

Aug. 25, 1964

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3,145,548

PATTERN MECHANISM FOR CIRCULAR KNITTING MACHINES

Filed Feb. 28, 1962

2 Sheets-Sheet 1

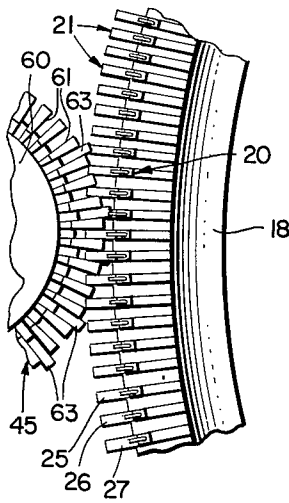


Fig. 2.

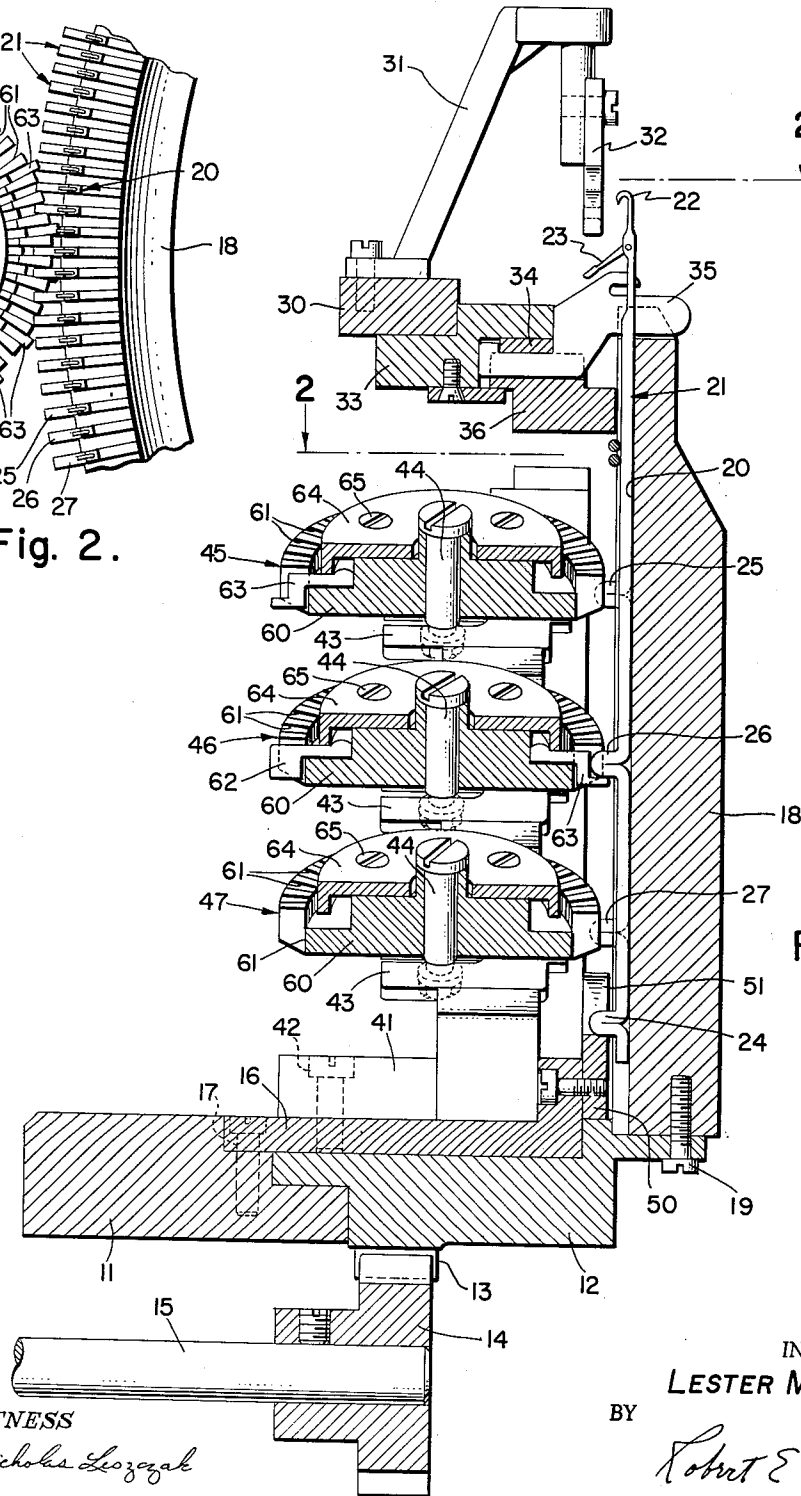


Fig. 1.

