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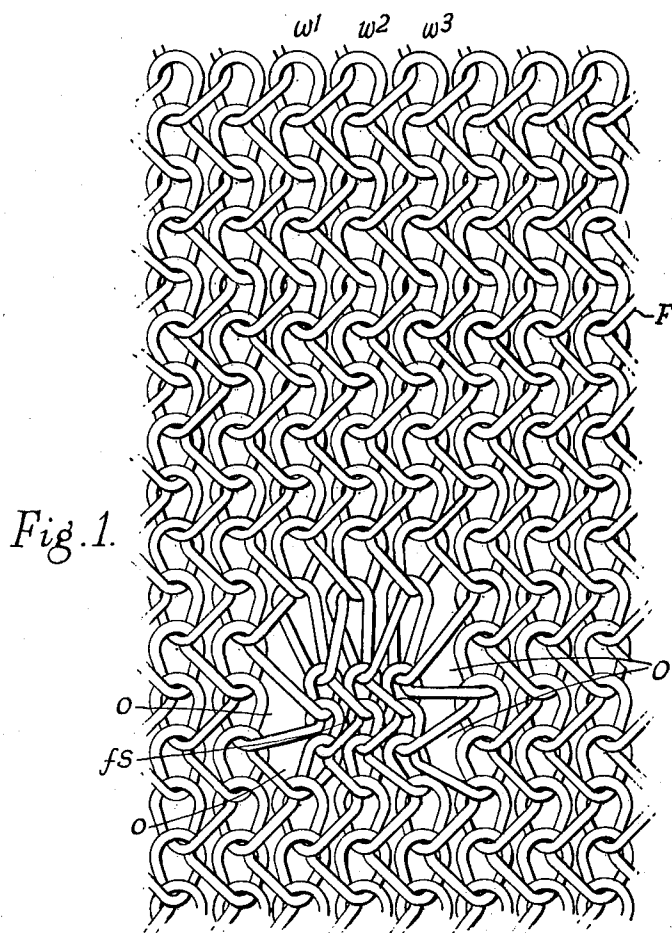
W. BOLTON

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METHODS OF PRODUCING WARP KNITTED FABRICS

Filed Feb. 7, 1958

5 Sheets-Sheet 1



INVENTOR

WILFRED BOLTON

*Larson & Taylor*

ATTORNEY

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W. BOLTON

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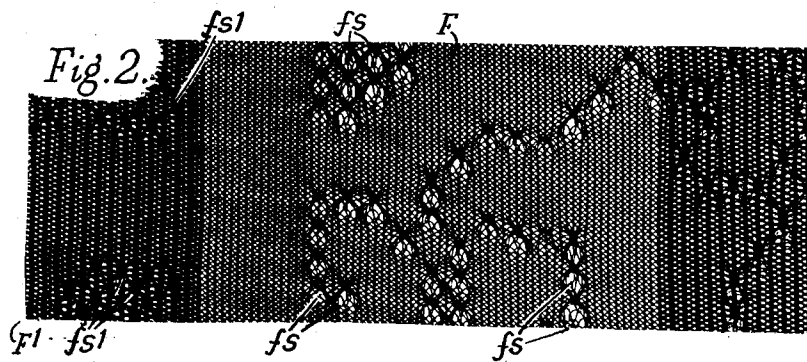
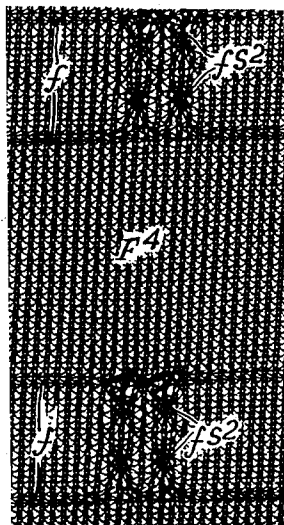


Fig. 4.



