T. HAHN.

ART OF KNITTING TUBULAR ARTICLES.

APPLICATION FILED MAY 9, 1917.

1,266,459

Patented May 14, 1918.

3 SHEETS—SHEET 1.

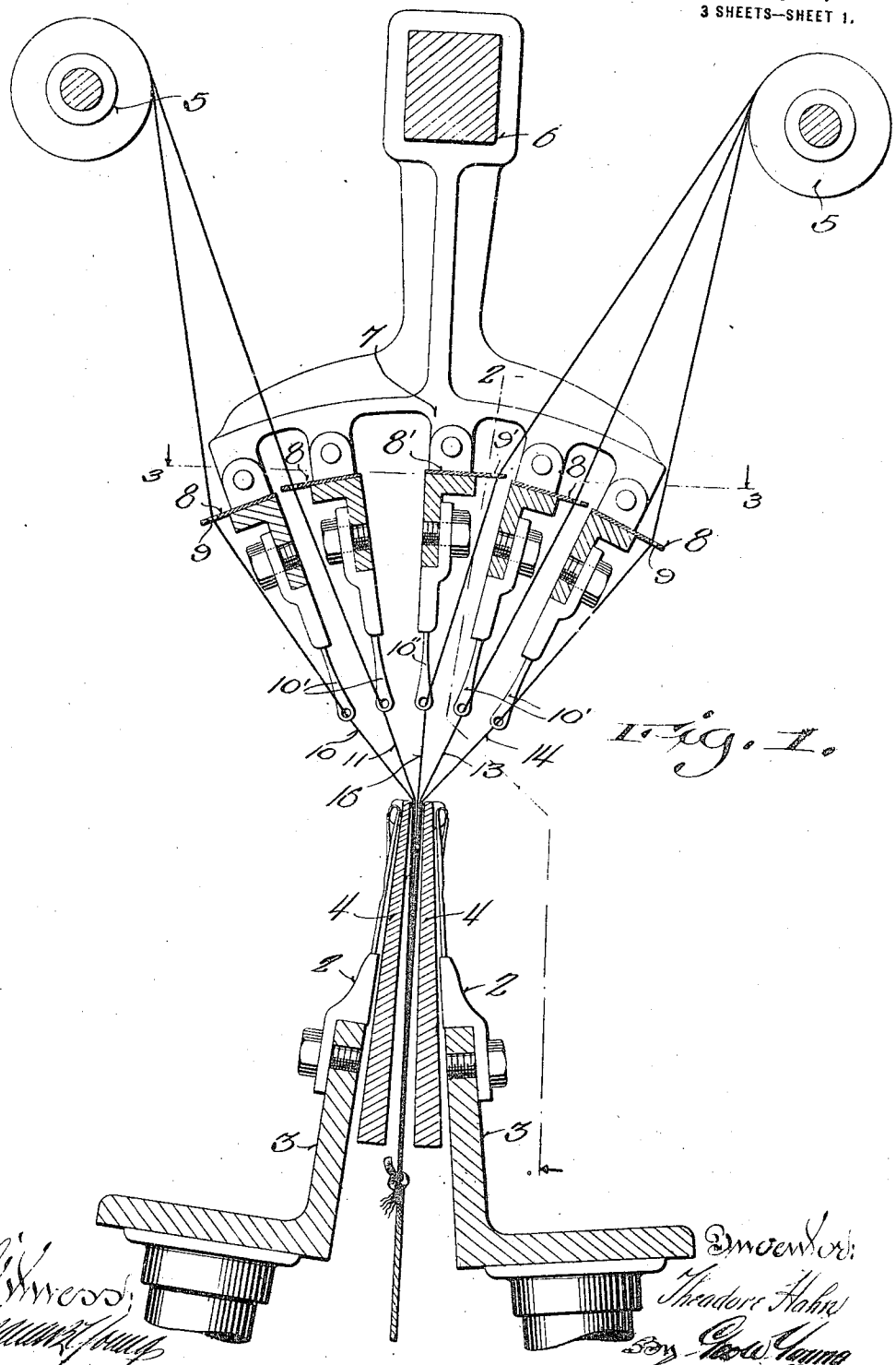

Fig. 1.

Witnesses:

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3 SHEETS—SHEET 2.

Fig. 2.

