April 28, 1964 E. RAAMAT 3,130,898

TUBE CLOSURE

Filed Jan. 11, 1962

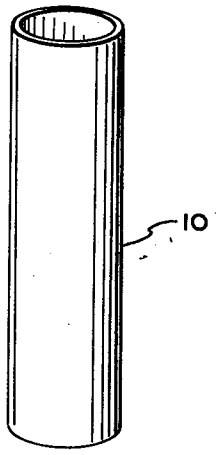


FIG. 1

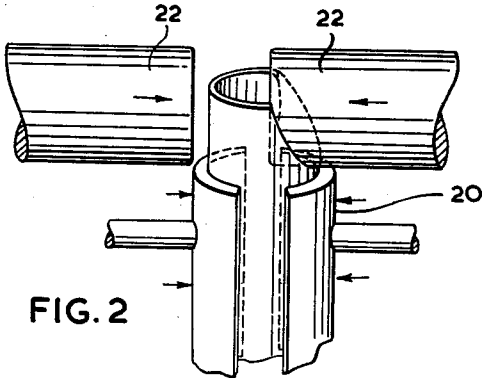


FIG. 2

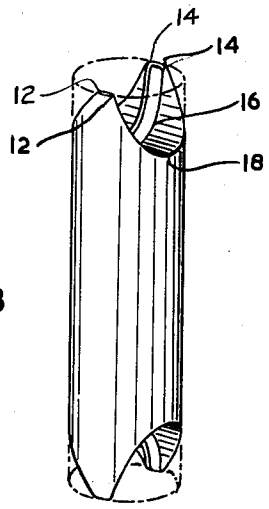


FIG. 3

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TUBE CLOSURE

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1 Claim. (Cl. 229—93)

This invention relates to tube closures for deformable tubes and to the method of achieving such closures.

It is an object of this invention to provide a tube closure suitable for a deformable tube which may be simply and conveniently provided, to close the end of a tube and which may be easily opened or reclosed.

It is an object of this invention to provide a deformable tube designed and constructed so that the novel closure may easily be attained.

It is an object of this invention to provide a method of closing tubes in a simple and novel manner.

The closure, in accord with the invention is adapted to be applied to tubes having at at least one end an exposed or "free" edge and the closure is applied between two points on said edge where the straight line between the two points is shorter than the edge extent therebetween. With this arrangement it will be seen that the edge extent will, viewed along the axis of the tube, be concave inward relative to the line joining said two points. In accord with the invention, a closure is provided for such tube by deforming the material at and adjacent said edge extent inwardly relative to said tube axis about a crease line extending between said two points and therebetween through the tube material. The material deformed inwardly relative to such line tends to form, relative to the crease line, a curve which is reversed from the undeformed curve. Relative to the plane including said two points and the portion of said crease line farthest from said edge, the curve of the edge after deformation is the mirror image of that before deformation. Since the distance through the material, between two points on the crease line which are on the same plane perpendicular to the tube axis, is longer than the straight line distance therebetween, there is an "over-centre" effect which tends to hold the material in its new position providing a tube closure which is secure, but is easily removed to remove material from the tube.

In a preferred embodiment of the invention two such closures are provided at each end of the tube. Each closure is approximately diametrically opposed to the other across the tube, and is made of such depth that the two closures in effect close the tube.

In drawings which illustrate a preferred embodiment of the invention;

FIGURE 1 illustrates a tube to which such closure may be applied.

FIGURE 2 shows a means suitable for applying such closure; and

FIGURE 3 shows a tube with the closure applied.

In the drawings, there is shown, a tube **10** of cardboard or other semi-rigid deformable material not subject to any substantial stretching under the normal bending and creasing operations. The invention is described in relation to a cylindrical tube although it will be appreciated that tubes of other form of cross-section could be used as long as the tube is, where the closure is applied, concave inward toward the axis.

In FIGURE 3 are shown points **12** and **14**, located on the edge of an open end of the tube **10** with the edge extent **16** between points **12** and **14** being longer than the straight line distance therebetween. It will be seen therefore, that the edge **16** may be deformed inwardly and downwardly to define the crease line **18** which joins the points **12** and **14** through the carton material. It will be seen that the edge **16** and each line through the deformed material will be curved, as a mirror image of the curvature before deformation, and that in view of this inverse curvature the material itself resists movement back to the original undeformed shape and there is thus an "over-center" effect tending to retain the closure.

With a cylindrical tube the best closure is achieved with two closures of the type described above diametrically opposing each other and with the opposing but approaching edges **16** as close as possible one to the other. The best closure is also attained, with a tube of circular cross-section when the tube is deformed between the two sets of points **12** and **14**, to provide a contour which, when viewed along an axis perpendicular to that of the tube and perpendicular to a line joining the points **12** and **14**, is an arc of the circle. It will be appreciated that this closure can be performed manually with the thumb or finger. However in FIGURE 2 is shown a method whereby manufactured tubes may be provided with crease lines **18** in advance to allow for easy closure of the ends of the tubes, in accord with the invention, at a later time. In FIGURE 2 clamping means **20**, as illustrated, holds a tube in position while a pair of cylindrical members **22**, of a diameter approximately less than the diameter of the inside of the tube, by twice the thickness of the tube material, is used for deformation. The lower halves of the cylindrical cross-section of members **22** are brought into contact with the tube as indicated in FIGURE 2 and although in FIGURE 2; for illustration, one of the deforming members **22** is shown approaching the tube and the other deforming member **22** is shown in contact with the tube, it would be appreciated, that in practice, the better method will be to have the two deforming members approach the tube simultaneously from opposite sides and contact it at the same time. When this has been done it will be seen that the deformable tube is provided with a crease line **18** simplifying the operation of providing a closure for a person using the tube. In most tubes the deformation illustrated in FIGURE 2 will be performed at both ends and after the deformation in each case, the closure portion, being the smaller portion defined by the crease line **18**, is snapped back to normal position in line with the remainder of the contour of the tube so that the tube again assumes the form indicated in FIGURE 1. The tube may then be sold, or provided with articles suitable for mailing in such tube, and the user of the tube may pick up the tube with the crease line but otherwise in the contour of FIGURE 1, insert the article in the tube and with his thumb or finger achieve the closure at both ends of the tube which is then ready for mailing.

In this way a convenient and secure closure is obtained which may be easily opened when required.

I claim:

A tube of cardboard defining a hollow cross-section having length and width; the material forming said tube terminating at at least one end thereof in a free edge; a pair of opposed portions of said free edge being deformed

inwardly at a 90° angle relative to said tube; each portion being deformed between two points on said edge to form a crease line terminating at each end of said edge; each area of deformed material forming about the plane defined by said two points and the intermediate crease line, a mirror image of its form before deformation; and wherein said deformed areas close a major portion of the end of the tube whereby said respective deformed edges are immediately adjacent one another and said deformed areas each provide a surface extending substantially perpendicular to the axis of the tube.

References Cited in the file of this patent

UNITED STATES PATENTS

1,156,476	Goudy	Oct. 12, 1915
1,745,341	Schoettle	Jan. 28, 1930
2,194,904	Jackson	Mar. 26, 1940