

Nov. 3, 1942.

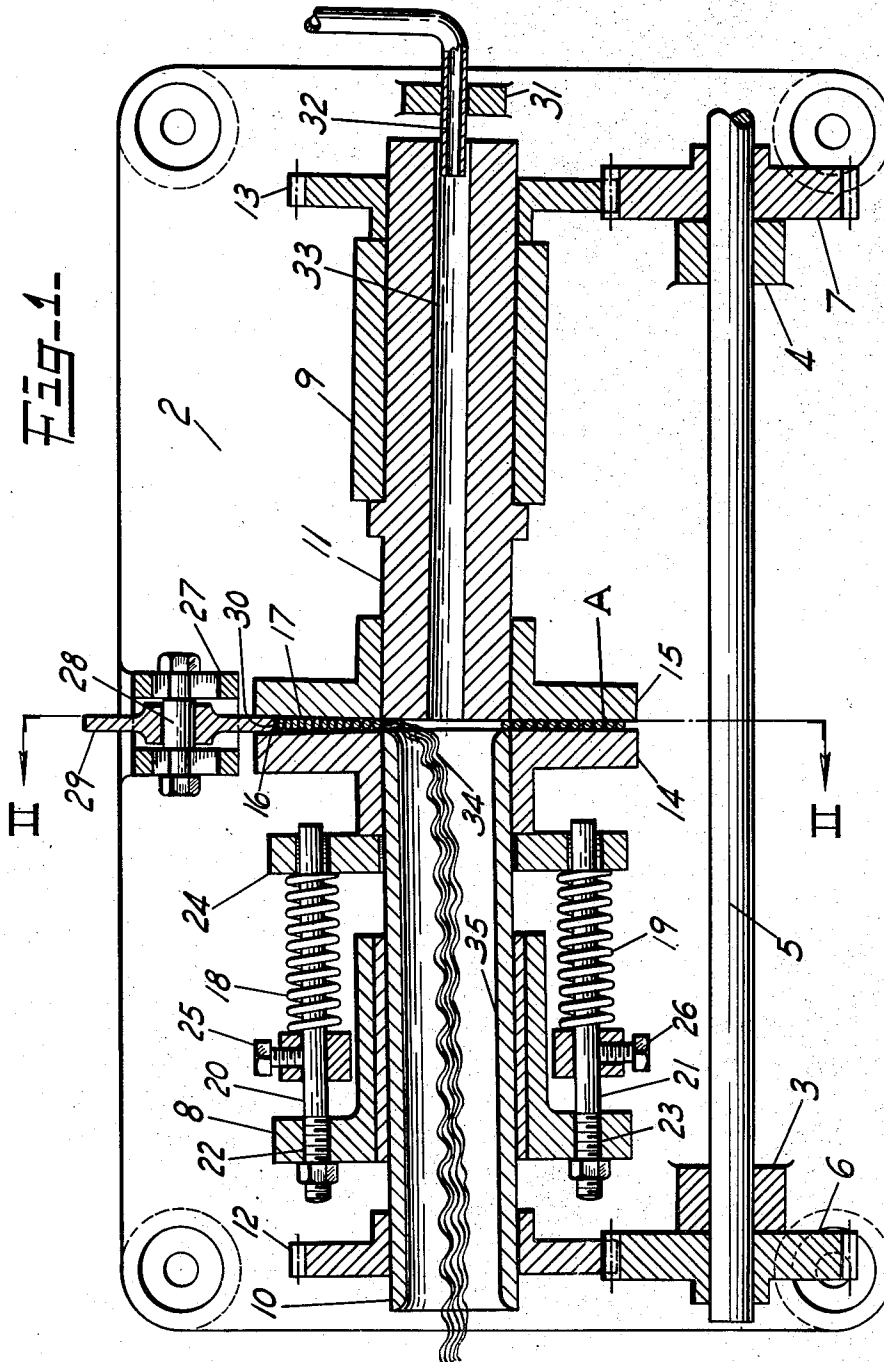
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2,300,791

