May 23, 1950 C. R. ANDERSON 2,508,348

COURSE MARKER FOR TRICOT AND THE LIKE
FLAT-BED KNITTING MACHINES

Filed April 11, 1949 3 Sheets-Sheet 1

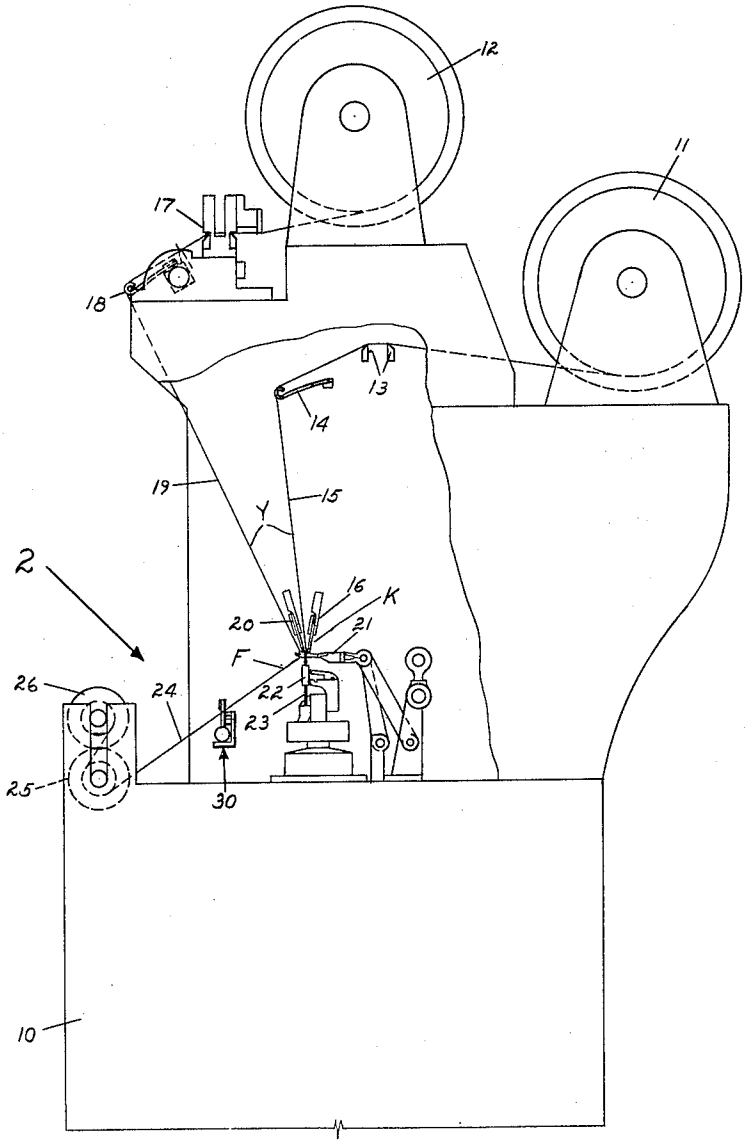


