

[54] **YARN DEFLECTING MEANS FOR
AUTOMATIC YARN PIECING APPARATUS**

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[52] **U.S. Cl.**..... 57/34 R

[51] **Int. Cl.**..... D01h 15/00

[58] **Field of Search** 57/34 R, 52-54

[56] **References Cited**

UNITED STATES PATENTS

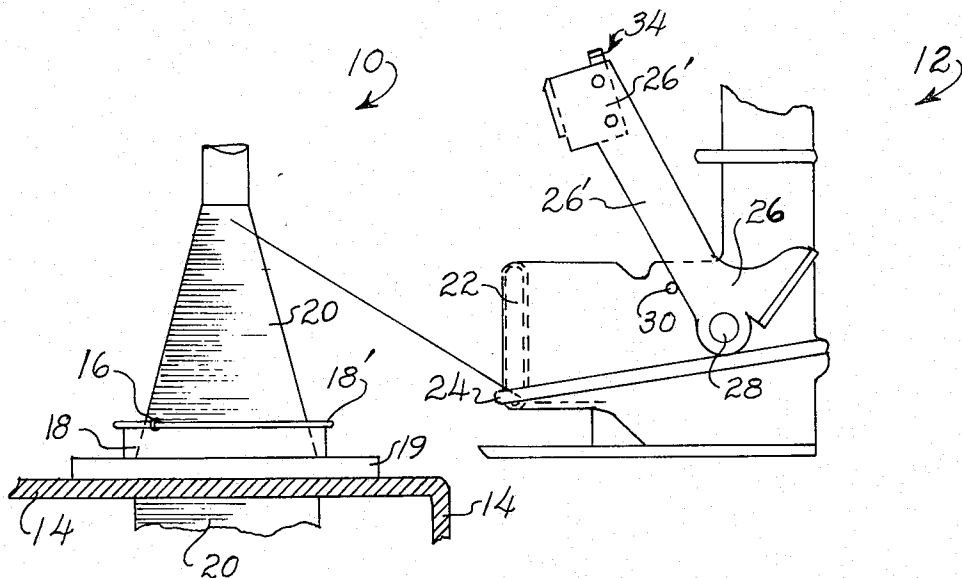
3,374,616	3/1968	Hidden et al.	57/53
3,486,319	12/1969	Lee, Jr. et al.	57/34 R
3,628,320	12/1971	Harmon	57/34 R
3,728,852	4/1973	Anderson et al.	57/34 R

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[57] **ABSTRACT**

Pneumatic traveler threading of a length of yarn extended between a bobbin-yarn package and the traveler flange of a spinning ring encircling such package is facilitated when required by a hook-like member which engagingly deflects such yarn at a location intermediate its length and inwardly of the spinning ring. such deflection causes that section of the yarn adjacent the traveler flange to extend at a relatively small angle to the horizontal, and preferably also causes such yarn section to extend laterally toward a point upon the traveler flange that is circumferentially spaced, in the direction of movement of the traveler during the traveler threading operation, from the point at which the yarn overlies the flange.