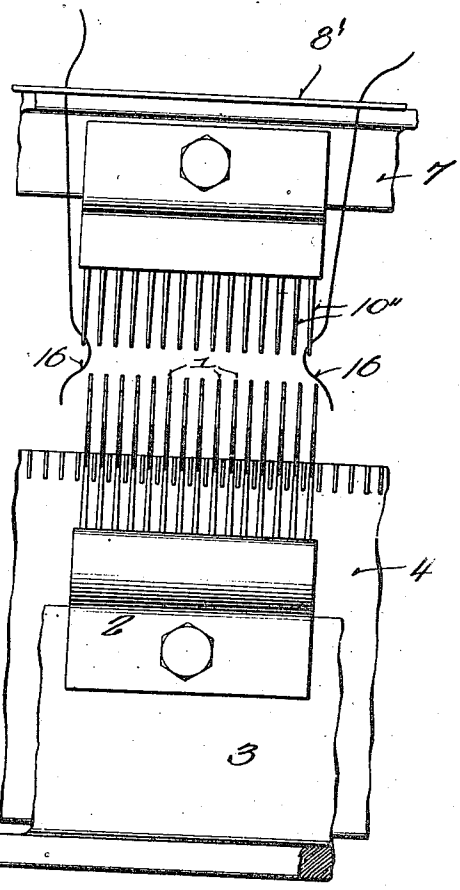
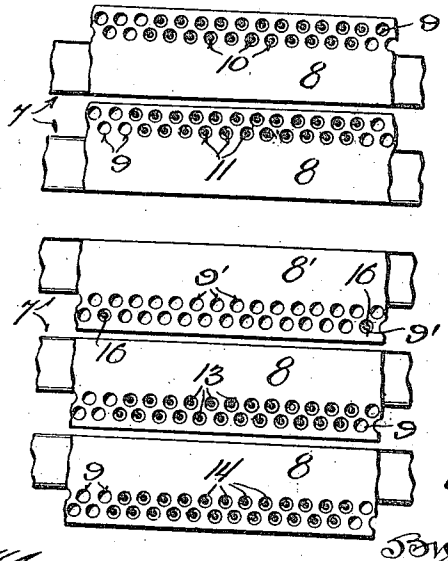


Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 4.

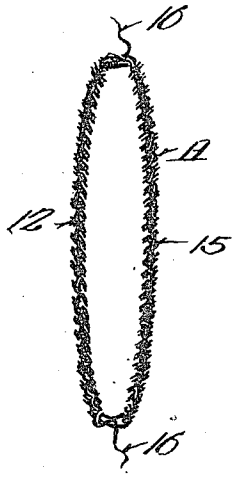


Fig. 5.

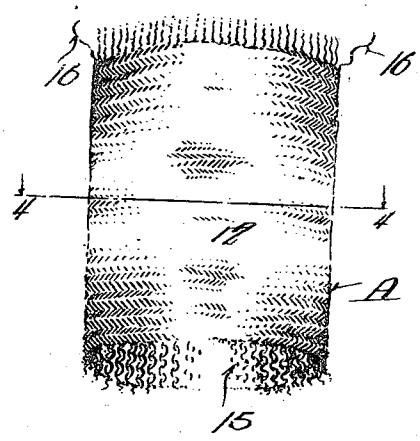
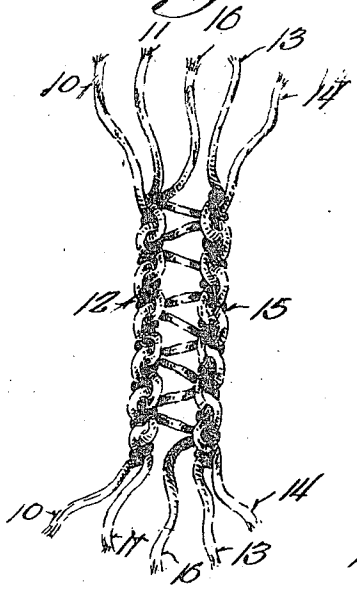


Fig. 6.



Witness:

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UNITED STATES PATENT OFFICE.

THEODORE HAHN, OF MILWAUKEE, WISCONSIN.

ART OF KNITTING TUBULAR ARTICLES.

1,266,459. Specification of Letters Patent. Patented May 14, 1918.

Application filed May 9, 1917. Serial No. 167,479.

