

Dec. 25, 1962

L. B. FREEMAN
YARN HANDLING APPARATUS

3,070,052

Filed Dec. 16, 1959

2 Sheets-Sheet 1

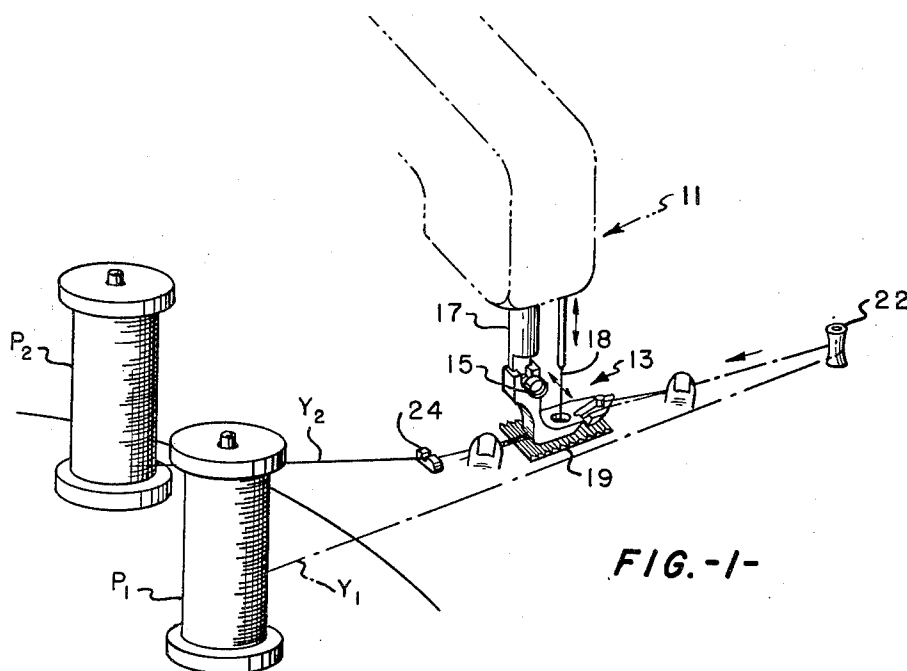


FIG. -1-

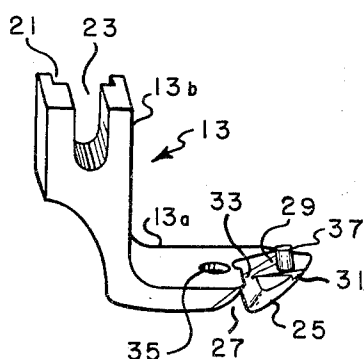


FIG. -2-

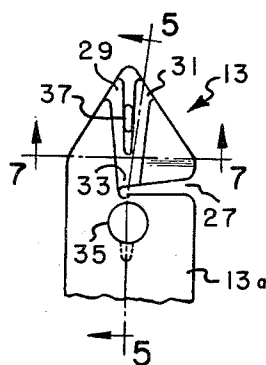


FIG. -3-

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2 Sheets-Sheet 2

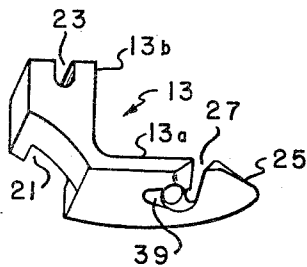


FIG. -4-

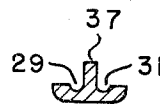


FIG. -6-

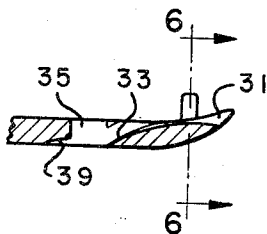


FIG. -5-

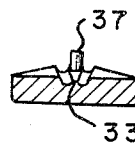


FIG. -7-

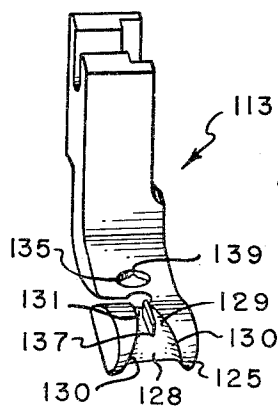


FIG. -8-

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3,070,052

YARN HANDLING APPARATUS

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Filed Dec. 16, 1959, Ser. No. 860,013

