

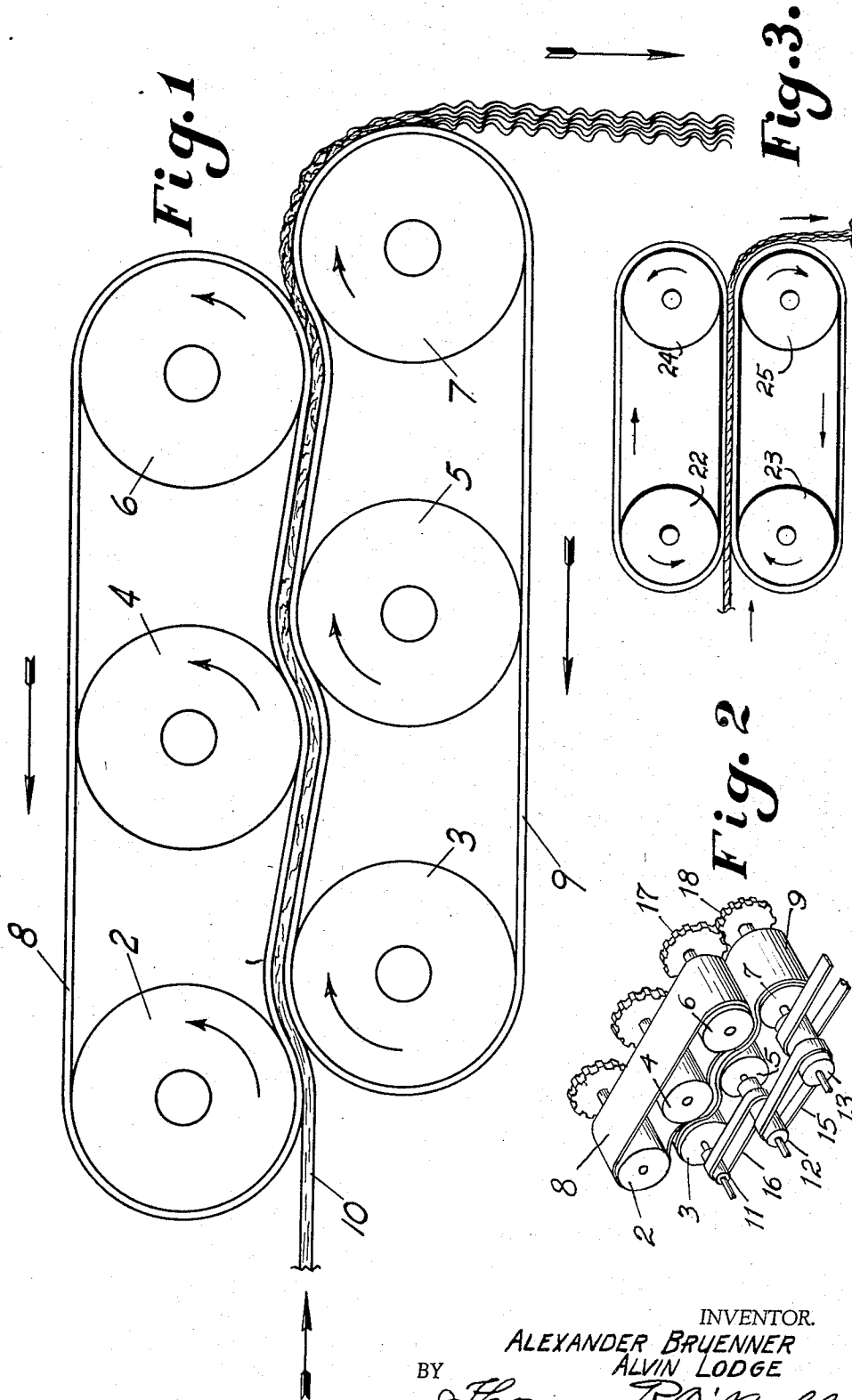
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METHOD AND APPARATUS FOR CRIMPING TEXTILE FIBROUS MATERIAL

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METHOD AND APPARATUS FOR CRIMPING
TEXTILE FIBROUS MATERIALAlexander Bruenner and Alvin Lodge, Meadville,
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9 Claims. (Cl. 19—66)

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

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 or the like to set the crimping or distortion therein permanently.

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

Further objects and advantages of the invention will be apparent from the drawing, the description and the claims.

Figure 1 of the drawing is a diagrammatic view illustrative of the invention.

Figure 2 is a perspective view showing one arrangement for driving the rolls of Figure 1.

Figure 3 is a side elevation of a modification.

