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METHODS OF AND APPARATUS FOR MAKING DOUBLE
FACED FLEECE KNITTED FABRICS
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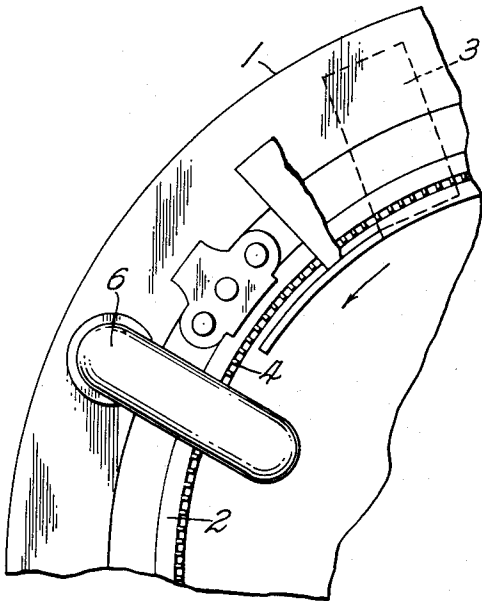


FIG. 1.

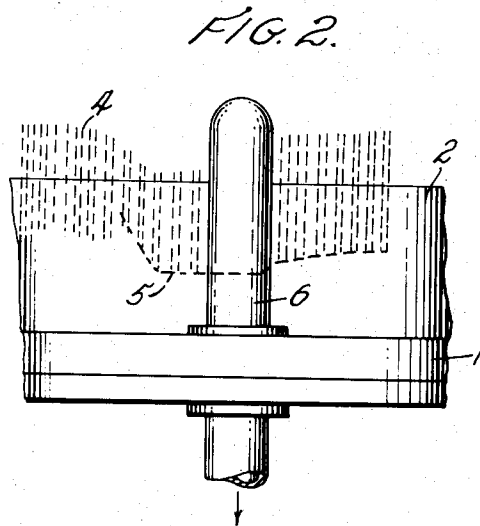


FIG. 2.

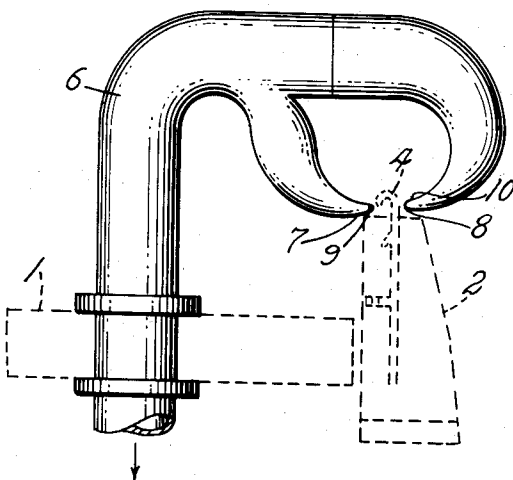


FIG. 3.

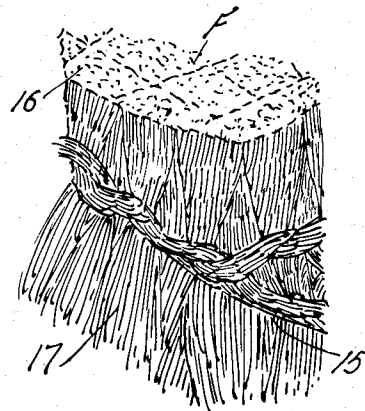


FIG. 4.

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METHODS OF AND APPARATUS FOR MAKING DOUBLE FACED FLEECE KNITTED FABRICS

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12 Claims. (Cl. 66—9)

The present invention relates to improvements in methods of and apparatus for making double faced fleece knitted fabrics, one object of the invention being the provision of a fabric that is made on a rotatable cylinder knitting machine, and in which loose fibers are fed to the needles to be knitted in with the fabric combined with means for "setting" a certain proportion of the free ends of the fibers upon the respective faces of the fabric so that a fabric having both faces pile or fleece is provided.

