H. T. BALLARD.

KNITTING MACHINE.

APPLICATION FILED FEB. 7, 1920.

1,424,274.

Patented Aug. 1, 1922.

Fig. 4.

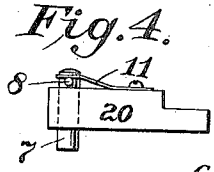


Fig. 1.

Fig. 3.

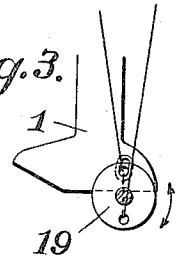


Fig. 2.

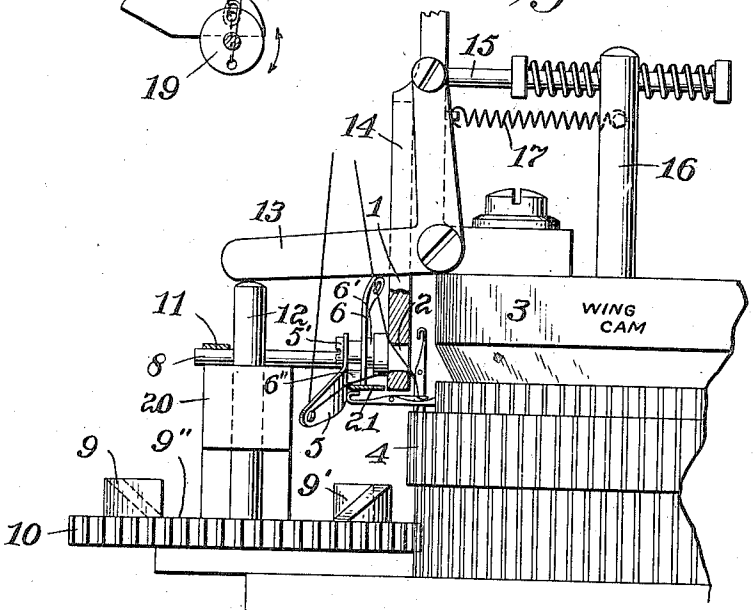


Fig. 5.

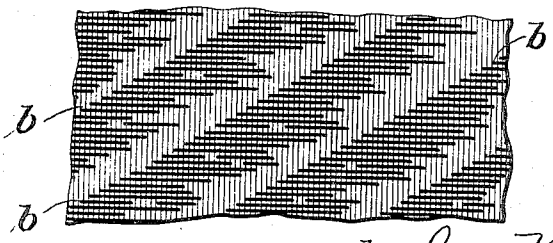
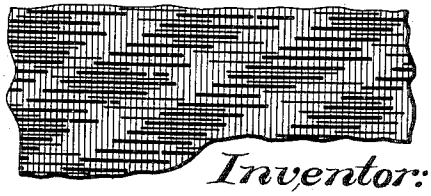


Fig. 6.



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KNITTING MACHINE.

1,424,274. Specification of Letters Patent. Patented Aug. 1, 1922.

Application filed February 7, 1920. Serial No. 356,808.

To all whom it may concern:

Be it known that I, HERBERT T. BALLARD, a subject of the King of Great Britain, and resident of the city of Norristown, State of Pennsylvania, have invented certain new and useful Improvements in Knitting Machines, of which the following is a specification.

My invention is designed to produce a knitted fabric having a certain structure adapting it to be used as a drapery, scarf or for other purposes.

The fabric produced is also a part of the present invention.

In the accompanying drawing,

Figure 1 is a side view of a part of a knitting head embodying my invention.

Fig. 2 is a view looking from the right of Fig. 1.

Fig. 3 is a view of another form of the invention.

Fig. 4 is a view of another detail.

Fig. 5 is a view of a part of the fabric.

Fig. 6 is a view of a modified fabric.

In these drawings, 1 indicates a main yarn guide having an eye 2 for directing the yarn to the needles, there being two rows of these for knitting rib. The needle dial is indicated at 3 and the needle cylinder at 4.

The yarn is supplied to the ordinary yarn guide by means adapted to feed two yarns and shift the positions of these yarns relative to each other. This means may assume different forms but I have shown one form as illustrative of the principle of the invention and not in a restrictive sense.

