

Feb. 16, 1954

I. G. ROYALL, JR

2,669,370

RUBBER STOPPER

Filed July 28, 1950

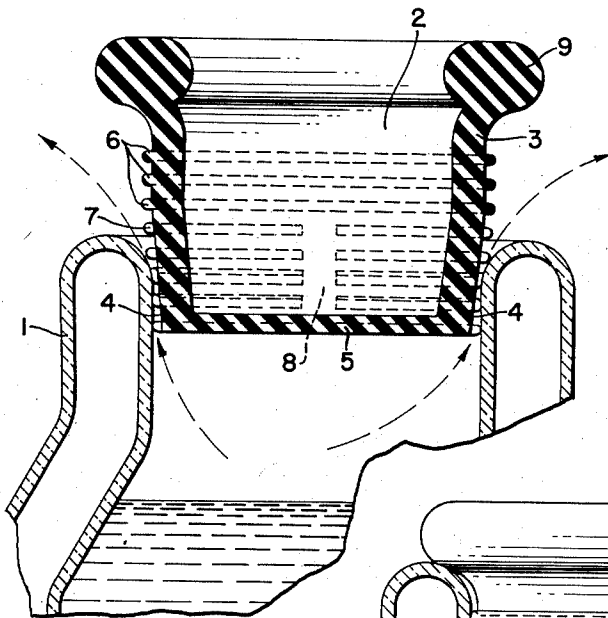


FIG. 1

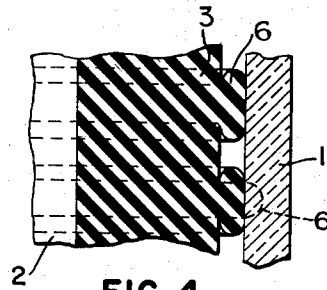


FIG. 4

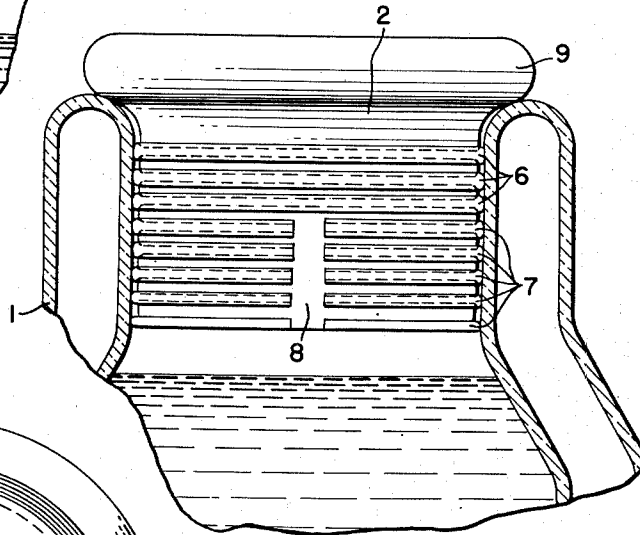


FIG. 2

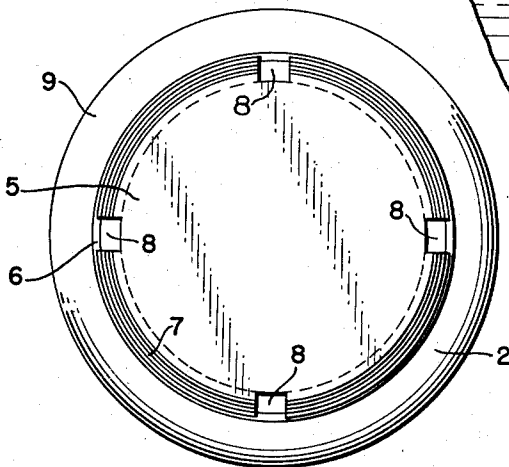


FIG. 3

INVENTOR.
IVEY G. ROYALL, JR.