Another object of the present invention is the provision of an apparatus that is easily applied to any one of the types of machines set forth in the U. S. Patents Nos. 2,255,078, 2,280,535 and 2,280,536, so that the needle held fibers after leaving the point of the knitting cam are simultaneously sucked at a very limited spot, so that the free ends are substantially divided, so that some will be drawn outwardly and some drawn inwardly, to form the pile on the respective sides of the fabric while being knit.

In the above noted patents, there is no provision for drawing the free ends of the fibers to the inside of the needles, and therefore in all instances, the two faces are covered by rolled and knitted in fibers. It was to overcome this, that the present arrangement was designed, and it was found that if the free ends of the fibers are drawn simultaneously to the inside and outside, that is parted at the web, that even though those upon the outside are slightly crumpled as the web is moved down into the cylinder, that this is readily cured in the finishing, by merely brushing the two faces of the fabric, and particularly that side that was in the normal fabric, the back.

In order that the invention may be fully understood, attention is invited to the accompanying drawings, in which:

Figure 1 is a fragmentary top plan view of a portion of a rotary cylinder latch needle machine, with fiber feeding brush in dotted lines, and with the fiber setting device in place.

Figure 2 is a front elevation of the machine adjacent the yarn feed and knitting cam portion thereof with the nozzle member in side elevation.

Figure 3 is a view looking at the fiber suction device taken from the right as viewed in Fig. 2.

Figure 4 is a fragmentary perspective view of the present double-faced fabric.

Referring to the drawings, the numeral 1 designates the frame member of a knitting machine, in which is mounted a knitting cylinder 2, of normal structure.

A fiber feeding brush 3, as shown in the above noted patents and as part of a fiber feeding machine, feeds fibers to the needles 4, just before they receive the yarn (not shown), and as they approach a knitting cam 5, dotted lines, Figure 2.

Disposed adjacent to the knitting cam, is a main suction conduit 6, provided with two nozzles 7 and 8, the nozzle 7 being disposed with its inlet 9, at the outer top edge of the cylinder, and of such a width as to act only on a

space substantially the distance between the needles, that is, in a ten cut cylinder, one-tenth of an inch, while the nozzle 8, is disposed directly opposite to the nozzle 7, so that the needles pass between the two nozzles and so that its inlet 10, the exact size of the inlet 9 of the nozzle 7, and inlet 9 equally oppose each other and substantially divide the free ends of the fibers, which are then drawn to the respective sides of the cylinder.

This combination suction head is used, one to each knitting point, but may be used in series, that is two or more, side by side where necessary and to assure the placing and division of the free ends of the knit-in fibers so that the faces of the fabric will be of equal fleece or pile when finished.

It will be noted that the fabric F, in Fig. 4, which is the type made by the present method and apparatus, consists of the fiber coated loops 15, and the oppositely disposed loose free ended fibers 16 and 17, to form the double-faced fleece or pile fabric.

Thus this arrangement, as contradistinguished from the fabric shown in U. S. Patent No. 2,280,536, has the needle held fibers anchored upon their respective bent portions, formed in the hook of the needle, while the free ends are substantially equally parted or "set" upon both faces of the knitted fabric, to provide a double faced pile or fleece fabric.

The mouths of the nozzles 7 and 8 may be lengthened, and yet narrowed, so as to span more than two needle spaces, and the suction flow of air may be steady or intermittent. To provide for the intermittent suction several methods may be employed, that is needle control or electrically synchronized control.

When needle-controlled, a wire finger is disposed in the path to be struck by the needles as they pass, so that each needle moves this finger to in turn, close an electric circuit, which has an electro-magnet in the circuit, which electro-magnet acts upon a spring returned armature, connected to a control valve, which is closed for an instant as the switch is closed and spring opened, when the circuit is opened. Also in lieu of the electro-magnet, a small motor may be used to rapidly open the air supply.

