July 6, 1948. J. L. GETAZ 2,444,503

REVERSE PLATING OF KNITTING FABRICS

Filed Oct. 12, 1945

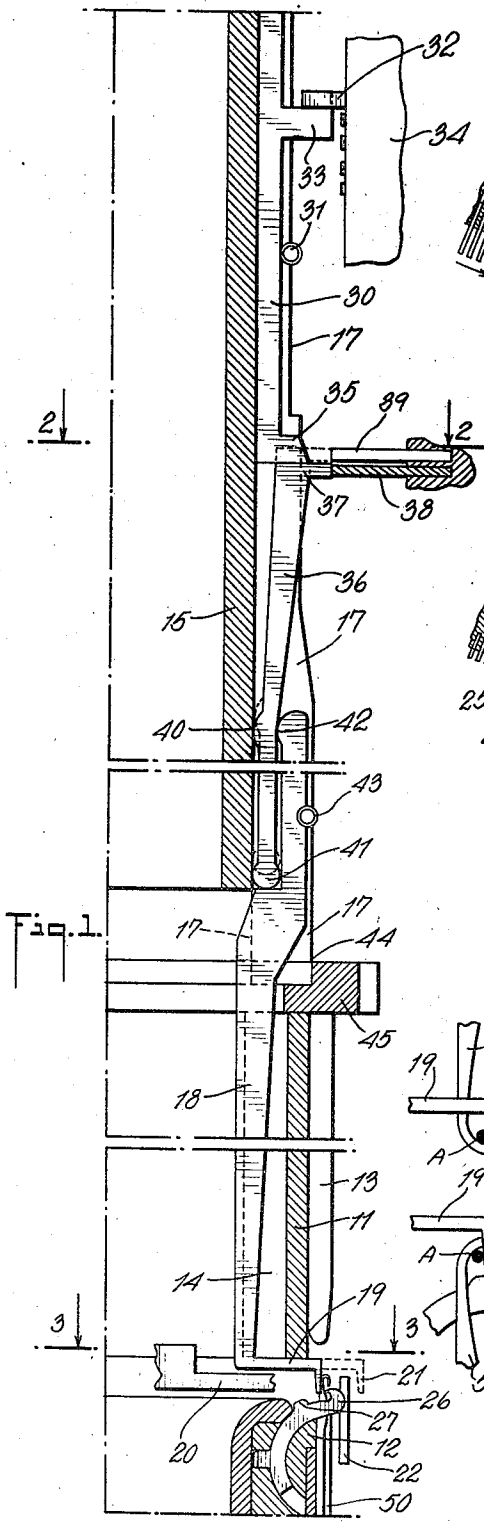


Fig. 1.

Fig. 2.

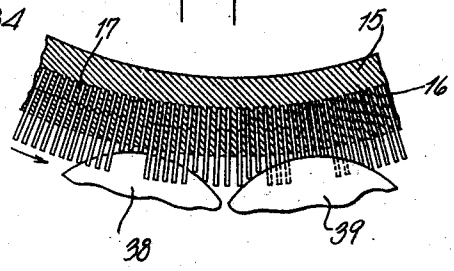
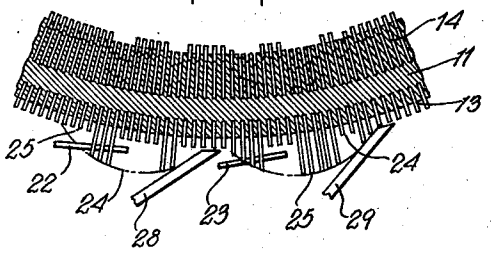


Fig. 3.



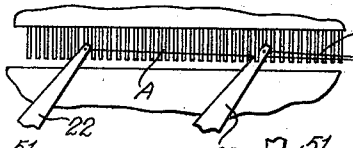


Fig. 4.

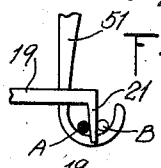


Fig. 8.

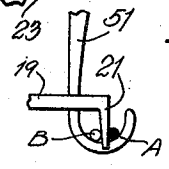


Fig. 7.

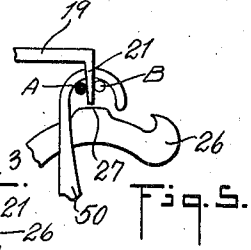


Fig. 5.

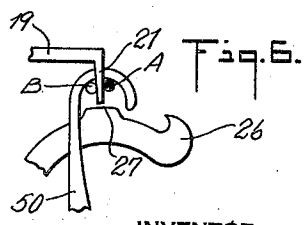


Fig. 6.

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REVERSE PLATING OF KNITTING FABRICS

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11 Claims. (Cl. 66—14)

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This invention is related to the knitting of textile fabrics and particularly to the control of reverse plating in such fabrics.

As is well known in the knitting art, patterns of contrasting colors may be made in knitted fabrics by feeding two yarns of different colors to the knitting needles at the same time. By controlling the relative position of these yarns in the hooks of the needles as knitting loops are drawn, either of these yarns may be made to appear on the face of the fabric, and by selecting first one yarn and then the other to be on the face of the fabric, patterns are formed.

In plain knitting on one set of needles, when two yarns of contrasting colors lie side by side in the hook of any particular needle, that yarn which lies next to the shank of the knitting needle will appear on the face of the fabric in the stitch which is being made by that needle. In order to keep one of two yarns in position next to the shanks of the needles, it is customary to apply a greater tension to one of these yarns, which draws that yarn against the shank of the needle and causes it to appear on the face of the fabric. Such a yarn with the greater tension is known as the face yarn.

The other yarn, which is known as the backing yarn, is fed with less tension, and takes a position in the hooks of the needles which is adjacent to the face yarn and on the outer side of the needle circle.

In order to form patterns of contrasting colors, means are provided for moving the outer yarn to the inner side of the hook for certain stitches where it is desired for the color of the backing yarn to be on the surface of the fabric. When these means for moving the outer yarn to the inner side of the hook are removed, the yarns resume their normal position, in which the yarn which is fed with greater tension is on the inner side of the hook when the stitch is drawn.

In knitting machines which have superimposed cylinders and two sets of knitting needles, such as are used for knitting ribbed hose, the conditions for plating in the lower cylinder are the same as described above for plating in a machine with one set of needles. But in the upper cylinder conditions are reversed, and the yarn which has the greater tension and lies next to the shank of the needles appears on the reverse side of those stitches which are made by the needles of the upper cylinder.

The result is that when a ribbed fabric is knitted with two yarns of contrasting colors in plating relation, all of the wales which are made by

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the needles of the lower cylinder are of one color, and these are known as face wales, while all of the wales which are made by the needles in the upper cylinder are of the other color and are known as rib wales. When the fabric is stretched, the rib wales show a contrasting color in vertical lines, and when the fabric contracts, all of the face wales appear on the surface as a solid color, and the rib wales are underneath. If means are provided for reversing the position of the face and backing yarns in the face wales, patterns may be formed of contrasting colors in the face wales which lie between panels of rib wales. But the width of these patterns is limited to the width of the panels of face wales. When the fabric is contracted, these patterns show small figures on a solid background, but when the fabric is stretched, the vertical lines of rib wales have the same color as the patterns in the face wales and the effect of the pattern is spoiled. On the other hand, if the areas of face wales is widened in order to get bold patterns, the ribbed effect of the fabric is destroyed.

By the means shown in this invention, in patterns which are formed by reverse plating, large figures of one color may extend across panels of face wales and panels of rib wales. In knitting large figures of this kind, the yarn which lies next to the shank of the needles of the lower cylinder must be away from the shank of the needles of the upper cylinder. As the yarns pass from a rib wale to a face wale, or vice versa, the relative position of the two yarns must be reversed, if the color of the figure in the pattern is to remain the same.

It is the purpose of this invention to provide means for controlling the plating of ribbed fabrics in both face and rib wales, so that either of two contrasting colors may be made to appear on the face of the fabric in any stitch of any wale. By the means shown below, this invention may be used to produce either large or small patterns of contrasting colors in any combination of face and rib wales which may be desirable for the construction of the ribbed fabric.

To accomplish the purpose of this invention, use is made of plating elements, one of which is associated with each needle and is so controlled as to place the yarns in their desired relative positions in the hook of each needle.

In the accompanying drawings:

Fig. 1 is a half section through the cylinder of a knitting machine embodying this invention.

