

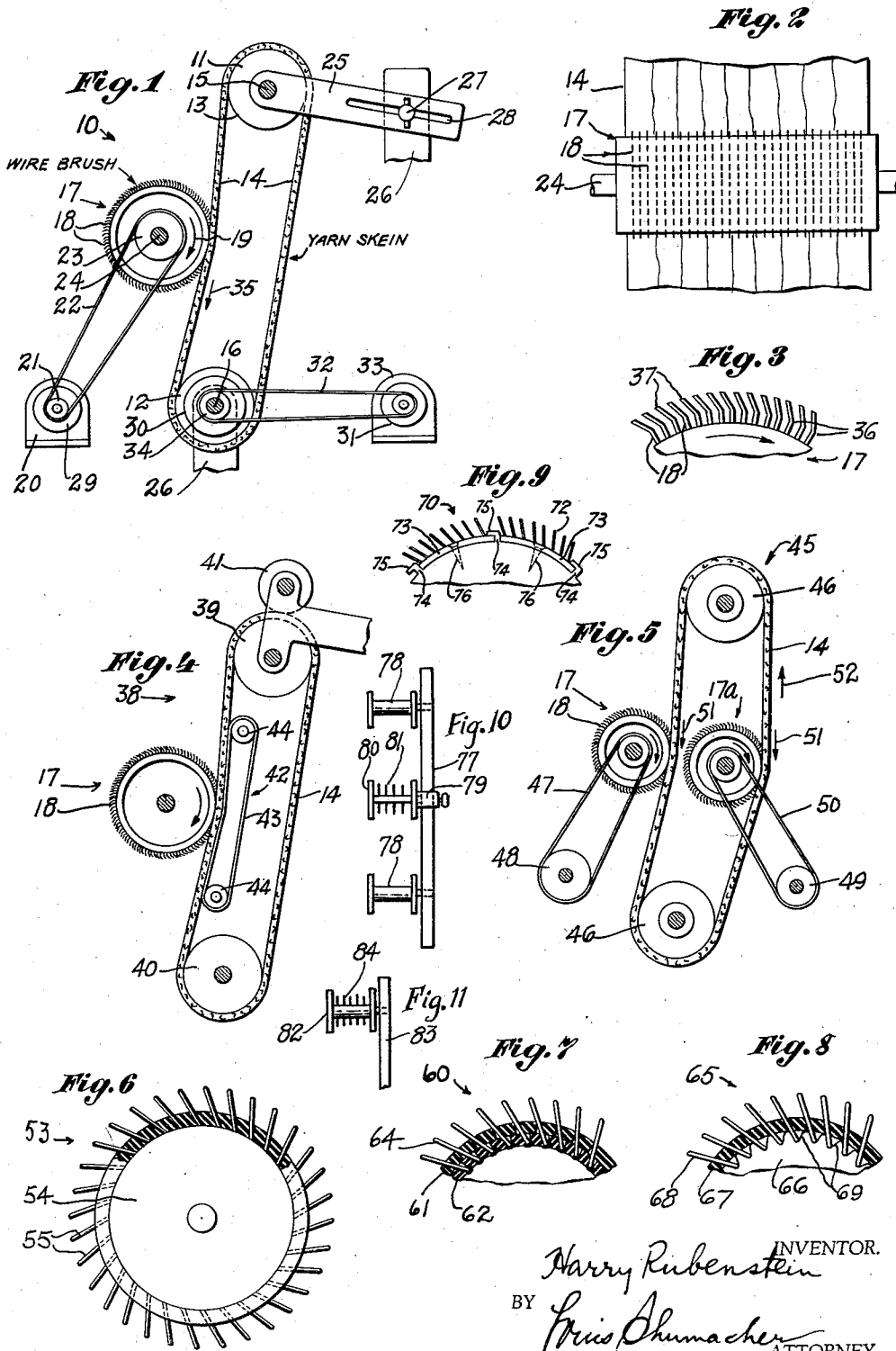
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PROCESS OF TREATING YARNS AND FABRICS MADE THEREFROM

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PROCESS OF TREATING YARNS AND
FABRICS MADE THEREFROM

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This invention relates to the napping of materials in the manufacture of fabrics such as knitted and textile goods, consisting of cotton, wool, silk or artificial fibers, and to the making of fabrics therefrom.

Heretofore it has been known in the carding and brushing of material that a nap was incidentally produced on the resulting strands. But this nap was eliminated in a substantial degree when the strands were twisted to form yarns. Generally these yarns were wound in skeins from which the yarn was later taken in any suitable manner for the knitting of garments or weaving of textiles.

In removing yarn from the skeins, the latter first required to be agitated to break up the matted condition of the yarn to avoid tangling and knotting thereof.

Subsequently the goods was brushed with a rapidly revolving wire brush to raise a suitable nap. This napping operation was frequently followed by the blowing of steam through the goods to raise the nap. Obviously this process was expensive as it had to be performed on large sections of textile material, and on knitted goods already formed into garments. Uniform results were difficult to attain. Frequently the goods was damaged, the damage being approximately 10 percent of the entire output of even the best regulated plants.

Even highly fluffy special yarns would lose a large part of their fuzziness or loft after dyeing and hence would require napping operations for the goods.

Of course the importance of providing goods with a proper nap resides in that the appearance of the goods is improved or various attractive effects provided, softness and warmth are attained, and more important still, because the desired goods can be manufactured with a lesser weight of yarn.

After a lifetime of experience in this art, I have discovered that the difficulties above noted may be overcome by napping the goods while it is still in skeins according to the invention, with the result that the nap so produced persisted in the knitted and textile fabric and was even much greater than what could be produced by napping such fabric directly, and that the napping according to the invention could be effected at decreased cost, and with increased uniformity, speed and reliability, so that occasional damage was eliminated. Further, an easier and more accurate control of the degree of nap was permitted.

The character of yarn at first presented the

main difficulty because of the tendency of the wire brush to wholly or partially break the yarn. With soft wooly yarns it seemed that such a method would be impossible even for a moment. I then discovered that if the brush wires were arranged to beat against the skeins at an acute angle, that is, with a partial wiping effect, the yarn could be napped at relatively high speed. Since heretofore such brushes had been used with their wires bent to beat on knitted or textile fabrics at an obtuse angle, my invention involved in a sense the reversal of the direction of rotation of such brushes.

To assure absolute safety and reliability, I found it preferable to round or bevel the wire points to avoid any possible tearing of the yarn.

An important advantage of the invention is that in napping the yarn, the matting of the skeins is eliminated, so that the separate working of the skeins to remove matted conditions is unnecessary.

Another advantage is that the wire brushes do not become clogged with removed nap, so that laborious cleaning of the brushes is avoided.

Another advantage of the invention is that the loft or fuzz may be raised on all sides of the yarn, instead of on only one side as in napping a textile or knitted fabric.

Another advantage of the invention is that the nap is produced without the tearing off or loss of fuzz as heretofore.

Another advantage of the invention is that the knitting or weaving of the yarn allows for the nap body so as to produce a fabric of greater volume because the nap is in the weave and not only on the surface of the goods. Nevertheless, the goods may be steamed in certain cases to train all the fuzz toward the face of the merchandise.

Another advantage of the invention is that standard machinery may be used with only minor changes to practise the process.

It is thus an object of the invention to provide an improved process and apparatus that shall overcome the drawbacks and realize the advantages mentioned in the treatment of yarn or skeins thereof and in the manufacture or treatment of goods made therefrom.

Other objects and advantages of the invention will become apparent as the specification proceeds.

With the aforesaid objects in view, the invention consists in the novel combinations and arrangements of parts hereinafter described in their preferred embodiments, pointed out in the subjoined claims, and illustrated in the annexed

drawing, wherein like parts are designated by the same reference characters throughout the several views.