When a synchronized device is employed, the same is of an electronic construction, actuated by an electric eye in line with the needles, which as they pass, block out the light to the electric eye, and vice versa. In this instance an electro-magnet control as above set forth can be used, or the motor.

Thus by this arrangement, the suction may be constant or intermittent, which ever may serve the purpose better.

From the foregoing description, it is apparent that the short loose fibers while held in the last row of stitches have their loose free ends proportionately or substantially equally divided and placed upon the inner and outer faces of the shanks of the needles just adjacent the upper edge of the cylinder, so that both faces of the fabric are provided with a pile or fleece surface, thus forming a double-faced pile or fleece knitted fabric.

In my former Patent No. 2,457,104, where its nozzle 9 acts on the outside of the fabric, the free ends are drawn to the outside, so that the movement of the cylinder lays them against the outside of the shanks of the needles for the distance of several needles, and thereby produces a small roll of fibers, which when the stitch is removed from the needle by the next stitch, the roll passes upon the face of the fabric upon the inside of the cylinder, the free ends of the fibers being matted. In my Patent No. 2,280,535 showing a nozzle 13 acting upon the inside of the fabric, the thus formed roll of the above mentioned patent may be pulled in through the spaces between the shanks of the needles, to produce a staggered matting of the free ends, so that when the nozzles 9 and 13 are combined in spaced relation to each other, there

are no free ends projecting from either or both sides of the fabric, and the same may be said of the nozzle 5 of my Patent No. 2,457,104, these nozzles 9 and 5 being in staggered relation and not opposed as in the present instance. Thus the nozzles 7 and 8 being opposed and both sucking similarly, the loose fibers being held in the hooks of the needles just before the cam acts to elevate and while elevating the needles, part the free portions of the fibers, substantially equally, so that free ends are disposed in opposite directions, and when the fabric is completed, are disposed equally upon both sides to produce a double-faced knitted pile fabric.

In this arrangement, the free ends of the held fibers are parted simultaneously so that substantially the identical numbers of the same will be laid upon each side of the web of the fabric, so that this invention relates particularly to a fleece fabric of the knitted nature, in which the free ends of the fibers of each stitch are parted at the web, with the web in between.

However, in any instance, the nozzles 7 and 8 must be beyond the downward incline at the forward edge of the knitting cam.

In order to insure the continued parting of the free ends of the fibers after they have been acted upon by the nozzles 7 and 8, oppositely disposed plates or rotating disks may be placed just beyond the nozzles and just prior to the next feeding in of the fibers, that is one upon each side of the needle shanks and adjacent the upper edge of the cylinder. This is particularly desirable when the knitting points are not close together, as in multiple knitting with from four to more feeders to the cylinder.

When the just finished stitch with its fibers parted is passed downwardly upon the inner face of the cylinder, there is a tendency to crush the free ends that have been sucked to the outside of the cylinder and shanks of the needles, but this will be remedied, in the finishing, where both sides are brushed to set the pile or fleece more firmly and produce an even plush like surface on each side of the fabric. This is particularly true when non-wavy or curly fibers, such as the synthetic fibers, nylon and acrylates are employed, while with wool, the pile is slightly wavy, but can be treated to stand up.

What is claimed, is:

1. The herein described method of making a knitted fabric, on a rotary cylinder knitting machine, which consists in delivering to the needle hooks as they are moving with the cylinder short loose fibers just previous to the placing of the yarn in such hooks, knitting in such fibers and yarn to form a combined yarn and loose fiber loop on the shank of each needle, and simultaneously sucking the loose ends of the fibers thus held, so that such free ends are equally parted at the web so that some are drawn in toward the inside of the cylinder and some are drawn outwardly to the outside of the cylinder simultaneously.

2. A method as claimed in claim 1 wherein the area acted upon by the suction action is substantially the width of a plurality of spaces between the respective needles in the cylinder and is at a point slightly above the upper edge of the cylinder.

