Jan. 16, 1968 C. W. SIMONS 3,363,793

CLOSURE ELEMENTS

Filed May 27, 1966

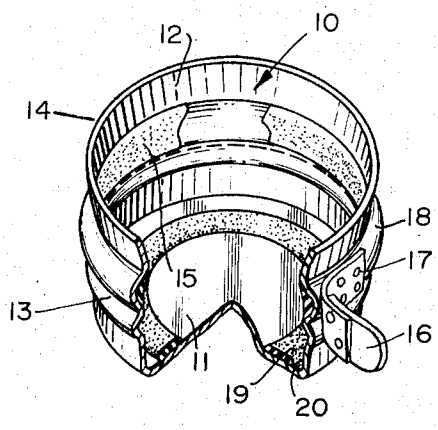


FIG. 1

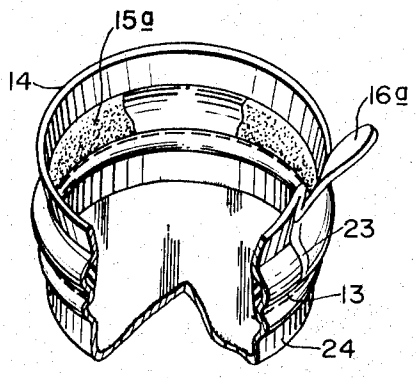


FIG. 2

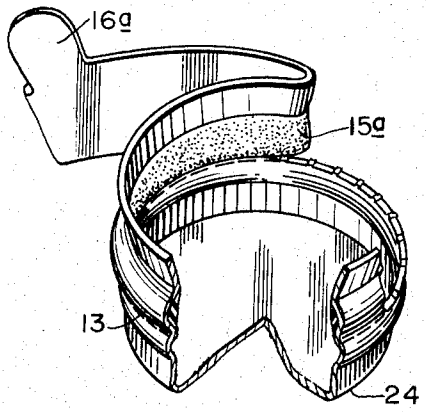


FIG. 3

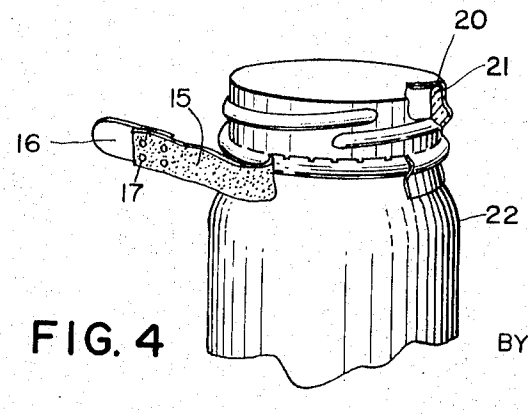


FIG. 4

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CLOSURE ELEMENTS

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ABSTRACT OF THE DISCLOSURE

A tamper-proof closure for maintaining a hermetic seal of a container which is composed of a skirted closure having a circumferential score line spaced upwardly a distance from the edge of the skirt and a primary sealing gasket disposed in the area intermediate the score line and the edge of the skirt. The seal is broken by severing the closure along the score line. A secondary annular sealing gasket may be included on the inner surface of the panel of the closure.

This invention relates to closures for containers. In a particular aspect, it relates to closures for hermetically sealed containers in which the closure is provided with a tear-strip section which functions as a means for easily removing the closure as well as a means for indicating whether the seal on a container has been tampered with before the container has reached the consumer.

Proper packaging of processed foods, such as baby foods, is imperative to protect the product from oxygen as well as bacteria. Processing involves cooking the product in a sealed container of glass or other material at a temperature and for a time sufficient to destroy all organisms that might cause spoilage. Oxygen in a sealed container is undesirable as it may react with the food and the metal closure and directly affect the quality and nutritional value of the food. Glass containers fitted with metal closures are used extensively to hermetically seal a wide variety of foods as the glass is not subject to oxidative attack and the packaged product is visible.

Sealing gaskets of various sorts are used to provide a hermetic seal between the container and the closure. These gaskets may be derived from rubber solutions, rubber latices, plastisols of a vinyl resin and other materials which have resilient properties. They may be applied in a fluid state by lining the periphery of the inside surface of a closure element and drying the lined composition in an oven. Upon heating, the liquid composition is transformed into a continuous rubber-like mass which insures an air-tight seal between the closure and the container.

