针织专业英语

（二）

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无锡轻工业学院

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Table of Contents

(Book II)

Chapter 1

Verlical Spring Needle Circular Knitting

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A LTHOUGH CIRCULAR latch needle jersey machines find more favor in knitted outerwear mills, the spring needle loopwheel machines possess certain advantages over their latch needle counterparts in the production of cloth manufactured on one set of needles.

The loopwheel machine has a very wide range of products. In addition to knitting excellent quality jersey cloths, they may be adapted to produce knit and tuck effects, patterns in color, raised colored patterns, single and double faced terry cloths, plated fabrics, plush fabrics very suitable for napping, eyelet cloths, and elastic fabrics. In additton, this versatility may be increased by changing the needles and loop forming elements to give different gauges of fabric.

An important advantage to the small manufacturer, especially when knitting expensive yarns lies in the fact that cylinder sizes can be changed, thus reducing unnecessary cutting waste on certain garment sizes. When producing fabrics for the cutting-up trade, an excessive number of holes may reduce the piece to a second, thereby lowering its value. It

is possible to repair a hole, pressoff, drop-stitch, or other fault on the machine by pressing the loops back onto the needles again. An expert operator is required, however, to do this work, but if stitching on is not required, an operator can tend twelve heads knitting plain jersey, while an operator may look after three multi-feed latch needle machines with a total of 192 feeds. Each loopwheel head will only contain from six to twelve feeds according to its diameter. As the needle speed of a loopwheel machine may safely exceed 275 feet per minute on good quality yarns, the speed will be far in excess of that of a similar diameter latch needle machine, and the stoppages will be less, causing the production per operator to be fairly comparative on plain jersey fabrics. The formula

$$\frac{1000}{D}$$

where D equals the cylinder diameter provides a suitable speed for average yarns so that a 20 inch diameter machine can rotate at 50 R.P.M.'s.

As the cylinder and fabric revolve and the cloth is taken upwards off the needles, the work is in constant view of the operator. " Pig-tail " tie ups may be safely used -- even on bottle bobbins as the bobbin

stand is usually on the floor underneath the table.

The superior quality of spring needle fabrics may be laid down to the following:

1. The needles are cast into leads or are firmly held by a clamp to the cylinder, and do not move independently of each other, thus insuring that each loop is drawn at the same distance from its neighbor (providing of course that the needles are pliered into the correct position).

2. The beard is closed by an independent source and does not rely on the old loop creating friction upon the latch.

3. When the beard is closed the fabric is not so distorted or stretched when it passes over the outside of the beard, although modern latch needles have been improved in this direction by providing longer latches and smaller hooks.

4. Each loop receives a measured amount of yarn.

Most loopwheel machines consist of a table upon which are supported two cylinders, rotated by a shaft which runs underneath the table. This shaft may also drive a vertical shaft coupled to the take-up mechanisms, which is supported above the cylinders, by a pillar located between the cylinders in the center of the table. The fabric take-up revolves in unison with

the cylinder and winds the fabric into a roll. Between the cylinder and cloth takeup are two fabric speaders -- one circular and one elliptical -- to guide the cloth to the rolls. On the inside of the cylinder is located a ring, upon which are fastened a number of brackets holding the loop forming elements known as burrs. These burrs consist of a number of steel blades fixed at an angle to a bronze hub. This hub is rotated upon a spindle attached to the bracket by means of the revolving needles. The hubs are cut to receive the steel blades to conform with the machine gauge, which is calculated upon the number of needles in 1 $1/_2$ inches of the cylinder circumference -- a throwback to the days when the gauge of a hand frame was determined by the number of two needle leads supported by a three inch clamp. Each blade fits between two needles and as the cylinder turns, the needles contact the burr blades and rotate the burr upon its spindle.

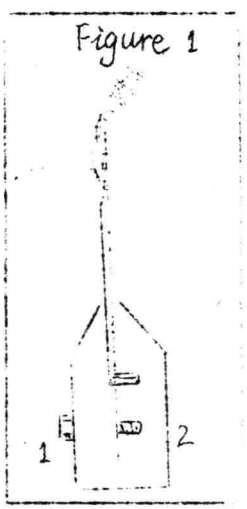
There are several different varieties of burrs. Some introduce yarn to the needles, others assist in moving the fabric up and down the needles in the formation of the stitch. Still others are used to locate the yarn in certain positions on the needle stem while other types may act as safety devices. The outside positioned burrs and other loop forming elements are located on