INVENTOR

WILFRED BOLTON

BY  
*Larson and Taylor*  
ATTORNEY



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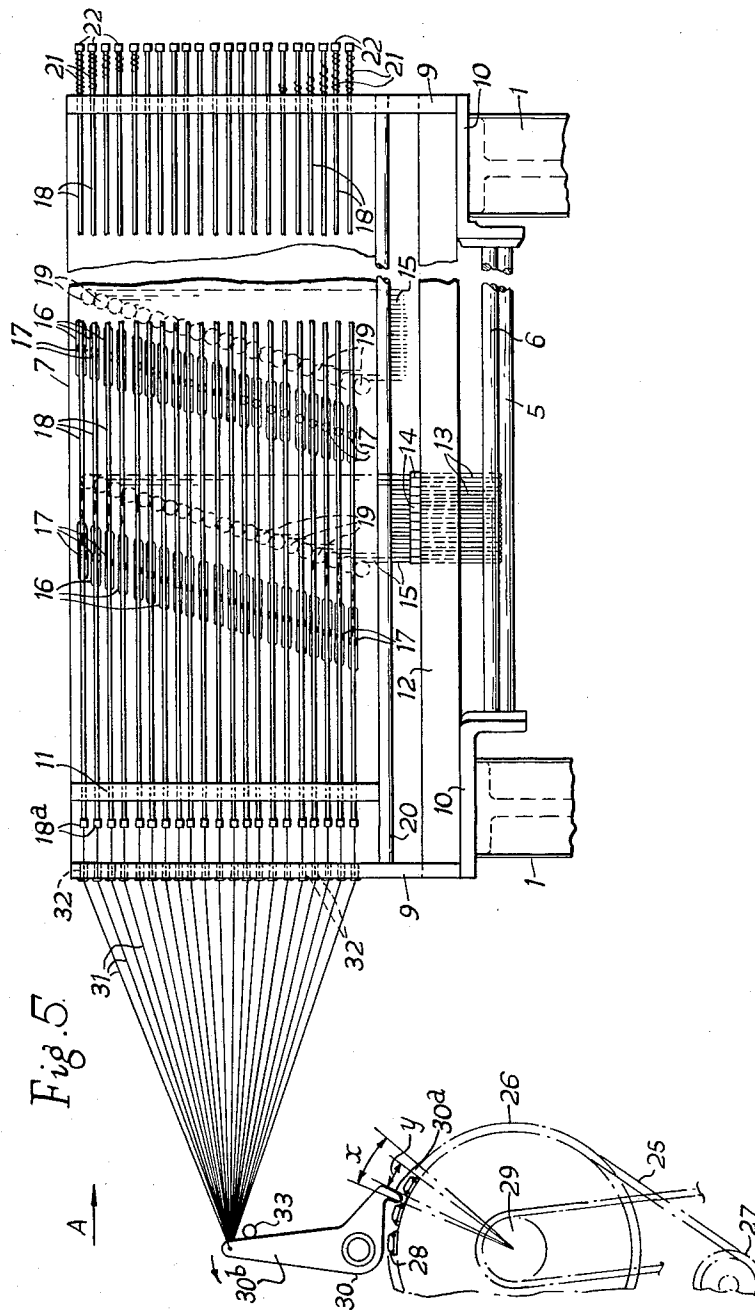
W. BOLTON

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METHODS OF PRODUCING WARP KNITTED FABRICS

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INVENTOR

WILFRED BOLTON

BY  
*Larson and Taylor*  
ATTORNEY

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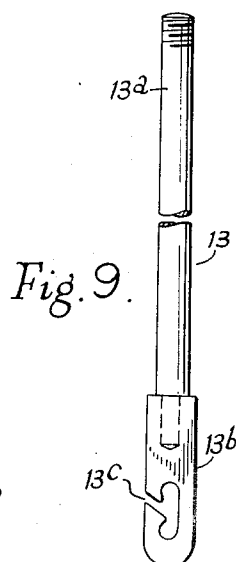
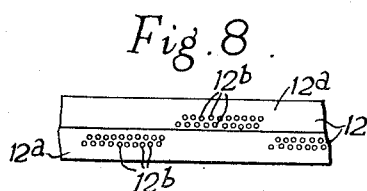
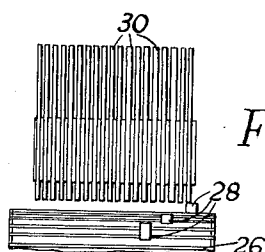
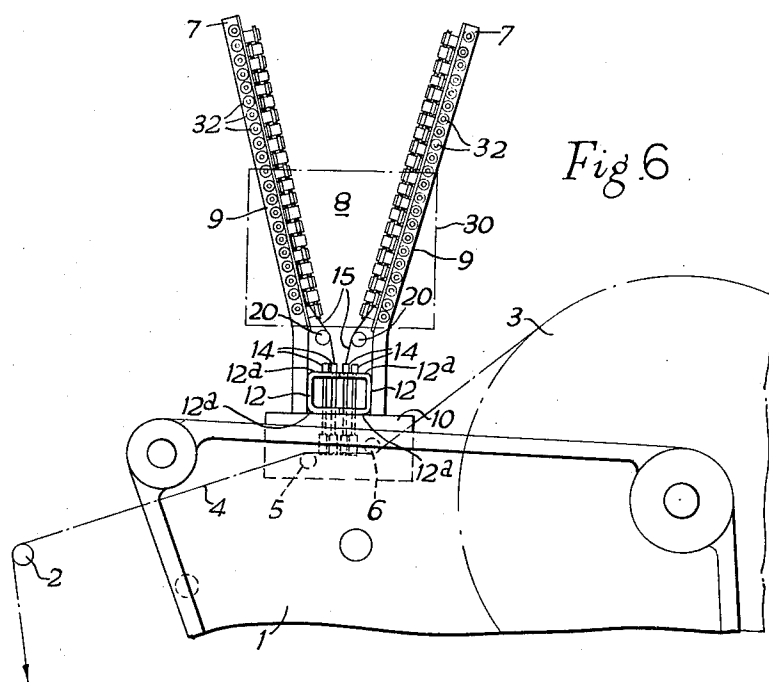
W. BOLTON