Rotatable closures are commonly used with glass containers. These are usually made of lacquered tinplate which include, among others, the screw type and lug type, and roll-on aluminum closures. The various rotatable closures differ chiefly in the means by which the closure is held firmly in place on the container. Such means include a continuous or discontinuous thread, projecting lugs, etc., which are located near the container opening and are adapted to mate in threaded engagement with a closure as it is rotatably advanced to bring the gasket into sealing relationship with the mouth of the container.

In sealing a jar with a closure, air is removed from the head space above the contents in closing machines which produce a vacuum either mechanically or by the condensation of steam. In closing the container, the torque must be sufficient to resist retractive movement during shipment and/or storage. Retraction of the closure is undesirable as it is apt to break the seal and result in leaks through which spoilage organisms will gain access to the contents of the container.

The removal torques for vacuum-packed containers vary widely, but it is well known that some containers, such as baby food jars, have the closures so firmly attached that it is necessary to resort to fairly drastic means to effect their removal. In other cases, the closures are loosely attached so that only a slight twist is required to remove the closure from the container. This is objectionable because the container is subject to tampering while stored on shelves by customers who remove the closure to examine the contents, reclose the container and then replace the container on the shelf. It is apparent that such opening breaks the seal and exposes the contents to the atmosphere with the result that spoilage will gradually occur.

It is, therefore, an object of this invention to provide a closure which is tamper-proof and which maintains a hermetic seal of a container. It is another object to provide a reclosable container in which removal of the closure is independent of any friction between the primary sealing gasket and the container. It is a further object to provide a container assembly comprising a container body, a reclosable cover therefor, and a tear-strip by which the seal of the container may be broken and thereby permit the removal of the closure.

The closure of this invention comprises a circular panel, a skirt depending from the periphery of the panel, a circumferential score line paralleling and spaced from the free edge of the skirt, and a primary sealing gasket secured to the inner surface of the closure in that portion intermediate the free edge of the skirt and the score line. Means, such as a tab, may be associated with the scored section by which the seal is broken and the closure is removed from the container. In another embodiment, the closure may be provided with a secondary sealing gasket which is positioned circumferentially on the inner surface of the panel and spaced inwardly a distance from the juncture where the skirt and panel merge.

In a further embodiment, the closure may be formed of a light-weight metal, such as aluminum, wherein threads are rolled into the closure and the score line is formed after it has been seated on the container. In this embodiment, the closure can be removed by imparting a rotary movement of sufficient force to sever the score line and thereby divide the upper portion of the closure from its lower portion. The upper portion may then be unscrewed from the container to expose the contents, and, in like fashion, it may be reused to close the container. The unthreaded lower skirt portion of the closure containing the primary sealing gasket may be retained on the container.

The closure of this invention is particularly adaptable for preserving processed foods. In this method, the contents in the container are heated immediately before sealing thereby causing the air in the headspace to be displaced by water vapor with the result that a vacuum is formed when the container is cooled to a temperature below that at which it was sealed. By positioning the primary sealing gasket near the free edge of the skirt, the gasket softens at food processing temperatures and forms an impression which conforms to the external surface of the container which it overlaps. Since the external surface of containers are imperfect, a seal is formed which compensates for these imperfections and prevents leaks through which air and micro-organisms can gain access into the container. To remove the closure from the container, the score line is ruptured whereby the vacuum in the container is completely relieved. Upon removal of the scored section of the skirt from the periphery of the container, the closure may be unscrewed from the container with little or no effort because no frictional forces exist to counteract the removal.

In the drawing, like numerals indicate like parts in which:

FIG. 1 illustrates a closure, partly in section, which includes a primary gasket, a secondary gasket, and a tab affixed to the outer surface of the closure by which the primary seal may be broken.

FIG. 2 shows a closure having only a primary sealing gasket and alternate means by which the gasketed section may be removed to break the seal.

FIG. 3 is a view similar to FIG. 2 and shows the scored portion of the skirt partly drawn away from the closure.