BY

R. L. Miller
ATTORNEY

UNITED STATES PATENT OFFICE

2,669,370

RUBBER STOPPER

Ivey G. Royall, Jr., St. Marys, Ohio, assignor, by
mesne assignments, to The Goodyear Tire &
Rubber Company, a corporation of Ohio

Application July 28, 1950, Serial No. 176,380

1 Claim. (Cl. 215—47)

1

The present invention relates to a rubber bottle stopper of the type to be used, for instance, with vacuum bottles for carrying cold or hot liquids, foods and the like. A primary object of this invention is to provide a stopper which is flexible and will readily accommodate itself to irregularities in the inner wall of the neck portion of such a bottle while effectively sealing the neck to retain the contents therein.

A further object of this invention is to provide sealing ribs on the outer surface of the bottle stopper which will more effectively seal the contents of the bottle while at the same time providing for a better seating of the bottle stopper in the neck and which will reduce the opportunity of pressure being built up on the inside of the bottle when the stopper is put in place.

Other objects of this invention will appear hereinafter as the description thereof proceeds, the novel features, arrangements and combinations being clearly set forth in the specification and in the claim thereunto appended.

In the drawings:

Fig. 1 is a cross-sectional view of the neck of a vacuum bottle provided with a stopper made according to this invention;

Fig. 2 is a similar cross-section of the vacuum bottle shown at Fig. 1 but with the stopper shown in elevation rather than in cross-section;

Fig. 3 is a bottom plan view of the stopper; and

Fig. 4 is an enlarged cross-sectional view showing the deformation of the upper ribs when the stopper is placed in position.

In Fig. 1, the vacuum bottle is shown having a neck portion 1 provided with a rubber stopper 2, it being understood that the term "rubber" applies as well to synthetic rubbers and like yieldable substitutes therefor as well as to natural rubber, the basic characteristics of the stopper itself for such a use being that the walls thereof be relatively flexible and pliable, yet of substantial thickness to prevent collapse and with the composition of the rubber or other material being of a character which will not contaminate the liquid or other material within the bottle. There are a large variety of compositions which meet these requirements and these are well understood in the industry and will not be described herein.

The stopper provides a somewhat cylindrical outer wall portion 3 which is tapered slightly at the outer lower end thereof as at 4 from a point about midway of the length of the stopper. The upper part of the wall is substantially cylindrical. The wall 3 is of substantial thickness so as to resist collapse of this wall but, at the same time,

2

provide for slight deformations in the wall to accommodate the stopper to irregularities in the neck portion. For example, sometimes these neck portions are somewhat oval-shaped on the interior or have slight depressions therein which require that some yielding material be used so as to provide for proper sealing. With the hollow stopper, this yielding of the material can take place without placing too much strain on the bottle neck itself. With ordinary stoppers which are solid, it is necessary to place that material under a compression in order that it can accommodate itself to the variations in the neck portion.

The inner end of the stopper is closed off by a wall 5 to retain the contents in the bottle and the outer peripheral surface of the wall 3 is provided with two sets of ribs 6 and 7. The ribs 6 arranged at the top are continuous throughout the periphery of the wall 3 whereas the ribs 7 are discontinuous, as is illustrated more clearly in Fig. 2. The discontinuous ribs at the lower end of the stopper provide passageways 8 which permit air or steam to escape from the bottle during the first movement of the stopper into operative sealing position. At the same time, with a stopper of this kind, it is rotated somewhat as it is being inserted and the ribs, although discontinuous, have a wiping action on the inner surface of the neck portion which will clean the inner surface of the neck portion and remove most of the moisture therefrom to permit a better seal to be effected by the ribs 6 when the stopper is moved into the position shown in Fig. 2. In Fig. 1, the arrows indicate the passage of air, steam or vapor out of the container during the first movement of the stopper into operative position. By permitting the air to escape from the bottle before the ribs 6 reach a sealing position, very little pressure is built up inside of the container when the stopper is in its final position as in Fig. 2. It is common knowledge that an ordinary cork stopper placed in a container of this kind generally builds up quite a pressure inside of the bottle and corks have been known to pop out under this pressure with a consequent spilling of the contents in case the container is inverted or laid on its side. It is true that with this stopper there is still some pressure built up in the container after the lowermost one of the continuous ribs 6 engages the inner neck portion of the bottle to seal it off but it is much less than ordinary stoppers.