FIG. 1

INVENTOR.
CARROLL R. ANDERSON
BY Paul, Paul & Moore
ATTORNEYS

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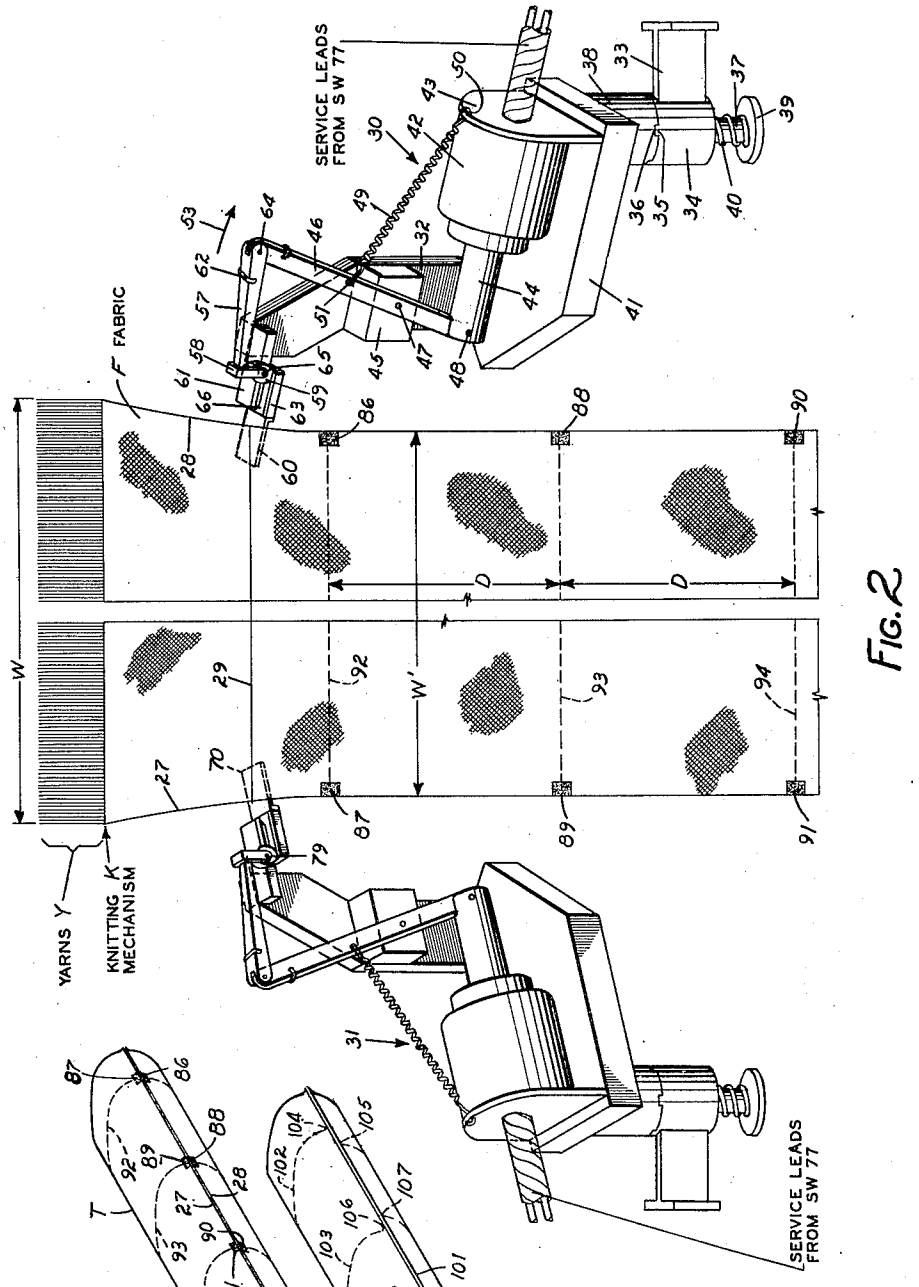