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METHODS OF PRODUCING WARP KNITTED FABRICS

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5 Sheets-Sheet 5



INVENTOR  
WILFRED BOLTON

BY  
*Larson and J...*  
ATTORNEY

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3,063,272

## METHODS OF PRODUCING WARP KNITTED FABRICS

Wilfred Bolton, Wigston Fields, Leicester, England, assignor of one-half to A. W. Swann and Company Limited, Leicester, England, a British company

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3 Claims. (Cl. 66—86)

This invention appertains to methods of and mechanism for producing warp knitted fabrics, that is to say fabric comprising chains or wales of ordinarily meshed knitted loops which are formed from individual threads or "ends" and are connected laterally.

The methods concern making warp knitted fabric on warp knitting machines comprising, in combination, at least one set of bearded needles or tubular needles furnished with tongues (of the FNF type) and, co-operable with presser means for controlling the needle beards or tongues, one, two or more sets of thread guides carried by a guide bar or bars which is or are adapted to be shogged to and fro longitudinally for lapping as well known to those acquainted with the art concerned.

In a warp knitting machine of this kind, the said presser means may consist of a solid presser bar.

Moreover, the invention is concerned with certain improvements relating to such warp knitting machines for carrying out these methods, as will be hereinafter set forth.

The aim of the methods and mechanism of the present invention is to provide, in warp knitted fabrics, novel patterning effects whereby a new range of pleasing patterns and designs of practically infinite scope and variety can be produced in a simple manner resulting also in unorthodox texture of the fabric.

Now faults caused in warp knitted fabrics by normally undesired interference with, or interruption of, the controlled run-in of the warp ends, during knitting, are very noticeable both on the back and the face of the fabric, irrespective of the lapping movements of the thread guides employed. The effects of faulty warping are all the more pronounced when yarn such as nylon is being knitted which yarn, besides being immensely strong, is capable of considerable stretch and of full and immediate recovery. Such faults, moreover, are very prominent when warp knitted fabrics, by virtue of being knitted with yarns of fine deniers have a tendency to transparency.

Thus, for instance, there is the fault caused by "dragging thread" and revealed, in the case of a 1 x 1 lap tricot, as an apparent joining or running together of the two needle wales concerned in the making of the laps. This appearance is due to the fact that loops in these particular needle wales are formed with ends under a greater tension than the ends used in forming surrounding loops. All the needle loops in the area of the fault are affected, and the prominence of the fault depends, of course, on the amount of tension to which the appropriate ends are subjected during the "dragging" period. In any event, there is a marked contrast between the tightened loops of a "dragging thread" fault and the surrounding loops formed under normal conditions long before the breaking point of the tensioned ends is reached.

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A second fault is one caused by slackening of warp ends resulting in snarling of the slackened ends which latter "bubble" through the ground structure.

As will be appreciated the faults referred to are normally rare owing to modern warping methods, good quality yarns and the efficient use of skilled labour.

An aim of the present invention, however, is deliberately to cause such faults in a controlled manner, and in predetermined sequences, resulting in the aforementioned patterns and designs. In short, the invention is based upon the judicious exploitation of known knitting faults.

The warp knitted fabric produced by the methods and mechanism of this invention is accordingly patterned by effects, hereinafter for convenience referred to as concentration of loops, produced by interference with, or interruption of, the controlled run-in of selected warp ends, during knitting of the fabric.