In the drawing:

5 Figure 1 is a diagrammatic view in elevation of an apparatus according to the invention, with parts removed.

Fig. 2 is a fragmentary view in front elevation of the brush and skein.

10 Fig. 3 is an enlarged fragmentary view of a brush and its wires.

Fig. 4 is a view like that of Fig. 1 showing a modification of the invention.

Fig. 5 is a similar view of a further modification of the invention.

15 Fig. 6 is an edge view of a brush for combing yarn.

Figs. 7 and 8 are fragmentary sectional views of modified forms of wire brush.

20 Fig. 9 is a traverse sectional view of a brush according to a modification of the invention.

Figs. 10 and 11 illustrate further modifications of the invention.

25 The advantages of the invention as here outlined are best realized when all of its features and instrumentalities are combined in one and the same structure, but, useful devices may be produced embodying less than the whole.

30 It will be obvious to those skilled in the art to which the invention appertains, that the same may be incorporated in several different constructions. The accompanying drawing, therefore, is submitted merely as showing the preferred exemplification of the invention.

35 Generally described, this invention relates to the treatment of different yarns, as in skein form to produce a loft, nap or other fluffy or fuzzy condition by longitudinally brushing the yarn or skeins, preferably by means of wire brushes, 40 whose bristle wires desirably beat on the yarn at an acute angle of lead with a partial wiping action to avoid tearing the yarn and to simultaneously comb or separate the yarns to break up the usual matted condition thereof. Thus there is 45 a continuous beating and combing, the acute angle position of the bristle wires being feasible due to the beating in which the wire points effectively raise a nap. Preferably the points of the bristle wires are rounded or beveled to prevent 50 cutting into and tearing of the soft yarn. Desirably the yarn is treated under suitable tension to maintain its twist closed, although the bristle wires will readily slip out from between the strands due to the relative acute angle position of the wires. In course of this treatment the yarn 55 or skein may be turned or otherwise acted upon to present all sides to the brush.

Referring in detail to the drawing, 10 denotes an apparatus for illustrating the process, and 60 which may be considered as embodying a phase of the invention. The same may include any means for mounting, supporting or holding at one or more points a batch or skein of yarn, for instance, a pair of rollers 11, 12 which may have 65 rough faces 13 or other means for gripping the skein 14 to avoid undesired slippage or to control the same. These rollers may be mounted on their respective shafts 15, 16. Coacting with the rollers is a brush means which is desirably 70 in the form of a roller 17 having bristles 18 of wire or other suitable material at an angle so as to whip or beat the skein 14 at an acute angle of lead, the direction of rotation of the brush being indicated by the arrow 19. Brushing motion may be obtained by relative movement as 75

by rotating the brush by any suitable drive such as a motor 20 having a pulley 21 connected by a belt 22 which engages a pulley 23 on the brush shaft 24.

5 The action of the roller brush is to cause a continuous beating and combing, the beating occurring as the wire points strike the yarn and the combing being due to the wire bristles as a whole, although the latter will also cause a beating of the yarn to raise a nap thereon.

10 Adjustment of the tension on the skein 14 may be effected by movement of the idlers or rollers 11, 12 toward and away from each other, and a relative adjusting movement may be had between the brush and rollers to affect the tension and also the penetration of the brush into 15 the skein. Thus the roller 11 may be mounted on a frame or arm 25 carried by a support 26 having a clamp 27 engageable in a slot 28 of the arm 25 whereby the latter may be angularly and longitudinally adjusted to set position. 20

For speed adjustment of the operation, any variable speed drive 29 may be interposed between the pulley 21 and the motor 20. While the rollers 11, 12 may be idlers, one of them may be 25 retarded by a friction clutch 30 at or in the shaft 16 in any suitable manner. Then again, a motor 31 may operate a removable belt 32 through an adjustable speed reduction drive 33, with the belt rotating a pulley 34 and hence the roller 12 30 through the clutch 30. Thus it will be seen that infinite variation is possible, with the skein moving under the pull or tension of the brush at any low speed, by reason of the clutch 30 or motor 31, or in opposition to the brush pull at various 35 speeds. Preferably the skein may travel as indicated by the arrow 35 at a low speed to permit the bristle wires to readily leave the skein without catching or dragging the yarn.

