United States Patent

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[33] **Germany**
[31] **P 17 60 026.9**

[54] METHOD OF KNITTING A DOUBLE FABRIC ON A WARP KNITTING MACHINE

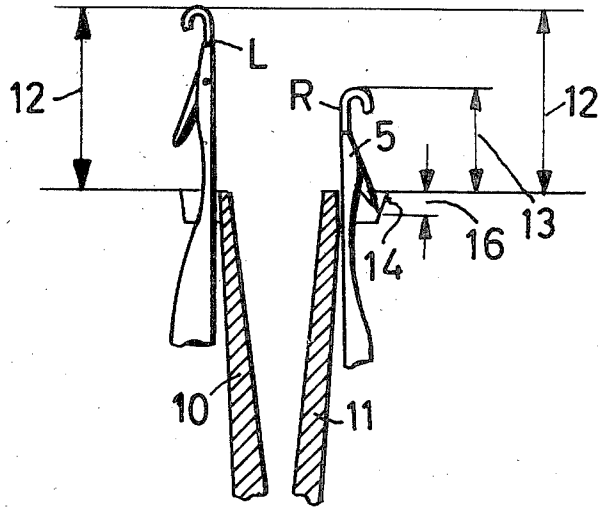
5 Claims, 5 Drawing Figs.

[52] U.S. Cl. 66/87
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[50] Field of Search 66/87, 86, 88

[56] References Cited
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ABSTRACT: A double fabric is knitted on a Raschel knitting machine having two needle beds and a needle bar motion which lifts one of the needle bars in alternating courses only high enough so that the free end of the open latches are still received in the grooves of the trick plate while the remainders of the latches project upward from the trick plate, the other needle bar knitting in the usual manner, and the two layers being connected by needles of one bar knitting in the other row of needles.



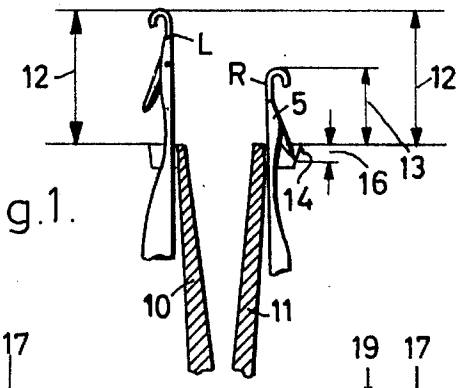


Fig.1.

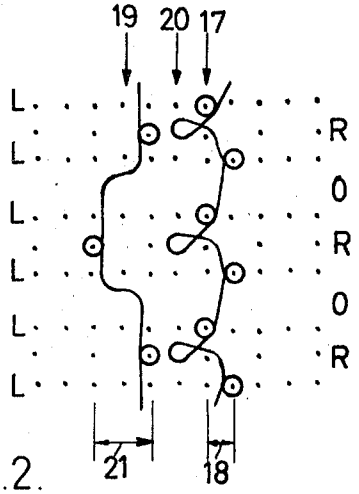


Fig.2.

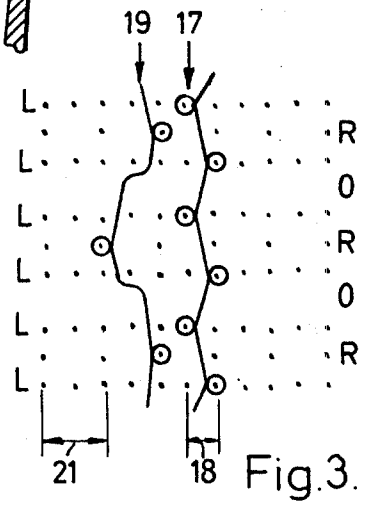


Fig.3.

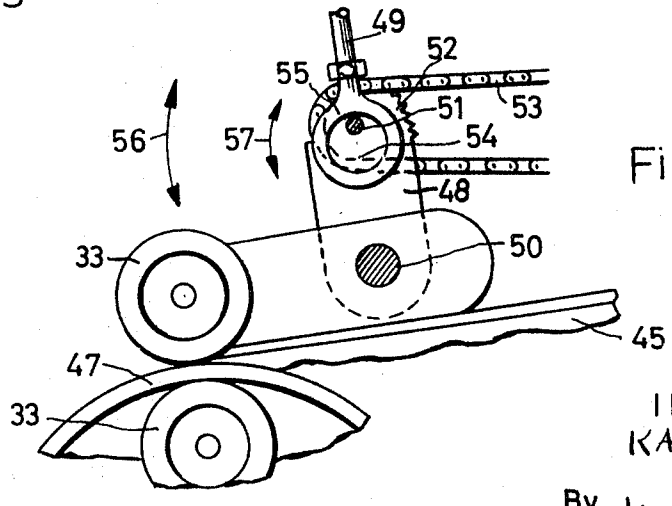


Fig.5.