METHOD AND APPARATUS FOR CRIMPING TEXTILE FIBROUS MATERIAL

Filed June 14, 1941

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

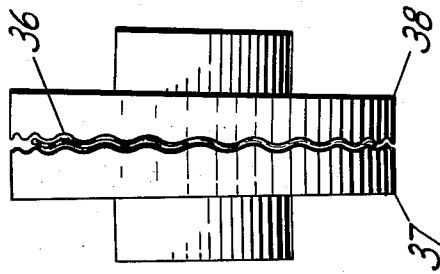


Fig-4-

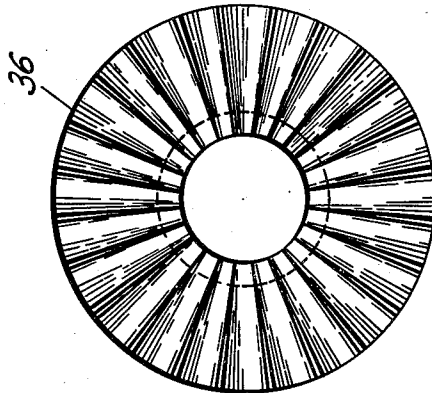


Fig-3-

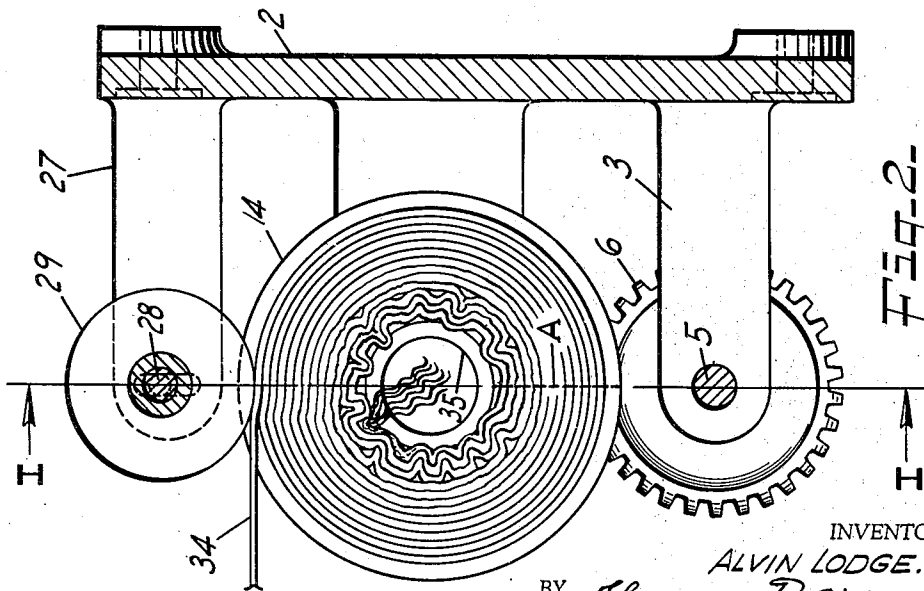


Fig-2-

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UNITED STATES PATENT OFFICE

2,300,791

METHOD AND APPARATUS FOR CRIMPING
TEXTILE FIBROUS MATERIALAlvin Lodge, Meadville, Pa., assignor to American
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Application June 14, 1941, Serial No. 398,014

14 Claims. (Cl. 19-66)

This invention relates to the crimping or similar distorting of textile fibrous material in the form of filaments, yarns, tows, staple fibers, or the like.

It is an object of the invention to provide a method of progressively crimping yarn and the like and simultaneously pressing the distorted or deformed yarn and the like to set the crimping or distortion therein permanently.

A further object of the invention is to provide a novel apparatus adapted to effectively carry out the method.

Further objects and advantages will be apparent from the description, drawings and the claims.

