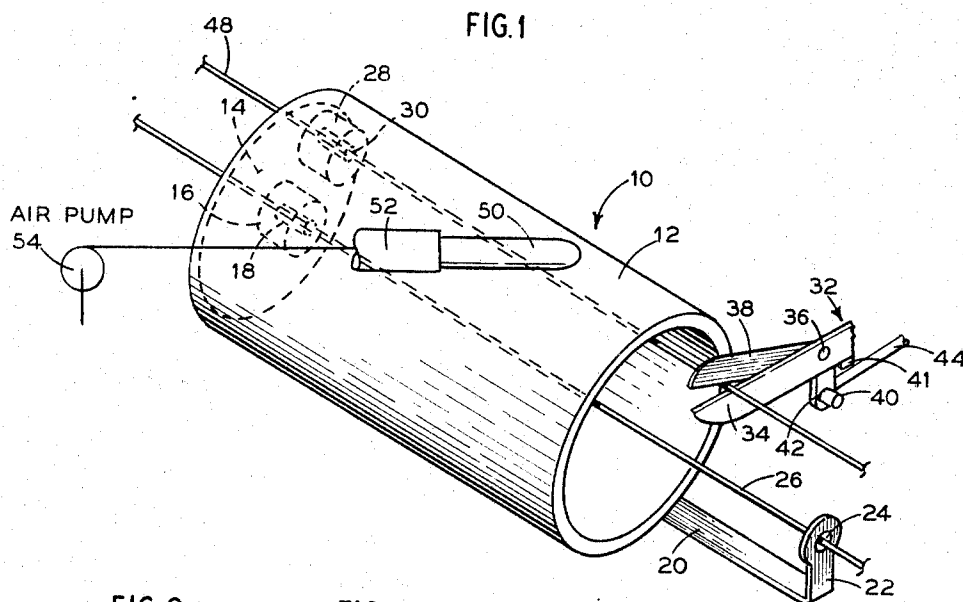
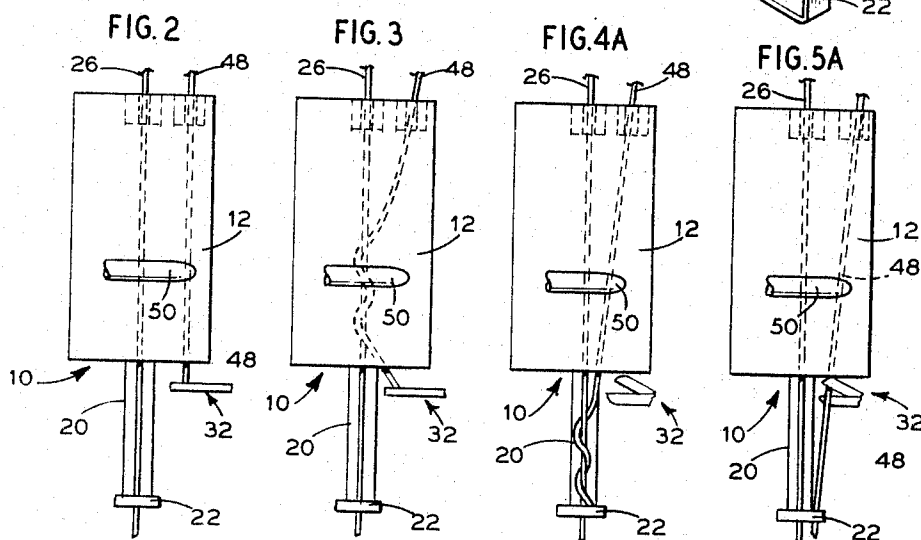
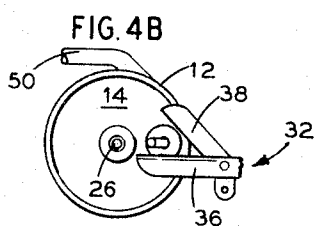
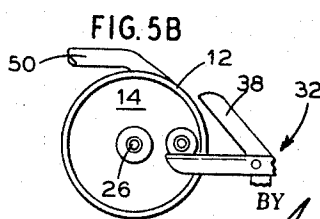


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 APPARATUS AND METHOD FOR CONNECTING A YARN TO
 AN EXISTING YARN
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APPARATUS AND METHOD FOR CONNECTING A YARN TO AN EXISTING YARN

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This invention relates generally to an attachment for a knitting machine and more particularly, pertains to an apparatus and method for adding one yarn to another yarn in a knitting machine.

In a knitting machine it is essential that the yarn or thread fed to the needles be continuous. Thus, if a reel or bobbin of yarn is used up and is not immediately replaced, holes may appear in the finished fabric. Additionally, it is often desirable to add one thread to another thread or yarn in a knitting machine for design purposes or as a reinforcing thread. While devices have been provided for adding one yarn to another to maintain a continuous thread or to provide a reinforcing yarn for the main yarn, these devices have usually been complicated and have required constant maintenance.

