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F. SCRAGG ET AL
TEXTILE APPARATUS

3,461,657

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FIG. 3.

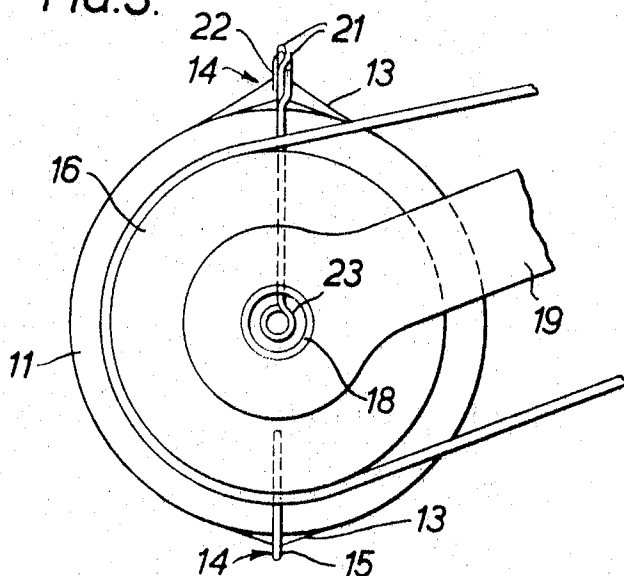
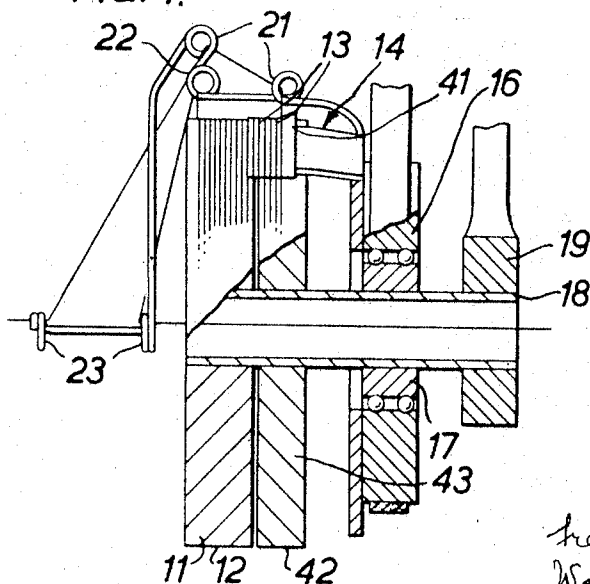


FIG. 4.



Inventors:
Friedrich Scragg
Walter Parker
David Leslie McNeight
By Michael S. Striker
Attorney

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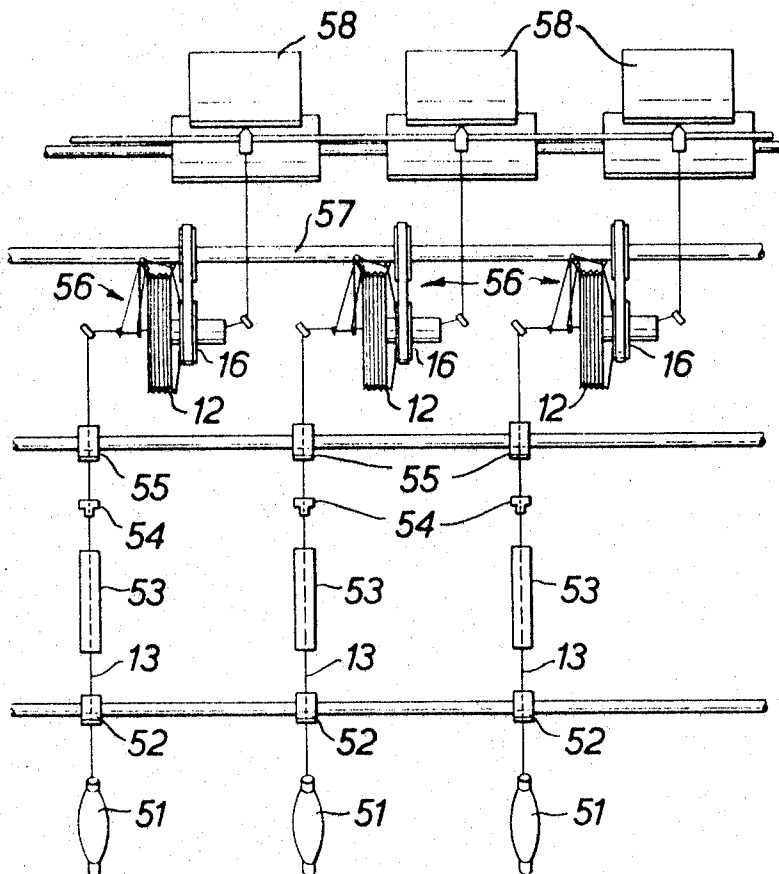
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3 Sheets-Sheet 3

FIG. 5.