8 Claims. (Cl. 112—235)

This invention relates to an improvement in the uniting of strandular textile material, and more particularly to an improved sewing machine foot and method particularly adapted to facilitate the sewing together of two ends of strandular textile material, such as tire cord, etc.

In the textile arts, it is a common problem to unite two ends of yarn or other strandular material together. The commonly employed method of uniting these ends of yarn is by tying the ends together in a knot, either by hand or by machine. This method is a serious detriment in many operations due for one reason to the fact that the junction of the two yarns at the knot is only of the order of 30–50% of the strength of the yarn itself, depending upon the particular knot which is tied, and the material of which the strands are made. Another difficulty arising from these knots is the fact that a substantially larger lateral cross section is provided by these knots than is the lateral cross section of the yarn itself.

It is an important feature and advantage of the present invention to provide a unique method and apparatus for uniting two yarn ends without the use of a knot and with a tensile strength at the joint which is of the order of 90–98% of the normal tensile strength of the yarn per se.

It is a further feature of this invention that two ends of yarn may be united together according to the invention through the employment of a modified sewing foot constructed according to the invention on a conventional sewing machine.

Still other features and attendant advantages will become apparent to those skilled in the art from a reading of the following detailed description of an illustrative embodiment of the invention, taken in conjunction with the accompanying drawings wherein,

FIGURE 1 is a general schematic illustration in perspective of one physical embodiment according to the invention.

FIGURE 2 is an enlarged orthographic view in more detail of the improved sewing machine foot of FIGURE 1.

FIGURE 3 is a fragmentary view in plan of a portion of the foot of FIGURES 1 and 2.

FIGURE 4 is a further orthographic view of the foot illustrating in more detail the bottom configuration.

FIGURE 5 is a fragmentary section view on line 5—5 of FIGURE 3.

FIGURE 6 is a section view on line 6—6 of FIGURE 5.

FIGURE 7 is a section view on line 7—7 of FIGURE 3.

FIGURE 8 is a front orthographic view of a foot employing a modified construction according to the invention.

Referring now in detail to the figures of the drawings the invention is illustrated in combination with a sewing machine 11 of the conventional type employing a novel presser foot 13. As in conventional sewing machines the presser foot 13 is preferably removably supported as by a set screw 15 on a vertical presser bar 17 which is adapted to be selectively raised and lowered in a con-

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ventional manner as by a manual control lever (not shown). Also, disposed in the base of the sewing machine beneath the presser foot is a conventional saw-toothed vertically and laterally reciprocable material advancing member 19 adapted to be moved in a conventional manner for advancing the material to be sewn together as by any suitable conventional mechanism, not shown.

The present invention resides more particularly in an improved method of uniting yarn ends and to the improved presser foot 13 for facilitating the accomplishment of the use of this method. The improved presser foot may have a side slot 21 formed therein for vertically adjustable engagement with the presser bar 17 of the sewing machine 11, and a screw receiving lateral slot 23 open at the top and connecting with the side slot 21 for receiving a set screw for the purpose of removably and adjustably securing the presser foot to the presser bar of a sewing machine.

