second open position.

Referring to FIG. 3, an enlarged view of a securing method is shown. Finger lift 20 cantilevers away from the outside rim of container 1, providing a grasping opportunity to apply force in an upward or downward direction. In a first closed position, curl 20-1 is pressed against the outside rim area of container 1, such as to have a frictional contact with the rim, applying force towards the container 1. An inner depending member 7, is positioned to locate the inside rim area of container 1 within an area defined by lip extension 19, having a frictional contact in an opposite direction to curl 20-1, together providing a clamping force to secure cover 10 in a closed position. Also shown is the flangeable connection 11 connecting cover 10 and rim seal 5 in a hermetically sealed flangeable connection. FIG. 4 shows the embodiment of this invention in an almost fully opened position. Cover 10 being rotated in an upward direction, and sealing panel 8 being rotated in a downward direction towards the interior of container 1.

A series of levers are provided located between the lower surface of cover 10, and the upper surface of sealing panel 8. Activating levers 14 are connected to cover 10 through flexible connectors 24, the distal ends being connected by flexible connections 25 to connecting lever 14-1. A rim seal extension 17, extends toward the center of rim seal 5, and terminates at flexible connector 28, which, in turn, connects to upper extension lever 15.

Lower extension lever 16 is connected to upper extension lever 15 by flexible connection 26, and at a lower end to sealing panel 8 through flexible connection 27. The position of the various levers as shown illustrate a collapsed position, representing a first sealing position of cover 10 with sealing panel 8 inserted into rim seal 5. (FIG. 2)

The Opening Sequence Will Now Be Described

Grasping and lifting finger lift 20, curl 20-1 is pulled slightly away from a rim surrounding container 1 breaking contact with the rim, inner depending member 7 slides up the inside of this same rim until both securing members are no longer making contact with the rim of container 1.

Cover 10 is now free to rotated in an upward direction around exterior hinge 18. Stiffening ribs 13 provide rigidity to maintain cover 10 in a basically flat plane during rotation. Flangeable seal 11 starts to tear apart in close proximity to an edge of container 1, and continues to separate around the periphery as rotation continues, terminating at a connection cooperating with exterior hinge 18. The initial action of separating flangeable seal 11 is accompanied by a noticeable resistance indicating the seal has not been previously separated, and provides a tamper proof indication to a user.

Gas vent cover 12 lifts and separates a sealing engagement with rim seal 5, and gas vent hole 9 is uncovered, allowing pressurized gasses within the container 1 to exhaust, equalizing internal and external pressure. The elimination of pressure on the interior of sealing panel 8 removes a forcing function which previously cooperated to maintain a gas tight seal within rim seal 5, making sealing panel 8 easy to separate from within rim seal 5. As cover 10 continues to rotate, flexible connectors 24 are rotating around external hinge 18, acting as a fulcrum. This rotary action is transferred to linear motion, causing a pulling action on connected activating levers 14.

This action is illustrated in FIG. 6, and FIG. 6a. (The numerals used are the same as in the described body of the drawings) An imaginary point on a lever (14) is shown in FIG. 6, spaced a certain distance d1, from a fulcrum (18). Member (10), connected to lever (14) through connector (24) is shown about to be rotated around fulcrum (18), in a direction indicated by an arrow. FIG. 6a shows the results of this rotation, with the distance d2, now reduced by an amount of radius (24/18). Thus the rotary motion of flexible connector 24 is turned into a linear pulling motion of activating lever 14.

It will be appreciated that pressure must be removed from sealing panel 8 in order to make easy a separation from rim seal 5, and such pressure be removed before a separating sequence begins. To achieve this requirement a delayed action is provided by lever 14-1. Lever 14-1 has to travel through a portion of the rotation of activating
lever 14, (FIG. 5, broken line 14-1) prior to being positioned whereby the force of the aforementioned pulling action is transferred directly to upper lever 15, so that a separation of gas vent cover 12 and rim seal 5, has taken place at a position over gas vent hole 9. This delay ensures the exhausting process of the pressurized gasses is complete prior to continuing the opening sequence, the direct application of a pulling force acting on upper lever 15, to start the separation of sealing panel 8. It will be noted the angle between activating lever 14, and positioning lever 14-1, varies from acute to obtuse in the various drawings presented.