One of the yarns is fed by a finger 5 and the other by the finger 6. The finger 5 is pivotally mounted at 5′ to any suitable form of bracket which may be in the form of an attachment to the machine. This finger has an eye for directing one of the yarns. The second finger 6 is pivoted to the bracket at 6′ and it is pivotally connected to the other finger at 6″, the arrangement being such that when the finger 5 is swung upwardly from the position shown in Fig. 1, the finger 6 will be swung downwardly and these fingers will in these movements cross each other so that finger 5 will occupy the uppermost position and finger 6 the lowermost position. The fingers are operated by a vertically movable pin 7 connected to the finger 5 by a pin 8. The pin 7 is operated by cam means 9, 9′ on the upper surface of a toothed wheel 10 which meshes with the stems of the cylinder needles to be operated thereby. The pin is pressed down by a leaf spring 11, when the low part 9″ of the cam comes under it. The effect of this change in the position of the feedfingers is to bring first one yarn and then the other to the surface of the fabric and supposing that the yarns are of different colors, there will occur a striped effect in the fabric, one color appearing on the surface for a part of a course and the other color for the next part of the course and so on alternately throughout the course.

If the two fingers are moved to the same degree of separation in changing from one position to the other the line of pattern at the right hand edge would not be irregular and would be clearly defined, but as I separate them widely on one movement but on the next movement do not separate them widely, the two yarns run in more nearly parallel and either one or the other is liable to appear on the surface and for indeterminate periods or for indeterminate lengths of the courses and hence the structure will be varied.

Somewhat of the same effect will be secured if we separate the fingers on each change or movement to the same degree but make one change slowly and the other rapidly or quickly. The underlying feature is to get a variation in the successive changes in the fingers in order to produce the result.

In order to get the changes above mentioned, the block 20 carrying the operating pin may be set on its post so that the pin will be raised by the cam to get a wide separation but on the down stroke the fall of the operating pin is limited by any suitable form of stop.

In the present case the cross pin 8 which connects the operating pin with the fingers will serve to stop by coming against the upper surface of the block. The stopping of the downward movement is such that the finger 5 will be at a low angle to the horizontal plane passing through the pivot 5′, whereas when the finger 5 is raised by the cam it will lay at a higher degree angle to the said horizontal plane, and the angular relation of finger 6 will correspond and this will give the different degrees of separation of the fingers.

In this form of machine, the toothed

wheel may have teeth dividing evenly into the cylinder needles in which case the line at the left, Fig. 5, would be vertical, or if the wheel has an uneven number of teeth not a multiple of the cylinder the changes will lag, or lead and the pattern will be formed diagonally, as shown at *b*.

The cams and toothed wheel may also be used for changing the structure of the fabric from plain to tuck stitch. For this purpose a vertically movable pin 12 will be operated by the cams 9, 9′ and this will operate a bell crank lever 13 pivoted to the bracket 14 of the main yarn guide. This bell crank will operate a link 15 connected with the post 16, which extends through a slot in the dial cap and connects with the wing cam of ordinary form and which in ordinary practice is employed to project the needles part way for tucking and all the way for knitting.

When the pin 12 rides on the high parts 9, 9′, of the cam, the wing cam will be adjusted towards the center of the head so that then the dial needles will project only part way and tucking will result, but when the low part of the cam comes under the pin a spring 17 will pull the operating connection radially outward and the wing cam will then assume knitting position and ordinary plain rib will be produced. A second plain feed is indicated generally at 18, this doing knitting all the time.

With the complete attachment involving the yarn changing mechanism and the mechanism for doing tuck and plain knitting the same cam 9, 9′ answers for both functions, i. e., changing the yarn and also changing the fabric structure from plain to tuck and if the toothed wheel has such a number of teeth compared with the number of needles that the latter number is not a multiple of the former, then the change in the structure both as regards tuck and plain work resulting from shifting the wing cam and the predominance of either one color or the other will take place in a spiral line around the tubular fabric because of the lag or lead, as the case may be, resulting from the uneven division of the number of teeth of the wheel into the number of cylinder needles which drive the toothed wheel, and furthermore the irregularity in the lengths of the changes of color in the courses will be present in this tuck and plain structure as would be the case if plain rib were knit.