10 Claims, 6 Drawing Figures



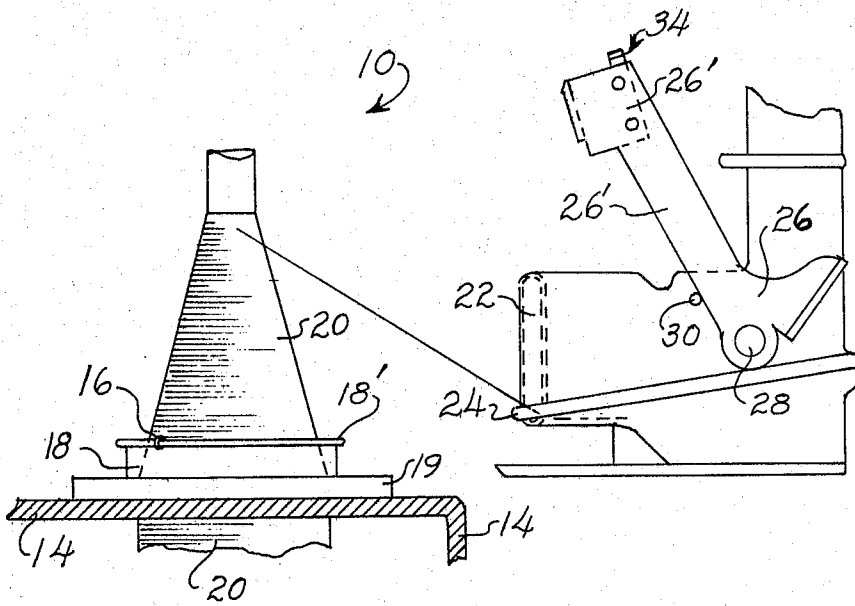


Fig. 1

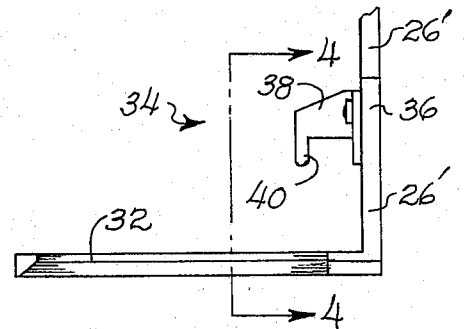


Fig. 3

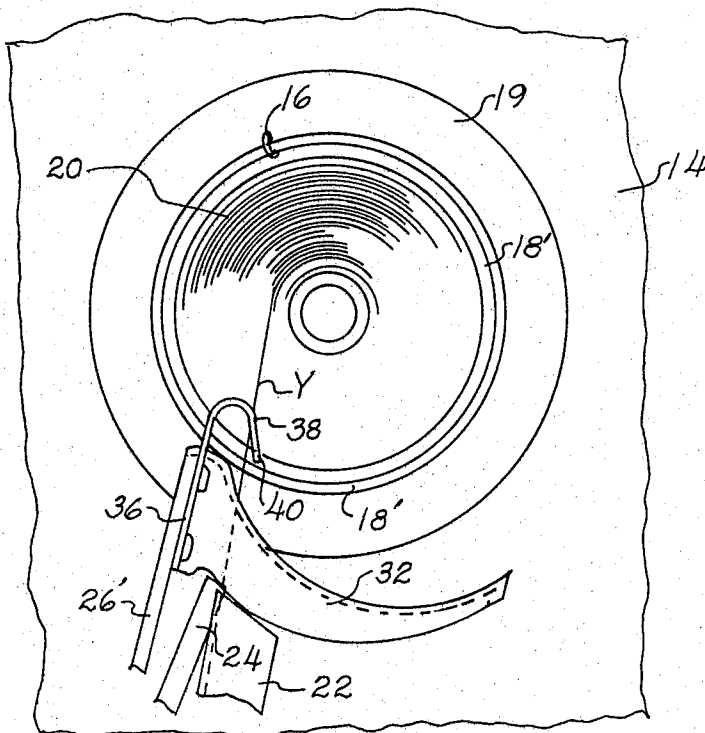


Fig. 2

FIG. 4

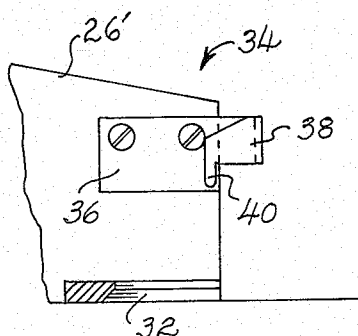


FIG. 5

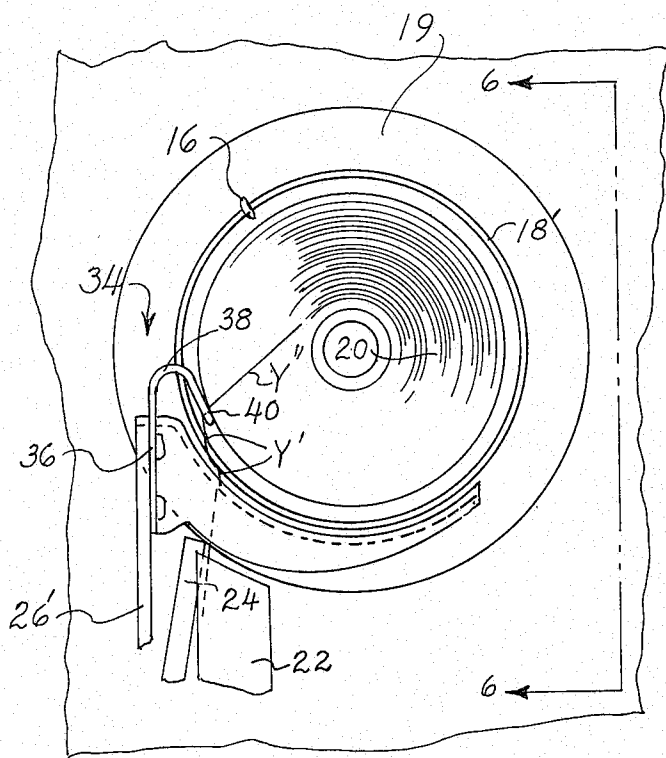
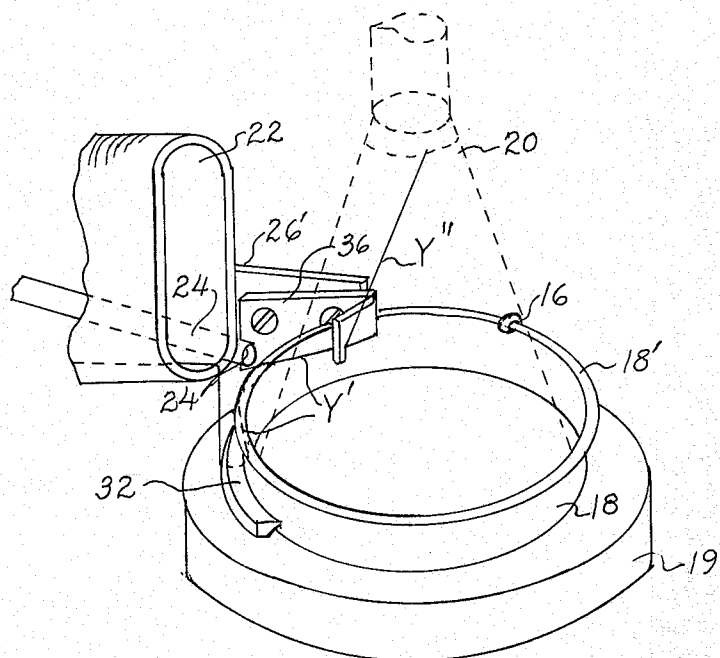


FIG. 6



YARN DEFLECTING MEANS FOR AUTOMATIC YARN PIECING APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to automatic yarn piecing apparatuses adapted to eliminate broken yarn or "end-down" conditions at deliveries of textile spinning machines. It more particularly relates to piecing apparatuses of the type which, while performing a piecing operation at a spinning machine delivery requiring end-down servicing, establishes a length of yarn extended between the yarn collection package and the traveler flange of the spinning ring encircling the package at such delivery, and which then performs the traveler threading step of the piecing operation by moving the traveler about the ring flange, usually by pneumatic means, onto the yarn extended across and engaging such flange. Illustrative piecing apparatuses of the foregoing general type are disclosed in U.S. Pat. Nos. 3,540,200, 3,628,320 and 3,728,852.

During each piecing operation performed at a spinning machine delivery by a piecing apparatus of the above-noted type, a length of yarn connected to and extending generally outwardly from the bobbin-yarn package at such delivery is engaged exteriorally of the spinning ring encircling such package by a member which secures the yarn in snubbed overlying engagement with at least the outer edge of the traveler flange of the spinning ring. The traveler mounted upon the ring flange is then propelled thereabout, which may advantageously be done by directing a blast against the interior surface of the spinning ring, so as to "mount" the yarn and establish a threaded relationship therewith. This desired result usually ensues when the yarn extending inwardly from the traveler flange defines a relatively small angle with the horizontal. However, when the aforesaid angle is relatively large, the traveler may not mount the yarn, thereby causing failure of the traveler threading step of the piecing operation.

Patent 3,628,320 recognizes the foregoing problem, and proposes a solution which entails allowing, before attempted performance of the traveler threading step, a certain amount of winding rotation of the bobbin-yarn package to which the yarn is connected. Such solution requires the performance of an additional step in each piecing operation conducted by the piecing apparatus, even though the yarn's angularity will not be such as to present a problem in an appreciable number of the total piecing operations conducted by the apparatus. The performance of such additional step during each piecing operation, and whether needed or not, requires the provision of additional control and/or other components upon the piecing apparatus and also requires that the yarn be needlessly subjected to some additional stress during many piecing operations.

