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ALKENYL AROMATIC RESINOUS PACKAGING

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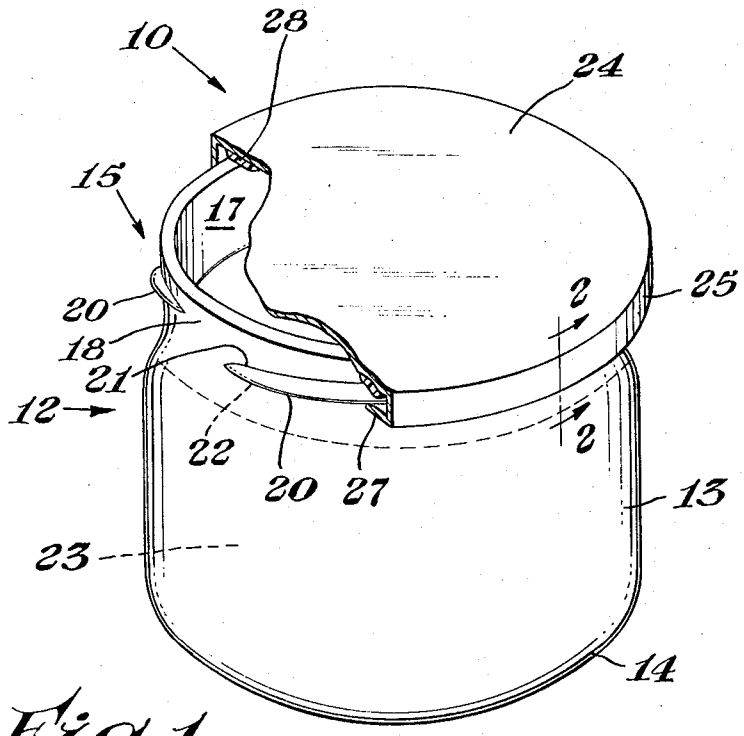


Fig. 1

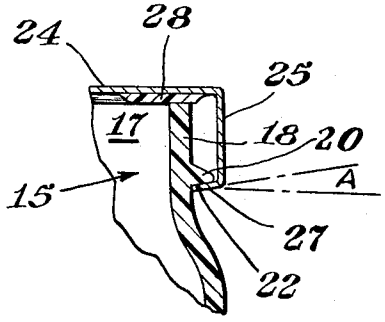


Fig. 2

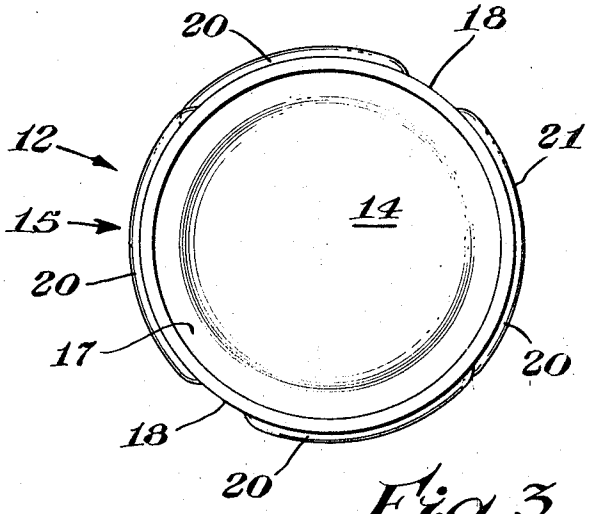


Fig. 3

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ALKENYL AROMATIC RESINOUS PACKAGING

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This invention relates to an improved alkenyl aromatic resinous package. It more particularly relates to improved packages comprising rigid alkenyl aromatic resinous containers having interrupted or multiple thread closures.

