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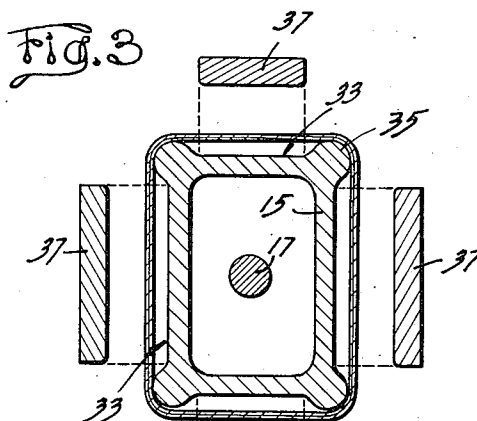
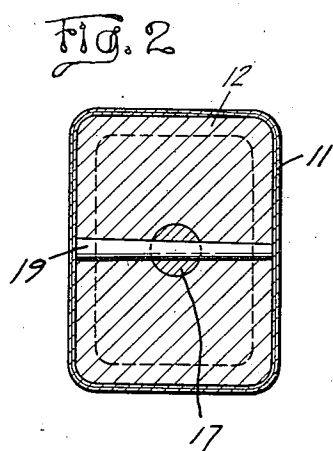
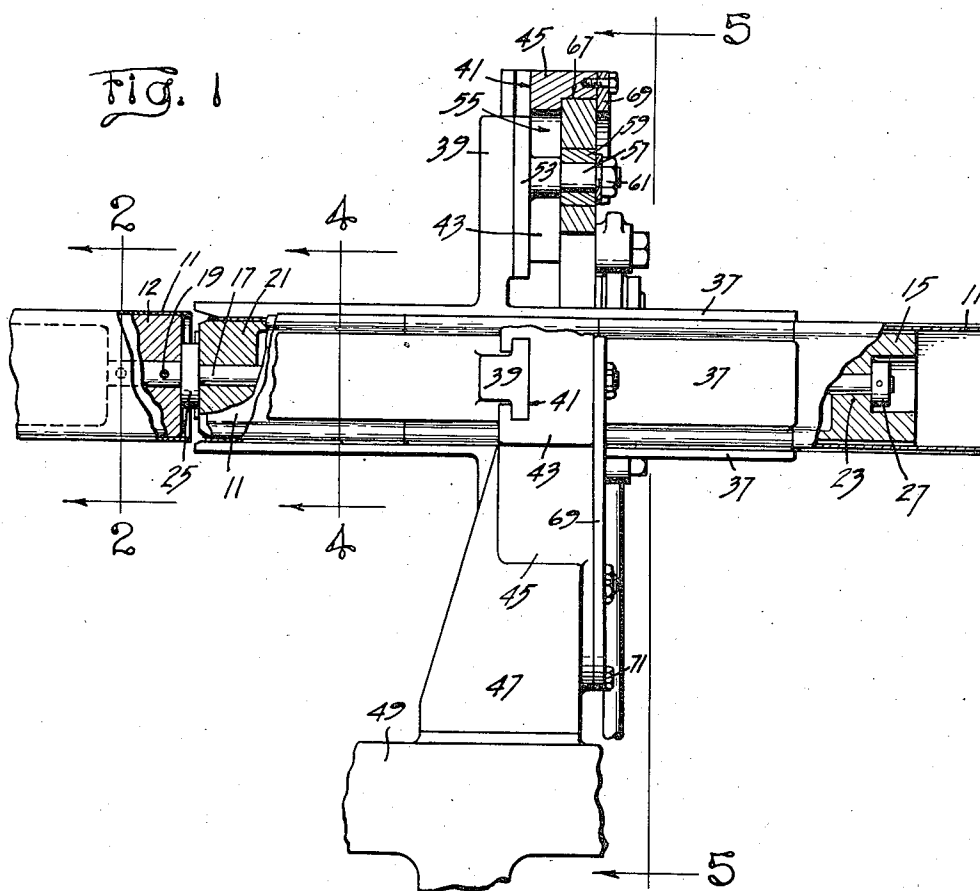
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2,034,731

