

Nov. 5, 1968

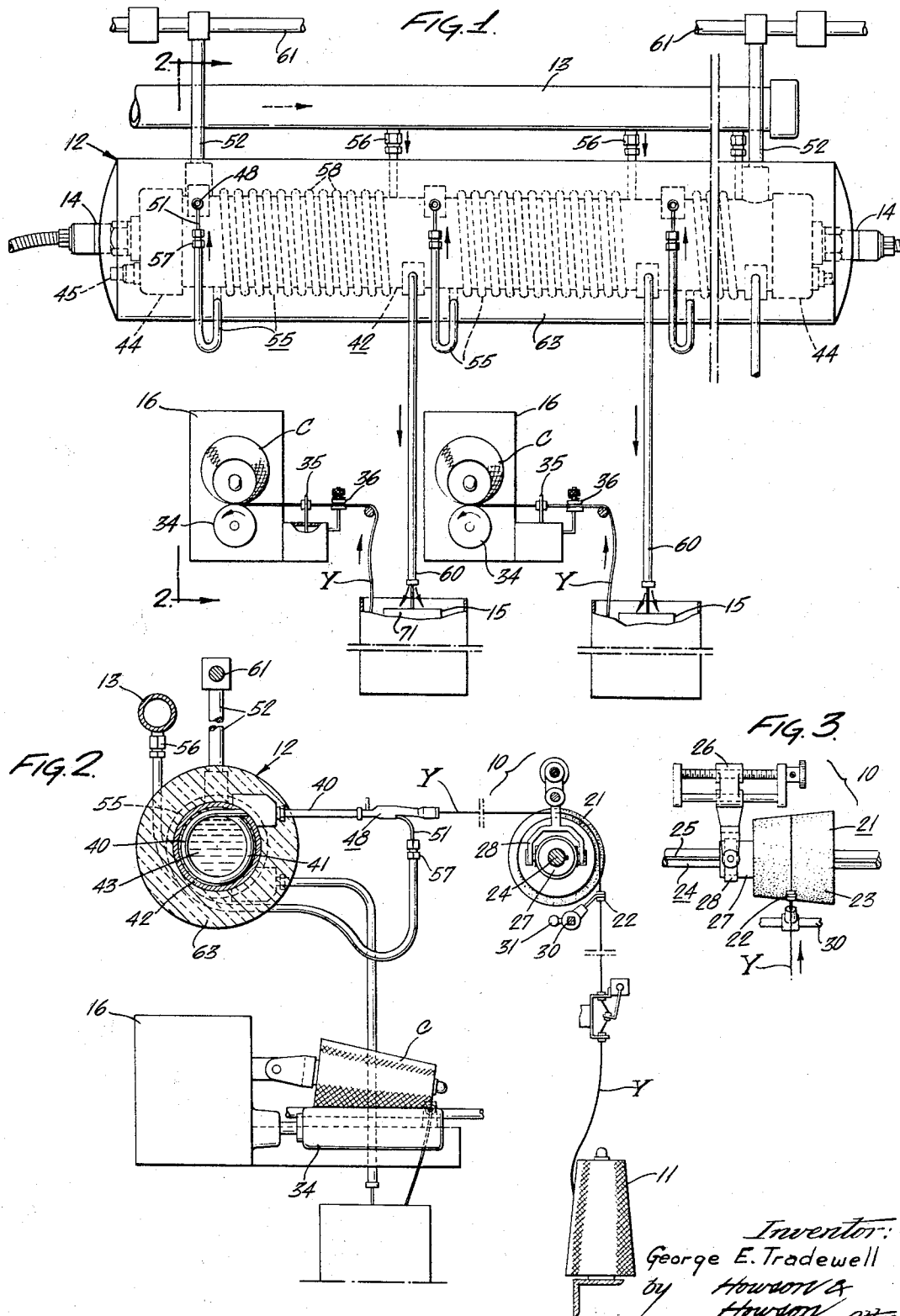
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3,408,716

YARN PROCESSING APPARATUS

Filed March 24, 1967

3 Sheets-Sheet 1



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FIG. 4.

