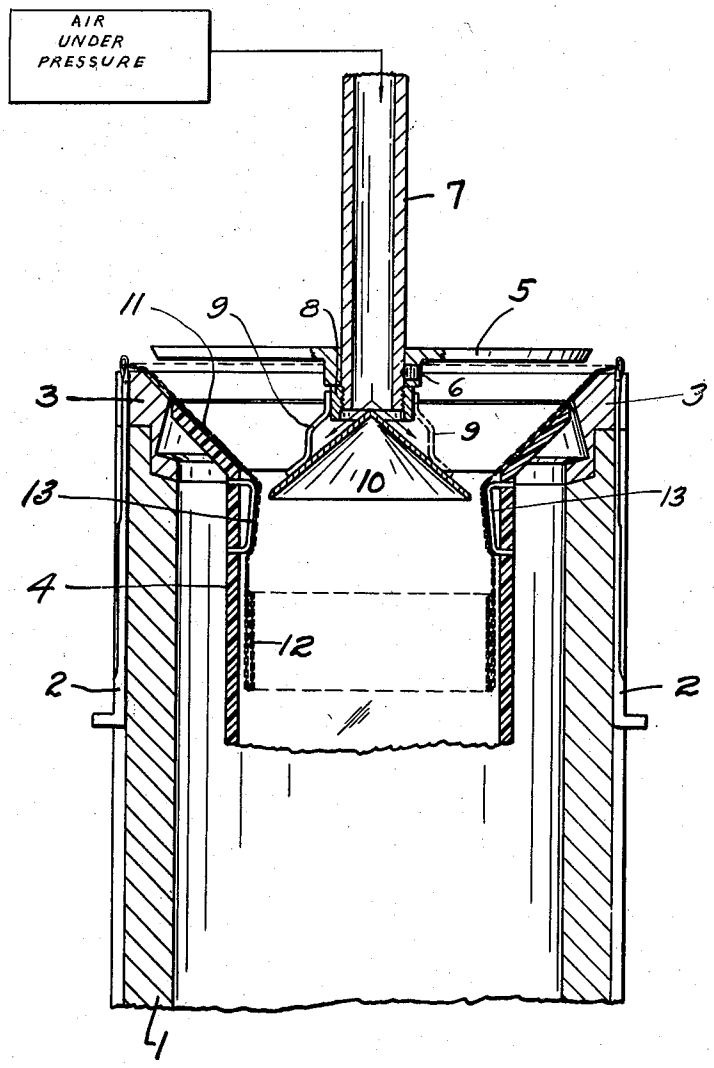
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FABRIC TENSIONING METHOD AND MECHANISM

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FABRIC TENSIONING METHOD AND MECHANISM

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This invention concerns circular knitting machines, and in particular, fabric tensioning devices for use in such machines.

Co-pending U. S. Patent application Serial No. 500,756, dated April 12, 1955, describes how, hitherto, complicated mechanical mechanisms have been necessary for the fully automatic knitting of separate articles such as individual stockings or hosiery on circular knitting machines, and discloses an improved fabric tensioning system wherein a current of air, produced by suction, is used to tension the fabric while it is being knit. This system is quite satisfactory. It requires, however, a relatively airtight mechanism consisting of a tube leading from the top of the cylinder, down through it, to a discharge zone where doors are automatically opened to remove the fabric after each article or stocking has been knit.

The purpose of the present invention is to provide a fabric tension which will have all of the advantages of the suction system referred to above, and yet will be simpler in structure and operation.

This is accomplished by blowing air down through the cylinder to engage the fabric and tension it during the knitting operation.

The inventor is aware that nozzles or jets introducing compressed air to the top of a needle cylinder have been used for cleaning purposes and to assist in the formation of a turned welt. For example, Williams Patent No. 2,275,276 suggests that compressed air can be directed to the stitch point to tension the stitches as they are knit and balloon the welt away from the needles; and Moss Patent No. 2,636,364 describes how the air can blow the welt into a specially constructed receptacle as it is being formed. The present invention goes beyond these practices and eliminates the mechanical takeup entirely by blowing air down through the cylinder, or a fabric receiving tube within the cylinder, with sufficient spread, volume and pressure to entrain the fabric and produce the effect of a weight dragging upon it throughout the knitting operation. This drag, however, is superior to that produced by the conventional weight attached to the welt in that it is effective even when there are heel and toe pockets and other slack portions in the body of the fabric.

