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2,392,049

MEANS AND METHOD FOR MAKING LATEX TUBES

Filed May 2, 1942

2 Sheets-Sheet 1

Fig.-2.

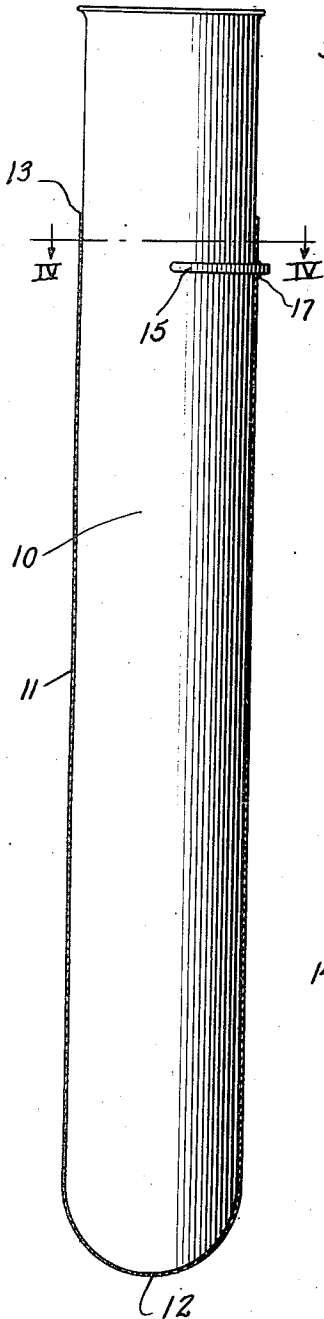


Fig.-1.

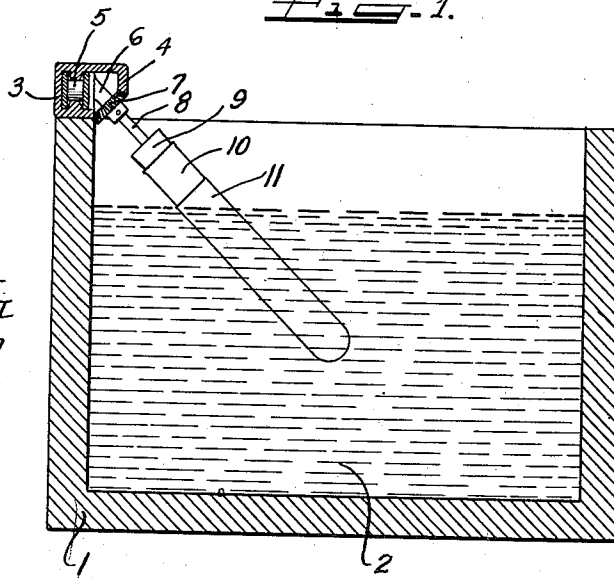


Fig.-3.

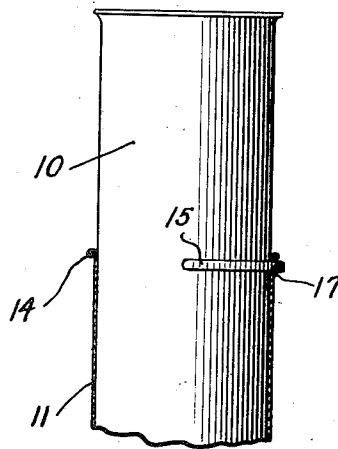
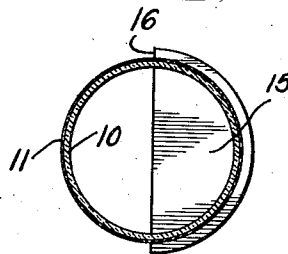


Fig.-4.



