

Aug. 6, 1935.

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2,010,475

METHOD OF PRODUCING ARTICLES FROM FIBERS AND THE PRODUCT THEREOF

Filed Feb. 28, 1935

2 Sheets-Sheet 1

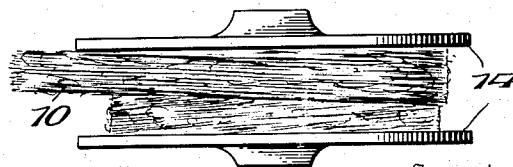
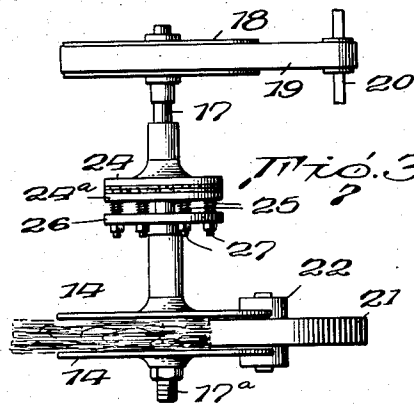
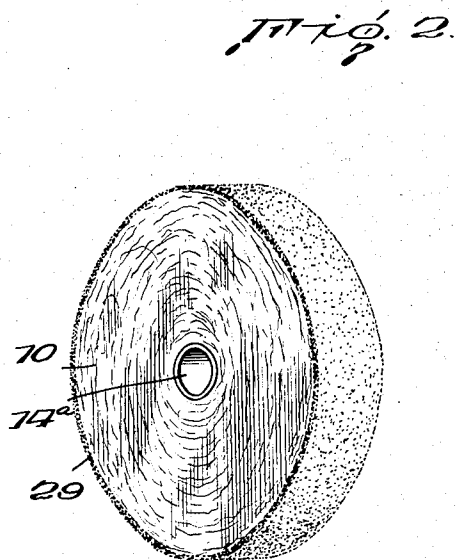
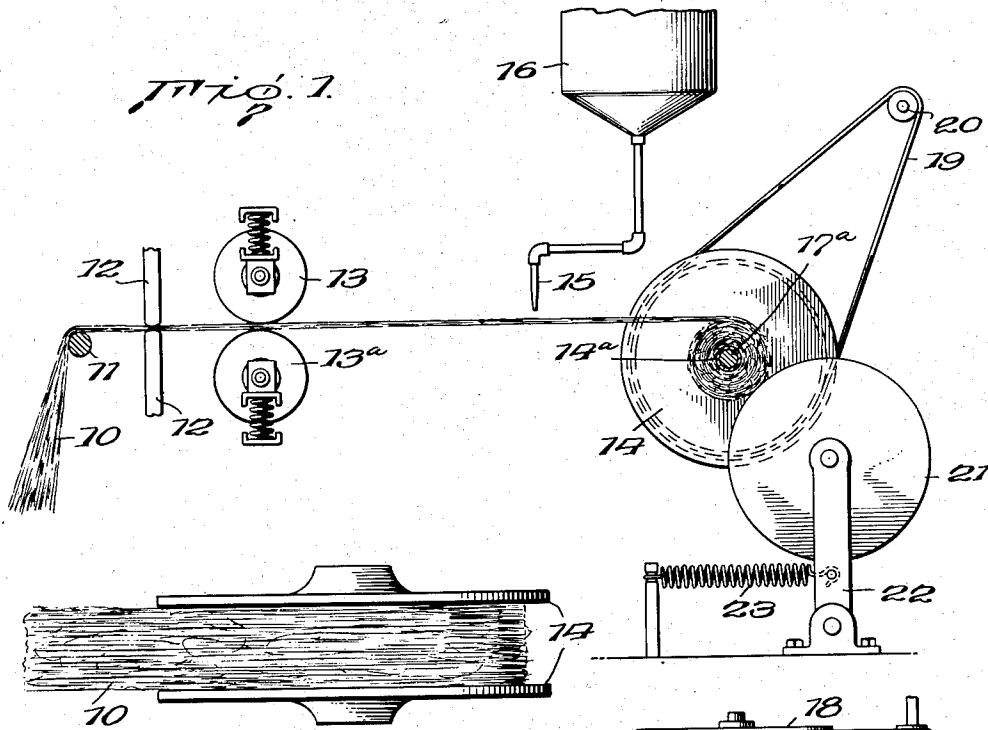


Fig. 5.

Fig. 6.

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2 Sheets-Sheet 2

Fig. 6.