By the term alkenyl aromatic resin is meant a solid polymer of one or more polymerizable alkenyl aromatic compounds. The polymer or copolymer comprises, in chemically combined form, at least 50 percent by weight of at least one alkenyl aromatic compound having the general formula:

$$Ar-\overset{R}{\underset{|}{C}}=CH_2$$

wherein Ar represents an aromatic hydrocarbon radical or an aromatic halohydrocarbon radical of the benzene series, and R is hydrogen or the methyl radical. Examples of such alkenyl aromatic resins are the solid homopolymers of styrene, α-methylstyrene, ortho-methylstyrene, meta-methylstyrene, para-methylstyrene, Ar-ethylstyrene, Ar-vinylxylene, Ar-chlorostyrene, or Ar-bromostyrene; the solid copolymers of two or more of such alkenyl aromatic compounds with minor amounts of other readily polymerizable olefinic compounds such as divinylbenzene, methylmethacrylate, or acrylonitrile, etc.

Rigid containers prepared from such alkenyl aromatic resins and particularly those prepared from polystyrene which utilize either a multiple thread closure or an interrupted thread closure have not generally been satisfactory for the packaging of many materials including peanut butter, mayonnaise, detergents and the like. Usually such jars or containers comprise a generally cylindrical body closed at one end, opened at the opposite end and having thread portions or lugs adjacent the open end to engage a suitable screw type cap. Such caps are adapted to be fully engaged or released by a rotation of 90° or less of the cap relative to the container. Such containers, when packed with peanut butter, mayonnaise and like substances, closed by means of a cap prepared from sheet metal or like material and closed with sufficient torque (usually about 35 inch pounds) fractured after a period of only about one and one-half hours.

It is an object of this invention to provide an improved alkenyl aromatic resinous rigid container having a screw type cap.

It is a further object of this invention to provide an alkenyl aromatic resinous container which does not crack or deteriorate on standing when in engagement with a screw type cap.

A further object of this invention is to provide an improved rigid alkenyl aromatic resinous rigid container which is suitable for packaging materials such as peanut butter, mayonnaise and the like.

These benefits and other advantages in accordance with the invention are achieved by providing an alkenyl aromatic resinous rigid container having a generally circular opening and a cylindrical configuration adjacent the opening, the outer portion of the cylindrical portion of said container being provided with a plurality of thread portions adapted to engage internally projecting lugs on a mating closure, said thread portions and lugs so constructed and arranged as to permit release of the closure from the container by a relative rotation of up to 90°, said

thread portions having a lug engaging surface disposed at an angle of up to about 10° as measured from a plane generally parallel to the opening of the container.

Further features and advantages of the invention will become more apparent from the following specification when taken in connection with the drawing wherein:

FIGURE 1 depicts a partly-in-section view of a package in accordance with the present invention;

FIGURE 2 is an enlarged sectional view taken along the line 2—2 of FIGURE 1;

FIGURE 3 further clarifies the lug arrangement of the container of FIGURE 1.

In FIGURE 1 there is illustrated a package **10** in accordance with the invention comprising a rigid alkenyl aromatic resinous container **12**. The container **12** comprises a body portion **13** having a closed bottom **14** and a generally cylindrical neck portion **15**. The cylindrical neck portion **15** defines an opening **17** and a generally cylindrical exterior wall portion **18**. Affixed to the cylindrical wall portion **18** are a plurality of thread portions **20**. The thread portions **20** are primarily defined by an upper surface **21** and a lug engaging surface **22**. Disposed within the container **12** is a packaged material **23**. A screw type cap **24** having a dependent rim portion **25** which in turn supports the thread engaging lugs **27** is in engagement with the neck portion **15** effectively closing the container. The cap **24** is provided with an internal annular gasket **28**.

FIGURE 2 depicts an enlarged detailed view of the engagement of the lug **27** with the lug engaging surface **22** of a thread **18**. The angle A designates the angular displacement of the lug engaging face **22** from a plane generally normal to the axis of generation of the cylindrical surface **18** of the neck portion **15**. The angle A is measured in a generally radially outward direction.

In FIGURE 3 there is illustrated a top view of the container **12** showing the positioning of the thread portions **18** about the periphery of the neck portion **15**.

