March 26, 1968 R. H. A. HOPE 3,374,928

PROTECTIVE COLLAR FOR SQUEEZABLE TUBES

Filed June 7, 1966 2 Sheets-Sheet 1

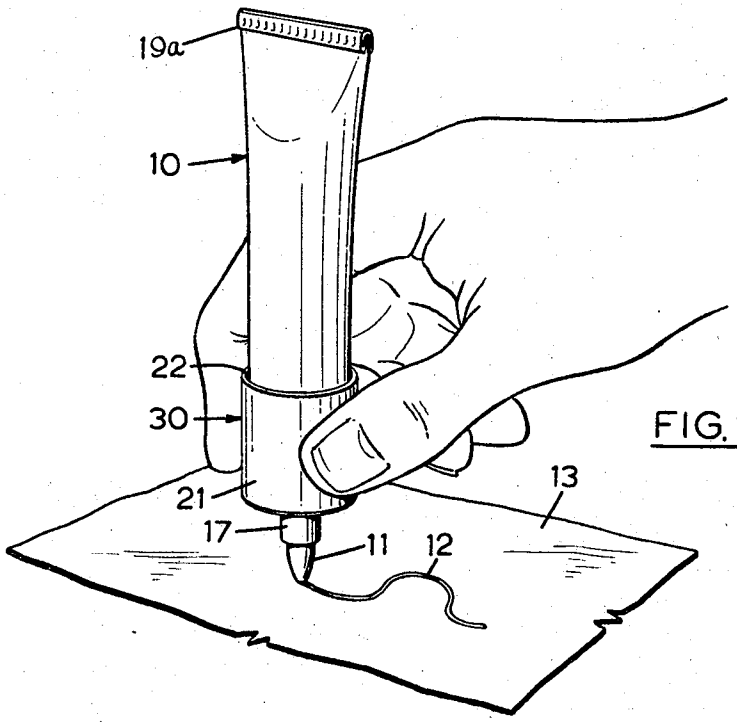


FIG. 1

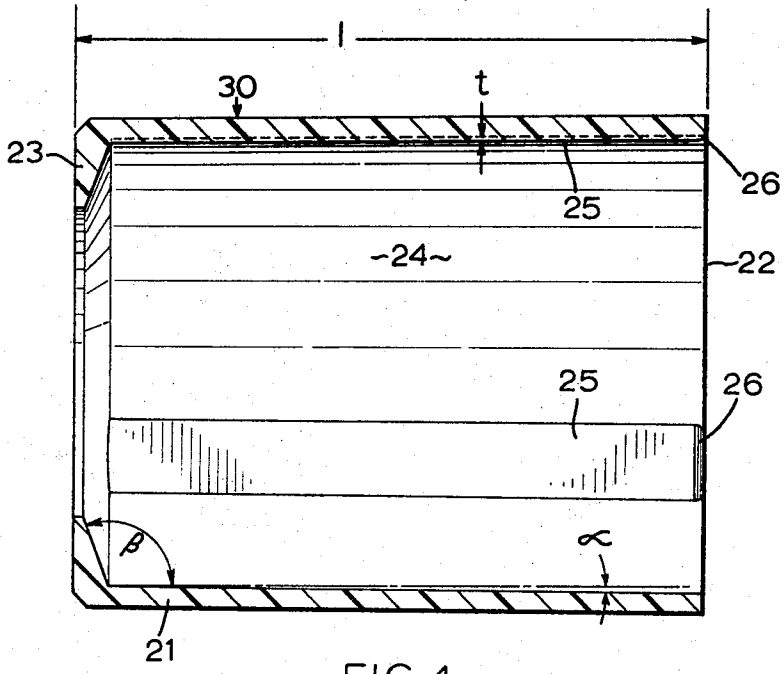


FIG. 4

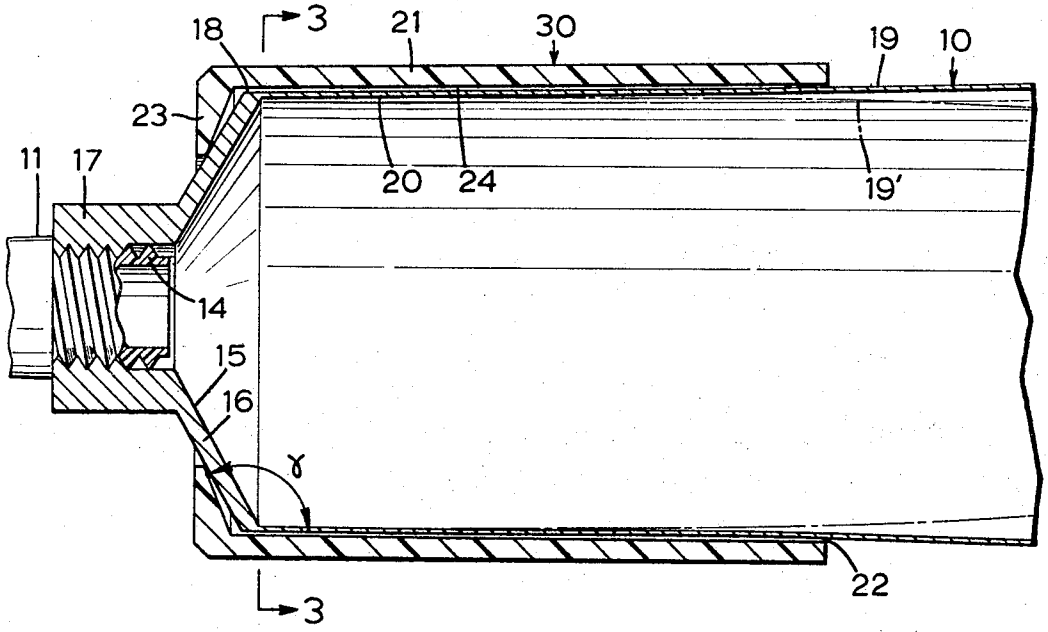
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FIG. 2



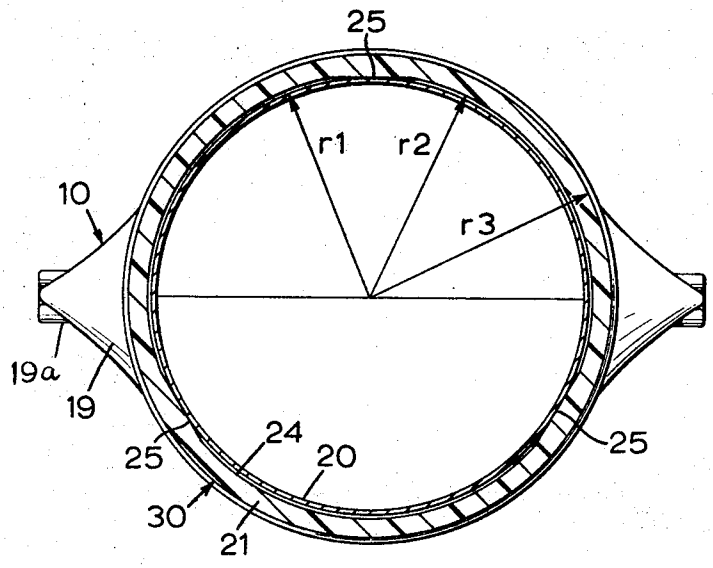


FIG. 3

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PROTECTIVE COLLAR FOR SQUEEZABLE TUBES

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16 Claims. (Cl. 222—105)

This invention relates to a collar for the dispensing end of a tube having a flexible tubular wall that can be squeezed to dispense the contents of the tube. The invention has particular use for tubes that contain paint and that are used as pens for drawing patterns, for example patterns that resemble embroidery.

Squeezable tubes that can be used as pens are commonly provided with an elongated tubular wall of thin, flexible and deformable metal which can be squeezed manually to force the contents of the tube through the dispensing end of the tube. The thin tubular wall is normally grasped between the fingers adjacent the dispensing end, and the latter is pressed against a surface on which the contents of the tube are to be dispensed. It is desirable to empty the tube from its flattened end towards its dispensing end, but the pressure of the fingers tends to distort the thin tubular wall adjacent the dispensing end, to force the contents of the tube from this end, and perhaps to rupture the thin wall.

It has been proposed heretofore to provide protective collars for such tubes over the areas where they are normally grasped by the fingers, but the collars of which I am aware have had the disadvantages that they are difficult to remove and they fit closely to the tubular wall of the tube and tend to score it. It is the object of this invention to provide an improved protective collar for such thin walled tubes.

A preferred embodiment of the invention is illustrated by way of example in the accompanying drawings in which:

FIG. 1 is a perspective view of a tube with a protective collar in place, the tube being held by the fingers in writing position;

FIG. 2 is a longitudinal sectional view through the assembled tube and collar, showing the widest portion of the tube, with the outer surface of the narrowest portion of the tube (which is in a longitudinal plane at right angles to FIG. 2) indicated by phantom lines;

FIG. 3 is a transverse sectional view on the plane of line 3—3 in FIG. 2; and

FIG. 4 is a longitudinal sectional view through the collar on a plane along the thickest portion of an internal land of the collar.