OBJECTS OF THE INVENTION

With the foregoing in mind, the primary object of the present invention is the provision of improved means, in an automatic yarn piecing apparatus which performs the traveler threading step of each piecing operation by propelling a traveler about a spinning ring onto a length of yarn extended between the traveler flange of such ring and a yarn collection package encircled thereby, for at desired times deflecting that section of the yarn adjacent to and extending inwardly from the traveler flange into a position favorable to mounting of the yarn

by the traveler when the latter is propelled about the flange.

A related and more specific object is the provision of improved means which eliminates the problem of excessive vertical angulation of the yarn, when such problem exists during a particular piecing operation, with the imposition of only minimal stress upon the yarn, and which imposes no additional stress upon the yarn during those piecing operations when the yarn-angulation problem is not present.

An additional related and more specific object is the provision of improved means of the described type which requires no additional control components in, or the performance of any separate operational steps by, the piecing apparatus, and which may comprise only one inexpensive component added to and operable in unison with an existing component of the apparatus.

SUMMARY OF THE INVENTION

The present invention provides improved means, in association with an automatic yarn piecing apparatus which performs the traveler-threading step of each piecing operation by propelling a traveler about a spinning ring onto a length of yarn extending between the traveler flange of such ring and a yarn collection package encircled thereby, for at desired times engaging such yarn intermediate its length and thereby deflecting that section thereof adjacent to and inwardly of the spinning ring into a position favorable to mounting of the yarn by the traveler when the latter is propelled about the ring flange. Preferably the yarn is deflected both downwardly toward the elevation of the ring flange, and laterally toward a point upon such flange spaced from the point where the yarn overlies the flange. When the piecing apparatus is of a preferred known type which includes a yarn depressor member engagable with the outer periphery of the spinning ring for the purpose of assisting in the establishment of the length of yarn extended between the package and the traveler flange of the spinning ring, the yarn deflecting means of the present invention may be and preferably is carried by the support arm of such depressor member in such a manner as to be automatically operable in unison therewith if, but only if, required during a particular piecing operation.

DESCRIPTION OF THE DRAWINGS

Other features and advantages of the invention will be in part apparent and in part pointed out hereinafter, in the following description of an illustrative embodiment thereof, which should be read in conjunction with the accompanying drawings in which:

FIG. 1 is a fragmentary and somewhat schematic side elevational view, partially in vertical section, of a conventional yarn collection package, ring rail, spinning ring and traveler at a delivery of a textile spinning machine, and of a servicing assembly of an automatic yarn piecing apparatus which includes, in addition to conventional suction head, yarn depressor and traveler threading members, yarn deflecting means in accordance with the invention;

FIG. 2 is an enlarged fragmentary plan view of the components of FIG. 1 during a later time in a piecing operation when the yarn depressor member has pivoted downwardly and is being advanced, with the servicing assembly, along the ring holder and toward the spinning ring of the spinning machine;

FIG. 3 is a fragmentary front elevational view of the yarn depressor member and the yarn deflecting means of the servicing assembly;

FIG. 4 is a side elevational view of the yarn deflecting means, and of adjacent portions of the yarn depressor member;

FIG. 5 is a fragmentary plan view similar to FIG. 2, but showing the servicing assembly in its fully advanced position occupied during performance of the traveler threading step of a piecing operation; and

FIG. 6 is a fragmentary side perspective view, partially in vertical section and with the yarn collection package shown in phantom lines, taken substantially along the line 6—6 of FIG. 5.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1 the numerals 10 and 12 respectfully designate a textile spinning machine and a servicing assembly of an automatic yarn piecing apparatus, only fragmentary parts of which are shown. Spinning machine 10 may be of a conventional and well-known type including, on each side thereof, a stationary spindle rail (not shown) and a vertically movable ring rail 14 which extend parallel to one another longitudinally of the machine and have a plurality of yarn spinning stations, or deliveries, spaced along the length thereof. At each delivery of machine 10, of which one is fragmentarily shown in FIG. 1, yarn issuing from the machine's drafting rolls (not shown) normally extends downwardly through suitable guides (not shown) to and through a traveler 16 movable about the traveler flange 18' of a spinning ring 18 carried by a ring holder 19 of ring rail 14, and thence to a yarn collection package 20 encircled by ring 18 and mounted upon the spinning machine's spindle rail (not shown) for rotation about a substantially vertical axis. During normal operation of machine 10, package 20 is rotated about its axis (in a clockwise direction when Z-twist yarn is being produced) so as to cause the yarn to be wound thereon, while ring rail 14 is moved vertically through reciprocal strokes or traverses so as to cause the package to possess the desired structure or "build." When the package 20 being formed is of the filling-wind type shown in the drawings, ring rail 14 may reciprocate through a constant traverse of, say, approximately two inches as it is moved slowly from a lowermost and to an uppermost position relative to the bobbin component of package 20. Spinning ring 18 and traveler 16 of course move vertically in unison with ring rail 14 at all times, both during normal operation of machine 10 and when an end-down condition exists at the machine delivery including such components.