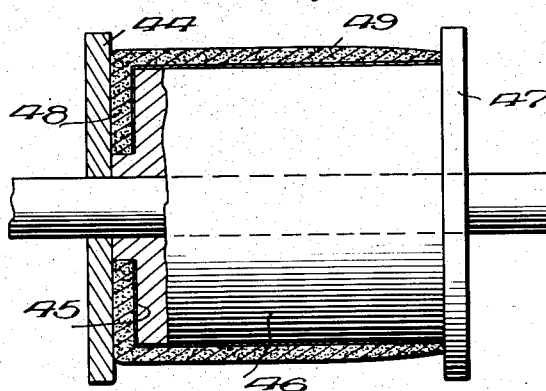


Fig. 8.

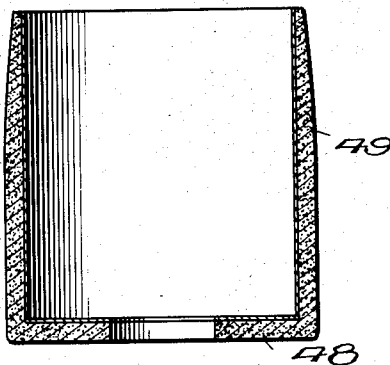


Fig. 7.

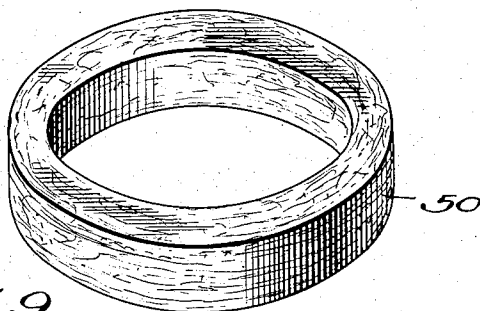
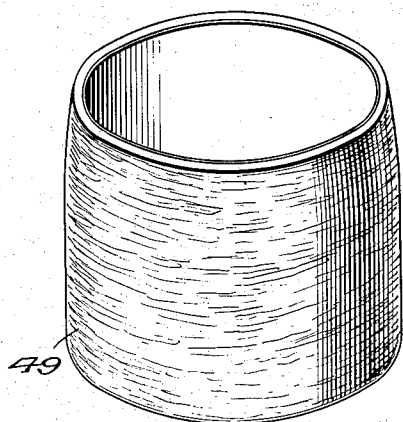


Fig. 9.

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UNITED STATES PATENT OFFICE

2,010,475

METHOD OF PRODUCING ARTICLES FROM FIBERS AND THE PRODUCT THEREOF

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Application February 28, 1935, Serial No. 8,763

8 Claims. (Cl. 51—278)

This invention relates to a novel method of producing articles of fiber construction and the product thereof.

The primary object contemplated by the invention is a method of producing articles having essentially all-fiber bodies wherein the individual fibrous elements are first arranged in substantial parallelism longitudinally of a continuous length of said fibrous elements and such continuous length then wound on a suitable form so as to produce an article of a given configuration. In the application of the continuous length of fibrous elements to said form, a certain amount of pressure and/or tension is imposed thereon to cause the individual elements of each winding to wedge or embed themselves radially between juxtaposed elements of the same and/or preceding winding. A suitable binder is, of course, applied to the fibrous elements to retain the shape of the finished article.

The applications of the present method might be said to be limitless because the form on which the fibrous elements are wound may be varied at will to produce articles of various shapes and by varying the pressure and/or tension on the elements during the winding operation, the density or compactness and resiliency of the finished article can be accurately regulated.

Another object is to provide an abrading or buffing roll that may be produced from comparatively inexpensive material with a minimum expenditure of labor and machinery.

More specifically, the invention contemplates the simple and inexpensive production of articles having a body composed of fibrous elements, such as vegetable fibers in sliver formation, the fibers being associated in the form of a continuous length of material, wherein the individual fibers are arranged in substantial parallelism longitudinally of said continuous length, this length of material being disposed spirally of the body of the finished article in superposed convolutions with the individual fibers of each convolution wedged between juxtaposed fibers of the same or preceding convolution. The fibers, thus compacted, are cemented together by a suitable binder but by varying the density or compactness of the body of fibers in the article, the resiliency of the latter can be controlled to render it highly adaptable and efficient for the use for which it is intended.

With these and other objects in view, the invention consists in certain details of construction and combinations and arrangements of parts, all as will hereinafter be more fully described

and the novel features thereof particularly pointed out in the appended claims.

In the accompanying drawings:—

Figure 1 is a side elevation, illustrating more or less diagrammatically, one form of apparatus for carrying out the present method in connection with the production of abrading or buffing rolls;

Figure 2 is an edge view of the form or spool or other rotatable member on which the fibrous elements are wound, this view illustrating a straight winding of the material;

Figure 3 is a plan view of one form of tensioning device for maintaining the desired tension on the material during winding thereof;

Figure 4 is an edge view of a spool or form illustrating what is called a universal winding of the material;

Figure 5 is a perspective view of a finished roll;

Figure 6 is a front plan view of a portion of the winding apparatus illustrating a winding form for the production of protectors for bottles and like containers;

Figure 7 is a perspective view of the finished protector;

Figure 8 is a section taken longitudinally of the protector; and

Figure 9 is a perspective view of a protector for high explosive shells.