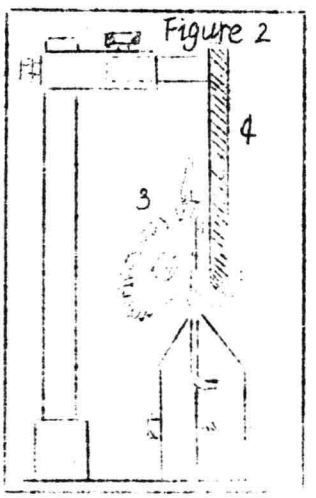
brackets fixed to an outer ring. Provision is made on all elements to insure adjustment in all direction. Cloth structure depends upon the place of these loop forming elements. Each group of elements constitute one feed and may consist of a simple arrangement to produce jersey cloth to a more complicated set out necessary to knit double faced terry cloth. The cloth structure and diameter of cylinder determine the number of feeds which can be accommodated around the periphery of the cylinder. A terry cloth arrangement requiring, of course, more space to knit one course of loops than a jersey cloth set out, and the production is therefore not so high.

Not in possession of holding down sinkers, fabric must be introduced to the loopwheel machine by pressing on to each needle, the needle loops along one course of a cloth from a similar gauge and diameter machine, and the excess courses are unravelled. A quicker method is used by stabbing the cloth, about an inch away from the cut portion, onto the needles. The other end of cloth is entered into the take up rolls, and tension placed on the cloth. The inch of cloth below the needles is then folded back over the needles. Too much tension on the cloth may cause bent needles, bed smashes, holes, and other faults, while too little tension

on the cloth may result in tuck stitches, floats, etc.

To produce jersey cloth, one push down wheel or shoe, one sinker burr, a presser, one lander, and one cast off burr are necessary. It is possible to eliminate one burr by using a combination burr to combine the functions of landing and casting-off. This reduces the area of one feed, and increased production can then be gained by fitting more feeds around the cylinder circumference. Very often a clearing burr is fitted to ensure that the fabric, and loose yarns are taken safely away from the beard to allow the positive introduction of the yarn by the sinker burr. For high quality goods a dividing wheel may be used immediately after the sinker burr to even out the stitches. The presser may take the form of a shoe to close all the





needle beards as they pass or a round wheel with small depressions cut in its circumference to match the gauge of the machine.

Fig. 1 shows the fabric loops in their normal or rest position at the commencement of a course. Tension on the cloth pulls the loop to the top of the needle where it is safely controlled inside the beard. A cloth wheel, rotated by contact with the moving fabric, and supported from the outside ring overcomes the tension on the cloth and pushes the fabric down to the bottom of the needle. If the wheel is adjusted too far in, the fabric loops tend to resist the effort of the wheel and remain in a high position on the needle causing the sinker burr to catch in the fabric loops. The clearing burr is set close to the leading edge of the cloth wheel on the outside of the needles in a low enough position to force all loose yarns and other foreign matter well down out of reach of the sinker burr, and to assist the cloth wheel in its duty (Fig. 2)

Fig. 3 shows the introduction of the yarn by the sinker burr, while the fabric is still held down by the cloth wheel. The yarn isr run from the cone or bobbin sitting on the floor, through stop motions, feed wheels, or tensior devices to a guide situated

very close to the edge of the sinker burr. The blades of the sinker burrs possess a small indentation known as a nib, and the guide eye is set level with the nib, so that upon rotation of the cylinder, and consequently the burr, the yarn is taken by the sinker nib and crimped around the needle stem. Due to the angle in which