40 It will be noted that the axis of the brush is preferably at right angles to the length of the skein, but it may also be at other angles thereto, as, for example, obliquely, with a resultant harder brushing action. The wires 18 may have bends 36 as shown in Fig. 3, with their ends shaped 45 or beveled as at 37 to permit the wires to wipingly penetrate the yarn and to avoid catching and tearing thereof.

In Fig. 4 is shown a modification 38 of the invention including carrier rollers 39, 40 for the 50 skein 14, a roller 41 being associated with the roller 39 to clamp the skein and avoid slippage thereof so that the movement of the skein may be properly controlled under positive drive or under pull of the brush 17. In order to assure full 55 penetration of the brush wires 18 into the skein, a backing 42 may be provided including, for instance, a belt 43 mounted on idlers or rollers 44 adapted to travel according to the peripheral speed of the rollers 39, 40, the latter being oper- 60 ated for instance, as in Fig. 1.

In Fig. 5 is shown a modified apparatus 45 according to the invention, including rollers or idlers 46 for mounting the skein 14. A pair of 65 like brushes 17, 17a may be arranged to operate on the skein, at one face thereof, but preferably one at an outer face thereof, and the other at an inner face thereof, so that the yarn is brushed simultaneously at opposite faces to produce the maximum fluffiness and avoid the need for turning 70 the skein around as in the devices of Figs. 1 and 4 if such brushing is desired. These brushes may be arranged so as to exert a pull in opposite directions on the skeins, as by rotating in the same direction and acting on opposite runs of 75

the skein or by rotating in opposite directions and acting on one run of the skein. The arrangement shown provides for even brush pressure against the yarn without the need for clamping the skein and marring the nap thereof. If one of the brushes be operated at slightly higher speed than the other, the skein will move on its idlers 46 to a corresponding degree. Accordingly the belt 47 for the brush 17 is connected to a pulley 48 which is larger than the pulley 49 to which the belt 50 for the brush 17a is connected. Hence the travel of the skein may be easily controlled as by the pull at the arrows 51, the direction of skein movement being shown by the arrow 52. Of course the members 46 may be operated in any manner hereinbefore suggested, if desired.

It will be perceived that the speed of brushing and the stiffness of the wires will vary with the softness and thickness of the yarn, and likewise the angle of the wires and the density of spacing thereof will have important effects so that many variable factors are introduced which must be specially solved for each particular yarn.

If desired, the wires 18 may be of irregular form or of polygonal cross section, for instance, square or triangular so as to increase the brushing action on a skein within the body thereof. The wires 18 may be regarded as square.

With my invention not only is the yarn brushed to produce a permanent nap, but the usual matted condition of the yarn is corrected and the yarns thus directly separated by the wires for easy removal from the skein without tangling.

The tension on the yarn closes the twist thereof but in any case the angular wires 18 easily disengage the yarn in any position. The blunt or beveled ends of the wires help to avoid tearing the yarn, especially due to the angular action of the wires which aids penetration thereof into the skein between the yarns so as to comb the skein. Hence no cleaning of the brushes is necessary nor is the fuzz so loosened as to be lost in subsequent knitting or weaving.

The skein thus treated is then unwound and the yarn fed to a knitting or weaving machine which operates under any required or lesser tension or throw consistent with the greater softness or fluffiness of the yarn to produce goods of large body.

Finally, the goods may have steam blown there-through to further raise the nap or train the fuzz toward one face of the goods, but this step may be dispensed with.