METHOD OF FORMING TUBULAR BODIES

Filed Oct. 5, 1933

2 Sheets-Sheet 1



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Fig. 5

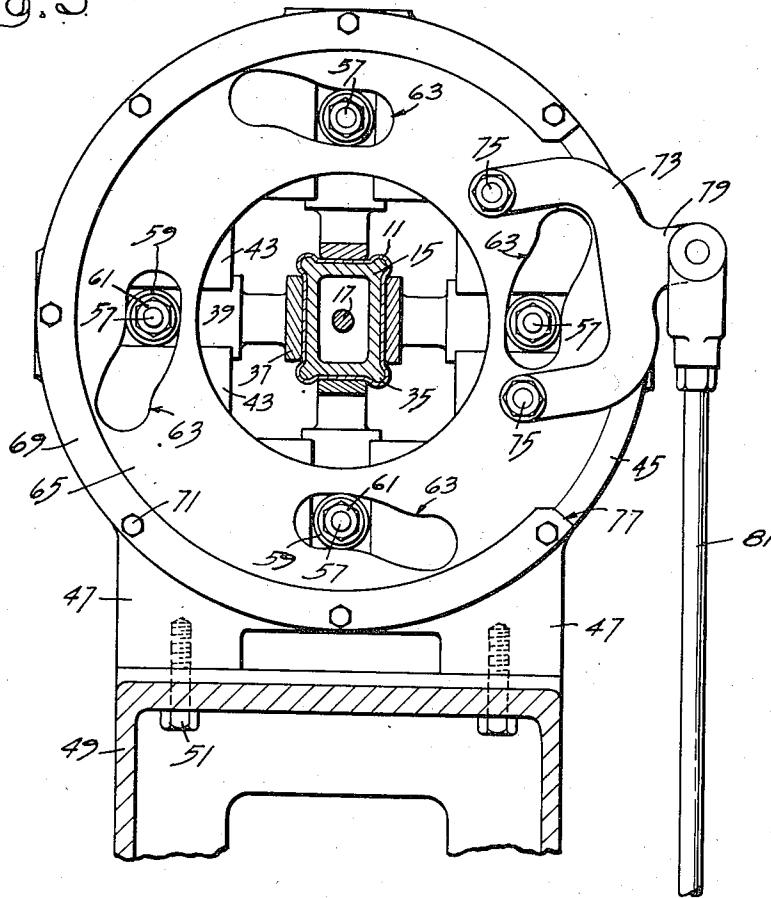


Fig. 4

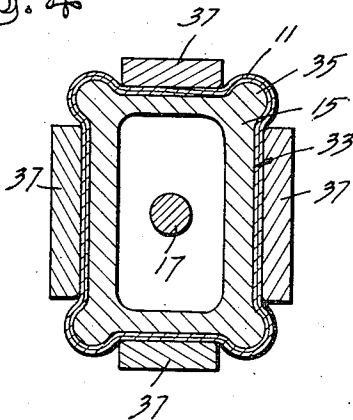
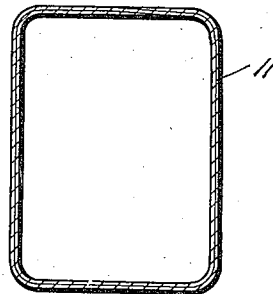


Fig. 6



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METHOD OF FORMING TUBULAR BODIES

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3 Claims. (Cl. 18—56)

The present invention relates to a method of forming true, tubular bodies and has particular reference to the reshaping of a non-circular fibre can body which has just been formed from layers of sheet material and while the body is still in a moist and plastic condition and to condition the moist body to utilize the drying strains and the contracting action of drying so that the desired shape results in the fully dried body.

Laminated fibre tubular bodies are selected by way of example to set forth a preferred manner of carrying out the method steps of the present invention. In the formation of laminated bodies a strip or strips of paper or other fibrous material are wound around a forming mandrel to obtain the desired body form, this being done while the material is in a moist and plastic or green condition, after which the bodies must be dried. In drying, internal strains are set up in the material (drying strains) effective within and between the various layers and such strains in the usual tubular manufacture more or less distort the body out of its original and its desired shape.

The tendency of these drying strains in non-circular bodies and in those having flat sides is an unequal expansion of the corners and the sides and the latter are pulled out and assume a curved shape when dry. In some cases where an exact shape is required it is necessary that the green body be held in molds or otherwise while drying so that it will retain its original shape within close limits.

An object of the present invention is the provision of a method of reshaping or reforming fibre tubular bodies based on a relation to the drying strains which will be set up in the body as it dries so that such drying strains will be utilized in bringing back the original body contour or shape in the completed body.

An important object of the invention is the provision of a method of reforming green, fibre non-circular or oblong tubular bodies by stretching their corners and adjacent wall parts so that when drying the stretched parts of the body are contracted just sufficient to bring back the desired finished shape and size into the body as it becomes fully dried.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figure 1 is a part elevation, part sectional view

of one form of apparatus for carrying out the method steps of the invention;

Fig. 2 is an enlarged sectional view of a primary forming mandrel, being taken substantially along the line 2—2 in Fig. 1;

Figs. 3 and 4 are enlarged fragmentary sectional views of the reforming mandrel being taken substantially along the line 4—4 in Fig. 1 illustrating different positions of associated reforming elements;

Fig. 5 is a sectional view, taken substantially along the line 5—5 of Fig. 1; and

Fig. 6 is a cross sectional view of a finished or dried tubular body as made according to the method of the present invention.

The first step in the present method may be considered to be the producing of a formed green tubular body just built up in a plurality of thicknesses from strips of paper or other fibrous material which have been wound while damp upon a revolving primary or forming mandrel. A laminated body rectangular in shape and having rounded corners is herein illustrated, the winding operation being a regular well known part of the usual fibre can manufacture. Where the bodies are relatively short in body height more than one is wound on the mandrel at the same time, the drawings illustrating three such bodies. Three bodies are thus received for the succeeding reforming steps.

These formed and green bodies are slid endwise off the primary mandrel and are moved endwise on to a secondary, stationary reforming mandrel where they are partially reformed by a stretching of the body stock around the rounded corners while the straight sides of the body are pressed in. This stretching and pressing may be done in different ways as by rollers applied to the rounded corners but a preferred mode of operation, as illustrated in the drawings, is by the use of squeezer jaws pressed into the sides of the body leaving the corners free.

In the drying out of the reformed bodies, which takes place after the bodies are removed from the reforming mandrel, the shrinkage strains set up in the material contract the stretched parts and draw the sides of the body taut. This brings back the original rectangular shape of the body, which when fully dried has straight non-bulging sides and round corners of the desired size.

The drawings show sufficient of the principal parts of a mechanism to carry out the method steps of the invention, the tubular bodies (Figs. 1 and 2) being formed while moist in the usual manner as by winding upon a rotatable forming

or primary mandrel 12 of a suitable tube winding machine.

The forming mandrel 12 comes to rest after each winding operation and it is at such a time that the bodies 11 are slid endwise on to a stationary reforming or secondary mandrel 15 supported at one end in the mandrel 12. Both mandrels 12, 15 are of a cross section equivalent to the body being formed and in the present instance are rectangular, having rounded corners. Mandrel 15 is slightly smaller than mandrel 12 to permit easy transfer of the bodies from the latter on to the mandrel 15.

The reforming mandrel 15 may be hollow to lighten its weight but is closed at each end and is supported on a shaft 17 which projects beyond the end of the mandrel 12 in which it is tightly held by pins 19. Since the shaft turns with the forming mandrel 12 bearings 21, 23 are provided in the end pieces of the reforming mandrel 15 so that the mandrel 15 will not turn with the mandrel 12. A spacing washer 25 on shaft 17 keeps the ends of the two mandrels apart and a collar 27 on the outer end of the shaft keeps the reforming mandrel from coming off of the shaft. The mandrel 15 is held stationary and prevented from turning as will be hereinafter fully described.

The mandrel 15 is provided with fluted sides, each of the four straight sides having a depression or wide groove 33 extending the full length of the mandrel and leaving the corners as rounded ridges 35. The green body is supported on these four ridges when first received on the mandrel and the reforming or reshaping elements press inwardly against the unsupported body sides.