The drawings show a conventional metal tube **10** having a conventional nylon dispensing tip **11** through which paint from within the tube can flow in order to draw lines **12** on a surface **13** when the tube is used in the manner of a pen. The tip **11** has a ball point (not shown) but its construction is well known and forms no part of this invention. As shown in FIG. 2, a threaded neck **14** of the tip is screwed into the annular dispensing end **15** of the tube **10**, said end consisting of a rigid frustroconical wall **16** and an internally threaded cylindrical nose **17** on which a cap (not shown) can be held frictionally when the tube is not in use.

The metal of the annular end **15** is relatively thick, so that its outer circular periphery **18** is of fixed diameter, i.e. does not normally become distorted during use of the tube. However the tube has a thin tubular wall **19** (normally 0.0065 to 0.0075 inch thick) extending from said periphery **18**, and this wall is capable of being squeezed manually to dispense the contents of the tube through the dispensing end **15**. Adjacent the end **15** the wall **19** has a generally cylindrical portion **20**, but

towards the other end the tubular wall gradually widens (see FIG. 2) and flattens (in a longitudinal plane normal to FIG. 2, as indicated by the phantom lines **19'**) from said cylindrical portion **20** to a flattened end **19*a*** of the tube, the end **19*a*** being formed by folding and crimping the metal of wall **19** upon itself. The tube **10** is normally made of a single piece of aluminum, the tubular wall **19** being deformable permanently when it is squeezed to dispense the contents of the tube.

As shown in FIG. 1 the tube is held vertically and the tip **11** is pressed down to write. However if the fingers squeeze the wall **19**, an excessive amount of paint may be dispensed and the cylindrical wall portion **20** may become buckled. If heavier flow of paint is required it is preferable to press the wall **19** from its flattened end. As paint is used, the wall **19** should be flattened from the closed end **19*a***, and the wall **19** should not be folded or rolled upon itself, to ensure that it does not crack. If the cylindrical portion **20** is deformed inwardly by the fingers, and then outwardly as paint is forced down by squeezing the flattened end of the tube, leaks may develop in the portion **20**. To protect the portion **20** against being flexed unduly, a protective collar **30** is provided.

The collar **30** is preferably made of clear transparent plastic so that it does not obscure any directions on the reading matter printed on the outer surface of the tubular wall **19**. The collar has a generally cylindrical body **21** of approximately the same length as the generally cylindrical portion **20** of the wall **19**. The body **21** has an open end **22** whereby the collar can be assembled onto the tube **10** by sliding it over the rigid annular end **15** and over the cylindrical portion **20** to encompass the latter within the collar. Opposite the open end **22** the collar has an internal annular lip **23** the minimum or internal diameter of which is less than the fixed diameter of the periphery **18**, so that as the collar is slid over the tube the lip **23** abuts against the rigid end **15** thereby limits the sliding of the collar towards the flattened end. The lip **23** thus provides an inwardly protruding stop means for positioning the collar on the tube.

Extending longitudinally of the internal surface **24** of the body **21** are three lands **25** (FIGS. 3 and 4) raised on the surface **24**. These lands **25** extend from the lip **23** (see FIG. 4) to the open end **22** where they are bevelled as at **26** to facilitate sliding the collar over the tube. The lands **25** are spaced 120° apart circumferentially of the internal surface **24** and define flats along said surface, i.e. they define plane internal faces substantially parallel to the axis of the generally cylindrical body **21**. With collar in place on the tube these smooth faces of the lands snugly engage the periphery **18** of the rigid annular end **15** of the tube and hold the collar frictionally on the tube, the body **21** being incapable of appreciable circumferential expansion. The lands may also engage the thin wall **19** for a short distance away from the periphery **18** but the entire internal surface **24** (including the flat surfaces of the lands) flares slightly from the lip **23** to the open end **22**, the flare being sufficient that the entire internal surface can be clear of the wall **19** at the end **22** when the lip **23** abuts the rigid end **15**. Thus the end **22** is not likely to score the wall **19**, and the internal surface **24** clears the wall **19** and the periphery **18** save for the frictional engagement of the lands **25** at and adjacent the periphery **18**. The engagement is sufficiently snug to resist displacement of the collar relative to the tube whereby, when the collar is gripped manually to press the dispensing end of the tube against the surface **13**, normal downward pressure on the collar will not force it longitudinally off the tube.