Servicing assembly 12 and the automatic yarn piecing apparatus (otherwise not shown) of which it forms a part may be and illustratively are of the general type disclosed in U.S. Pat. No. 3,728,852. Such an apparatus is movable adjacent one or more spinning machines to any delivery thereof requiring servicing by reasons of an end-down condition thereat. Upon arriving at such delivery, the apparatus halts and various servicing assemblies carried by and extendable from its performing sequential steps of a piecing operation which, if successful, eliminates the yarn discontinuity and thereby again places the spinning machine delivery in production. The one servicing assembly 12 shown in the drawings is mounted (by apparatus components not shown)

for vertical movement during part of each piecing operation in unison with the ring tail 14 at the spinning machine delivery undergoing servicing, and for compound pivotal movement in a generally horizontal plane toward and away from the spinning ring 18 and yarn package 20 at such delivery. Assembly 12 includes yarn retrieving means, illustratively in the form of a suction head 22, and traveler threading means, illustratively in the form of a nozzle 24, the suction head 22 and nozzle 24 being respectively connected to selectively actuable air suction and pressure sources (not shown) carried by the piecing apparatus. Assembly 12 also includes a yarn depressor member 26 pivotally connected adjacent its inner end to suction head 22 by a pivot pin 28 for movement, upon retraction of a retaining pin 30, from its elevated inoperative position shown in FIG. 1 to a lowered position in which member 26 extends generally horizontally. During that part of a piecing operation when assembly 12 is moving vertically with ring rail 14, the assembly is advanced to position the mouth of suction head 22 adjacent the chase surface of package 20, while such package is rotated in an unwinding direction and a suction air flow is produced through suction head 22. This, in possible combination with the application of other yarn retrieving forces to package 20, causes some of the yarn previously wound upon the package to be retrieved therefrom and sucked into head 22. Rotation of package 20 is then halted and assembly 12 is retracted away from the package, as shown in FIG. 1. Next, yarn depressor member 26 pivots downwardly from its elevated inoperative position, in the process of which an arcuate position 32 thereof engages and depresses the yarn extending between package 20 and suction head 22, and assembly 12 is again pivoted forwardly toward spinning machine 10. During this forward movement of assembly 12, engagement between an arcuate portion 32 of yarn depressor member 26 and the complementarily curved outer surface of spinning ring 18 assists in guiding assembly 26 from its intermediate position shown in FIG. 2 to its final position, shown in FIGS. 5 and 6 and wherein substantially the full length of depressor portion 32 engages ring 18. In the aforesaid final position of assembly 26, a length of the yarn previously retrieved by suction head 22 extends from package 20 to and over traveler flange 18' of ring 18, being secured in overlying engagement with at least the outer edge of flange 18' by arcuate portion 32 of yarn depressor 26. A blast of air then emitted from nozzle 24 into and against the inner circumference of ring 18 creates a clockwise air flow between ring 18 and package 20. Irrespective of the random position which traveler 16 occupies upon ring flange 18', such air flow propels traveler 16 in a clockwise direction around flange 18' to the yarn overlying such flange and, assuming that the traveler threading step is a successful one, into threaded engagement with such yarn.

The above described components of an automatic yarn piecing apparatus are generally of the known type fully described in U.S. Pat. No. 3,728,852, to which reference may be made for a more detailed description of the structure and function thereof, if desired.

If the yarn extending between package 20 and ring flange 18' defines too great an angle with the horizontal, as would sometimes be the case if matters were left purely to chance, traveler 16 will likely not mount and pass into threaded engagement with the yarn when pro-

pelled about flange 18'. To avoid this undesirable result U.S. Pat. No. 3,628,320 teaches allowing limited rotation of the yarn package in a winding direction subsequent to the retrieval of yarn therefrom, and prior to attempted performance of the traveler-threading step. In accordance with the present invention, this procedure need not be followed, since yarn deflecting means are provided to so position the yarn, when required during the traveler threading step of each piecing operation performed by the piecing apparatus, in a manner favorable to its mounting by the traveler.