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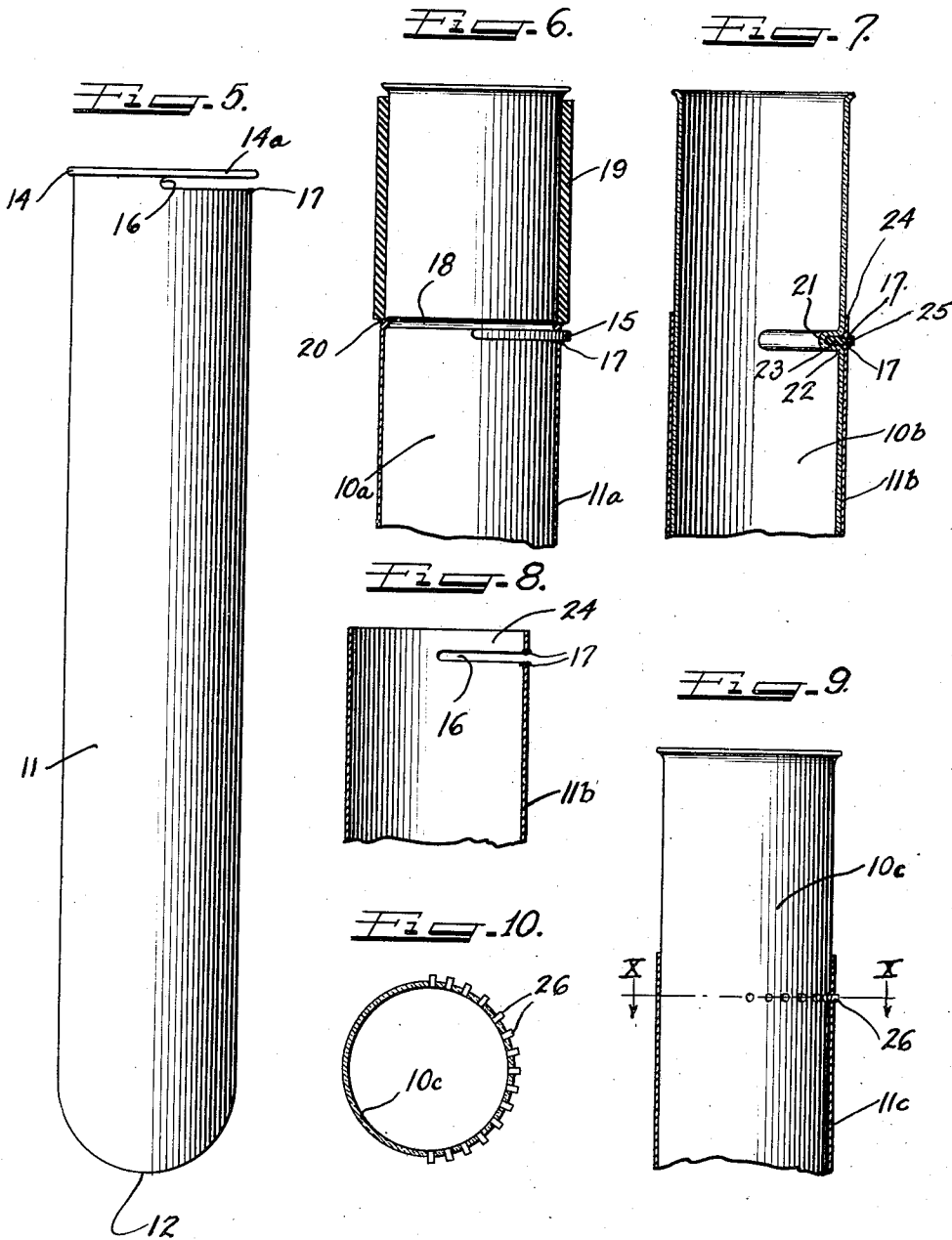
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,392,049

MEANS AND METHOD FOR MAKING
LATEX TUBES

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13 Claims. (Cl. 18—41)

This invention relates to improvements in means for and method of making a latex tube, the means and method being highly desirable for the production of latex tubes for use by physicians, surgeons, nurses, hospital and other medical attendants, and others in the prevention of disease, although the invention may have other uses and purposes as will be apparent to one skilled in the art.

The instant application is a continuation in part of my copending application entitled "Prophylactic sheath," filed August 4, 1940, Serial No. 351,421.

In the treatment of bodily diseases, the making of physical examinations, and in other instances, it is necessary for the insertion of an organ of one human body into an opening in another human body. Frequently it is necessary for a physician to insert his finger in the rectal, vaginal, or oral cavities or openings for the purpose of examination or treatment. Quite often there is grave danger of infection to the examining physician. As a precaution against infection, physicians and surgeons frequently use a covering for the finger or hand while making such examinations. The thickness or cumbersomeness of such protective covering quite often interferes to a material degree with the accuracy and facility of the examination, and many times causes discomfort to the patient. If a covering such as a single finger cot is used, there is danger of the cot being lost or misplaced, thus exposing the examiner to infection, and aggravating the entire circumstances.

An object of the invention is the provision of novel means to be used in the manufacture of a resilient protective tube, which lessens the formerly known operation necessary for the making of the tube, and results in more expeditious and economical manufacture.

Still another object of the invention is the provision of a novel method of making a resilient protective tube which eliminates steps heretofore found necessary in the manufacture of such tubes and results in more economical production.

Another feature of the invention resides in the provision of a resilient protective tube having an anchoring loop or band thereon which is partially separated from the tube, integral with the tube, and made of the same material as the tube; as well as the provision of novel means and a method of manufacturing such protective tubes.

A further feature of the invention resides in the provision of a protective tube having a beaded or otherwise reinforced open end, and means for

and a method of manufacturing such tube with the elimination of any rolling or brushing of the tube during the course of manufacture in order to provide such reinforced open end.

A further object of the invention resides in the provision of means for and a method of manufacturing a resilient protective tube having a slot therein adjacent the mouth end thereof, which slot extends substantially past the circumference of the tube, and the portion above the slot or near the open end of the tube may be used as an anchoring loop or strap, the portion below the slot having a reinforced edge to lessen the likelihood of tearing of the tube when in use.

It is also a feature of this invention to provide a new and novel method of making a resilient protective tube with a reinforced mouth edge.

While some of the more salient features, characteristics and advantages of the instant invention have been above pointed out, others will become apparent from the following disclosures, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a central vertical sectional view, somewhat diagrammatic, illustrating the first step, and the means therefor, in the manufacture of a tube, all of which embodies principles of the present invention;

Figure 2 is a side elevational view of a portion of the apparatus together with a partially completed protective tube thereon and shown in sections;

Figure 3 is a view similar to Figure 2 showing a further step in the making of the tube;

Figure 4 is a transverse sectional view taken substantially as indicated by the line IV—IV of Figure 2;

Figure 5 is a side elevational view of the completed product removed from the apparatus used in making it;

Figure 6 is a part sectional part elevational view illustrating a different form of product together with a variation in the method of making the product;

Figure 7 is a central vertical sectional view of a still different form of apparatus together with another modification of the product;

Figure 8 is a fragmentary vertical sectional view of the product made by the means disclosed in Figure 7;

Figure 9 is a fragmentary part sectional part elevational view illustrating a still different form of apparatus together with another modified form of the product; and

Figure 10 is a transverse sectional view taken

substantially as indicated by the line X—X of Figure 9.

As shown on the drawings:

In the various views of the drawings, certain features of the instant invention have been somewhat exaggerated for the purpose of clarity. Likewise, for the purpose of better presenting the invention, various modifications in means, method, and resultant product have also been illustrated, but it will be borne in mind that these methods or parts of them are interchangeable one with the other, as will more fully appear later herein, depending upon which specific apparatus and series of method steps may be deemed most desirable for a particular product.

For example, with the instant invention it is possible to make various types and sizes of finger cots for medical and surgical usage, rubber gloves and the like may also be made by obvious alterations in the form of the mold, finger tips such as are used by librarians, bookkeepers and checkers for leafing through a large series of sheets, prophylactic sheaths, and various other resilient tubular articles. Obviously, certain portions of the apparatus and various steps of the method may be altered at will consistent with the particular product desired.

Further, for the purpose of clarity, the instant invention will be herein described in connection with the use of liquid latex as the medium from which the product is made, although it will be readily understood that various other materials, such as synthetic rubber, certain forms of plastics, etc. might equally as well be used, and the terms liquid latex or latex as used herein and in the appended claims are to be construed in accordance with the above explanation.

In the first illustrated embodiment of this invention, seen in Figures 1 to 5 inclusive, there is shown a tank 1 containing a bath of liquid latex 2 or equivalent substance. Along one of the upper edges of the tank a track 3 is provided having a protruding portion 4 extending inwardly over the tank, and the under edge of the portion 4 is provided with a rack. A flanged wheel 5 rides along the track 3 and an obliquely disposed support 6 is carried by this wheel. The support 6 is freely joined in any suitable manner to a bevel gear arrangement 7 to which a spindle 8 is fixedly connected. The spindle 8 carries a form or mold support 9 thereon for a mold 10 upon which the resultant protective tube is formed. As the wheel or chain 5, as the case may be, travels along the track 3, the bevel gear 7 and likewise the mold 10 are rotated by the engagement of the gear with the rack on the projection 4. Thus, the mold is kept constantly spinning while disposed in an oblique position in the latex bath 2. The oblique disposition of the mold during the forming of the resilient protective tube eliminates the occurrence of a thickened globule of latex on the closed end of the resultant protective tube.

The form or mold 10 is preferably of glass, porcelain, or the equivalent. The form, in this instance, has the general shape of what laboratory technicians commonly term a test tube. One end remains open, the tube is hollow, and the other end is rounded and closed.

After the form 10 has rotated and remained in the latex bath 2 for a predetermined time, depending upon the thickness desired of the resultant protective tube, the form leaves the bath, and in Figure 2 I have illustrated a form after leaving the bath, removed from its mounting for purposes of illustration, and having thereon a

latex tube 11, resulting from the adherence to the form 10 of the liquid latex during the time it was in the bath. It will be seen that the product or protective tube 11 is of relatively thin and uniform thickness, having a closed end 12, and the other end extends along the form 10, terminating at the point 13. Before the latex tube 11 has had time to permanently set, the upper portion adjacent the edge 13 is rolled or brushed downwardly along the side wall of the mold or form 10 to provide a bead 14 as seen in Figure 3, which bead acts as a reinforcement for the open end of the latex tube. Timely provision of the bead 14 results in the layers forming the bead adhering to each other and uniting in substantially an integral structure or permanent bead which cannot be unrolled.

One of the features of this invention resides in the resultant construction of the latex tube, as well as in the construction of the form 10. This form is preferably provided with a slot through the wall thereof, and extending throughout substantially half the circumference of the form. In this slot a half-disk 15 of chlorinated rubber or the equivalent is inserted, and the half-disk 15 is of such size as to project radially outwardly beyond the form a material distance as indicated at 16 in Figure 4. Liquid latex will not adhere to chlorinated rubber so that there will be no formation of accumulated latex over the half-disk 15. However, chlorinated rubber does have somewhat of an affinity for liquid latex so that there will be a slightly greater accumulation of latex immediately adjacent the half-disk 15 and thus provide a reinforced edge as indicated at 17 around the slot 16. This reinforcement around the slot may be augmented by turning in the edge of the form 10 slightly around the slot in the form, thus permitting the latex to follow this curvature of the form adjacent the insert 15 and provide even greater reinforcement than is provided by the affinity of the chlorinated rubber disk or insert for the latex. Consequently, as seen best in Figure 2, the latex tube will accumulate on the form 10 above and below the insert 15 but not over the insert and thus the slot 16 with a reinforced edge therearound is provided in the resultant latex tube illustrated in Figure 5.

That portion of the bead 14, above the slot 16, which for the purpose of clarity will be designated 14a, is therefore free from the body of the resultant protective tube 11 for substantially half the circumference of the tube, thus forming a loop or band for anchoring the protective tube to the body of a user.

Assuming, for example, that the resultant latex tube is in the size and character of a finger cot for use by a physician, the tube may be initially rolled, the band portion 14a not interfering with the rolling operation. Then the tube may be unrolled over the finger of a physician or other medical examiner, intimately fitting the finger, and the loop portion 14a may be stretched and anchored around the thumb of the examiner so that there is no danger of misplacing or losing the protective tube during an examination of a body opening or cavity. The reinforced edge 17 around the slot 16 in the tube effectively prevents tearing of the tube during the stretching of the loop portion 14a and later use.

As another example, if the resultant latex tube should be used over the male organ of generation for medicinal or other purposes, the loop

portion 14a may be anchored around the scrotum to hold the latex tube in place.

In all of the subsequently described forms of the instant invention, it will be understood that in each instance the mold or form upon which the latex tube is made may be carried by some similar revolving apparatus and is rotated in a bath of liquid latex or equivalent substance, all as described in connection with Figure 1.

In Figure 6 I have shown an embodiment of a form, designated 10a, which not only has the slot with the insert 15 therein above described, but which is also provided with an annular inwardly extending groove 16 immediately above the insert 15. Above this groove 16, the form 10a is provided with a chlorinated rubber sleeve 19 which extends to the upper edge of the groove. When the latex tube, in this instance designated 11a, is made on the form 10a, the groove 16 as well as the affinity of the chlorinated rubber sleeve for the liquid latex will provide the equivalent of a bead at the mouth end of the latex tube, as indicated at 20. In this manner, the rolling or pressing action above described to provide the bead 14 is eliminated. The bead or reinforcement 20 will be of substantially the same character as the bead 14 illustrated in Figure 5, and be separated from the latex tube for substantially half the circumference. From the previously described embodiment, the mold 10a is turned slightly inwardly adjacent the insert 15 so that there will be a reinforcing thickening around the slot in the resultant latex tube as indicated at 17. The latex tube shown in Figure 6 functions in use in the same manner as above described.

In the embodiment of my invention illustrated in Figures 7 and 8, there is shown a mold or form 10b which, instead of being provided with a semi-circumferential slot, is provided with a semi-circumferential inwardly extending groove 21, the form wall being rounded as indicated at 22 adjacent both the upper and lower sides of the groove. In this groove a horseshoe-shaped insert 23 of chlorinated rubber or the equivalent may be inserted, the insert projecting radially outwardly beyond the wall of the form as explained above. In this instance, the latex tube 11b made on the form 10b is permitted to project above the insert 23 as indicated at 24. As seen best in Figure 8, the portion 24 thereby forms a band separated semi-circumferentially from the body of the latex tube 11b by a slot 16. However, there is no opening through the wall of the form 10b in the vicinity of the slot provided in the latex tube, and therefore in the event that heat is desired during the manufacture of the latex tube, a hot fluid may be utilized inside the form 10b, since the entire wall of the form is imperforate.

An additional feature is provided in the structure shown in Fig. 7 in connection with the formation of a reinforced edge around the slot 16 in the resultant latex tube. The curvature 22 of the wall of the form 10b provides an inward thickening or at least a reduction in diameter. Likewise, the affinity of the insert 23 provides a slight thickening adjacent the insert. However, the insert 23 may be provided with grooves 25-25 in the upper and lower faces thereof in the contact region of the latex with the insert, and thus augment the formation of an edge equivalent to a bead.

Obviously, the groove construction of insert 23 may be utilized in connection with the embodi-

ments of the invention described in connection with Figures 1 to 6, if so desired. Equally as obvious, if the band style of anchorage as indicated at 24 in Figure 8 is not desired on the construction shown in Figures 7 and 8, the chlorinated rubber sleeve 19 of Figure 6 may be utilized with the form 10b of Figure 7. In similar manner, features from all of the various embodiments of the invention herein described may be interchanged or substituted at will, depending upon the exact character of the resultant latex tube desired.

The final illustrated embodiment of the invention is shown in Figures 9 and 10, and includes a form 10c which is provided with a series of relatively closely adjacent apertures extending substantially half way around the tube as seen best in Figure 10. Each of these apertures is provided with a plug 26 of chlorinated rubber or the equivalent which extends radially outwardly beyond the wall of the tube. When the latex tube 11c is made on the form 10c, there will be a series of apertures through the wall of the latex tube. The upper portion of this tube may be finished off in any of the ways above described, so as to provide a suitable bead or equivalent reinforcement around the mouth end of the latex tube. If it is desired to have an anchoring loop or band on the latex tube 11c, it is a simple expedient for the user to sever the wall of the latex tube along the line defined by the apertures and thus provide the band or loop.

However, the latex tube 11c may be used without providing the loop or band if so desired, such, for example, as a rubber finger tip for leafing through a multitude of sheets, sorting work, etc., and the holes in the wall of the tube formed by the plug 26 will furnish ventilation for the finger of the user.

With respect to the showing in Figure 6, it will be noted that if desired the slot in the wall of the form 10a may be dispensed with as well as the chlorinated rubber insert 15. In other words, a form with a solid wall in lieu of the slot may be utilized, the other construction illustrated in this figure remaining the same. In that event, a latex protective tube will result having a bead or equivalent reinforcement 20 all the way around the mouth edge, and the entire wall of the latex tube will be imperforate. If no semi-separated loop for anchoring the latex tube in position is desired, the elimination of the slot and insert in the structure of Figure 6 provides a very expeditious and rapid operation saving medium for the manufacture of an imperforate latex tube having a sufficiently reinforced mouth edge.

From the foregoing, it is apparent that I have provided novel means for manufacturing a novel resilient protective tube, as well as a novel and labor saving method of making such a tube. It will be noted that with obvious alterations in the size and shape of the mold or form, various sizes and shapes of resilient protective coverings may be provided. The method is inexpensive to practice and is highly efficient and rapid. The resultant product is provided with suitable reinforcing at every free edge portion thereof, and may be provided with an anchoring loop or band to insure the protective tube remaining in position on the body of a user.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon

otherwise than necessitated by the scope of the appended claims.

I claim as my invention:

1. Apparatus for making a resilient protective tube, including a form on which a liquid substance may accumulate and set into a resilient tube, said form having an opening therein below the predetermined length of the resilient tube, and an insert in said opening extending radially outwardly beyond said form and of a material that is non-receptive to an accumulation of said liquid substance.