The invention is applicable to any kind of yarn of any twist or lack thereof. A batch and skein of yarn are regarded as the same within the scope of this invention.

In Fig. 6 is shown a brush 53 which may be used primarily for combing yarn, and includes a roller 54 having a peripheral facing of rubber or other suitable material from or through which extend any suitable bristles, wires or nails 55 of smooth contour and with rounded ends, whereby this brush is adapted for use on the most delicate fabrics, according to the invention. These elements 55 may engage the yarn at right angles but are preferably obliquely mounted as shown to provide an acute angle of lead with the yarn.

In Figs. 7 and 8 are shown modified forms of wire brushes wherein straight bristles are mounted in a yielding or rubber member and adjusted to an angle by relative movement between the member and a support therefor which engages the wire bristles. The latter may pass through

the member initially at right angles thereto, and deflection is permitted by the yield or elasticity of the member. Thus the brush may take the form of a rotary brush 60 having a pair of cylindrical bands or superposed walls 61, 62 of rubber or the like, wire bristles 64 extending through the elements 61, 62 for angular adjustment by relative angular movement between the elements, after which the latter are fixedly interconnected or vulcanized together in any suitable manner. Alternatively, the device 65 may have a roller 66 having a cylindrical band or wall 67 of yielding material through which pass the wire bristles 68 whose inner ends are engageable in irregularities 69 such as cups or grooves in the surface of the roller, so that angular adjustment of the bristles is effected by relative angular movement between the element 67 and the roller 66 after which the same are adhesively or otherwise fixed in relation to each other in any suitable manner.

If desired, the elements 61, 62 and 66, 67 may be relatively angularly settable, as by a set screw, in order to adjust the angle of the wire bristles to thus control the angle of lead. Of course the devices of Figs. 7 and 8 are applicable at any angle of lead whatsoever.

In Fig. 9 is shown a brush 70 having removable wire bristle units for ready and convenient removal and replacement by other bristle units so that the roller may have wire bristles of any desired flexibility, length, angularity and spacing without requiring replacement of the roller itself. Accordingly, the roller 71 may have longitudinal bristle units 72 having any suitable backing 73, or as suggested in Figs. 6, 7 and 8, removably secured to the roller 71 in any feasible manner. For example, the roller 71 may have longitudinal spaced ridges 74, each having a longitudinal lip 75, all the lips facing in one angular direction to thus overlap and hold the backing 73 to resist the tendency for removal thereof with the angularity of the wire bristles being as shown, and the strips being additionally removably secured by any suitable means such as screws 76 spaced along the strips.

In Fig. 10 is shown a device for merely combing yarn, according to the invention. The same may include a frame 77 on which are mounted the skein carrying idler spools 78, which may be analogous to the rollers 11, 12. Also mounted on the frame 77 is a wing nut clamp device 79 of any conventional type settable up and down along the frame and toward and away from the plane of the spools 78, this clamp carrying an idler brush 80, whose engagement with the skein is thus adjusted. The brush 80 includes wire bristles 81 whose purpose is primarily to beat out the matted condition of the skein by separating the yarns. The skein is moved by the pull on a single yarn thereof caused by the bobbin of a knitting or weaving machine, the skein causing rotation of the elements 78 and 80.

In Fig. 11 is shown a spool 82 freely rotatably mounted on the frame 83 and having wires 84 so that this spool can be substituted for one of the spools 78, thereby eliminating the need for the element 80. It is understood that the wires 81, 84 may be relatively widely spaced, of various lengths and stiffnesses and may be radial or of other angularity.

I claim:

1. The herein described method including longitudinally wire-brushing a batch of yarn to raise a nap thereon, with the wire bristles being 76.

at an acute angle to the yarn batch to wipingly penetrate the latter and separate the yarns thereof.