Fig. 2 is a section along line 2—2 of Fig. 1.

Fig. 3 is a section along line 3—3 of Fig. 1.

Fig. 4 is an elevation showing the feeding fingers by which yarns are fed to the needles.

Fig. 5 shows the face and backing yarns in the hook of a needle of the lower cylinder with the plating element between the two yarns. The yarns as shown in this figure are in position to place the face yarn on the outside of a face wale.

Fig. 6 is similar to Fig. 4, showing the yarns in position to place the backing yarn on the outside of a face wale.

Fig. 7 is similar to Fig. 5, showing the yarns in the hook of a needle of the upper cylinder in position to place the face yarn on the outside of a rib wale.

Fig. 8 is similar to Fig. 6, showing the yarns in position to place the backing yarn on the outside of a rib wale.

In Fig. 1, the upper cylinder 11 is superimposed on the lower cylinder 12 for knitting ribbed fabric. Cylinder 12 is of the same design as is commonly used on machines of this type. Cylinder 11 is grooved on the outer side with slots 13 for the sliders and needles in the same manner as is commonly used on machines of this type, and in addition is grooved on the inner side with slots 14. Slots 14 are of the same number and approximate width as slots 13, as shown in Fig. 3, but are offset from slots 13, as is explained below.

Superimposed on cylinder 11 is cylinder 15, which is grooved on the outer side with slots 16, which are the same in number and radial position as slots 14. The walls 17 between the slots 16 extend below the body of cylinder 15 and rest on gear ring 45, so that cylinder 15 is held in place by these extended walls 17. By this construction there is a space in the slots 17 above cylinder 11 and below the body of cylinder 15 which is open. The purpose of this open space between the walls 17 is to permit the plating elements 18 to be removed and replaced without disturbing the cylinders 11 or 15.

The plating elements 18 have their upper portion in slots 16 on the outer side of cylinder 15, and their lower portion in slots 14 on the inner side of cylinder 11. These plating elements 18 have at their lower extremity a horizontal portion 19, which extends between cylinder 11 and verge plate 20, and the slots 14 are so positioned with reference 13 that the portion 19 of each plating element is between a needle and an adjacent verge bit. At the outer end of portion 19 is a vertical point 21, which projects downwardly, and it is this vertical point 21 which controls the relative position of the plating yarns.

The face yarn A is fed through finger 22, and the backing yarn B through finger 23, as shown in Figures 3 and 4. Each of the elements 18 are selected and given one of two radial motions by the mechanism attached to cylinder 15, as described below. In one of these radial motions, the point 21 follows the path 24 and in the other it follows path 25. In following path 24, the point 21 will pass outside of finger 22 and inside of finger 23. It will be between yarns A and B, as it approaches the knitting point holding yarn A next to the cylinder. If the needle 50, with which point 21 is associated, is in the lower cylinder its position between the yarns is as shown in Fig. 5 and yarn A will appear on the face of the fabric. If the needle 51, with which point 21 is associated, is in the upper cylinder, its position between the yarns will be as shown in Fig. 8 and Yarn B will appear on the face of the fabric.

If element 18 has been so selected that point 21 will follow path 25, it will pass inside of finger 22 and outside of finger 23. It will be between the yarns as it approaches the knitting point holding yarn B next to the cylinder. If the needle with which point 21 is associated is in the lower cylinder, its position between the yarns is as shown in Fig. 6 and yarn B will appear on the face of the fabric. If the needle with which point 21 is associated is in the upper cylinder, its position between the yarns is as shown in Fig. 7, and yarn A will appear on the face of the fabric. The guards 28 and 29 are for the purpose of guiding the points 21 along paths 24 and 25 on the inward radial motion of elements 18.

The needles 50, which are in the lower cylinder, draw the loops over the sinkers 26, as shown in Figures 5 and 7. To hold the yarns in their relative position while the loops are being drawn, the lower extremity of points 21 should not be above the upper edge of the sinkers 26, while there should be sufficient space for the fabric between the points 21 and the sinkers while the loops are being shed. To insure that the yarns are being held in the relative position as determined by the motion of the plating elements, the sinkers 26 have a hump 27, which comes under points 21 when the sinkers are out, and this hump holds the yarns high enough so that they are above the lower extremity of points 21. When the stitch is shed, this hump passes to the position shown in Fig. 1, and space is left between the points 21 and the sinkers 26 for the fabric to move as the loops on the needles are being shed.