FIG. 2

FIG. 5

FIG. 6

INVENTOR.
CARROLL R. ANDERSON
BY Paul, Paul & Moore
ATTORNEYS

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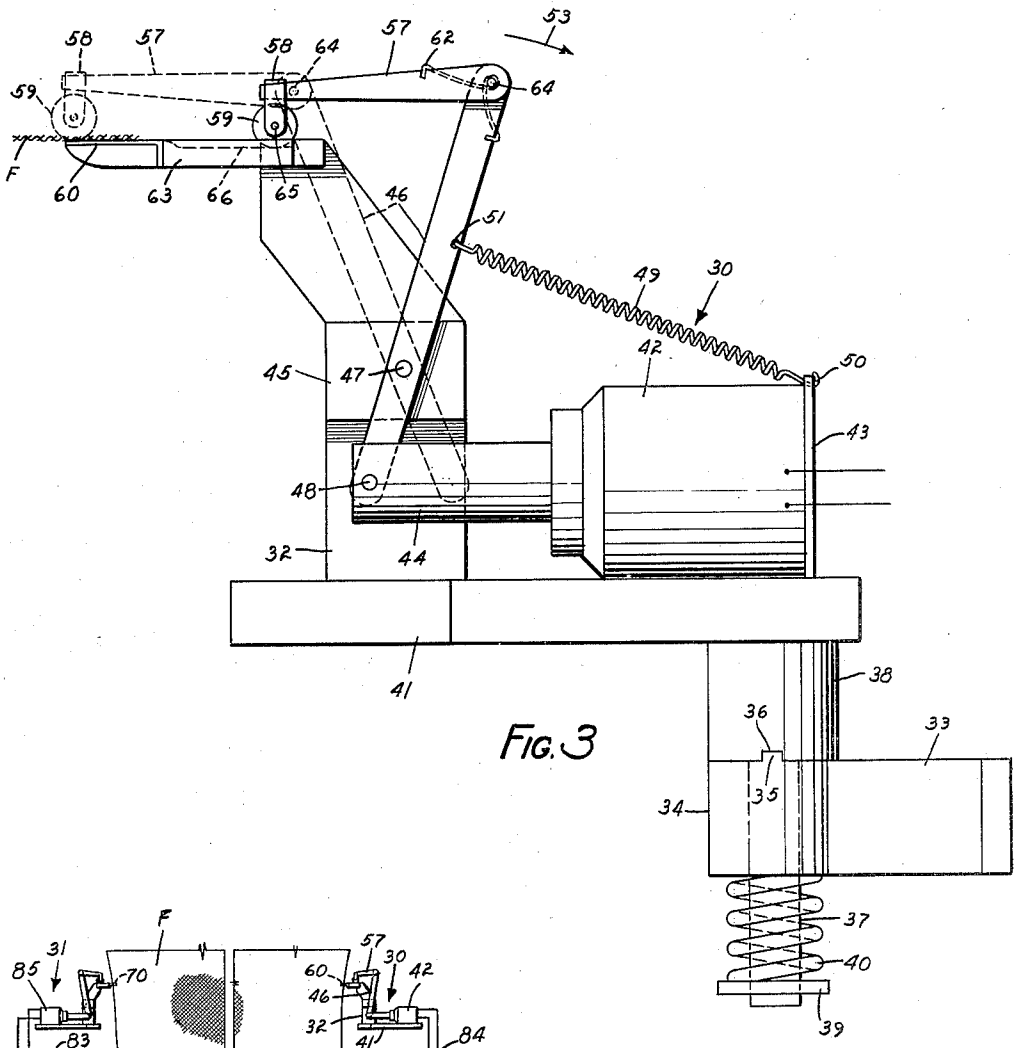