In the drawings, illustrative of the invention, Figure 1 is an elevational cross-sectional view of the device taken on line I—I of Figure 2,

Figure 2 is a cross-sectional view taken on line II—II of Figure 1,

Figure 3 is a face view of a modified pressure plate, and

Figure 4 is an elevational view showing the arrangement of the modified pressure plates.

The method of this invention involves the forcing of lengths of the yarn or the like into a substantially circular or spiral form and substantially continuously reducing the effective radius of the arc subtended by the length of yarn, whereby the reduction in the effective length causes crimping and distortion of the yarn. A further feature of the invention involves pressing the yarn with repeatedly increased force applied substantially at right angles to the plane of the spiral or circular arcs.

A suitable form of apparatus for practicing the invention is shown in the drawings. As shown therein, a bed-plate 2 is provided with a pair of bearings 3 and 4 for supporting a drive shaft 5 having keyed to each of its ends the gears 6 and 7. Two other bearings 8 and 9 are fixed to the bed-plate 2 for supporting the hollow shafts 10 and 11 respectively. A gear 12 keyed to the shaft 10 meshes with the gear 6 while the gear 13 keyed to the shaft 11 meshes with the other gear 7 on the drive shaft 5. The bearings 8 and 9 are so arranged upon the bed-plate 2 that the axes of the shafts 10 and 11 are slightly misaligned angularly. Upon the adjacent ends of the shafts 10 and 11 there are provided pressure plates 14 and 15 whose opposed faces 16 and 17 are frusto-conical in shape, the cones having a relatively small altitude extending longitudinally of the shafts 10 and 11. The angular misalignment of the shafts 10 and 11 may be adjusted so that the pressure plates 14 and 15 have a portion of their

opposed surfaces 16 and 17 in substantially parallel relationship along an apical line as shown at A in the drawings or so that there is more space between the plates near their centers where the yarn is most crimped and crowded. The pressure plate 15 is fixedly mounted on shaft 11 while the other pressure plate 14 is keyed to the other shaft 10. There may be employed resilient means, such as springs 18 and 19 guided on pins 20 and 21 threadedly engaging the bearing 8 at 22 and 23, to press a slidable collar 24 against the pressure plate 14. The pressure exerted by the springs may be varied by adjusting the set-screws 25 and 26.

A bearing 27 upon the bed-plate 2 is provided with a shaft 28 for rotatably supporting a disc 29 so that a portion of its periphery extends into the gap 30 between the pressure plates at its widest opening.

A bearing 31 is supplied upon the bed-plate 2 for supporting a pipe 32 with clearance within the hollow bore 33 within the shaft 11.

In operation of the device, yarn 34 or the like is supplied between the pressure plates 14 and 15, as shown diagrammatically in Figure 2, at the widest opening of the gap therebetween as the pressure plates are rotated at the same speed. As the freshly supplied yarn enters under the disc 29, it is pressed radially inwardly, and it in turn presses the previously wound arcs of the yarn inwardly. This effect is in turn transmitted through each concentric winding so that the innermost winding is continuously forced into the bore 35 of the shaft 10 through which it is blown outside the device by a blast of air supplied through the pipe 32.

The yarn or the like may be supplied to the machine in the dry form or somewhat softened by means of water, steam, or a suitable plasticizer therefor. The blast of air or other fluid used to force the distorted yarn out of the device may be heated to harden the crimped or distorted yarn by assisting the volatilization of the softening agent from the yarn. Alternatively, the air may contain suitable chemical compounds for effecting hardening, stiffening, or setting of the distorted yarn.

In passing through the device, the yarn or the like is formed into a roughly circular or spiral arc which, after one revolution of the pressure plates, is forced into a roughly circular area having a shorter effective diameter so that a reduction of the effective circumferential length of the yarn is necessitated. This is a cumulative process as a given length of the yarn is progressively

forced radially inwardly along the pressure plate surfaces. While this progressive compression proceeds, given radial sectors of the pressure plates 14 and 15 approach each other as they proceed from the area adjacent the disc 29 to the region A where they make their closest approach and then they separate as they proceed from the point of closest approach to that adjacent the disc 29. The repetition of this approach and recession effectively enhances the working and distortion of the yarn or the like and further improves the permanency of the distortion as it is progressively produced in the yarn throughout the cycle of operations that take place while it is between the pressure plates. The maximum pressure of the plates against the yarn is controlled by adjusting nuts 25 and 26.