The accompanying drawing presents a sectional view of a circular knitting machine equipped with one form of fabric tensioning mechanism embodying the invention.

In the drawing, the conventional needle cylinder **1** is equipped with the usual needles **2**. At the top of the cylinder is a stitch ring **3**, and inside the cylinder is a fabric guiding tube **4** made of plastic, metal, or other suitable material.

The machine is equipped with a dial **5** which is fixed by means of set-screw **6** to a shaft **7**. The shaft **7** is hollow, thus providing a conduit for bringing air under pressure to the top of the cylinder.

The bottom of the shaft **7** is threaded, and screwed to it is a collar **8** which carries a number of brackets **9** supporting an air deflector **10**. The deflector **10** has the

shape of an inverted cone and serves to direct the air coming down the shaft **7** outward so that it is spread as it enters the tube **4**.

The drawing shows hosiery fabric **11** in the process of being knit by the cylinder needles. A turned welt **12** has already been formed and has passed part way down the tube. The air under pressure coming down through the shaft **7** and fanned outward by the deflector **10** entrains this fabric and carries it downward through the tube.

Fabric lifting fins **13**, similar to those described in the application identified above, are angularly disposed at the top of the tube which is stationary. This produces a camming action on the rotating fabric which assists in feeding it downward through the tube. Also, by lifting the fabric, the fins enable some of the air current to pass between the fabric and the tube, thereby counteracting to some extent the effect of frictional contact between them. This results in a more satisfactory entrainment of the fabric by the air as it passes down through the cylinder.

The tube **4** may lead straight from the bottom of the cylinder to a fabric receiving container located directly below the machine, or it may be U-shaped and the container may thus be located convenient to the hand level of the machine operator. In either case, the air blowing down through the tube will carry the completed stocking, after it is pressed from the needles, into the container.

The container should be covered to prevent stockings from being blown out of it by the air current; and the cover, or some other portion, should be of a screen-like structure to provide an escape for the air coming through the tube and container.

Reference has been made above to the use of this fabric tensioning device on machines producing fine gauge fabric, such as ladies' hose. The invention, however, is not to be understood to be limited to such a machine. It is equally applicable to coarser gauge machines or those having needles in their dials and knitting rib fabric. Nor is it limited to dial machines. Means other than a hollow dial shaft can be used to blow air down through the cylinder and tube; and forms of air deflectors other than the one shown are also to be contemplated.

I claim:

1. A circular knitting machine having a cylinder, a dial, a hollow dial shaft, means for providing a current of air under pressure through said hollow shaft to the interior of said cylinder and means for directing said current of air in a direction substantially coaxial with said cylinder.

2. The invention according to claim 1 and wherein said cylinder is provided with a fabric receiving tube.

3. The invention according to claim 2 and wherein means is provided to direct said current of air to move downward through said tube with a spread adapted to entrain fabric within said tube.

4. The invention according to claim 3 and wherein said directing and spreading means comprises a cone-shaped air deflector.

5. The invention according to claim 3 and wherein said tube is provided on its inner surface with elements arranged to hold parts of the fabric away from said surface and thereby permit air to pass between said fabric and said surface.

6. In a circular knitting machine having a needle bearing cylinder and means for producing knitted fabric to be drawn downwardly within said cylinder, means for discharging a stream of air substantially concentric to said cylinder and downwardly thereof to tension said fabric as it is knitted throughout substantially the entire cycle of knitting thereof.

7. In a circular knitting machine for knitting hosiery,

a needle cylinder, a dial, needles carried by said cylinder and instrumentalities in the dial for cooperating therewith to form an article of hosiery, means for tensioning and drawing the fabric from the needles as it is formed which comprises a means positioned for discharging within said cylinder and directed downwardly thereof, an annular stream of air disposed substantially concentrically to the cylinder thereby to entrain and to impart its tractive effort uniformly about the circumference of the article of hosiery for substantially the entire cycle of knitting thereof.

8. Mechanism as defined in claim 7 wherein a fabric receiving tube is disposed within said cylinder and said means for discharging air is positioned, at least in part, within said tube.

9. A method of tensioning and taking up fabric as it is knitted in a circular knitting machine which comprises

the step of discharging downwardly within and substantially concentrically of the needle cylinder of such machine an annular column of rapidly moving air to entrain and impart its tractive effort uniformly about the circumference of the fabric and for substantially the entire cycle of knitting thereof.

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