FIG. 3

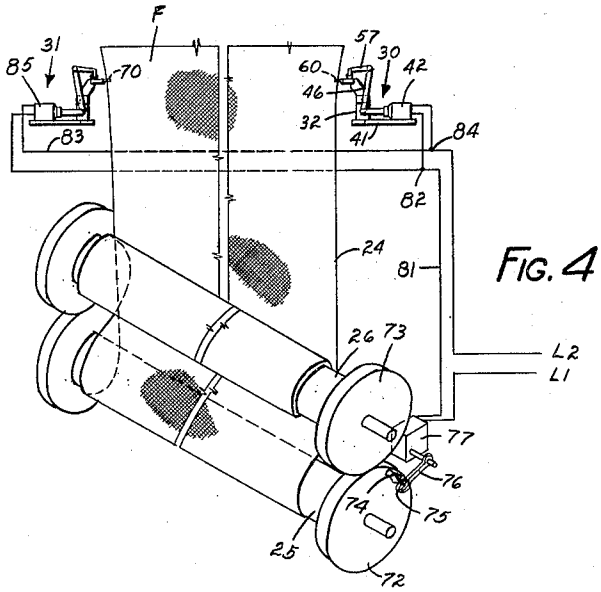


FIG. 4

INVENTOR.
CARROLL R. ANDERSON
BY Paul, Paul & Moore
ATTORNEYS

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COURSE MARKER FOR TRICOT AND THE LIKE FLAT-BED KNITTING MACHINES

Carroll R. Anderson, Minnetonka Beach, Minn., assignor to Munsingwear, Inc., Minneapolis, Minn., a corporation of Delaware

Application April 11, 1949, Serial No. 86,613

8 Claims. (Cl. 66—147)

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This invention relates to course markers for use in connection with flat bed knitting machines, such as the tricot knitting machine or Raschel knitting machine. In machines of this character, which are well known in the textile art, the fabric is knitted as a flat piece, as distinguished from a circular, tubular fabric. The flat bed knitting machines are widely used in the textile art for manufacturing knitted fabrics of acceptable design for use in the manufacture of undergarments, girdles and many other fabric garments.

In the knitting of flat fabrics on flat bed machines, such as the tricot or Raschel flat bed machines, the fabric after being knitted is very stretchy and can be pulled and stretched either crosswise of the length of the fabric or lengthwise of the fabric and can be pulled or stretched along either edge without measurably stretching the opposite edge, due to the great flexibility of the knitted fabric itself. Furthermore, in examining many of the finer gauge fabrics, it is almost impossible to trace the course of any particular row of knitted stitches across the fabric, due to the fineness of the thread used in knitting the material.

In the usual manufacturing operation after the fabric has been knitted as a flat sheet, it is folded so as to bring the opposite edges of the flat fabric into juxtaposition and the edges are then stitched so as to form the flat sheet into a tubular composite which is then subsequently manufactured into garments of varying designs.

In sewing the flat sheet of knitted fabric into a folded or tubular composite the operator must maintain the edges under some tension so as to produce a well stitched seam. In stitching the tubular composite from the flat knitted fabric the operator thus tensions both edges of the garment simultaneously as the folded composite is run through the edge stitching machine. Since the fabric itself is very elastic in all directions, it is easily possible for the operator to stretch one edge of the originally flat fabric more than the other and thus cause portions of the fabric to be stitched together in folded relation which are not of the same transverse lines knit across the fabric. In other words, a single line of knit for best results should be laid down so that the single lines at the edges of the fabric meet when the fabric is folded, but due to the stretchiness of the fabric this is almost impossible to obtain by visual inspection.

In order to provide some degree of control on the amount of stretching of the fabric and so as

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to allow corresponding knit lines across the fabric sewn together and thus produce a tubular composite of undeflected character, it has heretofore been customary for the operator of the knitting machine to use a marking pencil and to mark opposite edges of the fabric as near as possible simultaneously as the fabric is produced on the flat bed knitting machine. These hand methods of producing marks upon opposite edges of the fabric have been of some assistance in producing folded or tubular composites, but have been subject to the objection that the operator cannot ever produce an exactly simultaneous marking at opposite edges of the fabric due to the fact that the fabric is knitted very rapidly and also because the fabric is so wide and is knitted so fast that the marks cannot simultaneously be placed on the fabric by one operator.

It is an object of the present invention to provide a marking device for flat bed knitting machines so as to produce simultaneous marks on opposite edges of the fabric as a guide to subsequent fabrication of the flat knitted fabric into tubular or folded composites where the edges are sewn.

It is a further object of the invention to provide an automatic course marking machine which is not subject to the vagaries of operator control.

It is a further object of the invention to provide an automatic course marking machine capable of producing course marks simultaneously and at uniform intervals along opposite edges of the knitted fabric.