WITNESS

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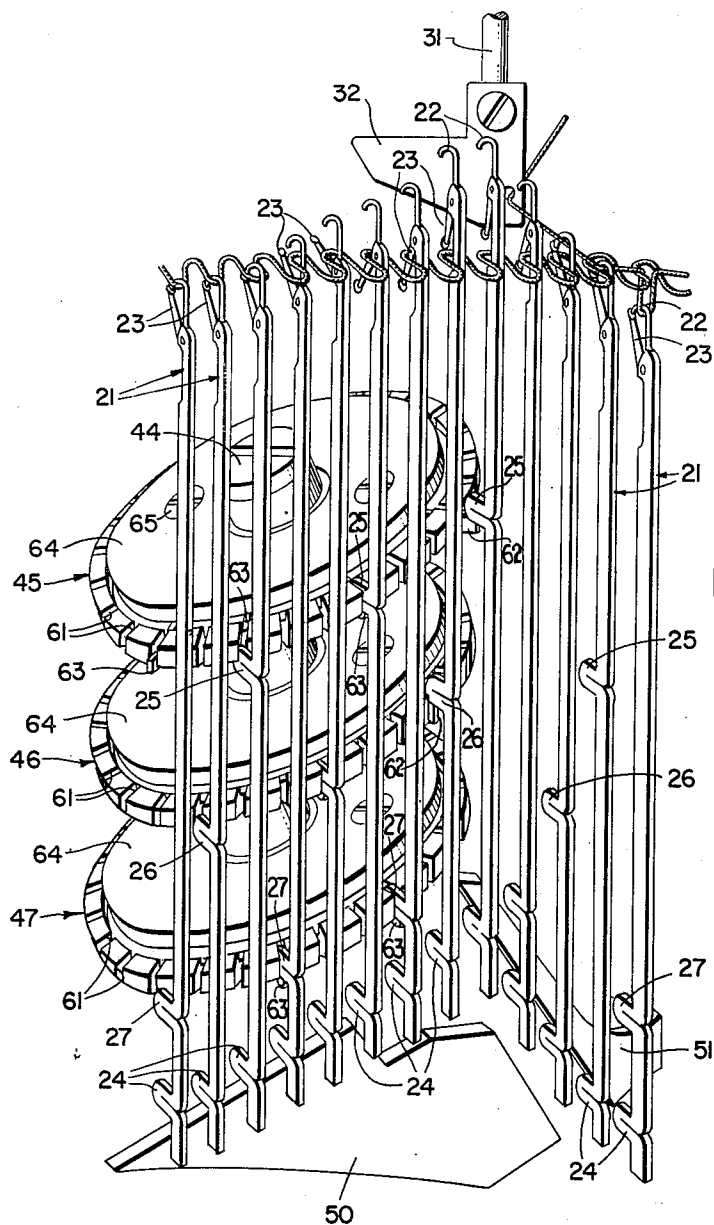


Fig. 3.

WITNESS

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PATTERN MECHANISM FOR CIRCULAR KNITTING MACHINES

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Filed Feb. 28, 1962, Ser. No. 176,277

5 Claims. (Cl. 66—50)

This invention relates to circular knitting machines, and more particularly to patterning mechanisms for use with a circular knitting machine in the production of fabrics having preselected designs, either of texture or color.