FIG. 4 is a fragmentary view of a closure seated on a container with the scored portion partly drawn away and a sectional view showing the position of the secondary gasket on the container.

Referring to the embodiment illustrated in FIG. 1, the closure **10** includes a circular panel **11** integrated at its periphery with a skirt **12**. It may be formed of a suitable metal, such as tinplate or aluminum, having its inner surface bearing a protective coating (not shown) such as a vinyl or oleoresinous type, to protect the contents in the container against direct contact with the metal. A score line **13** circumscribes the skirt at a point inwardly of the free edge **14** of the skirt. The score line, which may be continuous or it may consist of a series of spaced aligned depressions, is impressed in the skirt to a depth sufficient to define a weakened crease but insufficient to penetrate through the metal. Its weakness is such so as to rupture the skirt at that point and thus permit the upper portion of the closure to be removed.

A primary sealing gasket **15** is affixed to the inner surface of the closure at a point intermediate the circumferential score line **13** and the free edge **14** of the skirt and resides exclusively below the score line. A tab **16**, which may be metal or plastic, is secured to the external surface of the skirt by suitable means, such as rivets **17**, and is operatively associated with the score line. To rupture the skirt at this point, it is only necessary to apply sufficient force by grasping the tab and pulling it in a direction away from the container whereby the scored section is broken.

The removal of the lower portion of the closure together with the primary gasket **15** is illustrated in FIG. 4. It is noted that upon removal of the terminal end of the skirt that the primary gasket is likewise removed thus leaving a clean surface to the container finish. When the section of the skirt below the score line is removed, the upper portion of the closure, which includes the threaded section of the skirt and the panel, may be removed simply by imparting a rotating movement thereto.

In the embodiment shown in FIG. 1, the closure is provided with a continuous thread **18** by which it is removably engaged to the container. Lugs or other engaging means may be substituted for the continuous thread **18**. A secondary gasket **19** may be positioned circumferentially on the inner surface of the panel **11** and is spaced inwardly from the juncture where the skirt and panel merge to define a channel **20**. As shown in FIG. 4, the lip **21** of the container **22** fits into the channel **20** which insures against overflow of contents from the container to the threads during processing or handling.

It is noted that the primary sealing gasket **15** is positioned below the score line **13** and provides the container with the main sealing function. It is important that the primary sealing gasket reside below the score line in order to permit air to enter into the container and thus break the vacuum when the score line is ruptured. The secondary sealing gasket is so located that it will not allow the contents of the container to flow over into the threads at any state of handling or processing, but it will readily admit air into the jar when the primary seal is broken.

The embodiment as shown in FIG. 2 includes a tab **16***a* extending from the free edge **14** and is associated with a vertical score line **23** which merges with the circumferential score line **13**. A primary sealing gasket **15***a* is

secured to the inner surface of the skirt and resides below the score line **13**. The removal of the skirt section together with the gasket **15***a* is illustrated in FIG. 3 and is accomplished by grasping the tab **16***a* and drawing it up and away from the closure whereby the score line **23** is ruptured vertically. As the rupture continues, it connects with score line **13** at a right angle which permits the removal of the lower section of the skirt from the periphery of a container.

It is noted that a secondary sealing gasket is absent in the panel section of the closure illustrated in FIG. 2. This arrangement is particularly adaptable to containers bearing contents which are not subjected to processing conditions requiring elevated temperatures. It is especially adaptable to bottled beverages, such as alcohol, or prepared mixes for cocktails. When applied to containers which do not include heat-processed foods, the tab **16***a* and its associated vertical score line **23** may be eliminated. In this variation, the upper threaded portion **24** of the closure may be removed by applying a rotative force sufficient to rupture the score line **13** as the gasket **15***a* provides sufficient friction to prevent twisting of the lower portion of the skirt. When the score line **13** is completely ruptured, the top portion **24** may be removed simply by unscrewing it from the mouth of the container.