The desideratum of the present invention is to provide an apparatus for adding one yarn to an existing yarn in a knitting machine that is simple and compact in construction, and is easy to maintain.

Another object of the present invention is to provide an apparatus of the type described that is compatible for use in conjunction with existing knitting machines.

The above and other objects and advantages of the apparatus of the present invention will become more apparent from a consideration of the following detailed description when taken in conjunction with the drawings, in which,

FIG. 1 is a perspective view, to an enlarged scale, of an apparatus constructed according to the present invention;

FIG. 2 is a top plan view of the apparatus shown in FIG. 1 with parts removed and with the reinforcing yarn in its clamped position;

FIG. 3 is a top plan view similar to FIG. 2 illustrating the reinforcing yarn being twisted around the main yarn;

FIG. 4A is a top plan view of the apparatus shown in FIG. 1 with parts removed, illustrating the position of the reinforcing yarn just after its release from the clamp;

FIG. 4B is a front elevational view of the apparatus shown in FIG. 4A, with the forward yarn guide removed;

FIG. 5A is a top plan view of the apparatus shown in FIG. 1, with parts removed, illustrating the path of the reinforcing yarn during reinforcement of the main yarn; and

FIG. 5B is a front elevational view of the apparatus shown in FIG. 5A with the forward yarn guide removed.

The apparatus of the present invention is designated generally by the numeral 10 in the figures and includes a hollow open-ended circular sleeve 12 having a rear wall 14. The sleeve 12 is adapted to be mounted on a knitting machine (not shown) by appropriate mounting means, such as a bracket (not shown). Provided on the rear wall 14 is a forwardly extending coaxial bushing 16 having a central through bore 18. An arm 20 extends laterally forwardly, from the front edge of the sleeve 12 for a predetermined distance and is provided with an upstanding leg 22 having a through aperture 24 therein; the axis of the aperture 24 is in alignment with the axis of the bore 18. The bushing 16 and the leg 22 provide respective rear and forward main yarn guides. Accordingly, a main yarn or thread extends from a bobbin (not shown) or similar source of yarn through the bore 18, the sleeve 12 and the aperture 24, and is connected to one of the needles (not shown) of an associated knitting machine. Thus, the

yarn 26 extends substantially along the axis of the sleeve 12 and is in sliding engagement with the bore 18 and the aperture 24.

A forwardly extending bushing 28, radially offset with respect to the bushing 16, is similarly provided on the rear wall 14 of the apparatus 10. A through bore 30 is provided in the bushing 28. The bushing 16 serves as a rear reinforcing yarn guide. A cutter and clamping assembly, designated generally by the numeral 32, is positioned adjacent the open end of the sleeve 12. The cutter and clamping assembly 32 includes a stationary transversely extending blade 34 having an upper cutting edge that is positioned essentially in alignment with the axis of the bore 30. The blade 34 may be connected directly to the sleeve 12 by appropriate means (not shown), or the blade 34 may be connected to a portion of an associated knitting machine so that the blade assumes the position noted above. Pivotally connected to the stationary blade 34 by a pivot pin 36 is a movable blade 38 having a lower cutting edge. Depending from and integral with the blade 38 is a foot 40 having an aperture 42. Received within the aperture 42 is an operating rod 44. A forwardly projecting stop 41 is provided on the foot 40 and it is adapted to engage the under edge of the blade 34 when the blades are in superposed relation to limit the downward movement of the blade 38 about the pin 36. Thus, when the rod 44 is moved toward the left, as taken in FIG. 1, the blade 38 is rotated clockwise about the pin 36 and the blades 34 and 38 separate. When the rod 44 is moved toward the right, as taken in FIG. 1, the blades 34 and 38 close until the stop 41 engages the blade 34.

The assembly 32 terminates short of the main yarn 26 (FIGS. 4B and 5B) and the blades are sized and positioned to clamp a reinforcing yarn 48 therebetween when the assembly is in the closed position, as shown in FIG. 1. The reinforcing yarn 48 extends from a source of yarn (not shown) through the bore 30 in sliding engagement therewith and the sleeve 12, in spaced relation to the yarn 26, and it is clamped between the blades 34 and 38.

A hollow conduit 50 is mounted on the wall of the sleeve 12 with a passage of the conduit communicating with the interior of the sleeve at a point above and to the left of the reinforcing yarn 48. The conduit 50 is connected to a source of compressed air 54 by flexible tubing 52. The conduit is positioned so that the air exiting from the passage will traverse a circular path in the sleeve 12 (i.e., there will be a clockwise flow of air as viewed from the open end of the sleeve).