The production of several different articles is illustrated in the accompanying drawings. For instance, Figs. 1 to 5 illustrate the production of an abrading roll body. Referring particularly to Figs. 1 to 4, a group or length of fibers, preferably hemp or other fiber of appreciable length, is shown at 10, all of the fibers therein having been associated in substantial parallelism with one another longitudinally of said group. This is preferably accomplished by passing successive overlapping groups or hanks of fibers through the usual preparation machines commonly employed in the rope and cordage industry for combing the fibers preparatory to the spinning of yarns, etc.

After the continuous length 10 of parallel fibers has been prepared, said length of fibers is passed over a guide 11, and then between oppositely disposed spreader devices 12. From the spreader 12, the fibers pass between rotating rolls 13, 13', yieldingly urged toward one another and driven at a constant peripheral speed. Before reaching the form, in this instance a winding spool, a suitable binding material is applied to the fibers. Various binders such as latex cement, glue or the like may be used although it will be appreciated that glue will tend to reduce the resiliency of the finished product. The binder can be applied to

the fibers in various ways, although in the present instance it is shown as being sprayed through one or more nozzles 15, supplied from a reservoir 16.

5 The form on which the continuous length of longitudinal, parallel fibers is wound in making the abrading roll is a spool composed of readily detachable sections to permit removal of the finished roll therefrom. This winding spool is
10 mounted on a shaft 17 carrying a pulley 18 to which power is supplied by a belt 19 from a drive shaft 20. The construction of spool illustrated consists of disks 14 adapted to be secured on the end 17^a of shaft 17 and a short length of tubing
15 14^a, usually paper, which is securely held between said disks on the shaft. After the roll is completed it is removed from the spool by backing off the outer disk 14. The paper tube may remain within the roll, forming a center or hollow core for the
20 roll. The radial thickness of said core or center may be varied, as desired.

As the successive convolutions or windings of the fibers 10 are wound around the spool, they are pressed radially inwardly of the spool by a
25 pressure roll 21 journaled in pivoted bearing members 22 yieldingly urged toward the spool by spring 23.

To properly tension the fiber elements and impart the desired density or compactness to
30 the finished roll during the winding thereof, shaft 17 is made sectional and a friction or slip clutch interposed between said sections. This clutch may consist of a plate 24 fast on one shaft section frictionally engaging a second plate 24^a
35 loose on the other shaft section, but urged toward plate 24 by springs 25 interposed between said plate 24^a and a plate 26 fast on said other shaft section. Springs 25 may be coiled on bolts
40 27 threaded through plate 26 and loosely engaging plate 24^a. By adjusting nuts 28 on bolts 27 the frictional engagement between plates 24, 24^a, may be varied or regulated at will. If desired, the tensioning of the fiber windings may be controlled by manual operation of the winding spool.

45 Where a straight winding is used, as illustrated in Figs. 2 and 3, the layer of fiber elements should be of a width corresponding to the width of the periphery of the roll being produced. Where a "universal" winding is used, as in Fig. 4, the
50 width of the layer 10 is reduced, as shown.

The periphery of the roll is provided with a covering or finish depending upon the use for which the roll is intended. For instance, for
55 abrading rolls, a covering 29 of abrasive material is provided. This application of material to the roll is known in the industry as the "heading" operation and is carried out in the conventional manner.

In rolls of this construction, the fiber elements
60 of each succeeding convolution embed or wedge themselves radially between juxtaposed elements of the same convolution and also of the preceding convolution, leaving a substantially smooth peripheral surface. This is especially true where
65 the continuous length of material is composed of individual fibers because of the comparatively small diameter of the fiber. In other words, elements of small diameter are preferred as the larger the diameter, the larger will be the valley
70 or depression between juxtaposed elements. In all forms it is due to the association of the elements in parallelism circumferentially of the roll and, by the same token, the absence of transversely disposed elements in the mass. These
75 factors lend to the production of a very compact

roll construction. A further advantage is the presence of a minimum number of ends at the peripheral surface of the roll, thus eliminating, or at least reducing the dressing or finishing of that surface before the application of the abrasive or other covering.