Suitable materials from which the primary sealing gasket may be formed include cut rubber rings, uncoated or coated with a pressure-sensitive heat- or solvent-reactivatable cement; polyamide hot melt adhesives; rubber/resin blends, including blends based on neoprene, nitrile, natural, styrene-butadiene, and ethylene-propylene rubbers; vinyl resin compositions, including plastisols of vinyl chloride polymers and blends of vinyl resins; polyurethane rubbers and rubber gaskets prepared from solutions or latices and flowed and solidified in position on the closure skirt. These materials may be modified by the addition of various additives to impart desirable properties such as fillers, plasticizers, tackifiers, curing agents and antioxidants.

Since the secondary sealing gasket contacts the contents within the container, it must be composed of materials which are acceptable for packages designed for human consumption. It may be formed of plastisols of vinyl chloride polymers which when fluxed have a solid or cellular structure, and rubber compositions, such as foamed latices. As indicated previously, the secondary sealing gasket is not essential to the success of the closure in all uses, but it is desirable to prevent overflow of processed foods into the skirt of the closure. In containers packed under vacuum, the secondary gasket acts as a valve in that during the sealing step this gasket is urged inwardly and around the inner surface of the container mouth. When the seal provided by the primary gasket is broken, air is admitted into the container through the space between the external surface of the container and the inner surface of the skirt of the closure. The admission of air causes the panel and, concomitantly therewith, the secondary gasket to lift. An additional advantage is that the secondary gasket provides a measure of insurance in sealing glass containers which have a variation in the finish of the container mouth, and in providing additional sealing protection in cases where a perfect primary seal is not formed.

The invention is further illustrated by the following example:

Example

An aluminum closure formed of a panel and a depending skirt and having a panel diameter of 48 mm. was provided with a coating of a vinyl lacquer over its entire inner surface. A continuous strip of a polyamide sealing composition (softening point of about 380° F.) was applied over a ⅜ inch width of the inner surface of the closure and spaced inwardly a distance from the free edge of the skirt. A ring of a plastisol sealing composition having a width of ¼ inch was then applied to the inner surface of

the panel and spaced inwardly from the panel-skirt juncture. The plastisol was composed of the following ingredients.

Ingredient:	Parts by weight
Polyvinyl chloride (paste grade)	100
Dioctyl phthalate	208
Epoxidized soybean oil	20
Azodicarbonamide	2
Zinc oxide	1
Silica	10

After both sealing compositions were applied to the respective positions, the closure was heated to 400° F. for one minute at which time the plastisol developed a cellular structure and was fluxed. The closure containing the sealing gaskets was heated to 300° F. to soften the gaskets and thereafter engaged to a 4-ounce baby food jar. Sufficient force was then applied to press the primary seal of polyamide around the transfer bead of the container. Continuous threads were rolled into the skirt portion of the closure and a score line was impressed in the skirt above the primary sealing gasket. The closed container was then inverted under water in a vacuum chamber and vacuum was applied at increments of 5, 10, 15, and 20 inches of mercury at 75° F. This is an exceptionally severe test because in actual practice a vacuum would be present within the container. In this specific test, the external pressure caused an excess of internal over external pressure thus forcing the closure to lift from the container. Nevertheless, the severity of this test produced no evidence of leakage. This indicates that the gasket placements provide a highly efficient seal for container

closures while permitting ease of closure removal utilizing the weakened scored section.

I claim:

1. A closure for containers which comprises a threaded circular panel, a skirt dpending from the periphery of the panel, a circumferential score line paralleling and spaced from the free edge of the skirt, said score line being impressed in the skirt to a depth sufficient to define a weakened crease but insufficient to penetrate through the skirt, and a primary sealing gasket secured to the inner surface of the closure in that portion intermediate the free edge of the skirt and the score line.

2. A closure according to claim **1** which includes a tab associated with the score line by which the scored section is removed from the closure.

3. A closure according to claim **1** which includes a tab extending from the free edge of the skirt and is associated with a vertical score line which merges with the circumferential score line.

4. A closure according to claim **1** which includes a secondary sealing gasket positioned circumferentially on the inner surface of the panel and spaced inwardly from the juncture where the skirt and panel merge.

References Cited

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FRANKLIN T. GARRETT, *Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,363,793 January 16, 1968

Charles W. Simons

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 6, line 4, strike out "threaded"; line 5, for "a skirt dpending" read -- a threaded skirt depending --.

Signed and sealed this 25th day of February 1969.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents