Aug. 5, 1952 L. RUHLAND 2,605,505

DEVICE FOR MAKING ELASTIC BODIES

Filed Oct. 18, 1949

Fig. 1

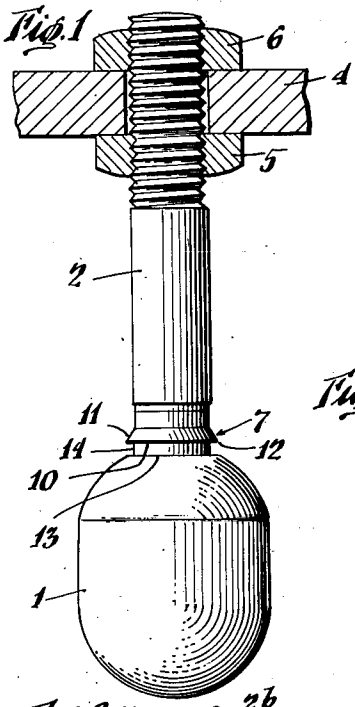


Fig. 2

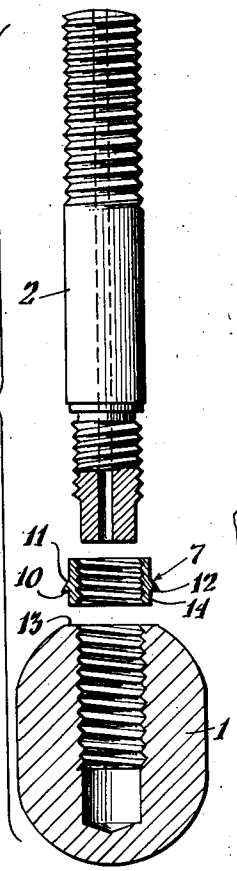


Fig. 3

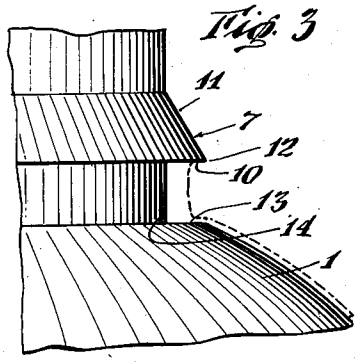


Fig. 6

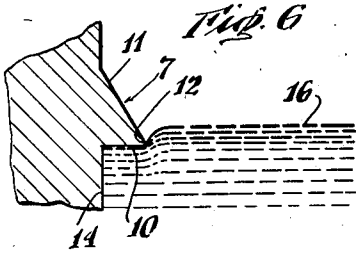


Fig. 8

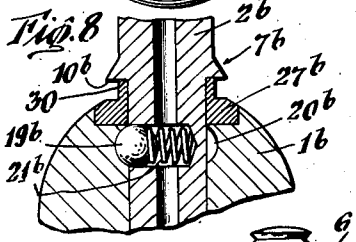


Fig. 7

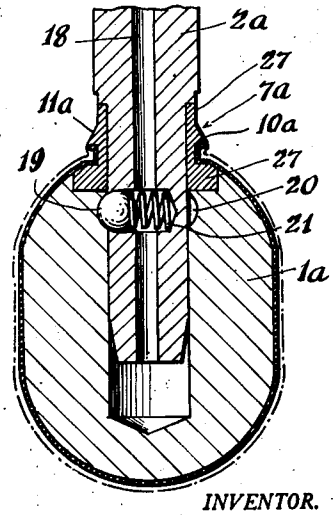


Fig. 5

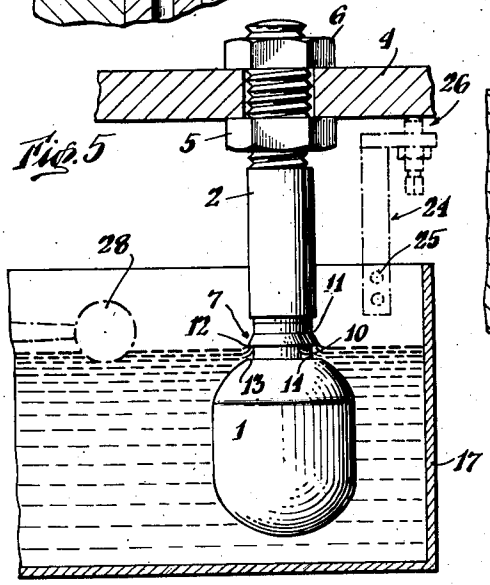
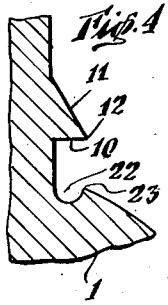


Fig. 4



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DEVICE FOR MAKING ELASTIC BODIES

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7 Claims. (Cl. 18—41)

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The present invention relates to a device for manufacturing elastic thin-walled hollow articles or sheaths.

Such an article or sheath usually includes an opening of substantially less cross section than the main portion of the sheath, and a reinforcing bead or band around the opening of substantially greater thickness than the sheath, which is depended upon for holding the article in place. Thus the body portion of the article may fit loosely and hold medication or a bandage on a part of the body covered by the article, the band preventing escape of medication or escape of contamination from the affected parts thus covered.

The bead or band has been often made hitherto by rolling up the edge of the molded article, but in certain uses this proved objectionable. Sometimes the bead lacked sufficient elasticity by reason of being rolled up to make a thick band, so that the rounded bead tended to dig into the flesh. Sometimes the surface of the bead in contact with the skin was too slight to offer sufficient friction to hold the article in place.

It has been attempted to solve the problem of making a satisfactory elastic band for such an article by a separate band applied before molding the body of the article by a dipping process. In that process an elastic band is first manually placed upon part of the mold and the mold is thereafter dipped in suitable liquid to immerse the band just far enough to cover or nearly cover the elastic band. When the liquid deposit on the mold dries, the band becomes united with the body portion of the article.

While the separate manufacture of the elastic band procedure produces a satisfactory article, the separate manufacture of the band and the required manual placing of the elastic band on the molds is a slow and expensive operation, and failure to accurately position the bands results in defective products. Under this procedure the mold body is usually removed from the shaft at every molding operation, with the result that the joint where the shaft enters the mold eventually becomes worn or otherwise damaged and during the dipping operation the liquid enters the damaged spot and results in a faulty article.

The present invention aims to overcome the disadvantages above mentioned and other disadvantages by providing devices and method which are relatively simple and may be used to manufacture improved elastic articles of the class described in large quantities at relatively low cost. The invention further contemplates the provision of a method and devices which may be utilized by relatively inexperienced and unskilled personnel to rapidly produce improved elastic articles embodying integral and simultaneously formed elastic bands and elastic body portions. According to the present invention, both the body and integral band or neck of the article are molded simultaneously, with integral band being of the desired "heavier" thickness than the body portion.

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An object of the present invention is to provide a new and improved method of making elastic articles.

Another object of the invention is to provide new and improved devices for making elastic articles.

Another object of the invention is to provide a new and improved apparatus for simultaneously forming the band and body portions of elastic articles.

A further object of the invention is to provide a new and improved apparatus for forming elastic bag-like articles having integral elastic band and body portions.

A still further object is to provide a new and improved device which reduce substantially the wear upon the molds and the number of operations involved in making elastic articles of the class described.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

A preferred embodiment of the invention has been chosen for purposes of illustration and description and is shown in the accompanying drawings, forming a part of the specification, wherein:

Fig. 1 is an elevational view showing one form of the present invention;

Fig. 2 is an exploded view, partially in section, showing parts of the device illustrated in Fig. 1;

Fig. 3 is an enlarged fragmentary view illustrating a portion of the device shown in Figs. 1 and 2;

Fig. 4 is an enlarged fragmentary sectional view showing a modified form of the invention;

Fig. 5 is an elevational view, partially in section, showing the molding device of Figs. 1 and 2 extending into a body of liquid;

Fig. 6 is an enlarged fragmentary sectional view illustrating in somewhat exaggerated manner a

relationship of a portion of the present molding device with respect to the surface of a body of liquid;

Fig. 7 is a fragmentary sectional view illustrating a modified form of the present molding device, together with a deposited layer of elastic material; and

Fig. 8 is a fragmentary sectional view of a modified form of the invention, along the lines of that illustrated in Fig. 7.

In the form of the invention illustrated more particularly in Figs. 1, 2 and 3 the molding device comprises a main body portion 1 located adjacent the lower end of a shaft or stem-like part 2, a multiplicity of such shafts being threaded, bolted, or otherwise secured to a carrying plate 4 of an appropriate frame (not shown). Any suitable number of such shafts and main body portions may be carried by the plate 4, for example, as many as one hundred and fifty, so that they may all be dipped into a body of liquid at the same time in the manufacture of articles. The shafts or stem portions 2 of the molding device may be held in position on the plate 4 by nuts 5 and 6.

It will be noted that the shaft 2 includes a reduced diameter upper portion located above an outwardly extending umbrella-like flange or projection 7, the projection comprising a substantially horizontal undersurface 10, spaced from the uppermost end of the mold body portion 1, and an inwardly inclined portion 11 which joins the cutermost edge 12 of the projection 10 with the reduced diameter portion of the shaft 2. The uppermost surface or edge 13 of the main body portion 1 preferably has an annular flat portion or width substantially equal to that of the undersurface 10 of the projection 7. The vertically spaced portions 10 and 13 of the projection and of the main body portion cooperate with the vertical connecting portion 14 to form an annular recess or groove immediately above the main body portion 1 of the molding device.

The tank 17 contains liquid natural latex, some synthetic solution such as "neoprene," or other appropriate liquid, and in forming an elastic article with the present molding device the latter is dipped into the body of liquid so that the main body portion 1 is completely submerged and so that the uppermost surface or meniscus of the liquid comes into contact with the undersurface 10 of the flange or projection 7. In the dipping operation the liquid thus fills the annular space between the upper end of the mold body and the spaced overhang 10 on the shaft. When the mold body is withdrawn from the liquid a relatively heavy or thick layer of the liquid is held in the annular recess formed by the shoulder 10, shaft portion 14 and upper edge 13 of the mold body 1; of course, a layer of liquid also covers the remainder of the main body portion 1 of the mold. The annular ring or layer of liquid which remains in the annular groove or collar above the main body portion of the mold upon withdrawal from the liquid is thicker than the layer formed on the main body portion and this extra thickness subsequently dries to form a thickened elastic band or reinforced elastic neck for the article.

In this manner there is provided a completely integral article with a heavier band and the time and labor formerly required in making the band separately and manually placing it on the mold is eliminated. In addition, the simultaneous formation of the band and body portion proper of the elastic article provide greater structural strength than is otherwise obtained, with less likelihood of separating the band from the remainder of the article.

With most liquids which are employed to form the elastic articles the upper surface of the liquid tends to creep or move slightly upwardly above the normal surface of the liquid to wet the whole of the undersurface 10 of the annular shoulder which forms the upper wall of the reduced diameter portion 14 of the shaft.

When the mold body and stem are lowered the correct distance into the body of liquid the liquid comes into contact with only the undersurface 10 and the formation of the desired and correct integral band portion results on the article. If a stem portion extended vertically upwardly from the outer edge 12 of the shoulder 7, lowering the mold slightly too far into the liquid would tend to cause wetting or creeping of the liquid upwardly along the shaft above the undersurface 10 of the stem; this is highly objectionable since it results in the formation of an undesirable fin or "flash" which mars the appearance of the resulting article.

In order to overcome or minimize this disadvantage or difficulty the portion of the stem immediately above the shoulder 10 is "cut back" to form what may be termed a reversely inclined surface 11, which inclines away from the outermost edge 12 of the undersurface 10. As shown in Figs. 1 through 6 this angle is about 60° but any other suitable angle may be utilized. When a molding device embodying this reversely inclined upper surface is lowered into the liquid it is difficult for the liquid to contact any surface above the outermost edge 12 and thus upward creeping of liquid along the shaft or other portion of the molding device is greatly minimized. Even in those instances where the molding device may be immersed slightly more than absolutely necessary into the liquid, the liquid surface does not objectionably wet any upwardly extending surface of the molding device. This improved action is illustrated in somewhat exaggerated form in Fig. 6 where the undersurface 10 and edge 12 are shown depressed slightly below the uppermost surface 16 of the body of liquid without wetting the inclined surface 11.

Thus it will be clear that the present molding devices may be lowered into a body of liquid without observing the same degree of exactitude of immersion as is required with molding devices which do not include the present "reversely" inclined upper surface 11. This reverse angle is even more highly desirable in practical commercial operations where a plurality of the molding devices are carried by a plate 4; in this latter instance some of the undersurface portions 10 of the molding devices may be at slightly different distances from the same mounting plate 4 than others, which makes it difficult to immerse each molding device into a body of liquid by exactly the same amount, as, in some instances, the plate 4 may not be exactly in the same plane throughout its area and, here again, the present devices provide correct wetting. With the present invention the molding devices carried by the plate 4 may have their undersurfaces 10 located in a common plane with a reasonable degree of exactness; even though the undersurface 10 of one of the molding devices may be immersed to a slightly greater extent than others, the reversely inclined upper surfaces 11 minimize the possibil-

ity of wetting even the more deeply inserted molding devices above the undersurface **10**. Thus there is provided correct formation of articles even though every molding device carried by the plate may not be immersed to exactly the same depth. This is highly desirable since a relatively inexperienced operator need observe only one of the molding devices to insure its immersion to the correct amount in order to immerse all of them to a practically correct extent. The same holds true with an automatic dipping mechanism. Even though the operator or automatic dipper tends to immerse a single molding device too far into the liquid, the inclined surface prevents or minimizes objectionable wetting of the mold stem and the formation of undesirable fins or webs. As a result dipping operations may be performed more rapidly since there is greatly decreased possibility of objectionably wetting the molds.

Excellent results may be achieved by utilizing, for the mold portions which form the annular recess around the stem, an undersurface **10** and a flat mold upper surface **13** each having widths in the neighborhood of .025 inch and a vertical connecting portion **14** having a dimension of about .12 inch to about .13 inch. These dimensions may be suitably varied to give desired other band thicknesses, etc.

In the process of molding by dipping the dipped mold is withdrawn with an adhered coating of the liquid and the deposited liquid substances is dried; thereafter the dipping and drying steps are repeated a desired number of times. It is preferable to dry the dipped mold after each dip to allow the thicker layer of deposit forming the annular collar ample time to dry. Thus a thickened band of deposited elastic material is formed around the opening and provides a thick elastic band at the opening of the relatively thinner article. Three successive dippings and dryings give excellent results, the additional dippings after the first tending to cover any defects which may exist from a previous dipping.

While the present molding device is illustrated in Figs. 1 and 2 as comprising separable shaft, collar and main body portions which thread together to form a complete molding device it will be understood that they may be formed by casting, molding or machining from a single piece of material. The molding device may be formed from metal, synthetic molding compound, or any other suitable substance. Where the article is comprised of separable parts such as illustrated in Fig. 2 the collar and other appropriate parts should fit tightly against each other to prevent the formation of any objectionable web or fin on the final molded article.

After articles have been formed on the molding devices by the dipping and drying steps the articles may be stripped from the molding devices by hand or by mechannical means and subjected to testing operations and the like. In order to loosen the articles sufficiently to facilitate stripping them from the molds they are preferably first soaked for a time in soapy water or the like and thereafter stripped.

In some instances it may be desirable to increase the height or vertical dimension of the band and to increase its gripping strength. This may be achieved (Fig. 4) by providing a groove or recess **22** at the upper part of the main body portion, in lieu of the flat surface **13**. The groove is shown extending from the vertical shaft portion to a relatively abrupt or sharp edge **23**. The

groove fills with liquid during dipping and increases the mass of the band, and its gripping effect when in use, by increasing the overall height of the band.

If desired, for convenience in handling and economy in assembling, the forms of molding devices shown in Figs. 7 and 8 may be employed. The molding device of Fig. 7 includes a main body portion *1a*, a shaft or stem *2a* and an umbrella-like projecting portion *7a* including an undersurface *10a* and an inclined upper surface *11a*, all generally similar to those previously described in connection with Figs. 1–3, 5 and 6. In the form of Fig. 7 the main body portion *1a* is separable from the stem *2a* by pulling the parts away from each other, being normally retained in position during molding operation by a ball or detent member **19** which is urged into a complementary recess **20** by a spring **21**. There may be provided a groove or recess such as that shown at **22** in Fig. 4.

The various shoulders may be formed on a hardened insert **27** shown set into an appropriate recess in the main body portion *1a*; this hardened insert minimizes objectionable wearing away over a period of time as a result of continued assembly and separation of the main body portion *1a* and the stem. Here again any suitable material such as metal, plastic, glass, porcelain, or the like may be utilized for the materials comprising the molding device.

Fig. 7 also shows in a general way the deposition of an initial thickness of elastic material in solid lines and in dot-dash lines the increased thickness which is obtained by subsequent dipping.

The finished article may be removed from the molding device of Fig. 7 by stripping it from the main body portion *1a* while the latter remains assembled with the stem *2a*, or the main body portion *1a* may first be removed from the stem to expose an upper edge of the thickened band, and then the band stretched to enlarge the opening and facilitate stripping of the article from the mold.

An air vent conduit or opening **18**, shown extending through the shaft of Fig. 7, may be used if desired. This vent is not essential where the molding device is made in one piece or where it is "built up" as indicated in Fig. 2. It is useful with the construction of Fig. 7 where the venting of air in the mold as the shaft is inserted serves to aid a tight fit and to eliminate the pressure of air heated in the drying process; it also facilitates the cooling of the form after leaving the drying room.

The construction of the molding device shown in Fig. 8 is generally similar to that of Fig. 7, except that the umbrella-like projection *7b* is formed on the shaft *2b* instead of on the insert member *27b*. The upper end of the insert member terminates in an edge **30** which abuts, in molding relationship, against the flat undersurface *10b*. When the retaining ball *19b* is seated in the recess *20b* it holds the uppermost end **30** of the insert member *27b* firmly against the undersurface *10b*, thus preventing leakage of liquid into an intermediate joint.

To assist in obtaining dipping into the liquid for the exact required distance, downward movement of the dipping frame may be arrested by a stop **24** mounted on the side of the tank **17**, as by bolts **25**, and provided with a fine screw adjustment **26**. Other suitable means may be utilized for limiting the downward dip into the latex

solution or the operator may gauge the proper distance by observation, the latter being greatly facilitated by the surface 11 which inclines away from the edge 12 and minimizes the possibility of wetting any surface above the surface 10 of the ledge.

The stop adjustment 26 is adapted to be readily set to coordinate with the level of liquids in the tank 17, which may be accurately maintained by a float 28 controlling an inlet valve.

The stop means described immediately above is not necessary, however, with the present invention since the reversely inclined upper surfaces 11 of the molding device minimize the possibility of objectionable wetting of the molds above the surfaces 10 and consequent undesirable webs or fins in the finished article. It may, however, be utilized to supplement the action of the inclined upper surfaces 11.

It will be seen that the present invention provides a new and relatively simple method and devices for rapidly and inexpensively manufacturing improved elastic articles having integral or unitary bands, by dipping a mold into the liquid and retaining a thicker annular layer around the neck of the mold. The formation of objectionable fins or webs is avoided by the improved construction which minimizes wetting portions of the mold beyond a desired location. The present method and devices are well suited to use by relatively inexperienced personnel to produce a maximum number of perfect articles with a minimum number of "rejects." The method is relatively simple and the devices, by reason of their relatively simple construction, are inexpensive to manufacture.

As various changes may be made in the form, construction and arrangement of the parts herein without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim:

1. A molding device for forming elastic articles having an annular thickened band adjacent one end thereof, comprising a main body portion terminating in an annular shoulder, stem-like means of reduced cross section projecting above said main body portion, another annular shoulder extending transversely from and projecting beyond portions of the stem-like means intermediate said shoulders and having an undersurface spaced from said first shoulder a distance substantially equal to the width of the thickened band to be formed on the article and having an upper surface overlying said undersurface, said upper and undersurfaces meeting each other to form a corner with an included angle of less than ninety degrees.

2. A molding device for forming elastic articles having an annular thickened band adjacent one end thereof, comprising a main body portion terminating in an abrupt annular shoulder, stem-like means of reduced cross section projecting above said shoulder, another abrupt annular shoulder extending transversely from and projecting beyond portions of the stem-like means intermediate said shoulders and having an undersurface spaced from said first shoulder a distance substantially equal to the width of the thickened band to be formed on the article and having an upper surface overlying said undersurface, said upper and undersurfaces meeting each other to form a corner and the upper surface sloping inwardly and upwardly from said corner toward the stem-like means.

3. A device as claimed in claim 1, in which said undersurface of said other shoulder is substantially flat and perpendicular to the longitudinal axis of the stem-like means.

4. A device as claimed in claim 1, in which said annular shoulder of the main body portion and the undersurface of said other shoulder have substantially flat faces disposed toward each other.

5. A device as claimed in claim 1, in which said annular shoulder of the main body portion is recessed throughout its length.

6. A molding device for forming elastic articles having an annular thickened band adjacent one end thereof, comprising a main body portion having a socket therein, a collar extending about said socket having an abrupt annular shoulder and a portion of reduced cross section projecting above said shoulder, a member fitting into said socket provided with another abrupt annular shoulder extending transversely therefrom and projecting beyond said reduced portion of the collar members and having an undersurface spaced from said first shoulder a distance substantially equal to the width of the thickened band to be formed on the article and having an upper surface overlying said undersurface, said upper and under annular surfaces meeting each other to form a corner and the upper surface sloping inwardly and upwardly from said corner toward said member.

7. Mounting means carrying a plurality of molding devices for forming from liquid material elastic articles having an annular thickened band adjacent one end thereof, each of said devices comprising a main body portion terminating in an abrupt annular shoulder, stem-like means of reduced cross section projecting above said shoulder, another abrupt annular shoulder extending transversely from and projecting beyond portions of the stem-like means intermediate said shoulders and having an undersurface spaced from said first shoulder a distance substantially equal to the width of the thickened band to be formed on the article and having an upper surface overlying said undersurface, said upper and undersurfaces meeting each other to form a corner and the upper surface sloping inwardly and upwardly from said corner toward the stem-like means, tank means for holding said liquid material, and adjustable means carried by at least one of said mounting means and tank means for contacting the other to arrest movement of the mounting means toward said tank means.

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