It will be appreciated that by careful manipulation of the length of fiber material 10, the side members 14 of the winding spool may be dispensed with but their use is, of course, preferred. It may also be desirable to place the roll, after being wound, and before the binder has dried, in a mold under pressure and permit it to dry therein. This is not essential but, with certain types of binders, the strength of the latter is increased. Where latex, in a vulcanizable compound is used as a binder, heat should be applied to the mold, to vulcanize said binder. Again, it will be appreciated that the density or resiliency of the roll may be varied by the amount
20 of animal glue used in the binder. It will also be appreciated that the core 14^a may be removed from the roll or a core of greater diameter than that shown may be used, it only being necessary that the peripheral body portion of fibrous construction be of sufficient depth radially of the roll to provide the resiliency required in the class of work for which the particular roll is adapted for use.

Referring to Fig. 6, there is shown more or less
30 conventionally the form on which the protector illustrated in Fig. 7 is produced. Here the form consists of a disk 44 spaced from the closed end 45 of a drum-like form member 46. The length of fiber is wound between the disk 44 and bottom
35 45 of said member to form the bottom 48 of the protector after which the fiber is wound on the peripheral surface of member 46 to form the side wall 49 of the protector. A flange should be provided, as by disk 47, at the end of member
40 46 opposite disk 44 to confine the fibers on said member during the winding operation. After the protector is completed, member 46 is withdrawn therefrom. The necessary tensioning devices and pressure roll are adjusted to impart the desired density and resiliency to the protector. Here, again, the fibers will be wedged together the same as in the abrading roll. It will also be appreciated that the configuration of member 46 can be varied from true cylindrical shape, if desired.
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The protector (Fig. 9) in the form of a band 50, for high explosive shells, is produced in substantially the same manner as the abrading roll, a relatively large, removable core member being used in this instance as a portion of the winding
55 form.

The expression "fiber elements" is used herein as defining a number of elements each composed of an individual fiber or a plurality of fibers.

This application is a continuation in part of 60 applicant's applications, Serial No. 732,720, filed June 27, 1934, and Serial No. 8,761, filed February 28, 1935.

What I claim is:

1. The method of producing articles from 65 elongated fibers which comprises forming a continuous length of said fibers with the individual fibers arranged in substantial parallelism longitudinally of said continuous length, applying a binder to said fibers, and winding said continuous length in successive convolutions on a form, the fibers of each convolution being wedged between juxtaposed fibers of the same and a preceding convolution and forming a unitary body.
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75

2. The method of producing articles from elongated fibers which comprises forming a continuous length of said fibers, arranging the fibers in said length in substantial parallelism longitudinally thereof, applying a binder to said fibers, winding said length in successive convolutions on a form, and applying pressure and tension to said fibers as they are wound on said form to force the fibers of each convolution into wedging engagement with juxtaposed fibers on the form, said fibers being united into a unitary body by said binder.

3. The method of producing articles from elongated fibers which consists in forming a continuous length of said fibers, arranging all the fibers in substantial parallelism longitudinally of said length, applying a binder to said continuous length, winding said continuous length of parallel fibers in successive convolutions on a form, and forcing the fibers of each convolution into wedging engagement between juxtaposed fibers.

4. A roll of the character described having a body portion formed essentially of vegetable fiber elements wound in groups spirally of the roll in a direction from the center to the periphery thereof, substantially all the elements of each winding being disposed substantially parallel to each other circumferentially of the roll, and a binder for bonding said elements together, the peripheral surface of the roll being capable of imparting the desired finish to an article operated upon.

5. A roll of the character described having a body portion, a covering on the periphery of said body capable of imparting the desired finish to an article operated upon, said body portion being composed essentially of vegetable fibers wound in groups spirally from the center to the

periphery of said roll, and a binder for bonding said fibers together, the fibers of each winding substantially all lying substantially parallel to each other circumferentially of the roll with individual fibers wedged and compacted radially between juxtaposed fibers.

6. A roll of the character described having a body portion consisting essentially of a substantially continuous body of vegetable fibers wound spirally of the roll in a direction from the center to the periphery thereof, said fibers being associated in substantially parallel relationship circumferentially of the roll with individual fibers of successive windings wedged and embedded radially between juxtaposed fibers of the same and preceding convolutions, and a binder for bonding said fibers together.

7. A roll of the character described consisting of a continuous group of fibers associated in substantial parallel relationship circumferentially of the roll, said group of fibers being of a width substantially corresponding to the width of the roll and wound spirally of the roll from the center toward the periphery thereof with the individual fibers of each winding wedged radially between juxtaposed fibers, and a binder for bonding said fibers together.

8. A roll of the character described consisting of vegetable fibers arranged in a continuous group extending spirally of the roll from the center thereof toward the periphery, the fibers of successive windings of said spiral being disposed transversely of the peripheral surface of the roll, the individual fibers of each winding being arranged in substantial parallelism with each other circumferentially of the roll, and a binder for bonding said fibers together.

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