3. An apparatus for making a double faced fleece or pile knitted fabric, including in combination, a rotatable needle cylinder, needles carried thereby, a cam for actuating the needles to form wales from a yarn, a fibrous material feeding device operating to place fibers in the hooks of the needles in transit and previous to the action of the knitting cam thereon, and suction means disposed to act simultaneously and oppositely from both sides of the needles and the top of the cylinder to draw the loose free ends of the fibers simultaneously upon both sides of the needles to provide fleece surfaces upon both faces of the fabric.

4. An apparatus for making a double faced fleece or pile knitted fabric, including in combination a rotatable needle cylinder, needles carried thereby, a cam for actu-

ating the needles to form wales from a yarn, a fibrous material feeding device operating to place fibers in the hooks of the needles in transit and previous to the action of the knitting cam thereon, and suction means acting simultaneously from both sides of the needles and top of the cylinder to draw the loose free ends of the fibers simultaneously upon both sides of the needles to provide fleece surfaces upon both faces of the fabric, said suction means including a single conduit having two opposed and spaced suction nozzles which are disposed astride the needles adjacent the top of the cylinder.

5. An apparatus for making a double faced fleece or pile knitted fabric, including in combination a rotatable needle cylinder, needles carried thereby, a cam for actuating the needles to form wales from a yarn, a fibrous material feeding device operating to place fibers in the hooks of the needles in transit and previous to the action of the knitting cam thereon, and suction means acting simultaneously from both sides of the needles and top of the cylinder to draw the loose free ends of the fibers simultaneously upon both sides of the needles to provide fleece surfaces upon both faces of the fabric, said feeding device including a brush adjacent the needle cylinder, and said suction means consisting of two spaced needles straddling suction nozzles disposed upon opposite sides of the needles adjacent the top of the cylinder.

6. The herein described method of making a double faced pile knitted fabric, which consists in knitting in with a yarn short loose fibers, and parting such fibers while held by the needles during the formation of the stitch and the knitting operation, so that the free ends thereof are divided substantially equally upon each face of the fabric.

7. The method as claimed in claim 6, wherein the parting action is accomplished by air suction.

8. The herein described method of making a double faced knitted pile fabric, which consists in knitting in with a yarn short loose fibers, and parting such fibers while held by the needles and during the forming of the stitch, so that the free ends of the fibers are divided substantially equal upon each face of the fabric, and the parting action is accomplished by suction applied simultaneously at the same point from both sides of the needles.

9. An apparatus for making a double faced pile knitted fabric, including in combination, a rotatable needle cylinder, needles carried thereby, a cam for actuating the needles to form wales from a yarn, a fibrous material feeding device disposed to place fibers in the hooks of the needles in transit and previous to the action of the knitting cam thereon, and means for simultaneously parting the loose ends of the needle held fibers so as to dispose substantially an equal amount of the free ends of such fibers upon each side of the knitted web at the top of the cylinder.

10. An apparatus as claimed in claim 9, wherein the knitting cam has a relatively long lower edge and wherein the parting means is disposed above such long lower edge and adjacent to the top of the cylinder.

11. An apparatus for making a double faced pile knitted fabric, including in combination, a rotatable needle cylinder, needles carried thereby, a cam for actuating the needles to form wales from a yarn, a fibrous material feeding device disposed to place fibers in the hooks of the needles in transit and previous to the action of the knitting cam thereon, and means for parting the loose ends of the needle held fibers so as to dispose substantially an equal amount of the free ends of such fibers upon each side of the knitted web at the top of the cylinder, said parting means consisting of a double suction nozzle whose inlets oppose each other but are separated to straddle a point adjacent the rim of the cylinder and upon opposite sides of the needles.

12. The process of making a double faced pile fabric, which comprises feeding base yarn and fiber staple into open hooks of needles while in transit, knitting said fiber

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and yarn to form a knitted base fabric and pile, and parting each needle held pile during the knitting operation, whereby two pile surfaces, one upon the inner and one upon the outer face of the fabric, result.

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