As disclosed in Figure 1, a series of pairs of rolls 2 and 3, 4 and 5, and 6 and 7 are provided about which a pair of elastic belts 8 and 9 are arranged so that one belt 8 is driven about the rolls 2, 4 and 6 on one side of each pair while the other belt 9 is driven about the other rolls 3, 5 and 7. The rolls are positively driven, as indicated by the arrows in Figure 1, in such a manner that each roll of a given pair rotates in a direction opposite to that of the other of the pair but at the same speed, while the speed of each pair of rolls is less than that of the preceding pair when going from left to right of the device as shown in Figure 1. For example, the rolls 2 and 3 may rotate at 100 R. P. M., rolls 4 and 5 may rotate at 80 R. P. M. and rolls 6 and 7 may rotate at 60 R. P. M.

The operation of the device is such that the outer courses of the belts running from right to left, as shown by the arrows in Figure 1, are stretched since they proceed from slowly rotating rolls 6 and 7 to more rapidly rotating rolls 2 and 3 in the course of their travel. The belts may be made of any suitable elastic material, such as rubber or synthetic rubber, which permits a stretching to any degree that may be desired and subsequent contraction to substantially their original length.

The yarn, tow or staple fibers 10 which it is desired to crimp or distort are fed longitudinally into the device at the left as shown in Figure 1 and proceed between the opposed courses of the two belts between the nips of each pair of rolls in succession from those having the highest speed of rotation to those having the lowest speed of rotation. After entering the nip of the first pair

of rolls 2 and 3, the yarn or the like is subjected to forces exerted thereupon by the shortening of the belts tending to contract the fibers of the yarn longitudinally or parallel to the direction of travel of the yarn through the device. These contractile forces arise by virtue of the fact that the slow speed of the second pair of rolls 4 and 5 causes the elastic belts 8 and 9 to contract or relax from the stretched condition in which they enter the nip of the first pair of rolls 2 and 3. Since the yarn is gripped between two belt surfaces having similar frictional characteristics, the yarn is positively acted upon on both its upper and lower sides. The effects of the contractile forces are built up progressively as the yarn or the like traverses the distance between each successive pair of rolls, and the transverse pressure exerted upon the yarn by the belts as it passes with the belts between the several pairs of rolls tends to set more or less permanently whatever distortion or crimping has already been imparted to the yarn by virtue of the contractile forces acting upon the yarn or the like as it progressively passes through the device. The pressure effect, though present all along the adjacent courses of the belts, may be accentuated at the points of passing through the nips of the several pairs of rolls by causing the opposed rolls to press against one another.

Figure 2 shows one arrangement for driving the several pairs of rolls at different rotative speeds. The shafts of the lower rolls 3, 5 and 7 respectively are provided with sheaves of a diameter increasing in order from 11 to 12 to 13 respectively. One of the sheaves 13 may be driven by a belt 14 connected to a suitable motor (not shown) and the other sheaves may be driven therefrom by belts 15 and 16 respectively. The other ends of the shafts of each pair of rolls are provided with intermeshing gears 17 and 18 respectively.

While the drawing illustrates the device as embodying three pairs of rolls, satisfactory results may be obtained with a lesser or greater number of pairs of rolls (as shown in Figure 3 where two pairs of rolls 22, 23 and 24, 25 are used), the extent of crimping being dependent upon the particular number of pairs of rolls employed as well as upon the difference existing between the speeds of each successive pair of rolls, the greater the number of pairs of rolls and the greater the difference in their speeds, the greater the crimping effect. An essential feature of the invention resides in causing the two belts to exert pressure transversely of their opposed courses in order to set permanently whatever crimping or distortion

is imparted to the yarn as it progresses through the device.

The nips between each succeeding pair of rolls may be in alignment as shown in Figure 3, but it is preferred to tilt the pairs of rolls so that their nips are offset as shown in the drawing. In accordance with the offset arrangement the belts are positively pressed against the rolls along a greater distance thereby making the transverse pressure upon the yarns and the like more effective. Furthermore, the offset arrangement prevents slipping of the belts with respect to one another.

The yarns, tow, continuous filament, or staple fibers may be subjected to the working treatment described hereinabove in dry form or softened by any suitable means, such as steam, moisture, plasticizer, etc. The fibrous material to be treated in accordance with this invention may also contain such materials as pigments, fillers, dyes, lakes, fire-retardants, de-electrifiers, sizes or lubricants, such as are commonly employed in the particular fibers, yarns, etc. It may be made of any suitable natural or artificially produced fibrous material, such as viscose, cellulose, acetate, etc. Likewise, it may be in the form of continuous or discontinuous filaments and it may be of any suitable 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 materials as tow, yarn, individual continuous filaments, unwoven fibers, etc. suitable for subsequent manufacture into textile fabrics.

While a preferred embodiment of the invention has 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 we claim is:

1. In a method of crimping textile fibrous material, the steps of pressing said material between elastic material surfaces stretched in a direction generally parallel to the length of the fibrous material, causing said surfaces to exert contractile forces longitudinally of said fibrous material by relaxing the stretched surfaces while the fibrous material is held therebetween, and then continuing to press said surfaces against said fibrous material to enhance the effectiveness of said contractile forces.