The pressure plates shown in Figures 1 and 2 present smooth frusto-conical faces but modified forms of face may be employed. For example, the pressure plates may have plane faces arranged somewhat out of parallelism, or converging radial grooves 36 (Figures 3 and 4) of wavy character may be provided upon the faces of the pressure plates 37 and 38 corresponding to the plates 14 and 15 in Figures 1 and 2. Alternatively, one of the pressure plates may be provided with a flat plane surface for bearing against a frusto-conical surface of the other pressure plate one or both of which may be smooth or grooved. Similarly one plate may have a concave conical surface adjacent which the other pressure plate having a convex conical surface of the same or of slightly greater altitude may operate.

Other forms of apparatus may be employed for performing the method. For example, one of the pressure plates may be held stationary, while the other pressure plate is rolled against the tow between the plates without rotation about a point centrally of its pressure surface. In this arrangement, the points of nearest approach of the two pressure plates move continuously around the plates in circular paths. In this case, yarn or the like is forced between the plates at the widest opening therebetween, and thus the insertion of the yarn into the device involves a winding operation in which successive portions of the arc are fed between the pressure plates as they open. A disc corresponding to the disc 29 may rotate in a planetary orbit about the pressure plates with the portion of its periphery entrant between the pressure plates following just behind the point of insertion of the yarn as winding causes that point to move about the pressure plates.

While the drawing illustrates a form of the invention in which frusto-conical plates having straight apical lines are used, it is equally possible to employ plates presenting somewhat convex surfaces. Such plates may be juxtaposed more closely along one pair of opposed lines than at other lines in their surfaces, thereby providing for the repeated variation of pressure laterally of the wound yarn.

As stated above, the yarn or the like to be treated may be in a dried unmodified form or it may be softened. It may also contain either incorporated therein or in a form of a coating such materials as pigments, fillers, dyes, lakes, fire-retardants, de-electrifiers, sizes or lubricants, such as are commonly employed in the particular fibers, yarns, filaments, etc. The yarn or the like may be made of any suitable natural or artificially produced fibrous material, such as cotton, wool, viscose, cellulose acetate, etc. Likewise, it

may be in the form of continuous or discontinuous filaments and it may be of any denier.

In the claims, the expression "textile fibrous material" is intended generically to include the various forms of the filaments contemplated by the invention, examples of which are indicated in the preceding paragraph. This expression is further intended to exclude woven fabrics, the invention contemplating such fibrous materials as tow, yarn, individual continuous filaments, unwoven fibers, etc., suitable for subsequent manufacture into textile fabrics.

While preferred embodiments of the invention have been disclosed, the description is intended to be illustrative only, and it is to be understood that changes and variations may be made without departing from the spirit or scope of the invention as defined by the appended claims.

What I claim is:

1. In a method of crimping textile fibrous material, the steps of winding said material generally concentrically into a substantially flat annular winding and reducing the effective diameter of the convolutions of said material whereby the circumferential crowding of said material causes distortion thereof.

2. In a method of crimping textile fibrous material, the steps of winding said material generally concentrically into a substantially flat annular winding and reducing the effective diameter of each convolution of the material in said winding by progressively forcing said convolutions into the space occupied by each smaller convolution adjacent thereto whereby the longitudinal crowding of said material causes distortion thereof.

3. In a method of crimping textile fibrous material, the steps of distributing the material in a generally spiral configuration, applying pressure against said material at approximately right angles to the plane thereof and reducing the effective diameter of each convolution of the material in said spiral by progressively forcing said convolutions into the space occupied by each smaller convolution adjacent thereto whereby the longitudinal crowding of said material causes distortion thereof.