The presser foot 13 further includes a lateral foot section 13a formed integrally with and extending laterally from the vertical presser bar engaging section 13b. This laterally extending foot section 13a may have an upwardly smooth curved outer free end 25, although such is neither necessary nor desirable for the purpose of the present invention, as will become apparent from the subsequent description of the method according to the invention. The present embodiment is illustrated with such an upwardly curved lower end surface for the purpose of illustrating the practice of the present invention through the modification of a conventional presser foot. In those instances where it is not necessary to modify presently employed presser feet in order to practice the invention and where a complete foot redesign is feasible, it is more desirable that the upper end surface of the presser foot be provided with a smooth downwardly curved or sloped end surface 125 as shown in the modification of FIGURE 8, rather than having the lower end surface be smoothly curved upwardly. The reason for this preferred latter configuration is that according to the method of the invention the strandular material is fed to the presser foot over the top of the free end of the foot section 13a as distinguished from being fed beneath the bottom of the free front end of the foot section as in the conventional employment of a presser foot on a sewing machine.

Formed in one lateral side of the presser foot adjacent a vertically extending needle-receiving aperture is a lateral thread-up slot 27 the bounding sides of which extend downwardly and rearwardly from the top surface to the bottom surface of the foot section 13a. Connecting with this laterally extending rearwardly and downwardly sloping slot 27 is a pair of yarn guiding grooves 29, 31 formed on the upper surface of the foot extension and extending between the lateral slot 27 and the outer free end of the foot section 13a. An important aspect of these guide grooves 29, 31 is their convergence inwardly as they approach the lateral guide slot 27, and their convergence to provide a common guide slot 33 for the two ends of yarn as the yarn ends proceed therethrough to and beneath the needle-receiving aperture 35.

Disposed between the two converging guide grooves 29, 31 is an upstanding yarn separator pin 37 formed or otherwise suitably secured on the upper surface of the foot between the outer free end and the side slot 27. This upstanding pin 37 serves to assure initial separation of the two yarn ends as they proceed through the guide grooves in converging relation to the sewing position beneath the needle aperture 35, thereby preventing the

passage of the yarn ends to the sewing area beneath the needle-receiving aperture in an intertwisted condition. While the preferred embodiment employs two guide grooves 29, 31 formed in the upper surface of the foot together with a separator pin 37, it will be apparent that one may in some instances employ only two converging grooves without the separator pin, since by forming the grooves of sufficient depth the ridge formed between the grooves may effectively form a separating and twist-stopping element. Also, a single groove 128 with converging side walls 130 may be employed (as shown in FIGURE 8) with a pin 137 or other separating element disposed in and extending up from the center of the groove, thus effectively forming two converging guideways 129, 131 for the two yarn ends.

There is further provided a relatively small, preferably tapered, guide groove 39 on the bottom of the foot and extending rearwardly of the needle aperture in order to facilitate guiding and holding together of the yarn ends as they proceed beneath the needle aperture. This guide groove 39 is complementary to or preferably of slightly smaller width than the sum of the lateral thicknesses of the two yarn ends Y_1 and Y_2 in order to exert a lateral pressure on the yarns tending to press them together as they proceed beneath the needle aperture. While this guide groove is illustrated as extending for only a very short distance beyond the needle aperture, it will be apparent that such may be extended for a further distance if such is desired.

In carrying out the method according to the invention the operator takes two or more ends of yarn or other textile strandular material, as from two yarn packages P_1 and P_2 , and places them in parallel side-by-side relation and preferably extending in opposite directions. The yarn ends Y_1 and Y_2 may preferably be guided for alignment with the foot and needle-receiving aperture as by suitably disposed guides 22 and 24. The two ends of yarn Y_1 and Y_2 are placed respectively in the two guideways 29, 31 or 129, 131 effectively formed on opposite sides of the separator pin 37 or 137, with the free end of one yarn and the long end of the other yarn extending beneath and somewhat behind the needle aperture 35 or 135 and the bottom guide groove 139. The presser foot 13 or 113 is then lowered into sewing position and the sewing machine is started in the conventional manner. The material-advancing element 19 engages the portion of the yarn ends extending beneath the presser foot and through its conventional oscillating movement progresses the yarn ends Y_1 and Y_2 incrementally beneath the needle-receiving aperture 35 or 135. The needle 18 is reciprocated in a vertical direction with a lateral side-to-side movement by any desired mechanism of conventional construction (not shown) in order that the needle may engage and pierce alternately one and then the other of the strands of yarn as they are progressed beneath the needle aperture. Thus the yarn ends Y_1 and Y_2 are sewed together in substantially parallel side-by-side continuous relation with a zigzag stitch, employing any suitable stitching yarn as may be desired, this stitching yarn being preferably of smaller diameter than the yarn ends being sewn together. The two ends are progressed beneath the needle aperture until the desired length of the two strands has been sewn together. A suitable sewn together length for tire cord is of the order of 1" to 2", although it will be apparent that the desired length to be sewn together will vary with the particular end use and material involved.