This invention concerns patterning of a knit fabric by the use of needle selecting devices such as jacks arranged in pattern wheel units in which the needle selecting devices remain unaltered during operation of the knitting machine. That is, the jacks remain in action and are not rearranged nor modified relatively to each other in any pattern wheel during operation of the knitting machine. The type of needle selecting mechanism with which this invention is concerned is characterized by high fabric productivity and low initial and maintenance costs because of the absence of complicated and cumbersome patterning mechanism for modifying the needle selecting devices during operation of the knitting machine as exist, for instance, in Jacquard controls and the like. A problem which has existed with such unaltered type of needle selecting device however, and toward the solution of which this invention is directed, is that of the limitation of the pattern area, i.e., the relatively limited number of knitting needles which may be controlled during each repeat of the preselected pattern.

It is an object of this invention to provide a novel and improved needle selecting device for patterning knit fabrics which remains unaltered during operation of the knitting machine which provides a pattern area of knitting needles controlled during each repeat of the pattern which is many times greater than has been heretofore obtainable.

It is a further object of this invention to provide a novel and improved needle selecting device of the above character for a circular knitting machine which utilizes a standard evenly cut cylinder and standard evenly cut pattern wheels.

With the above and additional objects and advantages in view as will hereinafter appear, this invention comprises the devices, combinations and arrangements of parts hereinafter described and illustrated in the accompanying drawings of a preferred embodiment in which:

FIG. 1 represents a vertical, cross-sectional view of a portion of a circular knitting machine taken substantially at a yarn feeding station thereof and having this invention applied thereto.

FIG. 2 represents an enlarged top plan view of a fragment of the circular knitting machine cylinder with the sinker mechanism and yarn carrier removed more clearly to illustrate the cooperation between the needles in the cylinder and one of the pattern wheels, and

FIG. 3 is a perspective, quasi-diagrammatic, view of the yarn carrier, needles, pattern wheels and fixed needle cams at one yarn feeding station of a circular knitting machine.

Referring to the drawings, FIG. 1 illustrates those portions of a circular knitting machine which will be necessary for an understanding of this invention. The knitting machine includes a housing ring 11 which is stationary and may be supported from the floor by legs (not shown). Journaled in the housing ring is a gear ring 12 formed with depending gear teeth 13 meshing with a drive pinion 14 fast on a drive shaft 15 which is journaled relatively to the housing ring 11 and may be driven, for instance, by an electric motor (not shown) to turn the gear ring. The

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gear ring 12 is constrained rotatably in the housing ring by a retaining ring 16 secured as by bolts 17 to the housing ring.

A cylinder 18, which is secured by bolts 19 to the gear ring, is formed in the outer wall with evenly spaced parallel vertical slots 20, each slidably accommodating a latch knitting needle indicated generally as 21.

As illustrated in FIG. 3, each needle in the bank of needles about the cylinder has in common a yarn engaging hook 22 formed at the upper extremity, a latch blade 23 pivoted thereto beneath the hook, and one butt 24 disposed at a preselected distance from the hook. The knitting needles are, however, divided into a plurality of like groups, each group being distinguished by a second butt having a spaced relation from the yarn engaging hook differing from that of the other groups.

In the embodiment illustrated in the drawings, the knitting needles are divided into three groups, a first group distinguished by butts 25, a second group having butts 26, and a third group having butts 27.

Disposed outwardly adjacent to the top of the cylinder 18 is a stationary carrier ring 30 on which at intervals about the cylinder yarn carrier brackets 31 are supported, each having attached thereto a yarn carrier 32 adapted to deliver a yarn to the hooks of those needles passing the yarn carrier which are raised into a yarn receiving position. Each yarn carrier thus defines a yarn feeding station about the cylinder. The number of possible yarn feeding stations or "Feeds" about the cylinder is limited only by the space requirements at each feed for the control devices which elevate and depress the knitting needles.

The carrier ring 30 has secured thereto a sinker cam ring 33, to which is attached a sinker cam 34 which is embraced by a multiplicity of sinkers 35 slidably disposed one between each of the needles in radial slots in a sinker rest ring 36 which revolves with the cylinder.

The control devices for elevating and depressing the knitting needles at each feed include a section block 41 secured as by fastening 42 to the cam retaining ring, the section block being formed with inclined forks 43, each adapted to accommodate the pivot bolt 44 of a separate pattern wheel 45, 46 and 47, thus to support the pattern wheels rotatably each at a level relatively to the cylinder for cooperation with the butts 25, 26 and 27 respectively of the three different groups of knitting needles.