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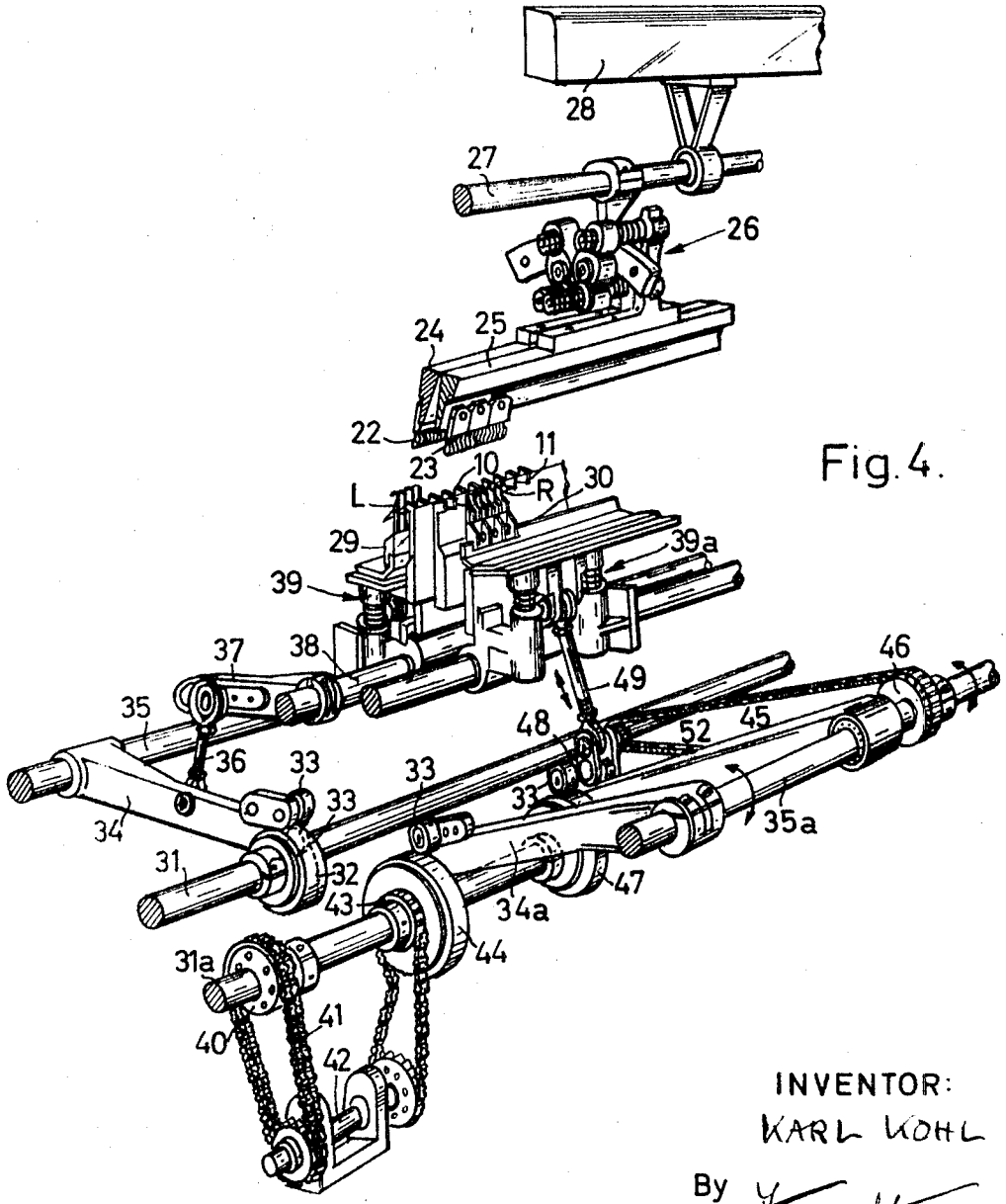


Fig. 4.

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METHOD OF KNITTING A DOUBLE FABRIC ON A WARP KNITTING MACHINE

This invention relates to double cloth, and particularly to a method of knitting a double fabric on a warp knitting machine.