The fixed diameter of the periphery **18** is usually 0.875 inch (i.e., twice the radius r_1 in FIG. 3), the length of the wall **19** being about 4 inches. For a tube having these dimensions, the collar **30** preferably has the following approximate dimensions as indicated in FIGS. 3 and 4.

	Inches
r_2	0.445
r_3	0.480
t	0.008
1	1.25

where r_2 is the radius of the surface **24** opposite the periphery **18**, r_3 is the outside radius of the body **21** at the same location, t is the maximum thickness of the lands **25**, and **1** is the length of the collar. The flare of the internal surface **24**, measured by the angle α that it makes with a line parallel to the axis of the collar, is about ⅓ of a degree.

The internal surface makes an angle β of about 110° with the lip **23**; this angle is less obtuse than the angle γ between the outer surface of the wall **19** and the outer frusto-conical surface of the end wall **15** as viewed in FIG. 2, the latter angle normally being about 120°, and thus the points of engagement between the lands **25** and the periphery **18** are spaced a short distance longitudinally from the lip **23**. It will be apparent that the points where the lands are to engage the periphery **18** must lie on an imaginary circle having a diameter that is substantially equal to and not greater than the diameter of the periphery **18**. In the example given above, the internal surface **24** has, opposite the periphery **18**, an internal diameter of $2r_2$ or 0.890 inch, which is 0.015 inch greater than the fixed diameter of the periphery **18**, but since the lands have a maximum thickness of 0.008 inch they are, before the collar is applied to the tube, tangential to an imaginary circle that is 0.001 inch smaller in diameter than the periphery **18**. Although the collar engages the tube sufficiently snugly to remain in place when the tube is used as shown in FIG. 1, the collar can nevertheless be pulled off the tube without difficulty. Because of the slight flare of the internal surface **24**, all parts of that surface (including the lands) at the larger end **22** lie outside an imaginary circle having a diameter equal to the periphery **18**, and thus the collar slides easily at first onto the tube.

The collar is preferably a moulded cellulose acetate butyrate moulding and extrusion composition sold by Eastman Chemical Inter-American Ltd. under the number 236A–37038–M2. This forms a resilient, single piece collar that is stiffened against transverse deformation by the lip **23**. The cylindrical body **21** can when gripped as in FIG. 1 be deformed to a slightly oval shape, particularly at the end **22**. Normally such deformation as does occur is slight, and the clearance between the inner surface **24** and the wall **19** prevents slight deformation of the collar from being transferred to the wall **19**. Greater flexing of the collar may cause limited but not harmful deformation of the wall **19**, the collar (with a thickness of $r_3-r_2=0.035$ inch) being sufficiently stiff to protect the cylindrical portion **20** of the wall **19** and prevent substantial squeezing thereof under any pressures likely to be applied in ordinary use of the tube and collar. The extent to which the tube can be squeezed under the collar depends on where the flats **25** happen to be located; if, for example, one of the flats happened to lie in the plane of FIG. 2 a smaller amount of deformation of the collar would be required to deform the tube wall, but no flat is diametrically opposite another and the tendency is for the collar itself to deform rather than to transmit pressure to the tube wall **19**. The clearance between the inner surface **24** and the tube wall **19** leaves room for the latter to deform as the contents of the tube are used and the tube is progressively flattened from its end **19***a*. Because the wall of the collar body **21** is capable of flexing it can if necessary accommodate itself to some lateral expansion of the tubular wall **19**, as the latter is flattened, without cutting into the wall **19**.

What I claim as my invention is:

1. A collar for a tube having an annular dispensing end with an outer circular periphery of fixed diameter and a tubular wall extending from said periphery to a flattened end of the tube, the tubular wall being capable of being squeezed manually to dispense the contents of the tube through said dispensing end, the collar comprising a generally cylindrical body that is relatively undeformable as compared to said tubular wall and that has an open end whereby the collar is slidable over said periphery and tubular wall to encompass a portion of the tubular wall within the collar, the body having an internal surface that clears said periphery and tubular wall save for circumferentially spaced apart lands raised on said internal surface adjacent at least the other end of the body which lands are snugly engageable frictionally with said periphery of the dispensing end to resist displacement of the collar relative to the tube whereby the collar can then be gripped manually to press the dispensing end of the tube against a surface on which the contents of the tube are to be dispensed without forcing the collar longitudinally off the tube, the collar being sufficiently stiff to protect the portion of the tubular wall that is encompassed by the collar and prevent substantial squeezing thereof.

2. A collar as claimed in claim **1** and having at said other end of said body stop means protruding inwardly to abut against said annular end of the tube and thereby position the collar on the tube.