It is another object of the invention to provide an automatic course marker for flat bed knitting machines.

It is a further object of the invention to provide an automatic course marker for flat bed knitting machines, such as the tricot or Raschel types which are controlled entirely by the machine and are not subject to the vagaries of operator actuation.

Other and further objects of the invention are those inherent in the apparatus herein illustrated, described and claimed.

The invention is illustrated with reference to the drawings in which corresponding numerals refer to the same parts and in which

Figure 1 is a side elevational view of a representative type of flat bed knitting machine with certain parts removed for clarity of illustration;

Figure 2 is a front view in a somewhat downward direction, as indicated by the arrow 2 of Figure 1, showing the course markers of the instant invention, together with a portion of the

fabric, the central portion of the fabric shown in Figure 2 having been removed so as to permit an enlarged view for greater detail;

Figure 3 is a side elevational view of the course marker of the instant invention;

Figure 4 is a partially schematic view showing the wiring controls for the course marker of the instant invention, together with certain of the take-up rolls and metering rolls of the knitting machine;

Figure 5 illustrates a portion of tubular fabric sewn together and utilizing the course markers of the instant invention, whereas Figure 6 illustrates a portion of tubular fabric wherein no course markers are utilized and illustrating the stretch of the fabric producing thereby a non-uniform or warped tubular composite.

Referring to the drawing the flat bed knitting machine with which the instant invention is used is illustrated in Figure 1 wherein 10 shows the side frame members of the machine. The machine carries a pair of yarn rolls 11 and 12, each of which may be 5 to 6 feet in length, or even more, and representing many hundreds of yarn ends for each roll. The yarns used are very fine, even filamentous in character for many fine knitted fabrics. The details in the knitting machine need not be described here, since per se they form no part of the instant invention, it being sufficient to state that the yarn from roll 11 is carried through suitable mechanisms 13 and 14 and thence along course 15 and through the thread guides 16. The yarn ends from roll 12, which likewise may be many hundreds in number, travel from the roll 12 and thence through the mechanisms 17 and 18 constituting a part of the knitting machine, and then travel as parallel strands along the course 19 to the thread guides 20.

Referring particularly to Figure 1 the yarn ends 19 which pass through the thread guide 20 and the corresponding yarn ends which pass through the thread guide 16 are guided and controlled thereby and cooperate with a mechanism 21, which is known as a sinker mechanism, and with the needle mechanism 22—23 consisting of a needle body 22 and needle tongue 23. These various knitting mechanisms 16, 20, 21, 22 and 23, collectively designated herein by the letter K, serve to knit the yarn from the rolls 11 and 12 into a flat knitted fabric F which leaves the knitting mechanism K and proceeds as a flat knitted fabric F which moves along the course 24 to a tension roller 25 and thence, after passing over the tension roller, the fabric passes to a take-up roller 26 where the flat knitted fabric is wound up as a roll until the roll is full and ready to be removed from the machine. Along the course 24, at each edge of the fabric, there are positioned the course marking devices of the instant invention, of which device 30 is shown in Figure 1.

Referring to Figure 2 the yarn strands 19 and 15 from the rolls 11 and 12, collectively designated, reach the knitting mechanism K where the yarn strands are converted into a flat knitted fabric F extending across the width W of the machine. In Figure 2 the central part of the fabric has been eliminated from the drawing so as to permit a larger and clearer illustration of the course marking mechanisms 30 and 31, but it will be understood that the fabric is as wide as the machine ranging from 4 to 6 feet in width and even wider, depending upon the knitting machine being used. After leaving the knitting

mechanism K the flat knitted fabric F, which as knitted has a width W, has a tendency to assume a somewhat narrower width W', due to a slight curling action at the edges of the knitted fabric and this change in width takes place along these portions of the edges designated 27 and 28. As shown in Figure 2 the course markers 30 at the right-hand side of the fabric and 31 at the left-hand side of the fabric are positioned along the edges of the fabric straight across from each other and comparatively close to the knitting mechanism K. As the fabric moves from the knitting mechanisms K it is simultaneously marked periodically by the course marking mechanisms 30 and 31 which are directly opposite each other along the line 29.