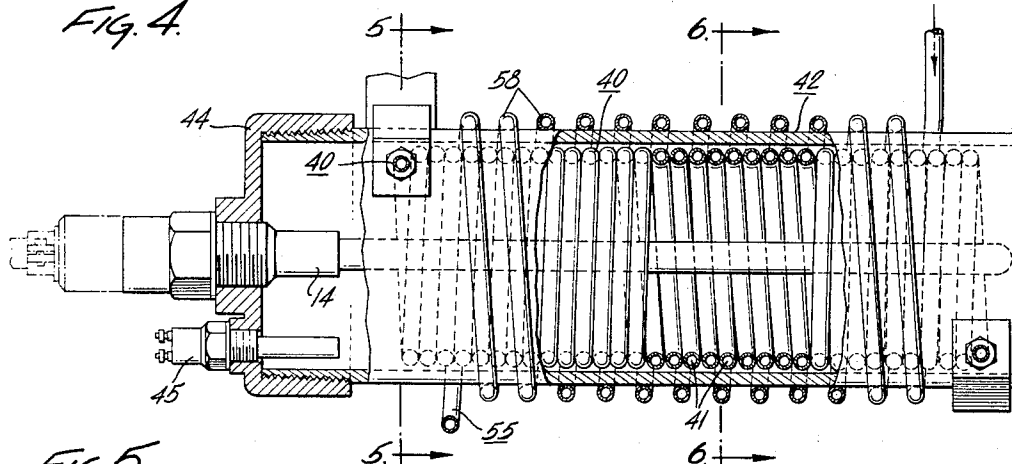


FIG. 5.

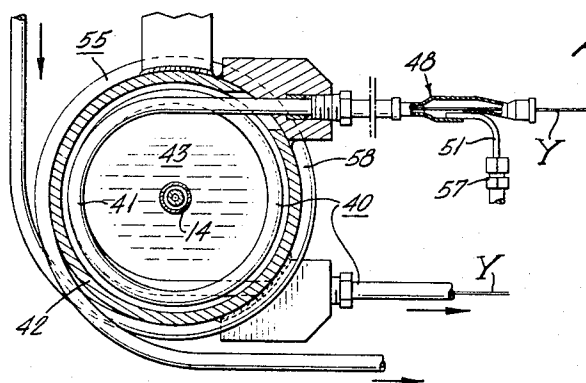


FIG. 6.

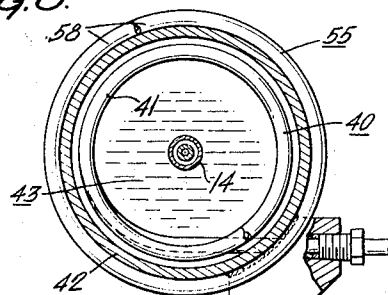


FIG. 7.

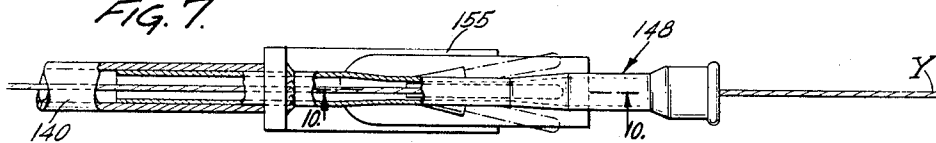


FIG. 8.

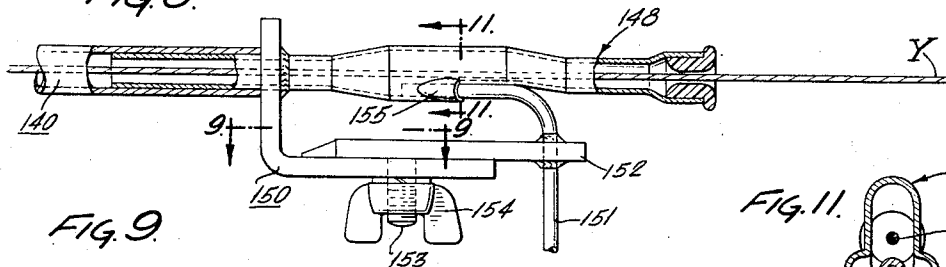


FIG. 9.

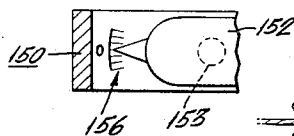


FIG. 10.

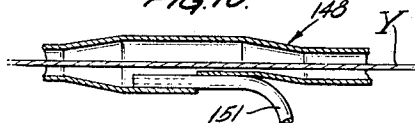
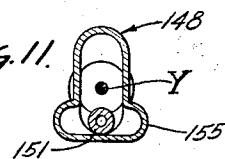


FIG. 11.



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FIG. 12.