Inventors:
Frederick Scragg
Walter Parker
David Leslie Mc Knight
by Michael S. Shicker
Attorney

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TEXTILE APPARATUS

Frederick Scragg, Trinity, Jersey, Channel Islands, Walter Parker, Wilmslow, and David Leslie McNeight, Macclesfield, England, assignors to Ernest Scragg & Sons Limited, Macclesfield, England, a British company, and Scragg A.G., Zug, Switzerland, a Swiss company

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22 Claims

ABSTRACT OF THE DISCLOSURE

A method and apparatus for heating yarn. An advancing yarn is convoluted about a heated surface of a body at a first position thereof so as to form at least one coil about the heated surface. The body is maintained stationary and the coil is shifted laterally of itself from the first position to a second spaced position on the heated surface. Thereupon, the thus-heated yarn is removed from the body at the second position.

This invention provides a method of and apparatus for heating yarn.

One problem in heating yarn in textile machines which process running yarn continuously, is that it is often difficult to apply the appropriate amount of heating for a sufficient length of time without having a long threadline, which cannot be reconciled with the desire to limit the overall dimensions of the machine so that an operator need not work at uncomfortably low or high levels. This problem has been aggravated, particularly on false-twist crimping machines, by the technological advances in other directions which have removed limitations previously imposed on processing speeds. The invention is concerned with this problem.

The invention comprises a method of heating yarn in yarn processing apparatus comprising the step of coiling an advancing yarn around a heated surface of a stationary body at a first position thereof, and traversing the coil or coils of yarn so wound laterally of themselves and along said body to a second position thereof, and removing said yarn from said surface at said second position.

The invention also comprises a method of producing modified crimped yarn, wherein the yarn is fed to and coiled around a heated surface of a stationary body at a first position thereof, and the coil or coils of yarn so wound are traversed laterally of themselves along said body to a second position thereof, and said yarn is removed from said body at said second position. The yarn fed to said surface may be crimped yarn produced, for example, by false-twist crimping, and such crimped yarn may be overfed by a desired amount to said surface so that it will be set thereon in a desired condition.

The body may have a taper in the direction in which the yarn is traversed thereon so that the yarn is allowed to contract while traversing the body.

The yarn may be laid on the surface by a flyer.

The or each coil of yarn may be traversed by a rotating comb-like member which revolves around the surface. Otherwise, a plurality of coils, adjacent ones of which are in contact, are all traversed by a rotating cam-like member acting at the winding-on end.

The temperature of the heated surface may be controlled.

The invention also comprises a method of producing modified crimped yarn, for example, modified false-twist crimped yarn, continuously with the crimping thereof, wherein the yarn is heated as herein described.

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The invention also comprises heating apparatus for yarn comprising a heatable body having a surface around which at least one coil of yarn can be wrapped, and means for traversing coils of yarn so wrapped laterally of themselves along the surface from a first position at which they are wrapped to a second position at which they are removed from the surface.

Said traversing means may comprise a member which revolves around said surface in a path axially spaced from the axial location at which the coil is laid on the surface, and engages the coil of yarn to move it from the one axial location to the other.

Said transversing means may comprise a comb-like member, for example, a wire of sinuous form, which revolves around said surface and engages each coil of yarn wrapped thereon. Two or more such comb-like members may be provided, spaced apart around said heatable body.

Said body may be capable of being fixedly mounted in yarn processing apparatus.

Flyer means for laying yarn on to said body and for removing yarn from said surface may be mounted for rotation with said comb-like traversing means, for example, on an anti-friction bearing mounted on a cantilevered supporting shaft which may also support said body. Said shaft may be hollow and said body may have a throughway leading to said hollow shaft so that yarn can be led away therethrough after its removal from the surface.

The body may have a circular or substantially circular cross-section, and may be cylindrical or tapered.

The body may be in the form of a disc having a periphery of about one metre and a width of about ten centimetres.

Electric resistance heaters may be incorporated in the body and may be so arranged as to provide a uniform temperature around said surface. Otherwise, the body may be hollow and adapted to receive circulating hot oil or other heating fluid such as hot air or other gas.

The invention also comprises heating apparatus as herein described, comprising means by which said comb-like member or other traversing means can be driven in rotation. Such driving means may comprise a pulley mounted for rotation relative to said body and carrying or otherwise adapted to rotate said comb-like member or other traversing means, which pulley may be driven by belt or like drive from a rotary shaft in a machine in which the heating apparatus is incorporated. Such a rotary shaft extending along a multistation machine, for example a false-twist crimping machine, may drive a plurality of such traversing means.