The two course marking mechanisms shown in Figure 2 are identical in design except that one is a right mechanism and the other is a left mechanism. Hence, only one need be described in detail. Referring to Figure 2 and particularly to the course marking mechanism 30, the mechanism consists of a bracket 33 which is attached to the framework of the flat bed knitting machine. The bracket 33 has a vertical journal portion 34 having a vertical aperture therethrough, through which a stem 37 that supports the course marking mechanism is adapted to slide and rotate. The stem 37 at its upper portion is enlarged at the boss 38 and the bracket portion 34 is provided with one or more upwardly extending tongues 35 and the boss 38 is provided with corresponding notches 36 into which the tongues are adapted to engage for holding the boss 38 from rotation relative to the bracket 33 with the course marker in active position. At the bottom end of the stem 37 there is a washer 39 and between it and the lower surface of the journal 34 there is provided a compression spring 40 which tends to push down on the washer and hence hold the stem 37 firmly downwardly in the journal 34, thus holding the notches 36 firmly in engagement with the upwardly extending tongues 35. However, by lifting up on the mechanism the spring 40 is compressed and notch 36 is lifted off tongue 35, thus permitting the entire course marker to be rotated forwardly for servicing and repair. To the upper portion of the boss 38 there is attached the platform piece 41 which has an upstanding bracket at 43 that serves to support the solenoid winding 42. On the bracket 41 there is also an upstanding member 32 which is thickened at 45 so as to present a bearing surface against which the lever 46 is adapted to engage and be steadied, the lever being pivoted to the pin 47. The lower end of the lever 46 is pivotally attached at 48 to the core 44 of the solenoid so that when the winding of the solenoid 42 is energized, the solenoid core 44 will be drawn into the winding and hence will move the bottom end of the lever 46 to the right, as shown in Figure 3, thus causing the upper end of the lever 46 to be moved opposite to the arrow 53. The lever 46 is normally drawn in the direction of arrow 53 by means of a spring 49 that is attached at 50 to the bracket 43 and attached to the aperture 51 in the upper end of the lever 46.

To the upper end of the lever 46 there is pivotally attached the arm 57 which is free to move about the pivot 64. A spring 62 is provided between the arm 57 and the arm 46 so as to hold the lever 57 downwardly. At the outer end of the lever 57 there is a downwardly extending portion 58 which serves to support the roller 59 on the pivot pin 65. The member 63 is a combined

platform and ink retainer of the mechanism having an ink well portion at 66 in which there is a felt pad saturated with washable ink. The outer end 60 of the platform 63 has a flat surface onto which the roller 59 is adapted to move outwardly when the solenoid 42 is energized. The energized condition of the solenoid and the consequent actuation of the inking roller 59 is shown in dotted lines in Figure 3. The full lines show the de-energized (retracted) position.

Referring to Figures 1 and 2 the course marking mechanisms 30 and 31 are mounted on the frame of the knitting machine along the course 24 of the knitted fabric F and the course markers are positioned so that the outwardly extending flat part 60 of the course marker 30 serves as a flat area over which the edge 28 of the fabric is adapted to run as the fabric moves from the knitting mechanism K towards the take-up roller 25, Figure 1. Similarly, at the left-hand side of the machine, the flat portion 70 of the course marker 31 is situated so that the edge 27 of the fabric likewise runs over the flat area 70. It will be noted that the two flat areas 60 and 70 of the two course markers 30 and 31, respectively, are directly opposite each other along the line 29 which is at right angles to the direction of movement of the flat knitted fabric.