Double fabrics are commonly used by decorators. One layer of the fabric serves as a carrier for the face layer. It has been customary heretofore to produce the two layers on separate knitting machines and to laminate them to each other. The known method is complex, and the product obtained is limited in its resistance to moisture, high temperature, and mechanical stress by the properties of the adhesive used for lamination.

The primary object of the invention is a method of producing a double knitted fabric of superior quality quickly and inexpensively.

It has been found that the two layers of a double fabric can be knitted simultaneously and interconnected by knitting stitches on a Raschel knitting machine having two needle bars by intermittently stopping the formation of stitches on one needle bar and raising the latch needles on that bar only to a level in which the free ends of the open latches are barely retained in the grooves of the associated trick plate.

In the method of the instant invention, stitch formation on one needle bar is interrupted only by shortening the upward stroke of the needles. Thus the yarn loop is retained in the needle hook after the formation of the last preceding stitch without crowding the courses on the other needle bed. The method of the invention thus permits for the first time to knit a fabric of relatively high needle gage and close wale spacing on one needle bed for a carrier layer prepared from relatively thin yarn and in any desired pattern, while the face layer of the double fabric is simultaneously being knitted on the other needle bed in a coarser gage from a coarser yarn in a pattern different from that of the carrier yarn, and still firmly to interconnect the two layers. The layers may be connnected to each other by needle loops or by sinker loops, the two terms being employed here by analogy to a warp fabric made on a machine having sinkers, not present in a Raschel machine. The term "-needle loop" thus refers to the upper loop of each stitch, and the term "sinker loop" to the lower loop, the upper and lower loops open in opposite walewise directions.

A double fabric of the invention is produced in a particularly simple and convenient manner when the ratio of the needle spacing or wale spacing to the course spacing is the same in each of the two layers. Thus, the needle bar whose stroke is intermittently shortened is set with only one half of the number of needles provided on the other bar, and the number of courses per unit length of fabric in the layer knitted on the first-mentioned needle bar is only one half of the number of courses in the same length of the layer knitted on the other needle bar.

Other features, additional objects, and many of the attendant advantages of this invention will readily be appreciated as the same becomes better understood by reference to the following description when considered in connection with the appended drawing in which:

FIG. 1 shows knitting implements of a Raschel knitting machine for performing the method of the invention in elevation, and partly in section;

FIGS. 2 and 3 are point paper diagrams of two different sets of guide bar movements for performing the method;

FIG. 4 illustrates the knitting machine in a fragmentary perspective view; and

FIG. 5 shows details of a needle bar mechanism in the machine of FIG. 4 in a view corresponding to that of FIG. 1.

Referring now to the drawing in detail, and initially to FIG. 1 there are seen two needles L and R respectively representative of the two rows of latch needles on the two needle bars of a Raschel knitting machine. FIG. 1 also shows the two trick plates 10, 11 in whose grooves the needles R, L are guided. The needle L is shown in the topmost position of its cyclic

movement in which the wide spacing between the needle top and the top edge of the trick plate 10 is indicated by the dimension 12. A basic feature of the invention resides in mechanism for limiting the upward stroke of the needles R on the other needle bar to a position in which the spacing between the needle top and the top edge of the trick plate 11 is reduced to a dimension 13. In this position of the needle R, the free end 14 of the open latch 15 on the needle is received in a groove of the trick plate 11 and extends barely below the top edge of the trick plate 11, the trick plate and latch being vertically coextensive over a distance 16 which is 2 millimeters in the illustrated embodiment, while the remainder of the latch 15 projects upward from the trick plate.

The manner in which the rows of needles R and L are used in knitting a fabric of the invention is illustrated in the point paper diagram of FIG. 2 The needles L knit a tricot fabric by guide bar motions 17, the needle gage being high, as indicated by the small needle spacing 18. The needles R also knit a tricot pattern 19, but they do not form stitches in alternating courses which are marked 0 because the stroke of the needles R is reduced in these courses. The fabrics respectively knitted on the needles of the two needle bars are connected by stitches 20 knitted by the needles L in the other row of needles so that the two fabric layers are interconnected by needle loops. It is evident from FIG. 2 that the spacing 21 of the needles R in the associated needle bar is twice the spacing 18 of the needles L, and the spacing of the courses knitted by the needles R is twice the spacing of the courses knitted on the needles L. The ratio of the spacings of the wales and courses in the two interconnected fabric layers is therefore the same.

A closely similar fabric is shown diagrammatically in FIG. 3 but the two layers of the last-mentioned fabric are connected by sinker loops.