Considered from its broadest aspect, the method producing a patterned warp knitted fabric therefore consists in maintaining, throughout their length, a calculated run-in of appropriate warp ends suchwise as to produce a ground of standard (normal) structure, and interfering with, or interrupting, the controlled run-in of each of selected ends during the knitting of predetermined courses so as to produce concentrations of loops but permitting the selected ends to run-in normally during the knitting of the remaining courses of the fabric. Thus, in the intervening periods between the periods of its abnormal run-in each selected end is allowed to resume its normal controlled run-in.

For producing concentrations of loops of the "dragging thread" type, the normal rate of run-in of said selected ends is reduced to apply tension to the latter, whereas to produce concentrations of the second type hereinbefore described the normal rate of run-in of selected ends is increased to slacken the same.

Broadly considered, the means provided in conjunction with a warp knitting machine for interfering with or interrupting the controlled run-in of selected warp ends may conveniently comprise, in combination, at least one row of individual and suitably guided warp end interfering members, one to each of predetermined ends or groups of ends in a series of ends threaded through the guides of a guide bar, relatively stationary tension elements adjacent to which the ends run, said elements being arranged at opposite sides of, and adapted to co-operate with, the interfering members, selectively operable actuating members each connected with some of the interfering members and adapted, when moved selectively in one sense, to raise or lower selected interfering members and so cause them to engage and lift or lower portions of the corresponding ends or groups of ends extending between the tension elements but when moved in the reverse sense to respectively lower or raise the elevated or lowered members and so return the relevant ends or groups of ends to their normal path and patterning mechanism for controlling the actuating members.

Conveniently, the warp end interfering, i.e. lifting or lowering members may be vertically movable in which instance the actuating members may consist of horizontally shiftable rods or the like which are connected with the interfering members by flexible elements passing over grooved pulleys or equivalent. In any event, warp end

interfering members of the row are each adapted to engage a group of, say, two, three or four selected ends.

In order that the invention may be more clearly understood and readily carried into practical effect, specific examples of warp knitted fabrics capable of being produced on a two bar warp machine and patterned by concentrations of loops by methods of this invention, and mechanism provided in conjunction with such a machine for producing the concentrations will now be described with reference to the accompanying drawings, wherein,

FIG. 1 illustrates, on a greatly magnified scale, the back of a portion of plain, single bar 1 x 1 warp knitted fabric incorporating a concentration of loops produced by tensioning or dragging selected ends,

FIG. 2 depicts, on a much smaller scale and for purpose of comparison, adjoining portions of single bar and double bar fabric both patterned by concentrations of loops produced by dragging selected pairs of ends in predetermined wales and over desired courses,

FIG. 3 is a digrammatic representation of a portion of tricot fabric having double or plated knitted loops and showing a concentration of loops involving two wales which are distorted towards one another and produced by tensioning or dragging a single warp thread or end,

FIG. 4 illustrates a portion of 1 x 1 tricot combining concentrations of loops produced in accordance with this invention with conventional patterning, as will be hereinafter described,

FIG. 5 is a side view of a mechanism adapted for use in conjunction with a two bar warp knitting machine for interfering with the controlled run-in of selected warp ends,

FIG. 6 is an end view of the said mechanism as seen in the direction of the arrow A in FIGURE 5,

FIG. 7 is a detail edge view of a set of chain-controlled levers provided for shifting horizontal actuating rods whereby the warp end interfering hooks are lifted and lowered,

FIG. 8 is a detail plan view of opposed U-section rails which are drilled to receive, house and function as guides for the said interfering hooks, and

FIG. 9 is a further detail view depicting one of the interfering hooks per se.

The portion of plain 1 x 1 fabric F shown in FIGURE 1 is produced on the single set of needles of a double bar knitting machine co-operating with the front bar only of the latter. As will be seen, the illustrated portion of fabric F incorporates a concentration of loops  $fs$  which involves three adjoining wales  $w^1$ ,  $w^2$ , and  $w^3$  and is produced by lifting and thereby tensioning or dragging two adjacent warp ends. The normal rate of run-in of these two ends is, therefore, reduced and the result is to drag and bunch knitted loops together into a knop adjacent to which small openings  $o$  occur. FIGURE 1 accordingly depicts a typical concentration of loops produced by dragging warp ends and distorting loops in a single bar fabric.