By circuit arrangements hereinafter described in greater detail the course marker solenoids are simultaneously energized and upon energization each inking roller, viz. inking roller 59 of the course marker 30, and the corresponding inking roller 79 of the course marker 31 are simultaneously propelled from their inking pans where the rollers are wetted with ink, thence out and over onto the edges 27 and 28 of the fabric F. When the solenoids are thus energized the inking rollers run outwardly on the portions 60 and 70 of the course markers and thence over the top part of the fabric which is running over the supports 60 and 70. Therefore, spots of washable ink are simultaneously applied to the edges 27 and 28 of the fabric F along transverse lines 29 every time the course marker solenoids are simultaneously energized.

Referring to Figure 4 there is shown a wiring diagram for the course marker mechanism. The take-up roll 25 serves as a metering roll since it applies tension uniformly to the fabric and draws the fabric from the knitting mechanism K to the tension roller 25. At the end of the tension roller there is provided a disk 72 which rotates with the roller and serves frictionally to engage the disk 73 of the winding roller 26. On the disk 72 there is provided a cam at 74 which serves once each revolution to engage a roller 75 on the end of the switch arm 76, thus causing the switch 77 to be moved from open to closed position whenever the cam 74 engages the roller 75. A circuit is provided from L_1 through the switch 77 and thence over line 81 to junction 82 whence the circuit divides and continues through the winding 42 of the course marker 30 to junction 84. From junction 82 the circuit of line 81 also extends to the winding 85 of the course marker 31 and thence continues over line 83 to junction 84 and to power supply L_2. Accordingly, as the tension roller 25 rotates and continues to draw the flat knitted fabric from the knitting mechanism K, the cam 74, once for each revolution of the roller 25, causes the closure of switch 77, thus completing a circuit from line L_1 to each of the solenoids 42 and 85, in parallel, and thence to supply line L_2. Accordingly, every time the cam 74 engages the roller 75 of the switch 77 the circuit is closed and both

course marker mechanisms are energized and simultaneously mark the edges 27 and 28 of the fabric with spots of washable ink which can easily be removed from the fabric in subsequent washing.

Referring to Figure 2 it will be observed that spots of ink have been applied to the edges 27 and 28 of the fabric F as indicated at 86—87, 88—89 and 90—91. The spots 86 and 87 are directly opposite each other along the line 92. Similarly, the spots 88 and 89 are directly opposite each other along the line 93 and the spots 90 and 91 are directly opposite each other along the line 94. The distance D between the lines 92 and 93 is equal to one turn of the tension roller 25 and hence the distances D between successive opposite course markers 86—87, 88—89 and 90—91 are uniform.

The lines 92, 93 and 94 being exactly transverse to the fabric accordingly follow the line of knitted stitches across the fabric which were formed during the knitting of the fabric. Accordingly, when the fabric is later on folded and sewed into a tubular composite it is only necessary to match the spots 86 and 87 with each other and 88 and 89 together and so on as the fabric is sewn, in order to have corresponding lines of stitches 92, 93 and 94 attached together in the tubular composite. This is illustrated in Figure 5 wherein a tubular composite generally designated T is illustrated. Thus, it will be observed that in Figure 5 the flat knitted fabric F has been folded or formed into a tube and that the spot 86 has been matched with 87, 88 has been matched with 89 and 90 has been matched with 91. It will also be noted that the edges 28 and 27 are brought neatly into juxtaposition as sewn. In forming the tubular composite the operator holds the edges 27 and 28 of the flat piece together and as the sewing progresses matches the spots 86—87 together and 88—89 together and so on. Thus, in the tubular composite which is finally formed by this operation, the line of stitching 92 goes directly around the tubular composite. Similarly, the lines 93 and 94 go directly around the tubular fabric and are not mis-matched.