While the invention has been illustrated and described only with reference to two physical embodiments constructed according to the invention, it will be readily apparent to those skilled in the art that various modifications and improvements may be made without departing from the scope and spirit of the invention. It is accordingly to be understood that the invention is not to be limited

by the specific illustrative embodiments but only by the scope of the appended claims.

That which is claimed is:

1. Apparatus for sewing together two ends of yarn or the like comprising a sewing foot having a needle-receiving aperture formed therein and extending there-through, a needle, means for reciprocating said needle into and out of said needle-receiving aperture in a lateral side-to-side oscillating relation to form a zigzag stitch pattern, and material advancing means disposed beneath said foot and adapted to engage material between said foot and said material advancing means, said foot comprising a laterally extending section having said needle-receiving aperture formed therein, a guide pin disposed on the upper surface of said foot in spaced apart relation with said needle-receiving aperture, a guide slot connecting between the upper and lower surface of said foot section, said slot being disposed between said pin and said needle-receiving aperture, means for guiding two strands in separated relation past said pin and in converging relation downwardly through said slot and beneath said needle-receiving aperture, and means for guiding said strands away from said needle-receiving aperture in substantially parallel adjacent relation after sewing together of said strands by said needle.

2. Apparatus according to claim 1 wherein said slot has an inclined strand guiding portion disposed substantially in alignment with said pin and said needle-receiving aperture, the said downwardly inclined portion extending downwardly and rearwardly from the upper surface adjacent said pin and toward the lower end of said needle-receiving aperture.

3. Apparatus according to claim 2 wherein said means for guiding said strands together in a converging path comprises a pair of laterally converging grooves formed on the upper surface of said foot section, said pin being disposed between said grooves, and a groove formed on the under surface of said foot section and in connection with said needle-receiving aperture, said under surface groove being of smaller lateral cross sectional size than the lateral cross sectional size of the two strands to be guided through said upper surface grooves and sewn together, whereby said under surface groove exerts a lateral compressive force on each of said strands tending to move said strands toward and into contiguous side-by-side relation with one another.

4. Apparatus according to claim 1 wherein said foot section is in cantilever form and has an outer free end with a smooth upwardly and rearwardly curved end surface for guiding yarn onto the upper surface of said foot section.

5. An improved sewing foot for uniting yarn ends together in laterally side-by-side relation, comprising a member having a material-engaging foot section with a needle-receiving aperture formed therein and a bottom strand-engaging surface, a strand-guiding groove formed on said bottom surface of said foot section in alignment with said needle-receiving aperture, said groove having opposing lateral side walls, the inclination of one of said side walls being upwardly and laterally inwardly inclined toward the opposite side wall of said groove, said groove being free of downwardly extending protuberances between said lateral side walls and adjacent said needle-receiving aperture so as to permit said upwardly inclined side wall to bias two strands of yarn into laterally snug relationship to one another as they pass through said groove and past said needle-receiving aperture.

6. Apparatus according to claim 5 wherein both of said opposing side walls are upwardly and mutually inwardly inclined for pushing two strands of yarn toward one another in the vicinity of said needle-receiving aperture.

7. Apparatus according to claim 5 wherein said groove is tapered in converging fashion along its longitudinal extent.

8. Apparatus according to claim 7 wherein said groove is tapered in converging fashion as it extends rearwardly from said aperture.

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