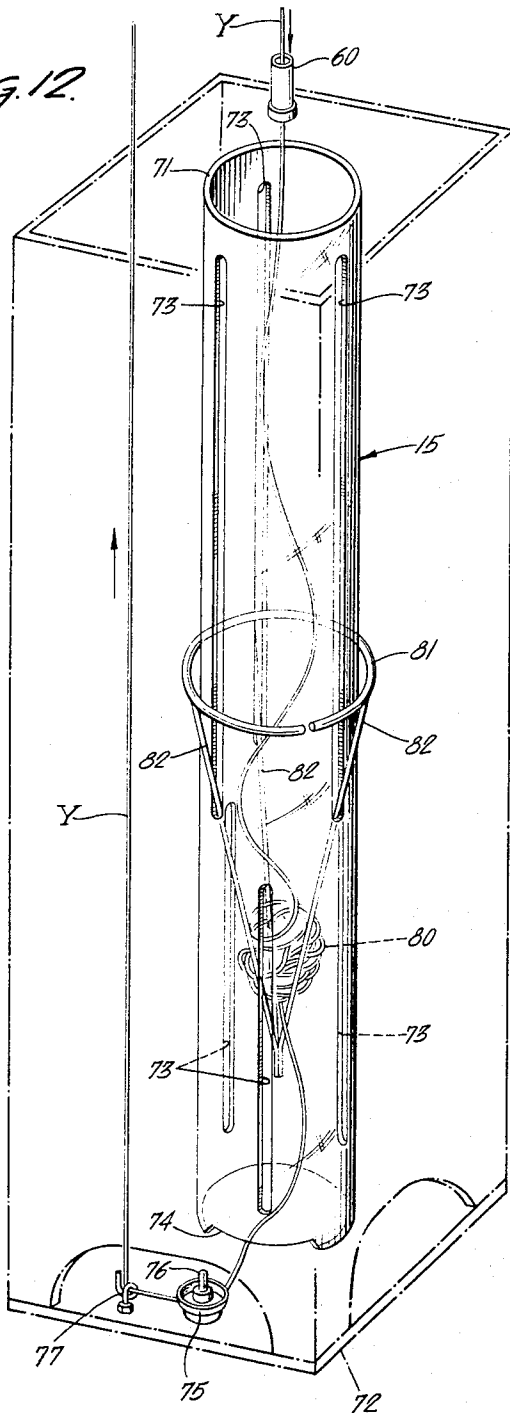


FIG. 13.

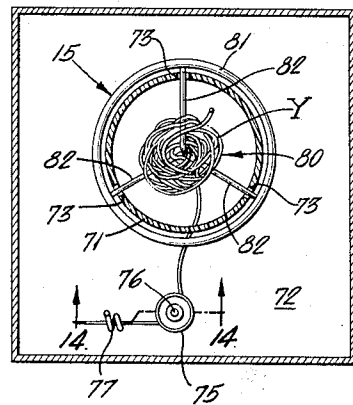
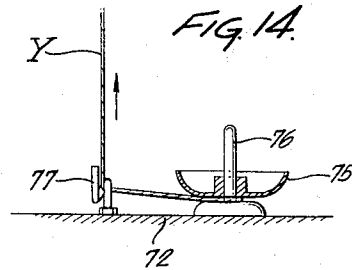


FIG. 14.



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3,408,716

YARN PROCESSING APPARATUS

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14 Claims. (Cl. 28—62)

ABSTRACT OF THE DISCLOSURE

Apparatus for processing yarn by heat while in a substantially relaxed state, for example to permit shrinkage and/or bulking of the yarn. The yarn is positively fed into a tubular conduit which is wrapped into a plurality of helical convolutions and maintained at a controlled temperature by immersion in a bath of fluid in a pressure vessel. The yarn is caused to travel through the conduit by using a laminar flow of air which is preheated by the pressure vessel. The processed yarn is cooled and collected at a rate correlated to the infeed and yarn shrinkage to heat-treat the yarn in a substantially relaxed state. The air may be introduced into the tubular member with either a left-hand or a right-hand vortex or with straight axial flow, as desired.

The present invention relates to apparatus for processing yarn and has particular application to apparatus for the heat treatment of yarns having thermoplastic characteristics to shrink, to bulk or to stabilize the same, without substantially disrupting the physical orientation of the filaments of the yarns while permitting molecular reorientation within the filaments themselves.

In the manufacture of textured yarn, it is common practice to heat the yarn under a controlled degree of tension in order to impart latent mechanical forces to the yarn. To provide a bulked yarn, it is preferred to heat the textured yarn while it is under minimum tension so as to permit the filaments to shrink or foreshorten by activation of the latent mechanical forces within the yarn. When heating yarns under tension, it is common to pass the traveling yarn into contact with a heated surface with the applied tension on the yarn compensated to reflect the drag imposed on the yarn by passage of the yarn across and in contact with the heated surface. When heating yarns under minimum tension, however, it has been found to be substantially impossible to obtain a satisfactory heat treatment by this method since the minimum tension applied to the yarn does not provide uniform contact between the yarn and the heated surface and, as a result, there is non-uniformity in the heat applied to the yarn along its length.

Until recently, satisfactory bulking has been obtained by winding the yarn into loose skeins and subjecting the skeins to the desired heat treatment, either wet or dry, in batches. Such batch treatment tends to lack uniformity between successive batches, and the additional handling of the yarn tends to impart additional local stresses which are not always eliminated during the heat treatment.