The knitting machine only partly illustrated in FIG. 1 is shown in more detail in FIG. 4. Yarn guides 22,23 are fastened to guide bars 24,25 which are moved longitudinally on hangers 26 by a nonillustrated pattern mechanism. The hangers 26 are suspended from a rocker shaft 27 movably mounted on the machine frame 28.

The knitting needles L,R are fastened to respective needle bars 29,30 and are guided in the trick plates 10,11. The motion of the needle bar 29 is brought about by the drive shaft 31 carrying radial cams 32 engaged by trucks 33 on an arm 34. The arm is pivoted on a stationary shaft 35 and actuates a connecting rod 36 hingedly fastened to an arm 37 on the shaft 38 of the needle-bar-lifting mechanism 39, not seen in detail in FIG. 4, which raises and lowers the needles L in a manner conventional in itself.

The needle-bar-lifting mechanism 39*a* for the needle bar 30 is driven by the shaft 31*a* in a manner analogous to the motion described with reference to the mechanism 39. The mechanism 39*a* is equipped with a supplemental device for reducing the upward stroke of the needles R.

A drive shaft 31*a*, connected to the shaft 31 by a nonillustrated transmission for synchronized rotation carries a sprocket 40 linked by a chain 41 to a smaller sprocket on a countershaft 42. The latter is connected by a chain with a small sprocket 43 coaxially attached to a radial cam 44 which freely rotates on the shaft 31*a*. Trucks 33 on an arm 34*a* travel about the circumference of the cam 44 and thereby oscillate a shaft 35*a* to which the arm 34*a* is fastened. The shaft 35*a* also carries a freely rotatable arm 45 and a fixed sprocket 46. Trucks 33 on the arm 45 follow the cam face of a radial cam 47 fixedly fastened to the shaft 31*a*.

The arm 45 is oscillated by the rotating cam 47, and its motion is transmitted to the push rod 49 of the needle bar mechanism 39*a* by a pair of links 48. As is shown in more detail in FIG. 5, the lower ends of the links 48 are connected to the arm 45 by a hinge pin 50, and the upper ends of the links rotatably carry the fixed shaft 51 of a sprocket 52 which is connected by a chain 53 with the aforementioned sprocket 46. An eccentric 54 fixedly arranged on the shaft 51 between the two links 48 is rotatably received in a conforming circular eye 55 at the lower end of the push rod 49.

The push rod 49 which directly imparts vertical movement to the needle bar carrying the needles R thus performs a movement which results from the superposition of the oscillation of the arm 45 indicated by the arrow 56 and the rotation of the eccentric 54, indicated by the arrow 57, the two movements being synchronized by the several chains and sprockets in such a manner that the eccentric tends to lower the push rod 49 in every other cycle of needle movement while the arm 45 tends to lift the push rod. The push rod 49 thus lifts the needles R only to the position indicated in FIG. 1 in the courses marked 0 in FIGS. 2 and 3, while lifting them in the other courses to the normal height occupied by the needle L in FIG. 1

What I claim is:

1. In a method of knitting a fabric having a carrier layer and a face layer different from said carrier layer on a raschel knitting machine having a first needle bar carrying a row of spaced first latch needles and a second needle bar carrying a row of spaced second latch needles, a trick plate associated with each needle bar, means for moving the needle bars toward and away from respective top positions in which the latches of said needles are upwardly spaced from the associated trick plates, and yarn-feeding means for feeding yarn to said needles in a manner to knit spaced courses of stitches on the needles of each needle bed when said needles move toward and away from said top positions, the stitches forming said layers, the improvement which comprises:

a. intermittently reducing the upward stroke of movement of said second needle bar to a top position in which the open latch of each second needle is received in a groove of the associated trick plate while the remainder of said latch projects upwardly from the associated trick plate, whereby a loop of yarn is retained in said latch and no stitches are formed on said second needles; and

b. engaging a loop of yarn knitted on a respective first needle with each of said retained loops during the knitting of a course of stitches on said first needles in such a manner that the layers of fabric respectively knitted on the needles of said needle bars are intermittently interconnected by the engaged loop.

2. In a method as set forth in claim 1, said engaged loops being needle loops.

3. In a method as set forth in claim 1, said engaged loops being sinker loops.

4. In a method as set forth in claim 1, said second needles being spaced wider apart than said first needles, whereby the wales in the fabric layer knitted on said second needles are spaced wider apart than the wales of the fabric layer knitted on said second needles.

5. In a method as set forth in claim 4, said courses being spaced in each of said layers in such a manner that the ratio between the spacings of the wales and courses in each of said layers is substantially equal to the ratio of the spacings between the wales and courses in the other layer.