In FIGURE 2 a much more extensive portion of such single-bar fabric is indicated at F, this portion being patterned by predetermined dispositions and sequences of concentrations of loops  $fs$  of the character described in the last preceding paragraph, and being adjoined by a portion of two-bar fabric  $F^1$  patterned by other sequences of more tightly formed concentrations of loops  $fs^1$ . Thus, in making the portion of two-bar fabric  $F^1$ , the back guide bar is only half set, i.e. with warp ends threaded through alternate ones only of the thread guides of the said bar, the latter being shogged such-wise as to produce 2 x 1 lapping. The front bar on the other hand, is fully set or "all in," i.e. with warp ends threaded through all of the guides in the bar and the latter is actuated to produce 1 x 1 tricot lapping. Of the series of warp ends threaded through the front guide

bar alternate pairs of these ends are permitted to run-in normally, whilst the intervening pairs are lifted to produce the desired sequences of concentrations of loops  $fs^1$  by the "dragging thread" technique. Although for convenience of illustration in FIGURE 2 a portion of single bar fabric is shown actually adjoined to a portion of double-bar fabric it would usually be the intention (without limitation in this respect) to produce such fabrics separately.

FIGURE 3 illustrates the incorporation of a concentration of loops  $fs^2$  in a true single tricot fabric  $F^2$ , that is to say double 1 x 1 warp knitted fabric made on one set of needles co-operating with two fully set guide bars each making similar laps but in opposite directions. In such fabric the knitted loops are double ones in plated relation. Thus, it will be realised that the un-shaded knitted loops  $l$  at the back of the fabric lie behind and are hidden by the shaded knitted loops  $l^1$  at the front face of the fabric. The face of the fabric, moreover, has normally straight prominent wales  $w^4$  and the crossings of the warp ends resulting from the manner of lapping are indicated at  $c$ . The two adjoining wales  $w^5$  and  $w^6$  are involved in the concentration of loops  $fs^2$ , these wales, as a consequence of a single warp end being lifted and tensioned, having the appearance of joining or running together at  $d$ . In practice, the tightened and distorted knitted loops in the area  $d$  contrast markedly with surrounding normal loops.

Front bar loops such as  $l^1$  which, due to their positions on the needle stems when lapping, normally plate on the face of the fabric as shown in FIGURE 3 tend to be disturbed at the times when concentrations of loops such as  $fs^2$  are being formed. No such disturbance is in fact shown in FIG. 3 as it may not always and does not inevitably occur. But where conditions are such that disturbance of the plating relationship of face loops  $l^1$  with respect to loops  $l$  of the back warp ends is likely to occur then the relative displacement of the front and back loops may be relied on to produce two-tone effects when using contrastingly coloured front and back warp ends. But to ensure that the disturbed plating is uniform throughout the width of the fabric, appropriate adjustment of the needle bar and other machine "settings" may be required.

In the warp fabric illustrated in FIG. 4 a ground structure or background  $F^4$  of 1 x 1 tricot produced by the co-operation of two fully set guide bars with a single set of needles, is ornamented by the combination of conventional patterning  $f$  with concentrations of loops  $fs^2$  produced in accordance with this invention. The patterning  $f$  in this case consists of horizontal stripes produced by varying the lapping of the front guide bar: thus, throughout the courses over which each of the stripes  $f$  extends the laps on the front bar are changed from 1 x 1 to 2 x 1 or even 3 x 1. Alternate pairs of the warp ends extending through the said front bar are liftable selectively to tension or drag these ends and so produce the concentrations of loops  $fs^2$ . Instead of being in the form of stripes, however, the conventional patterning may consist of diamonds, squares or any other appropriate geometrical designs.

Each concentration of loops can extend, walewise, over any appropriate number of courses and although the invention is by no means limited in this regard it may be mentioned that concentrations extending over anything from, say, eight to twelve or more courses are usually sufficiently bold for the purpose in view. As will be realised, moreover, concentrations of loops can be produced in predetermined wales and over any desired courses—either in selected areas, or throughout the full width of the fabric. Accordingly, the patterning scope is almost unlimited and practically infinitely variable. For example, the concentrations of loops may be so disposed in the improved fabric as to provide floral type designs, all-over effects, mock intarsia patterns, and various geometrical designs including those based on vertical or/hori-

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zontal stripes or/and blocks, diamonds and the like. Designs such as are adopted in lace and embroidery work can also be freely used.