2. Apparatus for making a resilient protective tube, including a form on which a liquid substance may accumulate and set into a resilient tube, said form having an opening therein below the predetermined length of the resilient tube, an insert in said opening extending radially outwardly beyond said form and of a material that is non-receptive to an accumulation of said liquid substance, the marginal portions of said form adjacent said opening being inwardly turned to encourage an added accumulation of substance adjacent said insert.

3. Apparatus for making a latex protective tube, including a hollow form having a closed end and on which liquid latex may accumulate and set into a tube, said form having a substantially semi-circumferential slot therein below the predetermined height of the latex tube, an insert in said slot of material non-receptive to latex accumulation and extending laterally beyond said form to mold a slot in the latex tube.

4. Apparatus for making a latex protective tube, including a hollow form having a closed end and on which liquid latex may accumulate and set into a tube, said form having a substantially semi-circumferential slot therein below the predetermined height of the latex tube, an insert in said slot of material non-receptive to latex accumulation and extending laterally beyond said form to mold a slot in the latex tube, and means of similar non-receptive material disposed around said form and spaced above said insert to determine the length of said latex tube.

5. Apparatus for making a latex protective tube, including a hollow form having a closed end and on which liquid latex may accumulate and set into a tube, said form having a substantially semi-circumferential slot therein below the predetermined height of the latex tube, an insert in said slot of material non-receptive to latex accumulation and extending laterally beyond said form to mold a slot in the latex tube, and means of similar non-receptive material disposed around said form and spaced above said insert to determine the length of said latex tube, said form having an annular groove therein immediately below said means to shape a terminal reinforcing bead on the latex tube.

6. Apparatus for making a resilient protective tube, including a form on which a liquid substance may accumulate and set into a resilient tube, said form having an opening therein below the predetermined length of the resilient tube, and an insert in said opening extending radially outwardly beyond said form and of a material that is non-receptive to an accumulation of said liquid substance, said insert being grooved in both its upper and lower surfaces to shape thickened reinforcing edges on the latex tube.

7. Apparatus for making a latex protective

tube, including a hollow form having a closed end and on which liquid latex may accumulate and set into a tube, said form having a substantially semi-circumferential groove therein below the predetermined height of the latex tube, an insert in said groove of material non-receptive to latex accumulation and extending laterally beyond said form to mold an opening in the latex tube.

8. The method of making a latex protective tube having an integral anchoring loop thereon, including the steps of spinning a form in a bath of liquid latex and simultaneously molding a semi-circumferential slot in the latex tube as it accumulates on said form, said slot being located adjacent the open end of the latex tube.

9. Apparatus for making a resilient protective tube, including a form on which a liquid substance may accumulate and set into a resilient tube, and a member of material non-receptive to the liquid substance extending laterally outwardly from said form at a point below the upper end of the intended accumulation of substance and in excess of one-third the distance but only partially around the form to mold an elongated opening in the body of the tube.

10. Apparatus for making a resilient protective tube, including a form on which a liquid substance may accumulate and set into a resilient tube, and a member of material non-receptive to the liquid substance extending laterally outwardly from said form in excess of one-third the distance around the form to mold an elongated opening in the tube, said member extending only partially around the form and being located immediately below the predetermined length of the tube to define a relatively narrow portion at one side of said opening.

11. Apparatus for making a resilient protective tube, including a form on which a liquid substance may accumulate and set into a resilient tube, and a member of material non-receptive to the liquid substance extending laterally outwardly from said form substantially half the distance around said form to mold an elongated opening in the tube, said member being located immediately below the predetermined length of the tube and having a groove in both opposed faces thereof adjacent the form to mold a reinforcing edge on the tube on each side of said opening.

12. Apparatus for making a resilient protective tube, including a form on which a liquid substance may accumulate and set into a resilient tube, and a member of material non-receptive to the liquid substance extending laterally outwardly from said form substantially half the distance around said form to mold an elongated opening in the tube, said form having an annular groove therein to mold a reinforcing edge on one end of the tube, and said member being located immediately below said groove.

13. Apparatus for making a resilient protective tube, comprising a form on which a liquid substance may accumulate and set into a resilient tube, the surface of said form being interrupted within the predetermined length of said resilient tube by material extending radially outwardly of said form surface, said material being of such character that said liquid substance will not accumulate thereon, whereby an opening is formed by said material in said resilient tube.

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