2. In a method of crimping textile fibrous material, the steps of pressing said material between elastic material surfaces stretched in a direction generally parallel to the length of the fibrous material, causing said surfaces to exert contractile forces longitudinally of said fibrous material by relaxing the stretched surfaces while the fibrous material is held therebetween, continuing to press said surfaces against said fibrous material to enhance the effectiveness of said contractile forces, and then increasing the pressure of said surfaces against said fibrous material to improve the permanency of the effects imparted by the contractile forces.

3. In a method of crimping textile fibrous material, the steps of softening said material, then pressing said material between elastic material surfaces stretched in a direction generally parallel to the length of the fibrous material, causing

said surfaces to exert contractile tangential forces longitudinally of said fibrous material by relaxing the stretched surfaces while the fibrous material is held therebetween, and continuing to press said surfaces against said fibrous material to enhance the effectiveness of said contractile forces.

4. In a device for crimping textile fibrous material, a pair of rotatable rolls, a second pair of rotatable rolls, an elastic belt extending about one corresponding roll of each pair, a second belt extending about the other roll of each pair, said rolls being arranged to press a course of one of said belts against the adjacent course of the other belt, means for rotating in opposite directions the rolls of said first pair, and means for rotating in opposite directions the rolls of said second pair at a lower speed than said first pair, said rolls being rotated in a direction such that the adjacent belt courses travel from the high speed rolls to the low speed rolls.

5. In a device for crimping textile fibrous material, a pair of rotatable rolls, a second pair of rotatable rolls having their nip aligned with the nip of the first pair, an elastic belt extending about one corresponding roll of each pair, a second belt extending about the other roll of each pair, said rolls being arranged to press a course of one of said belts against the adjacent course of the other belt, means for rotating in opposite directions the rolls of said first pair, means for rotating in opposite directions the rolls of said second pair at a lower speed than said first pair, said rolls being rotated in a direction such that the adjacent belt courses travel from the high speed rolls to the low speed rolls, and said belts being arranged to permit feeding fibrous material endwise therebetween at a point where they enter between the high speed rolls.

6. In a device for crimping textile fibrous material, a pair of rotatable rolls, a second pair of rotatable rolls having their nip offset with respect to the nip of the first pair of rolls, an elastic belt extending about one corresponding roll of each pair, a second belt extending about the other roll of each pair, said rolls being arranged to press a course of one of said belts against the adjacent course of the other belt, means for rotating in opposite directions the rolls of the first pair, and means for rotating in opposite directions the rolls of the second pair at a lower speed than said first pair, said rolls being rotated in a direction such that the adjacent belt courses travel from the high speed rolls to the low speed rolls, and said belts being arranged to permit feeding fibrous material endwise therebetween at a point where they enter between the high speed rolls.

7. In a device for crimping textile fibrous material, a plurality of pairs of rotatable rolls, an elastic belt extending about one corresponding roll of each pair, a second belt extending about the other roll of each pair, said rolls being arranged to press one course of one of the belts against an adjacent course of the other belt, means for rotating in opposite directions the rolls of one of said pairs at a slower rate of speed than a preceding pair of rolls in a direction such that the adjacent courses of said belts travel from the high speed rolls toward the low speed rolls, said belts being arranged to permit feeding fibrous material endwise therebetween at a point where they enter between the high speed rolls.

8. In a device for crimping textile fibrous material, a plurality of pairs of rotatable rolls, a belt extending about one corresponding roll of each pair, a second belt extending about the other cor-

responding roll of each pair, said rolls being arranged to press the course of one of said belts against the adjacent course of the other belt, means for rotating in opposite directions the rolls of each pair to cause the adjacent portions of the two belts to enter the nip of each pair of rolls in succession, said rotating means being arranged to rotate each succeeding pair of rolls at a speed less than that of the pair of rolls preceding it, said belts being arranged to permit feeding fibrous material endwise therebetween at a point where they enter between the high speed rolls.

9. In a device for crimping textile fibrous material, a plurality of pairs of rotatable rolls, a belt extending about one corresponding roll of each pair, a second belt extending about the other corresponding roll of each pair, said rolls being ar-

5 ranged to press one course of one of the belts against the adjacent course of the other belt and with the nips of the successive pair of rolls offset so that the courses of the belts pressed against each other are distorted from a plane, means for rotating in opposite directions the rolls of each pair to cause the adjacent courses of the two belts to enter the nip of each pair of rolls in succession, said rotating means being arranged to rotate each succeeding pair of rolls at a speed less than that of the pair of rolls preceding it, said belts being arranged to permit feeding fibrous material endwise therebetween at a point where they enter between the high speed rolls.

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