The number of initially separate warp ends incorporated in each concentration of loops may also vary in which regard the lapping movements imparted to the ends during the knitting of the fabric are an important factor contributing to the ultimate results. It is, however, found that to be of a bold and outstanding appearance a concentration of loops should normally be at least two needle wales in width. For instance, in a 1 x 1 lap tricot ground structure, and notwithstanding what is shown in FIG. 3, concentrations of loops each involving three needle wales are considered to be most satisfactory, and such effects may conveniently be produced by adopting a warp end set-out wherein spaced pairs of ends are selected to have their controlled run-in interfered with or interrupted whilst intervening pairs of ends are permitted to run-in normally. Theoretically, of course, the larger the number of ends used in producing the concentration of loops, the greater will be the contrast between these concentrations and surrounding loops, but, in practice, and to provide for maximum patterning scope, it is found that selected ends interfered with or interrupted in pairs, or in small groups of three or four, will satisfactorily cover most effects and lapping systems.

It is to be noted, moreover, that when producing concentrations of loops by deliberate and judicious tensioning or dragging of selected ends, recovery of normal run-in of the said ends, after controlled reduction of the normal rate of such run-in, tends to form slack loops which are visible on the face and back of the fabric. Slack loops formed in this way are not, however, detrimental and in some instances may enhance the design by virtue of producing "shadow" effect.

The depth, i.e. the walewise extent, of a complete pattern or design constituting dispositions of concentrations of loops as herein defined, may also vary widely according to requirements.

A mechanism eminently suitable for practising the "dragging thread" technique will now be described with reference to FIGURES 5-9. It is considered unnecessary to illustrate any of the warp knitting machine or loom—apart from portions 1 of the framework thereof by which the mechanism of this invention is carried. The mechanism now to be described is based on the fact that a reduction of the normal rate of run-in of selected ends can advantageously be effected by temporarily lifting the said ends in a controlled fashion at points between the source of the warp supply and the bearded needles of the machine or loom. Thus, selected ends may be lifted, as in the example illustrated, at points between a conventional tension bar 2 and a warp beam 3 (see FIG. 6). Moreover, it is preferred to lift portions of the selected ends (such as that indicated at 4) extending between spaced tension elements 5 and 6 beneath which the ends run, these elements not only serving to govern the degree of tension applied but also steadying or exercising a measure of control over selected ends during recovery of normal run-in.

As will be seen in FIGURES 5 and 6, the mechanism includes two long metal sheets 7. These sheets, which extend horizontally and practically the full length of the loom, are relatively splayed in the form of a V, each of them being disposed at an angle with respect to a vertical plane such-wise as to enable adjustments to be effected, and maintenance to be carried out, in the confined space 8 between them (see FIGURE 6). Relatively splayed brackets 9, supported from the illustrated portions 1 of the framework, in turn serve to support the sheets 7. The brackets 9 at the ends of the loom are mounted upon auxiliary brackets 10 and stiffening elements such as 11 are provided for the sheets 7. At their lower ends the brackets 9 supporting each such sheet have attached to their inner faces a U-section rail 12. The U-section rails 12 are,

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therefore, arranged side by side and they oppose one another with their spaced limbs 12a horizontally disposed, and inwardly directed. Consequently, the U-section rails 12 in effect support the two relatively inclined metal sheets 7. The limbs 12a of each such rail 12, moreover, are drilled, as indicated at 12b in FIGURE 8, to receive, house and function as guides for a longitudinal series of vertically disposed and slidable end-lifting hooks 13. As shown in detail in FIGURE 9, each lifting hook 13 consists of a steel shank 13a of circular cross section to the lower end of which is attached an apertured ceramic hook element 13b in which is formed an angularly disposed slot 13c to receive a predetermined warp end or two or more of such ends, according to requirements. The upper end of the shank 13a of each lifting hook 13 is screw-threaded to receive a screwed cap 14 (see FIGS. 5 and 6) whereby the hook is attached to a length of nylon cord 15 constituting a flexible drive-transmitting element. The two parallel series of lifting hooks 13 are provided for engagement respectively with selected ends or pairs or groups of such ends in the two sets of ends threaded through the two guide bars of the machine. The two metal sheets 7 are slotted as at 16 to provide guides for series of short pins 17 each of which pins is provided at its inner end with an adjusting screw (not shown) to which is attached the end of the relevant nylon drive cord 15 remote from the corresponding lifting hook 13. At its outer end each such pin 17 is drilled transversely with a hole through which extends the appropriate one of a group of horizontally disposed actuating rods 18. The pins 17 are secured to these actuating rods 18, e.g. by means of grub-screws, and the rods are supported one above another by appropriate ones of the brackets 9 and stiffening elements 11 supporting the metal sheets 7. These brackets and stiffening elements are, in fact, drilled to enable the actuating rods 18 to slide freely through them. The nylon drive cords 15 pass over grooved pulleys 19 rotatably mounted upon the metal sheets 7. The construction and arrangement so far described are accordingly such that by moving any one of the actuating rods 18 longitudinally, i.e. horizontally and laterally with respect to the loom and the warp ends 4 in the appropriate direction, those lifting hooks 13 which are connected, through the medium of nylon cords 15, with that particular actuating rod will be lifted vertically to engage and impart the required tension to the relevant individual ends or groups of such ends. As will be understood, only a few of the lifting hooks of one longitudinal series are shown in FIGURE 7.