4. In a method of crimping textile fibrous material, the steps of continuously winding said material generally concentrically into a substantially annular winding, pressing the external periphery of said winding radially inwardly, applying pressure substantially at right angles to the plane of said winding, and removing said material from the internal periphery of said winding.

5. In a method of crimping textile fibrous material, the steps of continuously winding said material generally concentrically into an annular winding, pressing the external periphery of said winding radially inwardly, pressing said material substantially at right angles to the plane of said winding, repeatedly varying the latter pressure against said material, and removing said material from the internal periphery of said annular winding.

6. In a method of crimping textile fibrous material, the steps of continuously winding said material generally concentrically into an annular winding, pressing the external periphery of said winding radially inwardly, applying various pressures laterally of said annular winding and continuously shifting said various pressures as a unit circularly around said annulus, and removing said material from the internal periphery of said annular winding.

7. In an apparatus of the class described,

means for winding a textile fibrous material generally concentrically into an annular winding, means for pressing the external periphery of said winding radially inwardly, means for pressing said material substantially at right angles to the plane of said winding, means for repeatedly varying the latter pressure against said material, and means for removing the material from the internal periphery of said annular winding.

8. In an apparatus of the class described, a member having a pressure surface, a second member having a pressure surface facing the surface of the first-mentioned member tilted somewhat from parallelism, means for feeding a textile fibrous material to an outer convolution of an annular winding thereof between said members means for rotating said surfaces about axes somewhat out of alignment, means for pressing the outer convolution of the winding inwardly and means for removing the internal convolution of said winding of material from between the two members.

9. In an apparatus of the class described, a rotatable plate, a second rotatable plate having a conical surface facing the first plate, said plates being arranged in close proximity with their axes somewhat out of alignment, means for feeding a textile fibrous material into the divergent space between said plates, and means for rotating said plates about their axes.

10. In an apparatus of the class described, a rotatable plate having a conical surface, a second rotatable plate having an annular surface of frusto-conical shape arranged in close proximity and facing toward the conical surface of said first plate, said plates being arranged on axes somewhat misaligned, means for feeding a textile fibrous material into the space between said plates at their external peripheries, and means for rotating said plates about their axes.

11. In an apparatus of the class described, a plate having a conical surface, a second plate having an annular surface of frusto-conical shape in close proximity to and facing toward the conical surface of said first plate in such a manner that one apicad line of one surface is

substantially parallel to the adjacent line of the other surface while the other opposed apicad lines diverge, means for feeding a textile fibrous material into a divergent space between said plates, and means for rotating said plates about their axes.

12. In an apparatus of the class described, two hollow shafts end to end with their axes slightly misaligned angularly, two annular pressure plates mounted on the adjacent ends of said shafts, said plates having frusto-conical surfaces arranged in substantially parallel relationship along one apicad line and with the other apicad elements in divergent relationship, means for feeding a textile fibrous material between said plates at their external peripheries at a divergent space, and means for rotating said shafts with said plates about their axes.

13. In an apparatus of the class described, two hollow shafts end to end with their axes slightly angularly misaligned, two annular pressure plates mounted on the adjacent ends of said shafts, said plates having frusto-conical surfaces arranged with one apicad element in each surface in substantially parallel relationship and with the other apicad elements in divergent relationship, means for feeding a textile fibrous material between said plates at their external peripheries at a divergent space, means for rotating said shafts with said plates about their axes, and means for removing said fibrous material from the internal periphery of said plates through one of said hollow shafts, said last-mentioned means comprising means for blowing air through the other hollow shaft.

14. In an apparatus for crimping textile fibrous material, means for winding said material into a plurality of generally concentrically arranged and substantially co-planar convolutions, means for applying pressure laterally of said winding, and means for progressively forcing each of said convolutions into the space occupied by each smaller convolution adjacent thereto whereby the circumferential crowding of said material causes distortion thereof.

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