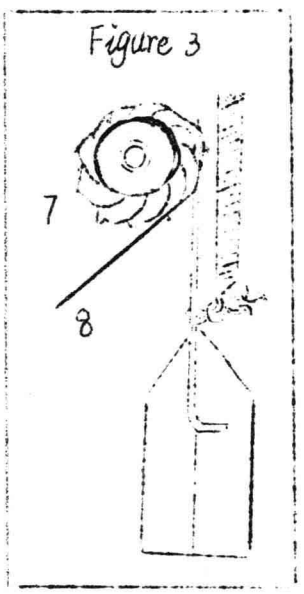


Figure 3

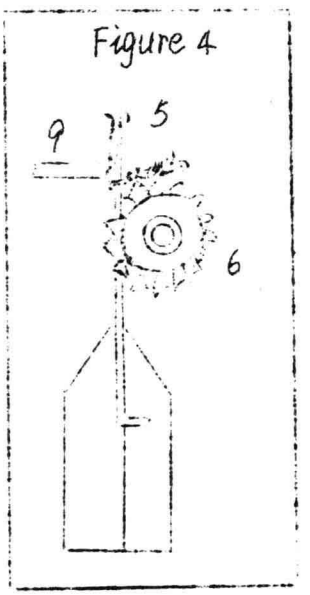


Figure 4

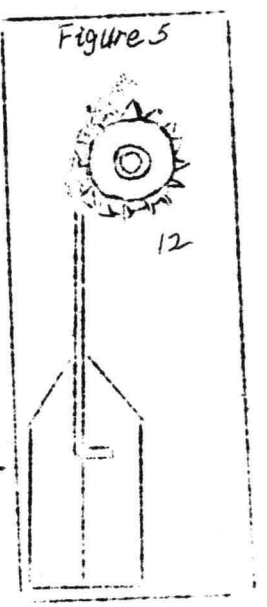


Figure 5

the burr is set the crimped yarn is pushed up underneath the open beard by the sinker blade. The setting of the sinker burr is most important. Set too high the yarn will not enter the beard and set too low will not be taken high enough towards the head of the needle by the sinker blade. Set at the

wrong angle the burr blades will strike the needles, bending them or tearing off beards. The depth to which the sinker blades are pushed in between the needles determines the length of stitch and the quality of the fabric. Pushing the sinker burr further in, towards the cylinder center, causes a longer loop to be formed between the nib and the needles, and a slacker quality fabric will result. Adjustment of the sinker burr too far in between the needles, may cause the blades to strike the cloth wheel or shoe, while insufficient stitch length will produce a tight stitch and may cause the cast- off operation to be difficult.

The most critical setting is perhaps the setting of the presser in conjunction with the lander burr and cloth wheel. The sinker burr should be set as close as possible to the presser in order that the newly formed loops will be left out of control for the least possible time. Lively yarns such as worsted yarns, highly twisted, or unconditioned yarns dislike being crimped into the shape of a loop, and have a tendency to jump out of the needle beard if it is not closed in time. To reduce this liveliness in yarns, it has been found beneficial to run the yarn through steam jets immediately prior to entering the yarn guide.

The presser is adjusted so that the blade is positioned

opposite the crimp of the beard and in such a horizontal position that the tip of the beard will be closed into the eye as the needle is revolved. On the inside of the cylinder immediately opposite the presser is a lander burr. This is located very close to the trailing edge of the cloth wheel. As the downward pressure of the cloth wheel is no longer apparent, the fabric loops are drawn upwards by the tension on the cloth. The angle of the lander burr causes each one of its rotating blades to strike the fabric loops and lift them upwards. As the beards are closed by the presser during this procedure, the fabric loops will pass over the outside of the closed beard while the newly formed loop will be securely enclosed in the needle beard. (Fig. 4). Too little a forward adjustment of the presser will result in tuck stitches as the fabric loop will pass up inside the beard, or become pierced by the tip of the beard, as the beard will not be fully closed. Needles which are bent away from the presser will invite a similar situation. Pressers pushed forward too far will cause heavy wear of the needle beards, and possibly injury to the lander burr.

Upward tension of the cloth prevents the fabric loops from falling down below the beard as the needles leave

the presser allowing the beards to spring open. Situated alongside the lander burr is a similar shaped burr set a little higher causing the fabric loops to be lifted still higher so that they pass over the beard and over the head of the needle to be supported by the newly formed loop which now becomes the fabric loop. (Fig.5). A high setting of this burr causes a strain on the needles and the yarn, while insufficient height or depth adjustment may not cast off the fabric loop, causing it to be pushed down the needle stem along with the newly formed loop at the next feed and cause a stitch or float to be made.

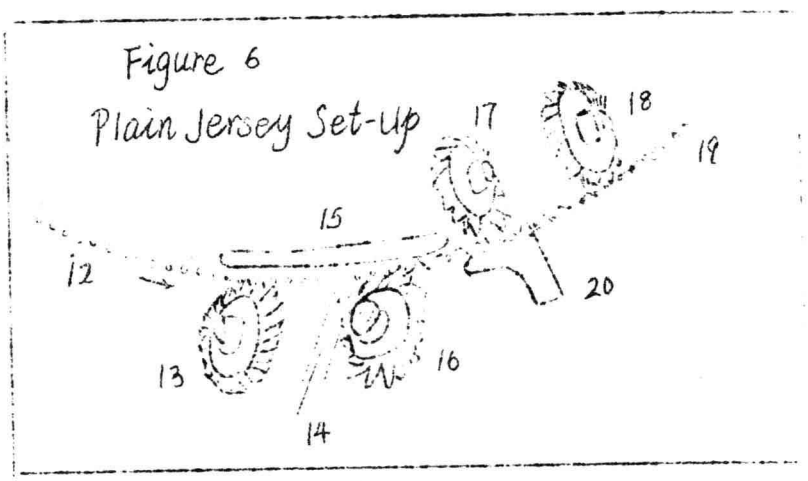
The relative position of these loop forming elements in knitting jersey cloth is shown by the plan view in Fig. 6 where the needle cylinder is rotating in a counter clockwise direction.