Alkenyl aromatic resinous containers in accordance with the present invention are advantageously prepared by injection molding in a manner well known to the art. If desired, they may be also prepared by blow molding or compression molding. However, for commercial purposes, injection molding is usually preferred. Although numerous alkenyl aromatic resinous materials may be chosen, particularly desirable are the clear, colorless transparent polymers such as polystyrene, and copolymers of styrene including those of styrene with various acrylate monomers such as a copolymer of polystyrene containing 20 percent by weight of methyl acrylate. It is critical that the angular displacement A of the lug engaging face of the thread portions **20** of the container not be greater than about 10°. The angular displacement referred to is shown in FIGURE 2 and designated by the letter A. If the angular displacement is greater than about 10° it is found that unsatisfactory containers are produced and they tend to fracture when packed with peanut butter, mayonnaise, detergents and similar materials. The angle A may be positive as shown in FIGURE 2 or negative. However, for convenience in most molding operations easier release from the mold is obtained when the angle is positive. Generally it is preferred that the angle be between about 1° and 6° for most convenient production.

By way of further illustration, a plurality of containers substantially as shown in FIGURE 1 were fabricated by injection molding from polystyrene. Each container had a capacity of 16 ounces liquid measure and an opening of about 82 millimeters in diameter. The container had four threads, each of equal pitch and position adjacent the opening. The angular displacement of the lug engaging surfaces of the thread portions was +2°. These containers were then filled within about one-half inch from

the top, some with peanut butter, some with mayonnaise. A standard commercially available metal cap having lugs to engage each of the thread portions was placed on the containers and tightened by applying a torque of 50 inch pounds. A similar group of containers were fabricated utilizing the same batch of polystyrene and identical molding conditions with the exception that the die employed gave a container having the conventional thread known to the art wherein the angular displacement of the lower surface was about 45°. Similarly a portion of the containers molded in this manner were filled with peanut butter and another portion with mayonnaise, also to within about one-half inch from the top. The containers were closed using identical caps to those employed with the containers in accordance with the invention and were tightened with a torque of 50 inch pounds. After a period of one and one-half hours the containers in accordance with the prior art showed numerous cracks in the walls whereas the containers in accordance with the present invention showed no cracking after 6 weeks. All containers were stored under identical conditions.

Similar beneficial results were achieved when polystyrene containers were prepared having 6 thread portions rather than 4.

In a manner similar to the foregoing illustrations, other alkenyl aromatic resins were utilized with equal benefit including such copolymers as those prepared by the copolymerization of 10 parts of methyl methacrylate with 90 parts of styrene, 15 parts of acrylonitrile and 85 parts styrene, 40 parts of ethyl acrylate and 60 parts styrene, polytertiarybutylstyrene, and the like.

As is apparent from the foregoing specification, the article of the present invention is susceptible of being embodied with various alterations and modifications which may differ particularly from those that have been described in the preceding specification and description. For this reason, it is to be fully understood that all of the foregoing is intended to be merely illustrative and is not to be construed or interpreted as being restrictive or otherwise limiting of the present invention, excepting as it is set forth and defined in the hereto appended claims.

What is claimed is:

1. In an alkenyl aromatic resinous rigid container having a generally circular opening, a cylindrical configuration adjacent to said opening, the outer portion of the cylindrical portion of said container being provided with a plurality of thread portions adapted to engage internally projecting lugs on a mating closure, said thread portions and lugs so constructed and arranged so as to permit release of the closure from the container by a relative rotation of up to about 90°, the improvement which comprises providing the thread portions with a lug engaging surface disposed at an angle of up to 10° as measured from a plane generally parallel to the opening of the container and in a radially outward direction.

2. The container of claim **1** wherein the alkenyl aromatic resinous material is polystyrene.

3. The container of claim **1** wherein the lug engaging surfaces are disposed at an angle of between 1° and 6° from a plane generally parallel to the opening of the container and normal to the axis of generation of the cylindrical portion of the container, said angle being measured as displacement toward the opening.

4. The container of claim **1** including a quantity of a foodstuff therein and a mating closure in sealing engagement therewith.

5. The container of claim **4** wherein the container is polystyrene.

6. The container of claim **5** wherein the foodstuff is peanut butter.

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