It is to be noted that while the stopper is shown as somewhat tapered at the bottom, the propor-

3

tions of the stopper are designed so that when the stopper is inserted, the tapered portion disappears because the upper portion of the wall 3, adjacent the continuous ribs, is forced inwardly, thus bringing that portion of the wall more or less in alignment with the lower portion of the wall which itself is gradually compressed into a substantially cylindrical shape during the insertion. Of course, it is realized that under all conditions this condition will not exist but it is preferable that the stopper be designed as shown so that the greatest sealing pressure is reached upon the full insertion of the stopper into the container.

The upper edge of the wall 3 is reinforced by a rib or lip 9 shown here as being somewhat greater in cross-section radially of the stopper than it is axially, whereby when the wall 3 tends to collapse under the pressure created during insertion of the stopper, it will not totally collapse but will be held against such a collapse by the thickened rim or lip portion 9 which, in addition, acts to provide means for gripping the stopper to remove it from or insert it into the container. This rim portion 9, while offering considerable resistance to inward collapse of the wall 3, still can be deformed readily when, for example, the neck of the bottle is somewhat oval.

In Fig. 4, I have illustrated on a rather enlarged scale, and probably in somewhat exaggerated form, the compression of the ribs upon insertion of the stopper in the bottle. These ribs tend to flatten out and elongate axially of the stopper so that there is a resilient force tending to hold the ribs against the inner neck of the bottle due to the tendency of the ribs to regain their normal shape, which is substantially semi-circular in cross-section, as indicated by dotted lines at 6 in Fig. 4.

It is obvious that with a stopper of this kind, the same may be readily molded with a relatively small amount of rubber, that it will yield to slight irregularities in the cross-sectional shape of the neck of a container with which it is to be used, and that during insertion of the stopper the lower ribs will tend to clean the inner neck of the bottle to make it more suitable for engagement with the sealing ribs 6 upon full insertion of the stopper to the position shown in Fig. 2 while at the same time permitting the escape of air, steam or the like from the container, at least up until the time when the lowermost of the continuous ribs 6 engages the inner surface of the neck. Such a stopper is substantially indestructible and will give considerable wear and can be readily cleaned and sterilized. It is to be understood that plastics which are sufficiently flexible for this purpose and provide the necessary other characteristics are

4

included within the scope of this invention as it is not intended to limit the invention to any particular material.

Having thus fully described my invention, what I claim and desire to secure by Letters Patent of the United States is:

A stopper comprising an imperforate generally cup-shaped member of readily yieldable material having an outer wall of generally cylindrical shape closed at its inner end by a thin transverse readily flexible wall, a plurality of peripherally extending, axially spaced, integral flexible ribs on the outer surface of said first wall, said ribs having rounded outer peripheries, a plurality of said ribs near the inner closed end of the cup-shaped member being recessed to permit passage of fluid past same and others thereof near the open end of the cup-shaped member being continuous to prevent such passage, said continuous ribs being distributed over substantially the upper half of the first wall and said discontinuous ribs being disposed over substantially the lower half thereof, said transverse wall being relatively thin and thus readily flexible axially of the stopper to permit axially inward movement of the ribs lying in the plane of the wall whereby the ribs may conform to irregular contours in an opening in which the same may be inserted and thus prevent undue resistance to insertion of the stopper, a number of said discontinuous ribs being arranged on the outer side of said first wall in axially spaced relation to said transverse wall whereby upon insertion of said stopper in an opening the transverse wall will not offer resistance to the radially inward movement of said latter ribs, the upper edge of said first wall being enlarged radially to provide a reinforced peripheral lip to resist collapse of the open end of said stopper and to also provide a means by which the stopper may be readily grasped to remove it from an opening in which same may be inserted.

IVEY G. ROYALL, JR.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,423,592	Baldwin	July 25, 1922
1,777,826	Cone	Oct. 7, 1930
2,196,785	Takiguchi	Apr. 9, 1940
2,353,674	Kimber	July 18, 1944

FOREIGN PATENTS

Number	Country	Date
395,293	France	Feb. 13, 1909
241,627	Switzerland	Aug. 1, 1946