The loopwheel machine will knit a plain jersey cloth in a greater range of counts than a latch needle machine of a similar gauge. A worsted yarn equal to $\frac{\text{Gauge}^2}{28}$ gives good results so that a 32's worsted may be run successfully on a 30 gauge machine. By feeding yarns in such a manner so that they do not enter the needle beards, it is possible to use yarns of much

heavier counts. This technique of "laying-in" yarn not only produces a much denser cloth but also gives good dimensional stability to the cloth. So much so that after finishing, these cloths are difficult to tell from woven samples, and are used in the manufacture of overcoats, topcoats, blankets, dress goods, snowsuits, windbreakers, ect.

These laid-in fabrics come under two categories: (1) Single plush and (2) double plush. There are several varieties of both types which can be made into many different fabrics by the application of different types of yarn and finishing processes.

The single plush is the most simple construction, and



when knitted in woolen yarn with a single plush feed alternating with a plain jersey feed produces after a slight mill and dyeing a handsome dress geogs material.

In addition to the set-up required for jersey cloth,

one or two "plush" or "backing" burrs are necessary for the production of single plush fabric. The use of one backing burr produces a "single plush single backing" fabric, while two backing burrs knit a "single plush double backing". The backing burr blades are shaped a little different from the sinker burr blades and are offered to the needles at an angle which will cause the yarn to be introduced in a downward direction. Between certain blades are placed blocks which push opposing needles towards the center of the cylinder. These blocks may be arranged between the blades in some form of pattern such as--one block in, one block out. The backing burrs are positioned just before the clearing burr. The yarn is fed through a guide to the backing burr. If no block pushes the needle back then the yarn will fall behind the needle, while a block will push its needle back and cause the yarn to be delivered to the front of the needle over the beard. Where twp backing burrs blocked 1 X 1 are in use, it is customary to time the second burr so that the needle edle pushed forward by the first burr will not be pushed forward by the second. As a result, the yarn is delivered to the needles in the manner described in Fig.7. The clearing burr will now push the backing yarns down to join the fabric loops held at the bottom

of the needle stem by cloth shoe. A cloth shoe controls a greater area of fabric than a wheel and is generally used on plush and terry cloths. A yarn for the ground fabric is introduced by a normal sinker burr, the presser closes the beards while the lander brings up the backing yarns over the needle beards along with the fabric loops. The laid-in yarns will be tied in securely by the newly formed loop and will appear on both sides of the cloth as shown in the single plush with qouble backing cloth mustrated in Fig.8.

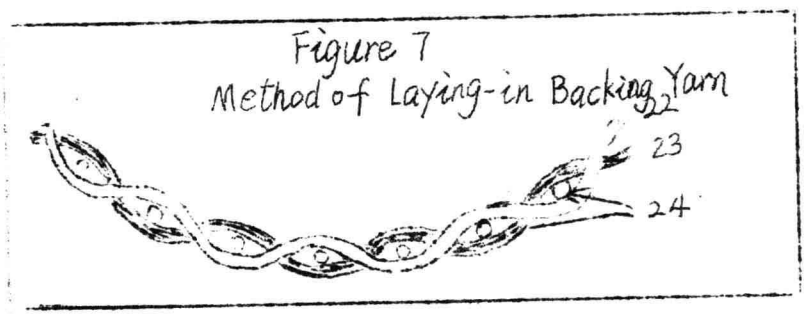


Figure 7
Method of Laying-in Backing Yarn

Variations of this can be made by employing different yarns, different counts, and arrangements of plain jersey or tuck feeds between alternate backing wheels at succeeding feeds.

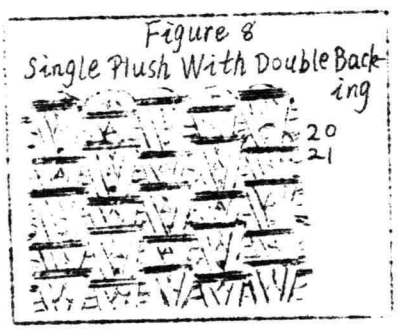


Figure 8
Single Plush With Double Backing

Double plush fabrics are used extensively for sweat shirsts, childrens garments, boot linings, windbreakers,