Instead of employing two fingers as shifting yarn guides, I may employ a disc 19 having two guide eyes and by giving this disc a back and forth rotary movement either one yarn or the other will be brought uppermost and will appear on the surface of the fabric. This disc may be operated from the cam 9, 9′ in any suitable manner.

In order to protect the yarn as delivered by the finger which is in its lowermost position, I provide a guard 21 consisting of a strip of metal overlying the projected dial needle so that the yarn will pass over this guard from the lowermost finger and thus will not be caught in the dial needle.

By employing another special feed like that above described having the two fingers and its controlling mechanism and in which the toothed wheel has a different number of teeth from that of the wheel above mentioned at the feed already described, a second stripe can be made in the fabric running around the same in the opposite direction from the stripe illustrated in Fig. 5, and I have shown a small portion of such fabric diagrammatically in Fig. 6. Either one or the other of the stripes made by the two special feeds mentioned may run vertically instead of diagonally, for which purpose the teeth of the wheel at this particular feed would divide evenly into the number of needles.

This second feed also could have the same arrangement shown in Figs. 1 and 2 for controlling the wing cam at this second feed so that tuck and knitting stitches would be formed in the manner previously described.

I claim:

1. In combination with a main yarn guide eye of a knitting machine, repeatedly shifting supplemental guide means for two yarns to shift the yarns in respect to the main yarn guide eye, one shift varying in respect to the other to vary the feeding conditions, one yarn appearing on the surface at one shift at predetermined points to make a substantially straight edge change in the pattern and the other yarn at the other shift appearing on the surface of the fabric at indeterminate points to make an irregular edge to the pattern and means for repeatedly shifting the yarn guides during the knitting of each of a plurality of courses, substantially as described.

2. In combination with a main yarn guide, a set of dial needles, a set of cylinder needles, and supplemental yarn guide means to deliver two yarns to the main yarn guide, said supplemental guide means being movable to present first one yarn and then the other yarn uppermost and a guard for protecting the lowermost yarn from contact with the dial needles, substantially as described.

3. In combination with a knitting machine, a main yarn guide, a supplemental yarn guide adapted to deliver two yarns to the needles and to reverse the position of said yarns whereby each at times will be uppermost, a toothed wheel with means for operating the supplemental yarn guide means from the said toothed wheel, said toothed wheel having such a number of teeth that the number of cylinder needles will not be a multiple thereof so that the changes effected by the supplemental yarn guide will occur

spirally around a fabric, substantially as described.

4. In combination with a knitting machine, a toothed wheel driven from the rotary member of the machine a cam carried by the toothed wheel, connections from said cam to the wing cam of the dial for setting it either in tucking or knitting position, a supplemental yarn guide adapted to deliver two yarns to the needles and means for operating the said supplemental guide from the toothed wheel, so that either one or the other of the yarns will be uppermost, substantially as described.

5. In combination with a rib knitting machine, a yarn guide, a supplemental yarn guide adapted to deliver two yarns to the main guide, a wing cam in the dial adapted to be set in either knitting or tuck position, a toothed wheel driven from the machine, a cam on the toothed wheel, a pair of pins vertically movable and operated from the cam, one of said pins having connection with the wing cam for setting it in tucking or knitting position, and the other pin having connection with the supplemental yarn guide to change it from one position to the other, so that first one yarn and then the other yarn will be uppermost, substantially as described.

6. In combination in a rib knitting machine, a wing cam in the dial, a main yarn guide, a supplemental yarn guide to direct two yarns to the main yarn guide, a toothed wheel driven from the machine, and means operated by the toothed wheel for adjusting the wing cam to make alternate portions of tuck and plain rib in the courses, and to shift the yarns in respect to the main yarn guide, to produce a substantially straight edge change in the pattern at one shift and an indented edge in the stripe or pattern at the other shift of the yarn guides, substantially as described.

In testimony whereof, I affix my signature.

HERBERT T. BALLARD.