To all whom it may concern:

Be it known that I, THEODORE HAHN, a citizen of the United States, and resident of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in the Art of Knitting Tubular Articles; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention relates to the art of knitting, more specifically to new and useful improvements in the processes of knitting on machines which are known in the trade as "flat" or "Rachel" machines.

Such machines as these are designed primarily for the knitting of fabrics which in their nature are flat throughout their length and breadth, although the size thereof is limited only by the size of the machine and the stitches of which the material is formed may be varied according to the type of article to be produced. Up to the present time it has been considered highly impractical and unprofitable to knit any other than flat objects on such machines, and so far as the inventor's experience extends no factory is at the present time attempting the manufacture of tubular or non-flat goods with this type of machine. In other words inventors and others familiar with the knitting art have found the non-flat goods knitted on "flat" or "Rachel" machines are inferior in workmanship and the means of improving the quality of such goods so unattainable that the use of such machines for the making of tubular articles never passed beyond the experimental stage.

The method of constructing tubular goods in the present as well as in the past, consists in using what is known as a circular machine, or in knitting flat pieces of material on the "Rachel" machine and sewing their edges together on an ordinary sewing machine. One means is substantially as efficient as the other, but relatively slow and expensive compared with the ordinary operation of the "flat" machine.

Therefore if the standard "Rachel" machine could be made to practically construct tubular and non-flat articles, it is obvious that with its greater speed, it would vary materially increase the per diem out-put and consequently lower the cost of production. Such is the object of the present invention in which the inventor has, by novel arrangement and utilization of parts, improved the "Rachel" machine to form tubular objects as will be hereinafter more particularly pointed out and claimed.

In the accompanying drawings:

Figure 1 represents a vertical cross sectional view through the portions of a standard "flat" knitting machine showing particularly the arrangement of the thread guides or carriers.

Fig. 2 is a detail longitudinal section taken on the plane of the line 2—2 of Fig. 1.

Fig. 3 is a horizontal section taken substantially on the line 3—3 of Fig. 1.

Fig. 4 is a transverse section through a tubular article knitted on a "Rachel" machine having its parts arranged in accordance with my invention, said section being on the line 4—4 of Fig. 5.

Fig. 5 is a perspective view of the tubular article shown in Fig. 4, and

Fig. 6 is a semi-diagrammatic view showing the manner of uniting the edges of two flat articles to construct a tubular one.

In the present application only so much of a standard "flat" or "Rachel" knitting machine has been illustrated to properly show the manner in which a tubular article may be knitted thereon. The usual methods of knitting on such a machine as this is very well known and therefore will not be particularly gone into.

However, the principal parts of the machine with which the present invention relates are the parts which carry the needles and those for feeding the yarn thereto. The needles 1 are the ordinary latch variety and are held in leads 2 which are disposed in longitudinal alinement and secured to the angle metal supporting bars 3 which are directly or indirectly, as the case may be, connected with means for vertically reciprocating the series of needles. In this type of machine two series of needles are provided, each being mounted on independently movable bars 3, and the work material which has been formed passes between the slays 4 which guide the needles during their reciprocative movement as shown in Fig. 1.

The yarn which is fed to the needles has been previously wound upon long spools 5, one of which is used for feeding the yarn to each series of needles and is disposed above the same as will be evident from the above mentioned figure. It is obvious that the spools 5 are disposed longitudinally of the machine and parallel to the series of needles,

and that the number of threads wound thereon depend upon the width and thickness of the articles to be knitted.

Between the two spools and parallel to the same is disposed a rocker shaft 6 which carries for oscillation a suitable number of supporting brackets 7 which have the yarn carriers 8 secured thereto. It is well known that the brackets 7 are caused by the rocker shaft 6 and a suitable cam acting on the latter to oscillate a greater or less amount with respect to the series of needles, and thereby form different stitches.

The formation of the different stitches is aided in machines of this character by longitudinal movement of the yarn carriers 8 which are flat strips of metal having longitudinally extending parallel rows of guide openings 9 therein through which the yarn is fed to the eyes in the ends of the sinkers 10′ which are also carried by the brackets and are attached thereto in the same or substantially the same manner as the needles 1 are secured to the bars 3. Such longitudinal movement of the yarn carriers 8 as well as the rocking of the shaft 6 is obviously performed in proper time to the vertical reciprocation of the needles 1 by the operation of cams (not shown) as it is customary in machines of this type. As shown in Fig. 2 the guides are adapted to be positioned between the needles when the latter rise upwardly and thereby force the yarn between the several needles.