Referring now particularly to FIGS. 2-6, the yarn deflecting means of the present invention comprises a hook-like member 34 having a base section 36 fixedly secured in any suitable manner upon the forward and upper end portion of the elongate support arm 26' of yarn depressor member 26. A main body section 38 of member 34 first projects forwardly from base section 36 and arm 26', and then extends laterally therefrom in a generally rearward direction. Formed integrally with the free end of main body section 38 is a depending section 40 having a rounded lower end. The length of depending section 40 of member 34 is such that its lower end is at an elevation only slightly above that of flange 18' of spinning ring 18 when depressor 26 is in a lowered position of engagement with ring holder 19.

The function of yarn deflecting member 26 will now be explained with reference first to FIG. 2, which as noted previously shows assembly 12 approaching spinning ring 18 preparatory to performance of the traveler threading step of a piecing operation. As shown in FIG. 2, the length of yarn Y extending between package 20 and flange 18' of ring 18 lies to the left of depending section 40 of member 26 as section 40 passes, during advancement of assembly 12, closely adjacent to and across the top of ring flange 18' and into the interior of ring 18 (i.e., into the cylindrical space enclosed by a vertical projection of the ring). During further movement of assembly 12 toward its final traveler threading position shown in FIGS. 5 and 6, the aforesaid length of yarn Y will, if extending at an excessively large angle relative to the horizontal, be engaged intermediate its length and deflected from a linear condition by sections 38 and 40 of member 34. As is best shown in FIG. 6, engagement between yarn Y and the lower and generally horizontally extending edge of section 38 of member 34 deflects the yarn downwardly, such that the section Y' thereof adjacent to and inwardly of ring flange 18' is positioned at a relatively small angle in relation to the horizontal. Such angle is of course less than defined with the horizontal by the remaining yarn section Y'' adjacent package 20, and preferably is not in excess of approximately 20°. Engagement between yarn Y and depending section 40 of member 34 deflects the yarn laterally toward a point upon ring flange 18' circumferentially spaced, in the "downstream" direction of clockwise movement of traveler 16 about flange 18' during performance of the traveler threading step, from the point at which the yarn overlies flange 18'. As is best shown in FIG. 5, such lateral deflection causes yarn section Y' to define a smaller angle with ring flange 18' than the angle defined with the ring flange by the remaining yarn section Y''. With segment Y' of yarn Y positioned as aforesaid, it will be apparent that traveler 16 will reliably mount and pass into threaded engagement with the yarn overlying flange 18' when propelled about the flange and into engagement with

such yarn by emission of a blast of air from nozzle 24. It should be noted, in the latter connection, that sufficient clearance is provided between member 34 and ring flange 18', in the position (FIGS. 5 and 6) occupied by member 34 during performance of the traveler threading step, for member 34 to in no way impede entry of the blast of air from nozzle 24 into ring 18, and to in no way impede movement of the air or of traveler 16 about ring flange 18'.

Following performance of the traveler threading step and during the thereafter ensuing retractive movement of assembly 12 away from package 20 and ring 18, the yarn previously deflectingly engaged by member 34 passes downwardly to and from the rounded lower end of its section 40.

While the benefits realized from member 34 are due primarily to the downward deflection of yarn Y, when required, by the lower edge of its section 38, they are also attributable in part to the yarn's lateral deflection by section 40 of member 34. Additionally, such lateral deflection of the yarn tends to minimize the small additional stress imposed upon the yarn by member 34.

During some piecing operations performed by the piecing apparatus, the length of yarn Y established between package 20 and ring flange 18' likely will not extend at an excessively large angle (e.g., more than approximately 20°) relative to the horizontal. During some such piecing operations, the yarn may not be engaged by either section 38 or section 40 of member 34, in which event even the aforesaid small amount of additional stress will not be imposed upon the yarn. During other such piecing operations, while the vertical angularity of the yarn may not be so excessive as to require or undergo correction by section 38 of member 34, lateral deflection of the yarn by section 40 of member 34 will still occur. This is not undesirable since, as noted previously, the yarn's lateral deflection does facilitate successful performance of the traveler threading step to some extent.