The following mechanism connected with cylinder 15 is for the purpose of selecting and controlling the radial movements of plating elements 18. In the upper portion of slots 16 the jacks 30 are held in place by band 31, and have a vertical sliding motion. Their downward movement is imparted by a series of cams 32, acting on butts 33, which move jacks 30 into the position shown in Fig. 1. The contact between cams 32 and butts 33 is controlled by the selector drum 34. Below jacks 30 in slots 16 are jacks 36, which are moved downward to the position shown in Fig. 1 by butt 35 acting against butt 37. These cams 38 and 39, as shown in Figs. 1 and 2, are mounted on the frame of the knitting machine and engage butts 37 of jacks 36. These cams are so mounted that they may be withdrawn from contact with butts 37 when the heel and toe are being knit. Cam 38 is located directly above the outer portion of path 24 and cam 39 is above the outer portion of path 25.

If jack 36 has been pressed downward to the position shown in Fig. 1, butt 37 is pressed inward by cam 38, which causes jack 36 to rock on pivot 40, and its lower extremity 41 moves outward. Resting on jack 36 in the lower portion of slot 16 is the upper portion of plating element 18, which turns about the pivot 42 and is held in its vertical position and against jack 36 by band 43. The outward motion of the lower extremity 41 of jack 36 causes an outward radial movement of plating element 18 when it passes the space below cam 38, and this causes point 21 to follow path 24.

If jacks 30 and 36 have not been pressed downward by the action of selector drum 34, but remain in the dotted positions shown in Fig. 1, butt 37 engages cam 39, which causes jack 36 to rock on pivot 40 and press plating elements 18 out-

ward when it passes the space below cam 39, which causes point 21 to follow path 25. After jacks 36 pass cams 38 and 39, a stationary cam, which is not shown, acts on butt 37 and raises jacks 36 and 30 to the dotted position shown in Fig. 1. By removing the band 43, any one of the plating elements 18 may be removed and replaced without disturbing other parts of the machine.

By means of this invention, as described above, the position of the yarns A and B, on the front or reverse side of any stitch may be controlled by the selector drum 34. If jack 36 is pressed down to engage cam 38, it causes plating element 18 to move in a radial motion, when passing below cam 38 and causes point 21 to move in path 24. This places yarn A on the outside of the stitch being formed if the needle is in the lower cylinder, and yarn B on the outside if the stitch is in the upper cylinder.

Similarly, if jack 36 is not pressed down and remains in the dotted position, it engages cam 39 and causes plating element 18 to move in a radial motion when passing below cam 39 and causes point 21 to move in path 25. This places yarn B on the outside of the stitch being found if the needle is in the lower cylinder, and yarn A on the outside if the stitch is in the upper cylinder.

I claim:

1. In a circular knitting machine, a lower cylinder, an upper cylinder axially opposed to said lower cylinder, grooves in the outer surfaces of said cylinders, independent needles in said grooves of said lower cylinder and said upper cylinder, plating elements associated with said needles, means for feeding a plurality of yarns to said needles in plating relation, means for drawing loops of said yarns by said needles in said lower cylinder, means for holding said yarns in desired plating relation in said loops by said plating elements while said loops of said yarn are drawn by said needles in said lower cylinder, means for drawing loops of said yarn by said needles in said upper cylinder, means for holding said yarns in desired plating relation in said loops by said plating elements while said loops of said yarn are drawn by said needles in said upper cylinder.

2. In a circular knitting machine, a lower cylinder, an upper cylinder axially opposed to said lower cylinder, grooves in the outer surfaces of said cylinders, independent needles in said grooves of said lower cylinder and said upper cylinder, plating elements associated with said needles, means for feeding a plurality of yarns to said needles in plating relation, means for drawing loops of said yarns by said needles in said lower cylinders, means for moving said plating elements to select the plating relation of said yarns in said loops before said loops are drawn by said needles in said lower cylinder, and means for moving said plating elements to select the plating relation of said yarns in said loops before said loops are drawn by said needles in said upper cylinder.