By this arrangement it is obvious that two flat articles may be simultaneously knitted, one by each series of needles. I have found that articles of different thicknesses are constructed by combining different stitches and different numbers of yarns. In carrying out my invention I construct the sides of the article of two yarns or threads, the yarn carriers for these threads being disposed side by side as in Fig. 1, or as is also shown in Fig. 3. The threads 10 and 11 when knitted together form the side 12 of the article A shown in Figs. 4 and 5, while the other threads 13 and 14 are knitted together to construct the other side 15.

Referring to Fig. 5 it will be seen that each of the sides 12 and 15 is different in appearance on its opposite surfaces because of the dissimilarity of the form of stitches used. In other words the yarns 10 and 11 and the yarns 13 and 14 are so knitted together that one surface of the sides 12 and 15 is made up of stitches of one character and the other surface is fashioned of stitches of a different character. This difference in stitches results from the manner of taking on and casting off the yarn from the needles, that is to say when the yarn is taken on one form of stich is made, and when cast off a different type is formed. In the portion of the article illustrated more or less diagrammatically in said Fig. 5 the inside is formed of a stitch of one character while the outside is of a stitch of a different character. Such an arrangement combines tightness and durability with elasticity.

I unite the adjacent edges of the sides 12 and 15, which, if they were not connected, would form two flat strips of material of the same width. Therefore, an additional yarn carrier 8′ is disposed between the innermost pair of yarn carriers 8, and through two of the openings 9′ therein is threaded a pair of yarns which are used as binding threads 16 for connecting the corresponding edges of the flat pieces or sides 12 and 15 together. It is obvious that the width of the sides 12 and 15 may be varied by using different numbers of yarns 10, 11, 13 and 14. Regardless of the width of the flat pieces whose edges are to be connected, the binding threads 16 are spaced apart a distance substantially equal to such a width, therefore it is advisable to provide a plurality of openings 9′ in the yarn carrier 8′ and a plurality of sinkers 10″.

After the yarns and binding threads have been passed through openings in the carriers 8 and 8′ as shown in Fig. 3 and through the eyes of the sinkers 10′ and 10″ as in Figs. 1 and 2, the operation of the machine may be commenced, it having been assumed that the cam for actuating the rocker bar 6 has been adjusted to permit the proper oscillation of the brackets 7 for using five threads or yarns. In this simple manner the binding threads 16 are woven in and out of the edges of the sides 12 and 15 of the article A as the same are being knitted. Or in other words the corresponding edges of the sides are knitted together simultaneously with and by the same operations as are used in their formation. The construction of a portion of edges of the article A is shown on a large scale in Fig. 6, it being assumed, however, that the sides have been pulled apart to loosen the binding thread. In actual practice the edges would be as closely knitted as the main portions of the sides, although the stitch of the binding threads is different from the stitches formed in the threads 10, 11, 13 and 14.

I claim:

1. The herein described method of forming tubular knitted articles which consists in simultaneously knitting two flat objects, each having its opposite sides formed with stitches of different character, and simultaneously with the formation of the flat objects of knitting their corresponding edges together.

2. The herein described method of forming tubular knitted articles which consists in simultaneously knitting two flat objects from two sets of yarns each to form the opposite sides with stitches of different

character, and simultaneously with the formation of the flat objects of knitting their corresponding edges together.

3. The combination with a flat knitting machine, of a carrier bracket, a central yarn guide mounted on said bracket and having a binding thread aperture at each end, the distance between said apertures being substantially the diameter of the article to be knitted, a pair of yarn guide bars disposed on each side of said central yarn guide, each having a longitudinal series of yarn guides, a series of needles for coöperation with each of said pairs of yarn guide bars, and means for feeding an independent series of yarns to each guide bar of said pairs of yarn guide bars whereby to form two flat pieces of fabric having stitches of different character on each side, the outer needle at the end of each series of needles being adapted to cooperate with the binding thread passing through the adjacent thread aperture in said central yarn guide whereby to knit the corresponding edges of said flat pieces of fabric together to form a tubular article.

In testimony that I claim the foregoing I have hereunto set my hand at Milwaukee, in the county of Milwaukee and State of Wisconsin.

THEODORE HAHN.