The nylon drive cords 15 pass over guide rods 20 supported in carrier elements mounted upon the brackets 9 supporting the metal sheets 7.

The actuating rods 18 are movable longitudinally against the action of compression springs 21 and when released, resume their normal positions under the spring action. The compression spring 21 controlling each rod 18 surrounds the latter and is interposed between an adjustable stop 22 thereon and a bracket 9 through which it slides.

Suspended beneath the U-section rails 12 by depending portions of the auxiliary brackets 10 are the two tension rods 5 and 6 which are arranged one at each side of the corresponding longitudinal set of lifting hooks 13 and are adapted to determine the amount of tension required to produce concentration of loops. The rods 5 and 6 may, if desired, be adjustable to govern the amount of tension required to produce concentrations of loops of varying character. In any event, and as previously explained, the rods 5 and 6, which are located near the lower ends of the lifting hooks 13, also control and steady the selected ends during recovery of normal run-in. The said rods may also be removable to enable the lifting hooks to be threaded prior to the commencement of knitting.

Patterning mechanism is provided for controlling the actuating rods 18. Such mechanism may advantageously comprise a supplementary pattern component or unit which

is arranged to be driven in timed relation with the main pattern drum of the machine and is furnished with pre-arranged lugs, studs, pins or the like which act selectively upon individually movable selector members connected with the said actuating rods 18. Thus, in the specific example illustrated in FIGURES 5, 6 and 7, a pattern component in the form of an endless chain 25 is provided, this chain passing at one end around a toothed drum 26 and at the other end around a chain jockey 27. The chain is furnished with pre-arranged studs 28 and may be of any appropriate length and much longer than that shown to provide a practically unlimited patterning range. The chain drum shaft 29 is, in the illustrated example, driven from the main pattern drum. The studs 28 are arranged to act on toes 30a of suitably pivoted selector levers 30 of bell-crank form, the upwardly extending arm 30b of each lever having attached thereto a length of nylon cord 31 by means of which the lever is connected with the relevant end 18a of the corresponding actuating rod 18. The nylon cords 31 pass through tubular guides 32 set in the brackets 9 at the relevant end of the mechanism. Thus there is one selector lever 30 to each rod 18. In FIG. 7 the number of levers 30 shown is only sufficient for selectively manipulating the rods 18 associated with one of the metal sheets 7. With the arms 30b of the levers 30 in contact with a fixed stop rod or bar 33 (see FIG. 5), the lifting hooks 13 are so positioned as to permit the warp ends extending therethrough to run to the knitting location of the loom at the normal rate of run-in and under a normal controlled tension. But if now the toe 30a of any one of the selector levers 30 is acted upon and lifted by a stud 28, the arm 30b of that lever will be swung away from the rod or bar 33 as a consequence of which the cord 31 attached to the lever will be pulled to shift the corresponding actuating rod 18 longitudinally against the action of its spring 21. As a result, all of the lifting hooks 13 connected by drive cords 15, with the shifted rod 18 will be raised to apply tension to and drag the selected warp ends engaged with the said hooks. When the stud 28 leaves the toe 30a, however, the arm 30b of the lever 30 will be returned into engagement with the rod or bar 33 and the previously shifted rod 18 will be restored by the spring 21 to its original position thereby permitting the raised hooks 13 to drop again.

In FIG. 5, the angular distance marked  $x$  represents, purely by way of example, sixteen courses and the lesser distance marked  $y$  represents twelve courses, viz. the full depth of a concentration of loops. Accordingly there are, in this set out, four clear courses between a walewise succession of such spots. As the toe 30a of a lever 30 climbs on to the top of a stud 28 tension is applied to the selected warp ends concerned and is progressively increased over four courses. Then, as the top of the stud passes beneath the toe the maximum tension applied to the warp ends is retained for four courses and, finally, as the toe gradually drops off the passing stud the tension is progressively relaxed over a further four courses. To achieve this set out, the chain drum 26 is rotated at  $\frac{1}{24}$  of the speed of the main drum. That is to say, one stud passes below the selector levers during each revolution of the main drum.