In normal operation, the main yarn 26 is fed directly to a needle of an associated knitting machine through the apparatus 10. Thus, the yarn 26 moves forwardly through the apparatus in the conventional manner. The end of the reinforcing yarn 48 is clamped in the assembly 32 and it is in spaced relation to the yarn 26 (FIG. 2). When it is desired to add the reinforcing yarn 48 to the main yarn 26 a blast of compressed air is sent through the conduit 50. The force of the circular flow of air in the sleeve 12 causes the reinforcing yarn 48 to similarly traverse a circular path and, accordingly, the yarn 48 wraps itself around the main yarn 26 (FIG. 3). It is to be noted that there is normally sufficient slack in the reinforcing yarn 48 so that the reinforcing yarn may be intertwined with the main yarn 26.

Immediately after the yarns 26 and 48 are entwined, the rod 44 is moved to left thereby to separate the blades 34 and 38 of the assembly 32 and release the end of the reinforcing yarn 48. Thus, the yarn 48 is free to move and, since the reinforcing yarn is now entwined with the main yarn 26 (FIG. 4A), the yarn 48 will similarly move forwardly through the apparatus 10 and will follow the same path as the main yarn from the apparatus 10 to the associated knitting machine.

The blades 34 and 38 of the assembly 32 and the leg 22 of the forward main yarn guide are positioned so that after the entwined sections of the yarns 26 and 48 pass through the aperture 24, the yarn 48 will be positioned between the open blades 34 and 38 of the assembly 32 (FIGS. 5A and 5B). Accordingly, if it is desired to halt the supply of the reinforcing yarn 48 to the associated knitting machine, the rod 44 is moved toward the right, as taken in FIG. 1, thereby rotating the blade 38 counter-clockwise to cut the yarn 48 and clamp the end thereof between the blades of the assembly 32. If it is desired to resupply the reinforcing yarn at a later time, the above described operations may be repeated.

Accordingly, apparatus has been provided for adding one yarn to an existing yarn which is simple in construction and which is easy to operate.

While a preferred embodiment of the invention has been shown and described herein it will be obvious that numerous omissions, changes and additions may be made in such embodiment without departing from the spirit and scope of the present invention. For example, the rear wall 14 may be eliminated and radially extending members having appropriate bores may be connected to the rear edge of the sleeve 12 to respectively be utilized as the rear main yarn and rear reinforcing yarn guides.

What is claimed is:

1. Apparatus for adding a reinforcing yarn to a main yarn comprising

a hollow sleeve having a front and a rear end,
first guide means associated with said sleeve for guiding the main yarn through said sleeve,
second guide means associated with said sleeve for guiding the reinforcing yarn through said sleeve in normally spaced relation to the main yarn,
clamping means positioned adjacent to the front end of said sleeve for releasably retaining the reinforcing yarn,
and pneumatic means connected to said sleeve operable to produce a flow of fluid in a predetermined direction in said sleeve for entwining the reinforcing yarn about the main yarn.

2. Apparatus as in claim 1, wherein said clamping means comprises a fixed member and a movable member movable between a closed position wherein the reinforcing yarn is clamped between said members and an open position wherein the reinforcing yarn is released, said fixed and movable members being positioned so that the rein-

forcing yarn normally extends between the members when the movable member is in the open position and the reinforcing yarn is connected to the main yarn.

3. Apparatus as in claim 2, wherein said fixed and movable members are provided with cutting edges for cutting the reinforcing yarn when the movable member is moved toward the closed position.

4. Apparatus as in claim 1, wherein said sleeve includes a rear wall, said first guide means including a coaxial bushing on said rear wall having a central through bore which slidably receives the main yarn therethrough, and a leg adjacent to the front of said sleeve having an aperture therethrough in alignment with the bore which receives the main yarn therethrough in a sliding engagement and means connecting the leg to the front of said sleeve so that said leg is spaced from the front edge of said sleeve by a predetermined distance.

5. Apparatus as in claim 1, wherein said pneumatic means includes a conduit connected to said sleeve and having a passage communicating with the hollow interior of said sleeve, said conduit being positioned to direct a circular flow of air about the interior of said sleeve when the pneumatic means is operated to entwine the reinforcing yarn about the main yarn.

6. A method of adding a reinforcing yarn to a main yarn comprising

threading the main yarn and reinforcing yarns through a sleeve in spaced relation to each other,
clamping the end of the reinforcing yarn,
directing a circular flow of a fluid under pressure in said sleeve to entwine the reinforcing yarn about the main yarn,
and releasing the main yarn.

7. The method of claim 6, including the further steps of cutting the reinforcing yarn when it is desired to cease reinforcing the main yarn,
and reclamping the reinforcing yarn.

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