A tubular fabric of mis-matched or warped character is illustrated in Figure 6, wherein it will be noted that the fabric F has no spots marked along opposite edges of the fabric. Thus, in the fabric shown in Figure 6 the edge 100 is superimposed upon the edge 101, but there are no spots along the edge showing corresponding courses of stitches across the fabric. In the tubular composite shown in Figure 6, the actual lines of stitches across the fabric may be illustrated by the dotted lines 102 and 103 and it will be observed that the ends of line 102 are not matched together, being terminated at 104 on the edge 100 and 105 on the edge 101. Likewise, the line of stitches across the fabric represented by the line 103 is also not matched as shown by the termination 106 on the edge 100 and the terminal point 107 on the edge 101. This is not an unusual condition where course marking is not used because in stitching the tubular composite the operator has no way of knowing whether the two edges are uniformly tensioned. Thus for line 101 it is possible that the edge 100 has been tensioned more than the edge 101 as the stitching progresses from right to left in Figure 6, therefore causing a displacement between 104 and 105. Similarly, at line 103 the edge 101 has been less tensioned, thus causing a displacement in the opposite sense. When tubular composites are thus made, they do not have satis-

factory draping and handling qualities and garments made therefrom are inferior to garments made from tubular composites in which the lines of stitches are matched evenly around the tube as the tubes are sewn.

As many apparently widely different embodiments of this invention may be made without departing from the spirit and scope thereof, it is to be understood that I do not limit myself to the specific embodiments herein.

What I claim is:

1. A course marker for flat bed knitting machines having yarn supply, a knitting mechanism and a tension roll for moving the flat knitted fabric in relatively flat condition away from the knitting mechanism, the improvement comprising a pair of course marking mechanisms situated at opposite edges of the fabric substantially at positions corresponding to a knitted course across the fabric, each course marking mechanism including means for applying marks on the edges of the fabric when the mechanisms are actuated, and means for periodically and simultaneously actuating said course marking mechanisms for simultaneously applying marks at opposite edges of the fabric along a corresponding course of knitted stitches across the fabric.

2. The apparatus of claim 1 further characterized in that said course marking mechanisms include means for applying ink marks at opposite edges of the fabric.

3. A course marker for flat bed knitting machines having a flat bed knitting mechanism for producing a width of flat knitted fabric and a tension roll spaced from the knitting mechanism for withdrawing the flat knitted fabric from the knitting mechanism, comprising marking devices positioned adjacent opposite edges of the fabric along a line extending at right angles to the length of the fabric, each course marking device including means for applying a mark to the adjacent edge of the fabric when the course marker is actuated, and means for simultaneously and periodically actuating said course markers.

4. The apparatus of claim 3 further characterized in that means is provided on the tension roll for periodically and simultaneously actuating the course markers.

5. The apparatus of claim 3 further characterized in that the course markers are simultaneously actuated and the edges of the flat knitted fabric marked uniform spacings along the length of the knitted fabric.

6. The apparatus of claim 3 further characterized in that the course markers are electrically operated and are simultaneously energized for marking the knitted fabric by means of a control switch connected to the course marker which control switch is mounted so as to be actuated periodically by the tension roll of the knitting machine.

7. A course marker for flat bed knitting machines wherein a flat strip of knitted fabric is produced, a track, means mounting the track so that it extends a short distance against an edge of the flat strip of fabric with the fabric edge running thereover, a marking roller, means for moving said roller along the track from a position where it is out of engagement with the edge of the fabric to a position where it engages the edge of the fabric and for retracting said roller from such engagement, and means on the track for inking the roller when it is out of engagement with the fabric.

8. The apparatus of claim 7 further characterized in that said means for moving said roller is an electrically actuated solenoid.

CARROLL R. ANDERSON.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,390,660	Weinerth	Sept. 13, 1921
1,767,762	Jennings	June 24, 1930
2,151,570	Shoults	Mar. 21, 1939
2,247,716	Shellenberg	July 1, 1941
2,298,888	Kaufmann	Oct. 13, 1942
2,321,010	Cohn	June 8, 1943