In view of the foregoing, it has been found desirable to heat continuously traveling yarns while relaxed by means of radiant heat. In view of the fact that the heat transfer by radiant heat is less efficient than the heat transfer by direct contact, the yarn has been enclosed during such radiant heat treatment to minimize the effect of changes in the ambient air conditions surrounding the yarn, for example by passing the yarn through a heated tube of sufficient diameter that the traveling yarn does not contact the walls of the tube. To prevent contact with the walls of the tube, it has been the practice to orient the tube vertically, and because of space limitations in the

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plant and on the processing apparatus, the maximum tube length has been on the order of five or six feet. To obtain effective heat treatment of the yarn in this limited length, the lineal travel of the yarn must be maintained at a relatively low rate, dependent on one hand upon the temperature of the tube and on the other hand, upon the heat transfer characteristics of the yarn itself. Theoretically, by elevating the temperature of the tube sufficiently, it would be possible to substantially increase the lineal speed of travel of the yarn through the tube; however, in practice, it is necessary to frequently reduce the speed of the yarn for threading-up purposes or for correction of malfunctions in the apparatus, and at such time, the yarn is susceptible to destruction by the excessive heat within the tube. Furthermore, in the event of inadvertent contact between the yarn and the overheated tube, the yarn is damaged, permitting breakage of the yarn with the consequent loss of production entailed thereby.

Despite the difficulties of providing high-speed continuous treatment of yarn of this character, there is a substantial demand for yarn which is uniformly heat-treated under minimum tension in the absence of disruptive air currents which might otherwise entangle or disrupt the physical orientation of the filaments of the yarn. The yarn treated in this manner is characterized by uniform dyeability from cone to cone as well as a uniformly smooth hand and softness which cannot be obtained effectively by other processing methods. Such yarn is readily distinguished from the air-bulked yarn wherein the filaments of the yarn are disrupted and entangled by a transverse air jet which blows through the yarn at high velocity.

The present invention provides apparatus for the high-speed heat treatment of yarn, which is capable of processing the yarn in a limited space without sacrificing the desirable yarn characteristics set forth above.

More specifically, the present invention provides apparatus for heat-treating yarn including yarn-feed means; a tubular conduit wrapped in a series of helical convolutions and including means to position the yarn centrally within the tubular conduit out of contact with the walls of the conduit as it travels in the helical path of the conduit convolutions; means to afford cooling of the yarn; and means correlated with the feed means to take-up the treated yarn.

The present invention is characterized by a vessel, preferably a pressure vessel, which encloses the helical convolutions of the conduit and maintains the conduit within the vessel at a uniformly-regulated predetermined temperature.

Another feature of the present invention resides in the provision of a gaseous medium such as air which is caused to flow concurrently with the yarn through the conduit to position the yarn centrally within the conduit, the flow of the gaseous medium being substantially laminar to avoid physical disruption of the filaments of the yarn passing through the conduit.

Another feature of the invention resides in the regulation of the input of the gaseous medium to control the movement of the gaseous medium from counterclockwise swirling movement through linear axial movement to clockwise swirling movement, thereby enabling the yarn to be twisted one way or the other as it is being heat-treated within the apparatus.

The invention also utilizes the heat generated in the vessel to preheat the gaseous medium used in carrying the yarn through the conduit so as to obtain effective utilization of the entire length of the conduit within the vessel for heating the yarn, both by radiation from the walls of the conduit and by heat exchange with the flowing medium.

The present invention also provides a novel yarn-

collecting reservoir in which the yarn may be cooled prior to take-up.

All of the objects of the invention are more fully set forth hereinafter with reference to the accompanying drawings wherein:

FIG. 1 is a fragmentary schematic view of apparatus embodying the present invention showing a pressure vessel for enclosing a plurality of heat-treating conduits;

FIG. 2 is a sectional view taken on the line 2—2 of FIG. 1 including the yarn supply means omitted from FIG. 1;

FIG. 3 is a fragmentary elevational view of a portion of the yarn supply means shown in FIG. 2;

FIG. 4 is an enlarged fragmentary view in side elevation of the pressure vessel shown in FIG. 1 with the insulation removed and with portions broken away to illustrate the internal parts thereof;

FIGS. 5 and 6 are fragmentary sectional views taken on the lines 5—5 and 6—6 respectively of FIG. 4;

FIG. 7 is a fragmentary plan view with portions broken away of a modified form of apparatus providing for manual regulation of the flow of the gaseous medium injected into the heat-treating conduit;

FIG. 8 is a view in side elevation of portions broken away of the structure shown in FIG. 7;

FIG. 9 is a fragmentary section taken on the line 9—9 of FIG. 8;

FIG. 10 is a fragmentary sectional view taken on the line 10—10 of FIG. 7;

FIG. 11 is a fragmentary sectional view taken on the line 11—11 of FIG. 8;

FIG. 12 is a perspective view of the yarn-collecting cooling device made in accordance with the invention;

FIG. 13 is a sectional plan view of the device shown in FIG. 12; and

FIG. 14 is a fragmentary section taken on the line 14—14 of FIG. 13.

The heat-treating device of the present invention may be incorporated, as shown in the drawings, in a separate treating apparatus including yarn supply means, the heater, a yarn cooler, and yarn take-up means. It should be understood, however, that the heater of the present invention may also be incorporated in other standard textile processing apparatus such as upwinders, downwinders, rewinders, and the like in which the yarn may be fed to the heater in a substantially relaxed or tensionless state by regulation of the yarn feed and take-up respectively.

Referring now to the embodiment of the invention illustrated in FIGS. 1 to 6 inclusive, the apparatus includes yarn-feeding means 10 for positively advancing yarn Y from a suitable supply 11. The yarn is passed through a heater 12 having an air supply 13 and a heating device 14 incorporated therewith. After heat treatment in the heater 12, the yarn is discharged therefrom and is cooled, for example in a cooling device 15, and is collected by suitable take-up means 16, onto a suitable package, in the present instance a cone C. The cooling of the yarn Y discharged from the heater enables reduction of the temperature of the yarn and sets the yarn in accordance with the molecular orientation thereof obtained in the heater.

In accordance with one feature of the invention, the yarn is maintained under minimum tension while in the heater. To this end, the feed means 10 is correlated with the take-up means 16 to advance the yarn at a sufficiently rapid lineal rate, relative to the take-up of the yarn and the shrinkage of the yarn occasioned by the heating, to maintain the yarn in a substantially tensionless state in the heater. To this end, the feed means comprises a driven feed roller 21 over which the yarn is directed by means of a guide 22. The roller 21 is tapered as shown in FIG. 3 and is provided with a suitable friction surface, in the present instance a flocked surface as indicated at 23. The roller is driven at a constant rotary speed by a shaft 24.

To vary the lineal speed of the yarn, dual adjustments are provided. A coarse adjustment is effected by displacing the roller on the shaft. To this end, the shaft 24 is splined as indicated at 25 and the roller 21 is keyed to the spline. The roller is adjusted axially of the shaft by a suitable adjusting mechanism 26 coupled to a collar 27 on the roller by means of a yoke 28. Fine adjustment of the lineal feed of yarn is accomplished by adjusting the guide 22 laterally on its support 30, for example by means of a set screw 31 (see FIG. 2). The drive shaft 24 is coupled to suitable drive means (not shown) which also drives the take-up mechanism 16.

The take-up mechanism 16 is a conventional cone-winding mechanism including a driven roller 34 upon which the cone C rests to be driven thereby. The yarn is traversed along the length of the cone C by means of a conventional traverse guide 35 and a disc tension 36 is provided to provide the proper tension in the yarn to insure a firm package.

In operation, the lineal feed of the yarn Y by the feeding mechanism 10 is sufficiently greater than the lineal takeup of the yarn Y by the takeup mechanism 16 to compensate for shrinkage in the heater. The lineal feed is adjusted by observing the yarn in the cooling zone and the coarse and fine adjustments 26 and 31 respectively are operated, in this instance manually, so that the amount of yarn in the cooling zone remains substantially constant.

When the roller 21 is displaced to the left, the yarn engages the larger circumference, thereby increasing the rate of feed and when the roller is displaced to the right, the yarn engages the smaller circumference, decreasing the rate of feed. The fine adjustment enables accurate positioning of the yarn upon the roller at the proper point along its length where the diameter is such as to drive the yarn at a rate to keep a constant amount of yarn in the cooling device 15. When this adjustment is accomplished, the yarn between the feed roller 23 and the cooling device 15 is maintained in a substantially tensionless state.

The heater 12 of the present invention comprises a first tubular conduit 40 which is wrapped into a plurality of helical convolutions 41 which are, in turn, enclosed within a pressure vessel 42. In the present instance, the pressure vessel 42 comprises a hollow elongated cylinder, and the helical convolutions 41 of the conduit 40 are spaced from the inner wall of the chamber 42 with limited clearance. The spacing of the conduit convolutions 41 from the wall of the pressure vessel reduces to a minimum the possibility of hot spots within the conduit and insures a uniform temperature within the conduit 40. If the cylinder 42 is a 4½ inch pipe, the center of the conduit may describe an arc of 2 inch radius. If 29½ convolutions are provided within a 10 inch length of pipe, the length of the conduit 40 is approximately 28 feet.