2. The herein described method, including
5 wire-brushing a skein of yarn lengthwise thereof to raise a substantial nap thereon, with the wire bristles held at an acute angle to the skein in the direction of brushing at the region of contact with the yarn, and then removing yarn from the
10 skein and constructing therefrom a fabric having said substantial nap.

3. The herein described method including longitudinally wire-brushing a batch of yarn with the wire bristles being at an acute angle of lead
15 to the yarn, pressing the wire bristles into the yarn batch and tensioning the latter while performing the brushing operation.

4. The herein described method comprising brushing a batch of yarn with wire bristles having beveled ends and being maintained at an
20 acute angle to the yarn for wipingly penetrating the same along the wire bristles and the beveled ends thereof, forcing the wire bristles into the yarn batch and tensioning the yarn in course of the brushing.

5. The herein described method including wire-brushing a batch of yarn at different faces thereof with the wire bristles held at an acute angle for partially wipingly engaging the yarn
30 to provide a nap on the yarn and to separate the yarns.

6. The herein described method including brushing a batch of yarn with wire bristles of angular shape held at an acute angle to the yarn
35 for partially wipingly engaging and separating the yarn to thus raise a nap on the outer and inner surfaces of the yarn batch.

7. The herein described method including longitudinally wire-brushing a batch of yarn by continuously beating and brushing the yarn batch to cause the ends of the wire bristles to raise a
40 nap on the yarn and to cause the wire bristles to comb and rub the yarn with the bristle wires being at an acute angle to the yarn to partially wipingly engage the yarn, to thus produce yarn
45 adapted to be formed into a nap bearing fabric.

8. The herein described method including longitudinally wire-brushing a batch of yarn by continuously beating and brushing the yarn batch to cause the ends of the wire bristles to raise
50 a nap on the yarn and to cause the wire bristles to comb and rub the yarn with the bristle wires being at an acute angle to the yarn to partially wipingly engage the yarn, to thus produce yarn
55 adapted to be formed into a nap bearing fabric,

the wire bristles having relatively blunt ends to avoid tearing the yarn.

9. The herein described method including longitudinally wire-brushing a batch of yarn by continuously beating and brushing the yarn batch to cause the ends of the wire bristles to raise a
5 nap on the yarn and to cause the wire bristles to comb and rub the yarn with the bristle wires being at an acute angle to the yarn to partially wipingly engage the yarn, to thus produce yarn
10 adapted to be formed into a nap bearing fabric, and then forming the yarn into a fabric of such relatively loose texture as to maintain the yarn in its fluffy condition.

10. The herein described method including longitudinally wire-brushing a batch of yarn by continuously beating and brushing the yarn batch to cause the ends of the wire bristles to raise a
15 nap on the yarn and to cause the wire bristles to comb and rub the yarn with the bristle wires being at an acute angle to the yarn to partially wipingly engage the yarn, to thus produce yarn adapted to be formed into a nap bearing fabric, and then forming the yarn into a fabric of such
20 relatively loose texture as to maintain the yarn in its fluffy condition, and finally blowing a gaseous fluid through the fabric to train the nap between the yarn toward one face of the fabric.

11. The herein described method including longitudinally wire-brushing a batch of yarn by continuously beating and brushing the yarn batch to cause the ends of the wire bristles to raise a nap on the yarn and to cause the wire
30 bristles to comb and rub the yarn with the bristle wires being at an acute angle to the yarn to partially wipingly engage the yarn, to thus produce a yarn adapted to be formed into a nap bearing fabric, the wire bristles having a cross section presenting a longitudinal ridge for laterally napping the yarn.

12. The method herein described, including brushing a skein of yarn at different faces thereof simultaneously, the directions of brushing being so related to the parts of the skein that are
45 being brushed that the brushing at one face creates a pull on the yarn that at least partially counterbalances the pull caused by brushing on the other face, the brushing being effected by rotary wire brushes having bristles engaging the
50 yarn at an acute angle and serving to beat the yarn and then to enter the same in course of engaging the yarn.

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