Embodiments of heating apparatus according to the invention, and methods of heating yarn thereby, will now be described with reference to the accompanying drawings in which:

FIGURE 1 is a perspective view of one embodiment. FIGURE 2 is a sectional elevation of the embodiment shown in FIGURE 1.

FIGURE 3 is a view in the direction of arrow 3 on FIGURE 2,

FIGURE 4 is a part-sectional elevation of another embodiment, and

FIGURE 5 is a diagrammatic front elevation of a false twist crimping machine capable of producing modified false-twist crimped yarn and incorporating a plurality of heating apparatus as shown in the other figures.

The heating apparatus illustrated in FIGURES 1 to 4 comprises a heatable circular disc-like body 11 having a peripheral surface 12 around which a plurality of coils of yarn 13 can be wrapped, and means 14 for traversing the coils 13 so wrapped laterally of themselves along the surface 12 from a first position 12a at which they are

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wrapped to a second position 12b at which they are removed from the surface.

The traversing means 14 illustrated in FIGURES 1, 2 and 3 comprise a comb-like member 15 which is formed by bending a wire into a sinuous form. The member 15 revolves around the body 11 and engages each coil of yarn 13 wrapped thereon. Two such comb-like members 15 are provided, diametrically opposed with respect to the body 11. The effect of the revolution of the members 15 is to traverse each coil engaged thereby from position 12a to position 12b.

The traversing means 14 illustrated in FIGURE 4 comprise a revolving cam-like member 41 which displaces a coil of yarn 13 (towards the left as seen in the figure) into contact with a previously laid coil. In this way, a plurality of coils are initially built up with adjacent coils in contact, and, with each revolution of the cam-like member 41, the mass of coils is pushed one coil's width laterally along the surface 12.

The traversing means 14 of either embodiment are carried by a belt driven pulley 16 which is mounted on a bearing 17 for rotation about a hollow shaft 18, which carries also the heatable body 11. The shaft 18 is secured to a bracket 19 of a yarn processing machine.

Also mounted on the pulley 16 for rotation thereby with the traversing means 14 are a flyer 21 for laying yarn on to the surface 12 at 12a, and a flyer 22 for removing yarn from the surface 12 at 12b, together with axially-disposed guides 23. In the embodiment of FIGURES 1, 2 and 3, the comb-like member 15, the flyers 21 and 22 and the axially-disposed guides 23 are all formed from the same piece of wire.

Yarn 13 is fed to the heating apparatus from feed rolls 24 via a guide 25, and leaves from guide 23 through the hollow shaft 18, whence it passes to wind-up means (not shown in FIGURES 1 to 4).

FIGURE 5 illustrates a false twist crimping machine for producing modified false twist crimped yarn. Yarn 13 is fed from a supply package 51 via lower feed rollers 52 to a heater 53 of the curved plate type, then through a false twisting device 54 to upper feed rollers 55. This part of the machine produces false-twist crimped yarn which is to be modified by the heating apparatus 56 according to the invention. When, as in this case, the yarn is to undergo further setting treatment it may be necessary for the yarn to be completely set in the false-twisting stage, and then the characteristics of the heater 53 need only be such that the yarn 13 can be delivered to the modifying heating apparatus in a crimped condition.

The pulleys 16 of the heating apparatus illustrated in FIGURE 5 are belt driven from a driven rotary shaft 57 extending along the machine.

The ratio of the speeds of the surface 12 of the apparatus 56 and the output speed of the feed rollers 55 is selected according to the amount of stretch it is desired to leave in the finished yarn. Instead of a cylindrical surface as illustrated, the surface 12 might be tapered conically or with a curved profile so that the yarn, while being traversed across it, is allowed to shrink. The shape of the surface 12 therefore also influences the nature of the finished yarn.

The yarn is subsequently wound up on wind-up means 58, the speed of which in comparison with the delivery speed of the heating apparatus determines the firmness of the package.

The circumference of the disc-like body is about 1 metre, and the width is about 10 centimetres. Each wrap of yarn therefore gives an effective heating length of about 1 metre and a sufficient number of wraps can be accommodated to give an extremely long heating time, adequate to set any yarn in whatever condition required.

Electric resistance heaters 26 (FIGURE 2) are incorporated in the body 11 in annular recesses 27 thereof closed by insulating members 28. A thermosensitive element 29 is located close to the surface 12 for controlling its temperature. Conductors 31 for the elements 26 and

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29 are taken through the hollow shaft 18. In an alternative arrangement (not illustrated) the body 11 is hollow and adapted to receive circulating oil or other heating fluid.