To insure uniform heating of the conduit, the vessel 42 is filled with a heat exchange medium such as water and is capped at both ends as indicated at 44. The heat exchange medium 43 is maintained at the desired temperature by the immersion heaters 14 which may be regulated in the conventional manner by a thermostatic sensing element 45 connected to the energy source for the heater through a conventional control box (not shown). Since the vessel 42 is a pressure vessel, the temperature of the medium may be above its normal boiling point. For example, the water 43 may be heated to a temperature of 325° and the pressure will be approximately 96 p.s.i.a. If other heat exchange media are used, the pressure may be reduced or increased depending on the boiling points or saturation temperatures thereof.

In accordance with the invention, means is provided to center the yarn within the tubular conduit 40 during its passage therethrough so as to effectively eliminate contact between the yarn and the walls of the conduit. To this end, the conduit 40 is provided with an inlet fitting 48 having injector means to introduce a flow of air there-

through. In the present instance, the injector means comprises an injector tube 51 projecting into the inlet fitting 48 to the conduit 40 so as to introduce a flow of air concurrently with the yarn travel. In order to prevent physical disruption of the yarn, the air injected into the tubular conduit 40 is caused to have laminar flow to prevent substantial turbulence within the conduit. It has been found that with air at a pressure of between 25 and 30 pounds per square inch, and a flow rate of approximately one cubic foot per minute, the flow within a conduit of $\frac{5}{16}$ inch diameter will be substantially laminar and will cause the yarn to travel through the conduit without contacting the side walls of the conduit as it is advanced through the helical convolutions thereof. Since the yarn is in a substantially tensionless state, the yarn is free to shrink or reduce its elongation as it is assisted in its travel through the conduit by the concurrent flow of air therebetween.

In the present instance, the injector tube 51 is mounted in the inlet fitting 48 so as to cause the air to flow substantially axially through the conduit without any swirling movement, so as to avoid reorientation of the physical relationship of the filaments of the yarn. If desired, however, means may be provided to impart to the air a swirling movement as it travels through the conduit. Such swirling movements tends to false-twist the yarn, in the direction of the movement of the air, which therefore imparts a physical reorientation to the filaments of the yarn as they are subjected to heat. The physical reorientation in conjunction with the activation of the latent mechanical forces accomplished by the simple application of heat to the yarn may provide desirable end results in the finished yarn. Since the air flow is laminar, the swirling movement is sufficiently gentle to avoid disruption of the yarn filaments.

In accordance with another feature of the invention, the heated pressure vessel 42 is utilized to preheat the air injected through the injector tube 51. To this end, the pressure vessel 42 is wrapped with a second conduit 55 which is connected at one end 56 to the air supply 13 and at the other end 57 to the injector tube 51. Intermediate the ends, the conduit 55 is wrapped with helical convolutions 58 around the pressure vessel 42 in intimate contact therewith to provide heat conduction from the vessel wall 42 to the conduit convolutions 58. Thus, the air flowing from the supply 13 through the conduit 55 is preheated approximately to the temperature of the pressure vessel 42 so that the air flowing within the first conduit 40 does not detract from the radiant heating effect upon the yarn within the convolutions 41 enclosed in the pressure vessel 42, but assists in heating the yarn by direct heat exchange. In the present instance, the pressure vessel is supported on the frame 61 of the apparatus by means of hangers 62 secured to the vessel 42. To minimize the heat loss, the vessel and the outer conduit convolutions 58 are enclosed in an insulating jacket 63.

In heat-treating Orlon, for example, it has been found that the yarn should be heated to approximately 325° F. With the conduit 40 being heated to 325° F. and being approximately 28 feet in length, the lineal rate of travel of the yarn may be up to 250 yards per minute and at this rate of travel, the yarn will be heated throughout uniformly to the desired temperature. When the rate of travel of the yarn is slowed, the yarn temperature will not raise above the 325° level to which the conduit 40 is heated within the pressure vessel.

If it is desired to provide means for readily adjusting the direction of air injection to provide either right-hand or left-hand swirling movement of the air within the tube, the inlet fitting may be modified as shown in FIGS. 7 to 11 inclusive. As shown, the fitting 48 is replaced by an inlet fitting 148 mounted on the heater conduit 140 which corresponds to the conduit 40 of the principal embodiment. The inlet fitting 148 includes a bracket 150 having an arm 152 adjustably secured thereto, for example by a

threaded post 153 having a stop nut 154 screwed thereon. The arm 152 mounts an injector tube 151 which corresponds to the injector tube 51 of the principal embodiment. To accommodate adjustment of the injector tube 151, the fitting 148 is provided with an outwardly-flared portion 155 through which the tube 151 projects. By adjusting the arm 152 about the axis of the shaft 153, the tube 151 may be positioned at various angles relative to the axis of the fitting 148. The angular position of the tube determines the character of the flow of the air through the tube between limits providing a right-hand or a left-hand swirling movement of the air through the tube respectively, or a straight-through flow, as desired. Suitable indicia is provided on the bracket at 156 to cooperate with a pointer 157 on the arm 152 to enable a predetermined position of the injector tube 151 within the fitting 148.