In the example illustrated, each lifting hook 13 engages four ends.

An increase in the normal rate of run-in of selected warp ends may conveniently be achieved with the use of the same mechanism by arranging that when the toes 30a of selector levers 30 are on the tops of studs 28 the relevant warp ends are running in normally at their normal controlled tension, and that when a toe drops off a stud the corresponding hooks 13 will be dropped, instead of lifted, to slacken and thus relieve the tension in the selected warp ends concerned.

Thread which, as a consequence of the slackening, is surplus to that of the loop length determined by the ma-

chine or loom "bubbles" through the ground structure and appears on the back of the fabric as irregular and fleecy floats. A secondary effect is the production of wider spaces between certain needle wales.

An increase in the normal rate of run-in of selected ends may alternatively be achieved by drawing groups of, say, two, three or four selected ends from individual rotary units such as small reels or bobbins, and appropriately controlling the rotational speed of the said units. Thus, while the ground ends would in this case be drawn, under strictly controlled run-in conditions, from a warp beam or beams in the usual way, the groups of selected ends would be separately drawn from the individual reels or bobbins the rotational speed of which latter may normally be such as to enable the selected ends to run-in at the same speed as the ground ends but may be increased at required times to slacken the selected ends during the knitting of predetermined courses.

Satisfactory results as regard to contrast and clarity of concentrations of loops produced by the "dragging thread" technique can be obtained on a 1 x 1 lap tricot, or any other warp knitted structure using 30 denier nylon on both bars of a two bar warp machine. The technique is, however, suitable for all deniers and all gauges of machines. Care must, in any event, be taken not to reduce the rate of run-in of selected ends to an extent likely to incur breakage of these ends. Recovery of normal tension of the selected ends is assisted by the precise type of yarn used and continuation of the knitting action. If, as is preferred, a nylon yarn is used successive concentrations of loops may be produced without any detriment to the yarn providing the latter is in good knitting condition. When adopting this particular technique, moreover, some adjustments may be found to be necessary to assist the knocking-over of loops having regard to the fact that some needle deflection is likely to be experienced when both under and over loops are formed with threads subject to different tensions.

A 28 gauge warp machine is found to be eminently satisfactory for the intended purpose although, of course, the invention is not limited in this respect. In this case the individual end-lifting or dropping members may be arranged to provide the possibility of 7 concentrations of loops per inch. Thus, in 112 ends width incorporating groups of two, three or four selected ends, any design may be executed providing its maximum width does not exceed 28 spots. But any pattern requiring 28 concentrations of loops coursewise can, of course, only be repeated walewise. It is, however, possible to incorporate diagonally opposed motifs within a design of a width embracing 28 spots. Broadly speaking, however, the pattern area is only limited by the width of the machine and the size of the patterning mechanism.

The novel technique may be adopted in the production of trimmings. The use of draw thread with trimmings would be confined to three or four bar machines, but straight edged trimmings could be produced on two bar machines, and after finishing each could be unroved from the other providing that sufficient ends were omitted from the front bar to leave two wales created by the back bar only, these, of course, being the divisions of each separate trimming width.

The hereinbefore described mechanism neither obscures the operator's view of the warp sheet nor impedes the slaying and threading up of the warps. The mechanism is also easily accessible for maintenance, and is so arranged as to produce repetition of twenty-eight units over the width of the warp sheet.

I claim:

1. A method of producing a patterned warp-knitted fabric on a warp-knitting machine, which consists in maintaining, between a warp beam and a knitting location, a calculated and controlled run-in of warp ends, knitting said ends into wales of knitted loops, lapping said ends to connect said wales and, during the knitting of predetermined courses, varying the run in of selected ones of

the said warp ends to tension the latter so as to produce at each of pre-determined points in the fabric a patterning concentration of tightened and distorted knitted loops, while permitting the said selected ends to run in normally during the knitting of other courses.

2. A method according to claim 1, wherein the normal rate of run-in of said selected ends is reduced to apply tension thereto at the desired location.

3. A method according to claim 1, wherein the said selected ends are temporarily lifted in a controlled fashion at desired times during knitting and at points between the warp beam and the knitting location.

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