[0059] An example is provided in FIG. 7, the position as shown illustrating an approximate midpoint between a collapsed position, and an extended position, of an opening sequence. Cover 10 is shown being rotated in a direction indicated by major arrows, with minor arrows indicating the individual movements of the connecting levers. The angle between activating levers 14, and connecting lever 14-1 has achieved a position whereby the pulling force is acting to rotate upper lever 15, and through flexible connection 25, is applying force to lower lever 16. The combination of the application of this force to upper lever 15, and lower lever 16 causes a change in position where by the distance between flexible connectors 28 at an upper position, and 27 at a lower position is increased. Sealing panel 8 is free to rotate around internal hinge 6, and the resultant force and increased distance, as mentioned above, cause a pushing action acting on sealing panel 8 in a direction toward the interior of container 1, providing a pour opening in container end wall 2.

[0060] FIG. 4 illustrates sealing panel 8 in a fully opened position, the position of the interacting levers lock sealing panel 8 in the mentioned open position, and by extension, act to support cover 10 in an opened secure position, allowing unimpeded access to a pour opening.

[0061] At some point during the initial rotation of cover 10, the underside becomes visible for the first time. A user is presented with indicia contained on the cover underside 22, offering advertising messages, or 'instant winner' games of chance.

The Closing Sequence Will Now Be Described

[0062] To return the closure to a closed position requires that upper lever 15, and lower lever 16, be returned to the aforementioned collapsed position.

[0063] The pulling action on the described levers as described above when rotating cover 10 in an opening direction, is available as a pushing action when the direction of rotation is reversed. Flexible connection 24 is again rotated around exterior hinge 18 (fulcrum) in a direction towards a first closed sealing position. This rotation provides a force that acts on activating lever 14 resulting in an opposite action of the levers as described above, such that the levers are returned to an original, collapsed position. The action of returning activating lever 14 to an original position rotates connecting lever 14-1 through flexible connection 25. During this portion of the rotation, only a small proportion of the force is applied to upper lever 15. However, when connecting lever 14-1 contacts stop 15-1 the position so formed makes more rigid the connection between the mentioned members, transferring all the force developed to rotate upper lever 15, and, hence, lower lever 16, to an original position. (Best seen in FIG. 5, and FIG. 7a) It follows that sealing panel 8, through the interaction of flexible connector 27, rotates around internal hinge 6, and is repositioned within rim seal 5. This action also returns gas vent cover 12 to an original position, covering gas vent hole 9, and reestablishing a gas tight seal.

[0064] Applying a downward force in an area approximately over lip extension 19, a user reestablishes contact with curl 20-1 and inner depending member 7, thereby securing cover 10 in a closed, re-sealed position. Subsequent dissociating gasses from the remaining beverage build up pressure. This pressure again acts on the underside of sealing panel 8, engaging tapers 21 further into sealing contact, effectively providing gas tight re-sealing of container 1. Container 1 can be re-opened and re-sealed many times by repeating this action.

[0065] An alternate embodiment of this invention is shown in FIG. 8 and FIG. 9. This embodiment differs only from the preferred embodiment in the modifications to, and method of opening and closing sealing panel 8.

[0066] Referring to FIG. 8 and FIG. 9, a rim seal extension 5-1 is shown protruding over the end wall 2 in a direction away from the main body of the closure, with cover 10 extended to enclose this additional area. A flexible strap 30 is shown attached at a lower position to sealing panel 8, and terminates at an upper position attached to connecting pin 33. Stiffening ribs 34 and 35 extend the length of cover 10, with collars 37 located at an inside extreme end of each, so that stiffening ribs 34 and 35 become a left and right hand pair. Stiffening rib 34 is further differentiated by the inclusion of circular pad 36, located to be in a sealing relationship with rim seal 5, and covering a small diameter gas vent hole 9.

[0067] Each end of connecting pin 33 is shown inserted into collars 37 so that rotation between connecting pin 33 inside collar 37 is possible. Strap 33 is positioned and constrained between rim seal plinths 31 at a lower position, and strap guides 32 at an upper position.

