

CLOSURE FOR A CONTAINER

FIELD OF THE INVENTION

This invention relates to a closure for a container, and more particularly is concerned with a closure for a plastic bottle or the like which is child resistant, that is, it is resistant to being removed by a child.

BACKGROUND OF THE INVENTION

It has long been recognized that there are numerous substances which are harmful to children and other people, such as the mentally handicapped. Such substances include paints, solvents, industrial chemicals, pesticides, toxic chemicals, cleaning solutions, and a variety of medicines both in liquid and solid form. It will further be realized that many of these substances can be found in a typical home. In many cases, they are kept in locations that are readily accessible to children. For example, it is common to keep cleaning materials in cupboards beneath the kitchen sink, which is at ground level and readily accessible to children.

Due to the inherent inquisitive nature of children, there are numerous instances where children gain access to containers holding such materials, and then open them. Particularly for very young children, a natural tendency with any new substance is to taste it. This can lead to severe injuries, and in some cases death of the child, if prompt action is not taken.

Accordingly, there have been developed a large variety of closures which are intended to be child-resistant. Generally, these closures provide some sort of mechanism that requires the user to have a certain level of manual dexterity or strength, and/or intelligence, which it is assumed would not be found in a child or a person who should not be opening the container. There have been two fundamentally different approaches to the design of such closures.

In one approach, a closure comprises two parts. There is an inner part which actually engages the bottle neck and forms the actual seal. An outer part is intended to be gripped by the user. The outer part is arranged so that, for unscrewing or opening of the closure, the user must manipulate it in a certain way for it to engage the inner closure, otherwise, the outer part will simply rotate freely without unscrewing the inner part. Commonly, it is necessary for the user to press down on the outer part whilst rotating it. Usually, a child will either not be able to read the instructions to this effect, or will not have the strength or dexterity to perform this operation.

An alternative approach is to have a one-piece cap or closure, which interacts with one or more locking projections or teeth on the neck of the container or bottle. There are a large number of earlier proposals embodying this approach, utilizing projections or teeth that extend both radially and axially. Very generally, these proposals provide for some sort of ratchet mechanism whereby locking projections of the cap automatically ride over the teeth or projections of the bottle neck during closure, but engage those projections to prevent unintended opening of the container. Different mechanisms are provided to enable this locking mechanism to be released. For axially extending projections or teeth, sometimes a portion of the cap is configured so that it can be raised to disengage the locking mechanism. For radially extending locking projections, one common technique is to provide two diametrically opposed lock-

ing projections on the cap itself. The cap is then configured so that by squeezing the cap at two locations midway between the locking projections, the cap will distort to displace those locking projections radially outwards, to disengage the locking mechanism.

While considerable thought has been put into developing these earlier proposals, with a variety of degrees of success, to applicant's knowledge no effort has been expended on developing a truly one-piece cap. More particularly, to applicant's knowledge, current child-resistant caps that are available require some sort of resilient liner, typically expanded polystyrene, to form a seal between the top wall of the cap and the lip of the container or bottle. Thus, even the so-called one-piece cap referred to above requires the presence of a liner for forming the seal.

The presence of such a liner does have some advantages. It can overcome imperfections in the neck of the container or the interior of the cap itself. Further, within certain limits, it can overcome problems due, for example, to the side wall of the cap distorting and permitting the top wall to lift at certain points from the neck of the container.

However, the provision of a separate seal also has significant disadvantages. It requires the presence of a separate component which has to be produced separately and then inserted into the cap. It has to be inserted in such a manner as to ensure that it does not fall out before the cap is placed onto the neck of the bottle, usually requiring an adhesive layer. This adds to the cost of the closure.

Further, at the present time, there is increasing pressure and incentives to make containers recyclable. In particular, there are many products which are sold at relatively low costs and in relatively large volumes. For example, windshield washer fluid is typically sold in containers having a four liter size or similar, and such a product is sold in large quantities at relatively low cost. This generates a large volume of containers that have to be disposed of. Typically, the container is made from polyethylene and the cap is made from polypropylene. Such materials by themselves are capable of being recycled and reused. However, the presence of the expanded polystyrene foam liner renders a container, or at least its cap, unsuitable for recycling.

Accordingly, it is highly desirable that a child-resistant closure be formed truly as one-piece, so as to make manufacture simpler and more economically, and to render a combined container and cap recyclable. It is therefore desirable that the cap and container together be manufactured so as to be capable of forming an adequate seal between them, without requiring the presence of a separate, resilient sealing element.

In accordance with the present invention, there is provided a closure for a container having an externally threaded neck and a plurality of radially extending locking teeth, the closure comprising: a top wall; a first outer side wall including a pair of projections which extend generally axially along an inner surface of the outer wall and which project radially inwardly, for engagement with locking teeth of a container neck; a second, inner side wall located within the outer wall, including an internal screw thread for engaging the external thread of a container neck; and one or more of an annular sealing surface with a textured finish, a plurality of reinforcing ribs around the second, inner side wall and a central sealing lip that extends axially from