From the outlet 60 of the heater conduit 40, the yarn passes into a cooling device. While the cooling device may be of any desired form, or may simply consist of an elongated loop of yarn traveling through the ambient air, it has been found desirable to provide a compact cooling device such as the device 15 shown in FIGS. 12-14. As shown therein, the cooling device 15 comprises an upstanding tubular column 71, in the present instance mounted on a base 72. To permit observation of the yarn, it is preferred to make the tubular column member of a clear plastic. As the yarn travels through the tubular member 71, it is subjected to ambient air which enters the column through ventilating slots 73 and cools the yarn substantially to ambient temperature. At the bottom of the tubular member 71, an outlet is provided at 74 through which the yarn may travel under a hold-down disc 75 which is loosely mounted on an upstanding pin 76 on the base 72. From the hold-down disc 75, the yarn passes under a guide 77 and thence to the takeup device 16.

In order to provide a prolonged cooling time for the yarn within the tube 71, storage means is provided therein. To this end, a reservoir 80 is provided within the tube 71. As shown, the reservoir 80 comprises a basket element consisting of a ring 81 mounted exteriorly of the tube 71 and a plurality of fingers 82 depending inwardly through the ventilating slots 73 of the tube 71 and meeting substantially centrally of the tube so as to catch the yarn being discharged into the tube.

In normal operation, the yarn is withdrawn from the bottom of the reservoir 80 by the takeup device 16 at a rate corresponding to the feed of yarn into the reservoir from the outlet 60, thereby maintaining the supply of yarn in the reservoir 80 substantially constant. In the event of a temporary interruption in the feed of yarn, the takeup 16 need not be arrested since the reservoir will provide sufficient yarn to enable continued operation of the takeup device 16 until the reservoir is emptied. Furthermore, the reservoir permits minor variations in the feeding rate of the yarn without adversely affecting the tensionless state of the yarn within the heater conduit 40.

As the yarn is drawn from the reservoir 80 by the takeup device 16, the disc 75 imparts sufficient tension to the yarn to remove any snags or snarls which might arise within the reservoir 80 before these snarls or snags reach the disc tension 36 of the takeup device. If greater tension is desired, the disc 75 may be weighted or otherwise biased against the base 72 to impart additional drag upon the yarn in its travel toward the disc tension 36.

It is apparent, therefore that the cooling device 15 shown in FIGS. 12-14 provides means to afford cooling of the yarn to ambient temperature without imparting substantial tension thereto before it is entirely cooled. The device also provides a reservoir of yarn for compensating for variations in the yarn supply without disturbing the constant takeup of the yarn by the takeup device. The transparent nature of the tube 71 enables visual observation of the reservoir 80 at start up so that

the feed rate of the yarn through the heating device 12 may be regulated by the adjustments 26 and 31 as discussed above, to maintain the supply of yarn within the reservoir at a constant level. After the initial adjustment, the reservoir will accommodate the normal variations in the lineal feed rate of the yarn relative to the take-up.

Only one treating station of the illustrated embodiment of the invention has been described although two treating stations are shown in the drawing. It is apparent that a commercial apparatus will embody an entire series of treating stations, limited only by the floor space available and the length of the pressure vessel 42 which may be operated to maintain a constant temperature throughout. If it is desired to increase the length of heater conduit, the number of convolutions within the pressure vessel may be increased, and the convolutions may be confined to a smaller length by wrapping a second series of convolutions within the first series so as to substantially double the length of heater conduit per unit length of pressure vessel.

It is apparent that other treatments may be effected concurrently with the heat treatment of the yarn. For example, a liquid treating medium such as a dye or a sizing or mercerizing material may be applied to the yarn prior to its entry into the conduit, or steam or other vapors may be used in place of or in addition to the air injected into the conduit at the entrance end to transport the yarn therethrough. The apparatus may be incorporated in other textile processing equipment to pre-treat or post-treat the yarn processed therein.

The processing apparatus of the present invention is particularly adapted to the bulking of spun yarns having thermoplastic qualities, but it is apparent that it has other uses including processing multifilament and monofilament yarns where it is desired to heat-treat the yarn under minimum tension without effecting physical contact of the yarn with heated heat-transfer surfaces.