The Opening and Closing will now be Explained

[0068] Referring to FIG. 8 and FIG. 9 grasping and lifting finger lift 20, curl 20-1 is pulled slightly away from a rim surrounding container 1 breaking contact with the rim, inner depending member 7 slides up the inside of this same rim until both securing members are no longer making contact with the rim of container 1.

What is claimed is:

1. A closure, set within an aperture of a container end wall, for gas tight containment of dissociating gasses that emit from carbonated beverage, whereby said container is a beverage container, and becomes pressurized when sealed, said closure comprising:
   a rim seal portion, inserted into said container end wall in circumferential sealing engagement defined by said container aperture, having an upper surface located on the exterior of said container, and a lower surface located on the interior of said container;
   a small diameter gas vent hole located within said rim seal, communicating between said exterior and interior surfaces of said container,
an internal opening, incorporating a tapered depending wall, said taper being open toward said exterior with a first diameter, and open toward said interior with a second larger diameter;

a sealing panel, having an upper surface located toward the exterior of said container, and a lower surface located toward the interior of said container, pivotally attached to said lower surface of said rim seal;

said sealing panel having on an external periphery a depending wall with a complementary taper to said rim seal, dimensioned to fit in sealing engagement within said rim seal, located in a first stored sealing position within and against said rim seal, and having a means by which said sealing panel can be selectively rotated into a second stored pour open position, located within said container interior;

2. A closure, as claimed in claim 1, including said closure being composed of an elastomeric material.

3. A closure, as claimed in claim 1, wherein increasing pressure building within said container is utilized to act upon said sealing panel said lower surface, compressing said tapers into a tighter sealing engagement and preventing release of said pressurized gasses.

4. A closure, as claimed in claim 1, wherein an enclosing cover is formed to encompass an area described by said closure, and extending toward a near edge of said container end wall, such as to provide protection against contaminants being present under said cover area, so that product transfer contacting said area remain contamination free during drinking or pouring;

5. A cover, as claimed in claim 4, having an upper surface located toward the exterior of said container, and lower surface located toward the interior of said container, wherein said cover is attached to said rim seal exterior surface by a hinge, including an integral gas vent sealing cover positioned on said interior surface, covering said exterior end of said rim seal gas vent hole located proximate the central axis of said end wall, so that rotation of said cover from a first sealing position where said gas vent is covered, to a second, open position whereby said pressurized gasses are vented, and access to said closure is presented;

6. A cover, as claimed in claim 4, wherein said cover incorporates longitudinal stiffing ribs, located on said lower surface, to provide rigidity of said cover, and a lifting member located opposite said hinge location, including a frangible seal formed between and joining the periphery of said rim seal on an upper surface said cover portion on said lower surface, encompassing said closure forming an hermetically sealed area, raising said lifting member starts a process whereby said rotation of said cover results in said frangible seal tearing and separating during an initial opening sequence, said opening sequence indicating tamper proof security by providing detectable resistance to a user during an initial opening act, which is unavailable during subsequent openings;

7. A closure as described in claim 1, wherein co-joined levers are attached at one end to said upper surface of said sealing panel, and attached to said lower surface of said cover at a distal end, said co-joined levers being activated by said cover rotation automatically adjusting the distance between said attached ends, providing a force that is transmitted to said sealing panel, applying said force to extend or retract said co-joined levers causing rotation of said sealing panel between said first sealing position within said rim seal and a second open position, secured within the interior of said container;

8. A small diameter gas vent hole as claimed in claim 1, wherein said small diameter gas vent hole is located in said rim seal in a position proximate said hinged connection of said cover, and opposite a lifting member of said cover, so as to produce a mechanical advantage assisting in compressing said gas vent sealing cover in a seal tight connection, covering said small diameter gas vent hole on said upper surface of said rim seal;

9. A cover, as claimed in claim 4, wherein said lower surface, hidden until said container is initially opened, becomes visible, providing a location and displaying indicia offering promotional, or other messages, using methods well established to advertise products or offer rewards or prizes.

10. A closure as described in claim 7, in an alternate embodiment, wherein different geometry of levers attached to said sealing panel are manually manipulated to impart a force to cause rotation of said sealing panel between said first sealing position within said rim seal and a second open position, secured within said interior of said container;

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