3. A collar for a metal tube having a rigid annular end with an outer circular periphery of fixed diameter and a tubular wall having a generally cylindrical portion extending from said periphery, the tubular wall gradually flattening and widening from said cylindrical portion to a flattened end of the tube, the rigid annular end having a dispensing tip, and the tubular wall being permanently deformable and capable of being squeezed manually to dispense the contents of the tube through said tip, the collar comprising a generally cylindrical body of approximately the same length as said cylindrical portion, said body having an open end whereby the collar is slidable over said rigid annular end and over said cylindrical portion to encompass the latter within the collar, the collar having at the other end of said body an internal annular lip with an internal diameter less than said fixed diameter to abut against said rigid annular end and thereby limit the sliding of the collar towards said flattened end, said body having an internal surface that clears said cylindrical portion save for circumferentially spaced apart lands raised on the internal surface adjacent at least said other end of said body which lands are snugly engageable frictionally with said periphery of the rigid annular end to resist displacement of the collar relative to the tube whereby the collar can then be gripped manually to press the dispensing tip against a surface on which the contents of the tube are to be dispensed without forcing the collar longitudinally off the tube, the collar being incapable of appreciable circumferential expansion and being sufficiently stiff to protect said cylindrical portion of the tube and prevent substantial squeezing thereof.

4. A collar as claimed in claim **3**, wherein said lands are frictionally engageable with said periphery at smooth land faces substantially parallel to the axis of said cylindrical body.

5. A collar as claimed in claim **4**, wherein there are three of said lands spaced 120° apart.

6. A collar as claimed in claim **5**, wherein said faces are plane surfaces.

7. A collar as claimed in claim **6**, wherein said internal surface adjacent said internal lip has an inner diameter approximately 0.015 inch greater than said fixed diameter of said periphery and said lands have a maximum thickness of approximately 0.008 inch.

8. A collar as claimed in claim **3**, wherein the points where the lands are engageable with said periphery lie

on an imaginary circle having a diameter substantially equal to and not greater than said fixed diameter.

9. A collar as claimed in claim **5**, wherein all parts of the internal surface of said cylindrical body at said open end lie outside an imaginary circle having a diameter equal to said fixed diameter.

10. A collar as claimed in claim **9**, wherein said cylindrical body has a slight internal flare from said other end to said open end and said lands extend substantially the entire length of said cylindrical body.

11. A collar as claimed in claim **10**, wherein said internal annular lip makes with said internal surface an angle that is less obtuse than the angle between the outer surface of said rigid annular end and the outer surface of said tubular wall.

12. A collar as claimed in claim **5**, wherein the collar consists of a single piece of resilient plastic material.

13. A collar as claimed in claim **12**, wherein the collar is slightly flexible when gripped between the fingers but the clearance between said internal surface and said cylindrical portion is sufficient to prevent slight deformation of the collar from being transferred to said cylindrical portion.

14. A collar as claimed in claim **13**, wherein said cylindrical body has a wall thickness of approximately 0.035 inch.

15. A collar as claimed in claim **14**, wherein the plastic is a moulded cellulose acetate butyrate composition.

16. A moulded plastic collar for a tube having a rigid annular dispensing end with an outer circular periphery 0.875 inch in diameter and a tubular wall extending from said periphery to a flattened end of the tube, the tubular wall being capable of being squeezed manually to dispense the contents of the tube through said dispensing end, the collar comprising a generally cylindrical body approximately 1.25 inch long with a slight internal flare

from one end to the other, said body being slidable larger end first over said periphery and tubular wall, the collar at the smaller end having an internal annular lip with an internal diameter less than 0.875 inch to abut against said rigid annular end and thereby limit the sliding of the collar towards said flattened end, said body having raised on its internal surface three longitudinally extending substantially plane lands that are equally spaced apart circumferentially and that are, when the lip abuts against said rigid annular end, snugly engageable with said periphery of the rigid annular dispensing end to resist displacement of the collar relative to the tube whereby the collar can then be gripped manually to press the dispensing end of the tube against a surface on which the contents of the tube are to be dispensed without forcing the collar longitudinally off the tube, the lands spacing the remainder of the internal surface of said body approximately 0.008 inch away from the tube at said periphery, said internal flare being sufficient that the internal surface can be entirely clear of the tubular wall at said larger end when the lip abuts said rigid annular end, the collar being resilient, incapable of appreciable circumferential expansion and sufficiently stiff to protect the tubular wall under it against substantial manual deformation.

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