Different parts of the surface 12 may be arranged to be at different temperatures. For example, it may be arranged that there is a temperature gradient between positions 12a and 12b of the surface 12. In FIGURE 4 is seen an arrangement in which yarn 13 is first wound on to the surface 42 of a cold disc-like body 43 before passing to the hot surface 12.

The use of such heaters is not restricted to false-twist crimping machines nor to modifying processes for crimped yarn. Examples of machines on which the heating apparatus according to the invention can replace existing types of heater include winding and twisting machines and draw-winding and draw-twisting machines (in which the flyer and forwarding means 21, 22, 14 can be made sufficiently strong to draw the yarn and the disc-like body 11 can be stepped or tapered). The heaters may however be used as pre-heaters or draw-frames, the drawing still being effected over a snubbing pin in the usual way. The flyer and traverse means must in this case also be strong enough to withstand the tension of the yarn on the pre-heater. Various modifications may be made to the apparatus particularly described. For example, in place of the wire comb-like member, a ceramic separator could be used, or a set of small pulley wheels. Or a roller could be rotatably mounted on an axis which is skew to and revolves around the axis of the disc-like body. The roller may be free to rotate about its axis, or may be driven in such rotation to avoid strain on the yarn, and it should preferably be revolved close to, and be small in comparison with, the disc-like body, to avoid lifting the yarn from more than a small part of the heated surface. Except in the embodiment illustrated in FIGURE 4 and similar embodiments, the surface of the disc-like body may, in addition, be provided with grooves or other means whereby to prevent sideways movement of the yarn except when it is so moved by the comb-like member or other traversing means.

What we claim is:

1. A method of heating yarn, comprising the steps of convoluting an advancing yarn about a heated surface of a body at a first position thereof so as to form at least one coil about said heated surface; maintaining said body stationary; shifting said coil laterally of itself along said body from said first position of said heated surface to a second position thereof; and removing the thus heated yarn from said body at said second position of said heated surface.

2. A method of heating yarn as defined in claim 1, said surface tapering in direction from said one towards said other position, and said method comprising allowing the yarn to contract during shifting of said coil to said second position.

3. A method of heating yarn as defined in claim 1, further comprising the step of regulating the temperature of said heated surface.

4. A method of heating yarn as defined in claim 1, further comprising forming additional coils of said yarn about said surface at said first location so as to obtain a mass of axially adjacent coils which abut one another; and effecting shifting of said mass of coils to said second position by exerting requisite shifting pressure against one end of said mass.

5. A method of heating yarn as defined in claim 1, and further comprising the step of false-twist crimping said yarn preliminary to convoluting it about said heated surface.

6. Heating apparatus for heating yarn, comprising in combination, a stationary body having a heatable surface; feed means operative for advancing a yarn towards said body and convoluting the yarn about said surface at a first location thereof so as to form at least one coil about said body; traversing means for traversing the thus-formed

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coil along and in contact with said surface to a second location of the latter; and removing means for removing the thus heated yarn from said body at said second location.

7. Heating apparatus for heating yarn as defined in claim 6, said body having an axis, and said first and second positions being spaced from one another in direction of said axis.

8. Heating apparatus for heating yarn as defined in claim 7, wherein said traversing means comprise a member revolving around said surface in a path axially spaced from said first position and engaging the coil of yarn to move it from said first to said second position.

9. Heating apparatus according to claim 8, wherein said traversing means comprise a comb-like member which revolves around said surface and engages each coil of yarn wrapped thereon.

10. Heating apparatus according to claim 9, comprising means for driving said comb-like member in rotation.

11. Heating apparatus according to claim 9, wherein said comb-like member comprises a wire of sinuous shape.

12. Heating apparatus for heating yarn as defined in claim 11; further comprising at least one additional comb-like member spaced apart from said first-mentioned member around said body.

13. Heating apparatus for heating yarn as defined in claim 6; further comprising electrical heating means for heating said surface.

14. Heating apparatus according to claim 13, wherein said heating means comprising electrical resistance heaters which are so arranged as to provide a uniform temperature around said surface.

15. Heating apparatus according to claim 6, comprising flyer means for convoluting yarn about said body.

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16. Heating apparatus according to claim 15, comprising flyer means for removing yarn from said surface.

17. Heating apparatus according to claim 16, wherein said flyer means are mounted for rotation with said traversing means.

18. Heating apparatus according to claim 6, wherein said body has a throughway through which said yarn can be led after its removal from said surface.

19. Heating apparatus according to claim 6, wherein said body has a circular cross-section.

20. Heating apparatus according to claim 6, wherein said body is cylindrical.

21. Heating apparatus according to claim 6, wherein said body tapers.

22. Heating apparatus according to claim 6, wherein said body is hollow and adapted to receive circulating hot fluid.

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U.S. Cl. X.R.

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