These elements comprise four squeezer blocks or jaws 37, each jaw being formed on the inner end of a radially movable T sectioned slide 39 (Figs. 1 and 2). Each slide operates within a T slot 41 cut into a housing 43 formed as a part of a circular bracket frame 45 which surrounds the reforming mandrel 15. The bracket frame 45 is carried by supporting legs 47 which rest on the top of a suitable frame 49 of the apparatus, being bolted thereto at 51.

Each slide 39 is provided with a boss 53 (Fig. 1) which projects into a slot 55 formed in an associated housing 43, and which carries a stud 57. A cam roller 59 is rotatably held on the stud 57 by a lock nut 61. Each roller 59 engages within an associated cam slot 63 cut in a ring plate 65 which is mounted to turn in a circular groove 67 formed in the bracket frame 45. A ring washer 69 is held on the face of the bracket frame 45 by bolts 71 and confines the ring plate in its groove.

The ring plate 65 is positively oscillated within its grooved seat by means of a bifurcated bracket 73 (Fig. 5) which is secured by bolts 75 to the face of the plate, the washer 69 being cut away at 77 to give clearance for the bracket. Bracket 73 extends out beyond the frame in a lever arm 79 which is pivotally secured to a connecting rod 81 which may be moved up and down in any suitable manner to impart the desired oscillation to the ring plate 65.

The ring plate 65 is cut across in four cam slots 63 and a roller 59 is located in each slot. When the ring plate is partially rotated all of the slides 39 and their jaws 37 move in or out in accordance with the direction of movement of the ring plate. When the plate is moved counter-clockwise (Fig. 5) by a lifting of the rod 81 slides

and jaws move inwardly, the latter closing in on the green bodies 11 positioned on the reforming mandrel 15, this being the positions shown in Figs. 4 and 5. Such clamping action squeezes in and reforms the sides of the bodies and draws the body stock of the corners taut over the mandrel ridges. This stretches the corners of the body.

The reforming operation takes place during the rotation of the forming mandrel 12 as it winds the next set of bodies. The squeezer jaws 37 held to hold the reforming mandrel 15 stationary and against rotation at such time and it is only after the forming mandrel has completed the winding and comes into its rest period that the squeezer jaws 37 are released. The new set of three bodies 11 just formed are then moved on to the reforming mandrel and these incoming bodies engage against and push the newly squeezed and reformed bodies off the mandrel 20 and out of the machine.

Just enough stretch is put into the body stock by the reforming operation just described to utilize the shrinkage strains present in the subsequent drying so that the inset side walls of the body pull out straight, the body corners holding their positions. A finished rectangular body having rounded corners and flat straight sides (Fig. 6) results without need of molds, supports, etc. It has been found that this drying for a given can body shape is uniform and the exact amount and kind of reforming after being determined by trial for a given shape of body holds good for all bodies of that shape.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the steps of the process described and their order of accomplishment without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the process hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. The method of forming non-circular tubular bodies of fibrous material and the like, which comprises subjecting a body formed in laminations and of the desired shape, while in a green or moist condition, to a reforming operation, wherein certain portions of the body wall are stretched, and thereafter drying said reformed body, after it has been removed from the reforming devices, whereby the drying strains restore the said body to its original shape and size when fully dried without subjecting the corner portions to strain.

2. The method of forming non-circular tubular bodies of fibrous material and the like, which comprises subjecting a body formed in laminations and having rounded corners and straight sides, while in a green or moist condition, to a reforming operation which stretches the side walls of the body between and adjacent its corners to a degree which will, after it has been removed from the reforming devices, counterbalance internal drying strains present in the body wall during drying, whereby the body sides are pulled back and the body resumes its original shape and size without distortion upon being fully dried and without subjecting the corner portions to strain.

3. The method of forming non-circular tubular bodies of fibrous material and the like, which comprises subjecting a body formed in a plu-

5 rality of separate thicknesses and of the desired shape, while in a green or moist condition, to external pressure while it is internally supported to press-in parts of said body to a degree sufficient to create a predetermined surplus area in the body wall, and stretching the corners of the body, then removing the body from the press-

ing means, and thereafter drying the body, whereby the inherent internal drying strains pull out the said predetermined wall surplus and restore the original formed shape to the fully dried body and without subjecting the corner 5 portions to strain.

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