3. In a circular knitting machine, a lower cylinder, an upper cylinder axially opposed to said lower cylinder, grooves in the outer surfaces of said cylinders, independent needles in said grooves of said lower cylinder and said upper cylinder, means for feeding yarns to said needles in plating relation, plating elements associated with said needles, means for placing said plating elements between said yarns, means for drawing stitches

of said yarns by said needles in said lower cylinder while said plating elements are between said yarns, and means for drawing stitches of said yarns by said needles in said upper cylinder while said plating elements are between said yarns.

4. In a circular knitting machine, a lower cylinder, an upper cylinder axially opposed to said lower cylinder, grooves in the outer surfaces of said cylinders, independent needles in said grooves, plating elements associated with said needles, means for feeding a face yarn and a backing yarn to said needles, means for selecting said plating elements into two groups, means for placing said plating elements in one of said groups in a position outside of said face yarn and inside of said backing yarn, means for placing said plating elements in the other of said groups in a position on the inside of said face yarn and on the outside of said backing yarn, means for drawing loops of said yarn by the needles in said lower cylinder, and means for drawing loops of said yarn by the needles in said upper cylinder.

5. In a circular knitting machine, a lower cylinder, an upper cylinder axially opposed to said lower cylinder, grooves in the outer surfaces of said cylinders, independent needles in said grooves, means for feeding a plurality of yarns to said needles in plating relation, additional grooves on the inner surfaces of said upper cylinder, plating elements in said additional grooves, means for controlling the plating relation of said yarns in said needles by the movement of said plating elements.

6. In a circular knitting machine, a lower cylinder, an upper cylinder axially opposed to said lower cylinder, grooves in the outer surfaces of said cylinders, independent needles in said grooves, means for feeding a plurality of yarns to said needles in plating relation, additional grooves on the inner surface of said upper cylinder, plating elements in said additional grooves, means for controlling the plating relation of said yarns in said needles in said lower cylinder by the movement of said plating elements, and means for controlling the plating relation of said yarns in said needles in said upper cylinder by the movement of said plating elements.

7. In a circular knitting machine, a lower cylinder, an upper cylinder axially opposed to said lower cylinder, grooves in the outer surfaces of said cylinders, independent needles in said grooves, means for feeding yarns to said needles in plating relation, additional grooves on the inner surface of said upper cylinder, a superimposed cylinder in line axially with said upper and lower cylinders, grooves in the outer surface of said superimposed cylinder, plating elements in said additional grooves of said upper cylinder and extending within said grooves of said superimposed cylinder, means for controlling the relative position of said yarns as fed to said needles by controlling the movements of said plating elements.

8. In a circular knitting machine with rotating cylinder, grooves in the outer surface of said cylinder, independent needles in said grooves, plating elements associated with said grooves, a yarn finger situated outside of said cylinder, means for moving said plating elements radially outward to pass outside of said yarn finger, and means for moving said plating elements radially inward after passing said yarn finger.

9. In a circular knitting machine with knitting cylinder, grooves in the outer surface of said cyl-

inder, independent needles in said grooves, plating elements associated with said needles, a finger for feeding a face yarn to said needles on the outside of said cylinder, a knitting point at which loops of said yarn are drawn by said needles, a finger for feeding a backing yarn located between said face yarn finger and said knitting point, means for moving said plating elements radially outside of said face yarn finger, and means for moving said plating elements radially inward before reaching said backing yarn finger.

10. In a circular knitting machine with knitting cylinder, grooves in the outer surface of said cylinder, independent needles in said grooves, plating elements associated with said needles, a finger for feeding a face yarn to said needles, a knitting point at which loops of said yarn are drawn by said needles, a finger for feeding a backing yarn located between said face yarn finger and said knitting point, means for moving said plating elements radially outward between said yarn fingers, and means for moving said plating elements radially inward after they pass said backing yarn finger.

11. In a circular knitting machine, a knitting cylinder, grooves in the outer surface of said cylinder, independent needles in said grooves, means for feeding a face yarn and a backing yarn to said

needles, plating elements associated with said needles, means for selecting one of two paths for the movement of said plating elements, one of said paths being outside of said face yarn and inside of said backing yarn, and the other of said paths being inside of said face yarn and outside of said backing yarn.

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