While a preferred embodiment of the invention has been specifically shown and described, it is to be understood that this was for purposes of illustration only, and not for purposes of limitation, the scope of the invention being in accordance with the following claims.

That which is claimed:

1. In combination with an automatic yarn piecing apparatus servicing a textile spinning machine, including a spinning ring having a traveler flange encircling a yarn collection package, said apparatus including yarn positioning means for establishing a length of yarn extending from said package to and across said flange of said spinning ring, and traveler threading means for moving a traveler about said ring flange and onto said yarn extending across said flange, the improvement comprising:

yarn deflecting means for engaging said length of yarn at a location thereon intermediate said package and said ring flange and at desired times during operation of said traveler threading means, and for deflecting a section of said yarn adjacent to and inwardly of said spinning ring flange into a position favorable to the mounting of said yarn by said traveler upon movement thereof about said ring flange by said traveler threading means.

2. The improvement as in claim 1, wherein said deflecting means is means for deflecting said yarn section downwardly to define an angle with the horizontal

which is smaller than the angle defined by the remaining section of said length of yarn adjacent said package.

3. The improvement as in claim 1, wherein said deflecting means is means for deflecting said yarn section generally laterally toward a point on said ring flange circumferentially spaced from the point at which said yarn crosses said flange, so as to cause said yarn section to define an angle with said ring flange smaller than the angle defined by the remaining section of said yarn adjacent said package.

4. The improvement as in claim 1, wherein said traveler threading means includes nozzle means for, at said desired times, creating a circular movement of air about the inner surface of said ring for moving said traveler about said ring flange, and wherein said yarn deflecting means is spaced from said ring to permit said movement of said air and said traveler about said ring in an unobstructed manner.

5. The improvement as in claim 2, wherein said yarn deflecting means comprises a generally hook-like member having a generally horizontally extending section for said downward deflecting such that said yarn section defines said smaller angle, and further having a downwardly depending section for deflecting said yarn section laterally toward a point on said ring flange circumferentially spaced from the point where said yarn crosses said flange.

6. The improvement as in claim 1, wherein said yarn positioning means includes a yarn depressor member engageable during operation of said traveler threading means with said spinning ring exteriorly thereof for securing said yarn in position across said flange, and wherein said yarn deflecting means is carried by said yarn depressor member and projects therefrom into said spinning ring during said operation.

7. The improvement as in claim 6, wherein said yarn positioning means further includes yarn retrieving means for retrieving yarn from said package and extending the same outwardly from said package and beyond said spinning ring above said ring flange, and means mounting said yarn depressor member for moving it downwardly into engagement with the yarn extending between said package and said spinning ring above said ring flange, and thereafter for moving it forwardly into engagement with the exterior of said spin-

ning ring, and wherein a part of said yarn deflecting means is moved by said mounting means inwardly of said spinning ring to a yarn deflecting position with said forward movement of said depressor member.

8. The improvement as in claim 7, wherein said yarn deflecting means comprises a generally hook-like member having, in the operative position thereof, a generally horizontally extending portion having a free end, and a downwardly extending portion depending from said free end, the lower end of said depending portion being closely adjacent the elevation of the top of said flange.

9. The improvement as in claim 8, wherein said traveler threading means includes nozzle means for, at said desired times, creating a circular movement of air about the inner surface of said ring for moving said traveler about said ring flange, and wherein said yarn retrieving means includes a suction head adapted to apply yarn retrieving suction forces to said package, and further wherein said yarn deflecting means is spaced from said ring to permit said movement of said air and said traveler about said ring and application of said suction forces to said package in an unobstructed manner.

10. In combination with an automatic yarn piecing apparatus servicing a textile spinning machine including a spinning ring having a traveler flange encircling a yarn collection package, said apparatus including pneumatic traveler threading means for pneumatically moving a traveler about said ring flange and onto a segment of yarn carried by said package and extending therefrom into overlying engagement with said flange, the improvement comprising:

yarn positioning and deflecting means carried by said apparatus and engageable with said segment, at a location thereon intermediate said package and said ring flange and at desired times during operation of said traveler threading means, for positioning and deflecting said segment relative to said flange at an angulation favorable to mounting of said segment by said traveler upon said flange upon movement of said traveler thereabout by said traveler threading means.

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