While particular embodiment of the present invention have been herein illustrated and described, it is not intended to limit the invention to such disclosure, but changes and modifications may be made therein and thereto within the scope of the following claims:

What is claimed is:

1. In apparatus for processing yarn comprising yarn feed means, including a positive feed device, yarn take-up means to take up yarn at a predetermined rate, heater means intermediate said feed and take-up means to heat the yarn to a predetermined temperature, and means intermediate said heater and said take-up to afford cooling of said yarn, the rate of feed of said feed means being correlated to the predetermined rate and the shrinkage of said yarn in said heater means to maintain the yarn in said heater means in a substantially tensionless state, the improvement wherein said heater means comprises a tubular conduit receiving said yarn, said conduit being disposed in a plurality of convolutions, and means to inject gaseous medium into said conduit adjacent the inlet thereof to cause said air to flow through said conduit concurrent with said yarn with laminar flow devoid of turbulence to thereby position said yarn centrally in said conduit during its travel through the convolutions out of contact with the side walls of said conduit, and means to heat said convolutions of the conduit to thereby impart radiant heat to said yarn traveling therethrough.

2. Apparatus according to claim 1 including means to preheat the gaseous medium injected into said conduit whereby said gaseous medium cooperates with the heated conduit convolutions to additionally heat the yarn by direct heat exchange with the gaseous medium.

3. Apparatus according to claim 1 including a vessel enclosing said convolutions of the conduit, said means to heat the convolutions comprising a fluid heating medium contained within said conduit, and heater means to maintain said fluid medium at a predetermined temper-

ature to thereby maintain said convolutions at said predetermined temperature.

4. Apparatus according to claim 3 wherein said vessel is a pressure vessel, and said fluid heating medium is maintained under pressure to thereby afford heating of said medium above its normal boiling point.

5. Apparatus according to claim 3 wherein said means to inject gaseous medium into said conduit comprises an injection tube projecting into said conduit adjacent the inlet, a supply manifold for said gaseous medium, and a second tubular conduit interconnecting said manifold and said injector tube and positioned in heat exchange relationship with said vessel to thereby preheat the gaseous medium prior to injection into said first conduit.

6. Apparatus according to claim 5 wherein said vessel is a hollow cylindrical member and said second conduit is wrapped helically about the exterior of said cylindrical member in heat exchange relationship thereto.

7. Apparatus according to claim 5 wherein said injector tube projects into the inlet of said first conduit in a substantially axial direction to afford linear flow of said gaseous medium axially of said conduit.

8. Apparatus according to claim 5 wherein said injector tube is mounted for movement in said inlet about a pivotal axis perpendicular to the axis of said inlet of the conduit to afford adjustment of the angle of injection of said gaseous medium between limits providing right-hand and left-hand vortexes in the injected gaseous medium within the conduit respectively to thereby impart a rotational force on said yarn passing therethrough.

9. In apparatus for processing yarn comprising yarn feed means, including a positive feed device, yarn take-up means to take up yarn at a predetermined rate, heater means intermediate said feed and take-up means to heat the yarn to a predetermined temperature, and means intermediate said heater and said yarn take-up to afford cooling of said yarn, the rate of feed of said feed means being correlated to the predetermined rate and the shrinkage of said yarn in said heater means to maintain the yarn in said heater means in a substantially tensionless state, the improvement wherein said means to afford cooling of the yarn comprises a cooling device adapted to collect yarn from said heater and afford advancement of the same to said take-up means at said predetermined rate, said device comprising an upstanding hollow column adapted to receive the yarn, a reservoir in said column comprising a plurality of fingers depending inwardly and downwardly from the wall of said column and meeting centrally therein to form a collecting basket, said yarn adapted to accumulate in said basket from the top and pass out from the bottom of said basket, said column having an opening adjacent the bottom thereof, guide means to direct yarn passing outwardly through said opening, and hold-down means to apply tension to said yarn as it travels through said guide means to thereby remove any snags or snarls appearing in said yarn by reason of its collection in said basket.

10. Apparatus according to claim 9 wherein said column has a plurality of longitudinal slits therein affording inflow of cooling air therethrough.

11. Apparatus according to claim 10 including a ring mounted exteriorly of said column, said fingers passing through said slits and being supported on said ring.

12. In apparatus for processing yarn comprising yarn feed means and yarn take-up means, a device adapted to collect yarn from said feed means and afford advancement of the same to said take-up means, said device comprising an upstanding hollow column adapted to receive the yarn, a reservoir in said column comprising a plurality of fingers depending inwardly and downwardly from the wall of said column and meeting centrally therein to form a collecting basket, said yarn adapted to accumulate in said basket from the top and pass out from the bottom of said basket, said column having an opening

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adjacent the bottom thereof to direct yarn outwardly through said column.

13. Apparatus according to claim 12 including guide means to engage the yarn passing through said opening and means to apply tension to said yarn as it travels through said guide means to remove any snags or snarls appearing in said yarn by reason of its collection in said basket.

14. Apparatus according to claim 12 wherein said column has a plurality of longitudinal slits therein and including a ring mounted exteriorly of said column, said

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fingers passing through said slits and being supported on said ring.

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