The control devices at each feed also include a fixed needle raising cam 50 which may be secured to the cam retaining ring and cooperates with the butts 24 common to all the needles to raise each of the needles to a position wherein the butts 25, 26 and 27 are in position to be influenced by the pattern wheels 45, 46, 47 respectively. In addition, the control devices at each feed include a stitch cam 51 which may be secured to the section block and serves to cooperate with the butts 24 common to all the needles to depress the needles after they have been influenced by the pattern wheels to complete whichever type of yarn manipulation has been dictated by the pattern wheels.

It will be appreciated that the common butt 24 on each needle makes it possible to use only one raising cam 50 and one stitch cam 51 at each feed. The common butt 24 on each needle may be dispensed with if separate raising cams and stitch cams are provided at each feed for each of the groups of needles.

The pattern wheels 45, 46 and 47 may be of similar construction, each including a wheel 60 formed with evenly spaced radial slots 61 having a width equal to that of the needle butts. Each pattern wheel slot is adapted to accommodate either a high jack 62 or a low jack 63, the jacks being clamped in the wheel by a retainer plate 64, held thereon by fastening screws 65. In addition to the possible selection of either a high or low jack

in any particular slot 61, the slot may be left vacant, the three possibilities being illustrated in FIG. 1.

The spacing between adjacent slots 61 in the pattern wheels or the "cut" of the pattern wheels is made preferably equal to the spacing or "cut" of the needle accommodating slots 20 in the cylinder although this invention comprehends the provision of pattern wheels cut at a multiple of the cut of the cylinder where the cut of the cylinder is sufficiently coarse as to make a finer cut pattern wheel a practical possibility.

The pattern wheels are adjusted in the forks so as to mesh with the needle butts 25, 26, 27 respectively with clearance between the pattern wheels and the cylinder. As is known in the art, a high jack 62 upon engaging a needle butt will raise or select a needle to latch cleared position of that needle so that the needle will knit i.e., the fed yarn will be taken by that needle hook and thereafter drawn through the previous loop of yarn on the needle. A low jack 63 upon engaging a needle butt will raise a needle sufficiently high so that the needle hook will take the yarn fed at that station but not to sufficient height for clearance of the latch so that the needle will tuck i.e., it will add the fed yarn to the previous loop held on the needle hook. If the pattern wheel slot which meshes with a needle butt has no jack, the needle will not be raised to take the fed yarn and a welt will result i.e., only the previously held loop or loops will be held with the fed yarn passing as a float behind that needle.

As shown in FIG. 3 of the drawings, the needles are arranged about the cylinder with one of each group 25, 26 and 27 in turn. There is thus the space occupied by two needles separating adjacent butts of any one group of needles and every third jack accommodating slot in each pattern wheel will be effective in seriatim to select the needle position. Other repeating arrangements of the needle groups are possible, to the extent that the space between adjacent butts of any one group of needles can not exceed that which will mesh simultaneously with the jack accommodating slots of the pattern wheel. The maximum spacing will of course vary with the cut of the cylinder and with the diameter of the pattern wheel; in the most prevalent sizes however, a pattern wheel will mesh with approximately seven adjacent needle butts simultaneously.

In the operation of a machine built in accordance with this invention, the knitting needles will be positioned consecutively by the pattern wheels at each feed but each one of the groups of pattern wheels at each feed will operate only on butts of one of the needle groups. The jacks or jack accommodating slots in any pattern wheel will not become effective consecutively but rather in accordance with the arrangement of needles of the corresponding needle group. In the preferred embodiment illustrated in the drawings, every third jack accommodating slot in each pattern wheel will become effective in seriatim. In order for all of the jack accommodating slots in a pattern wheel to become effective during each pattern repeat, it is necessary that the total number of jack accommodating slots in any pattern wheel be a number which is not divisible exactly by any prime factor of the number of groups of knitting needles, a prime factor being defined as any prime number other than one.

In prior art knitting machines employing pattern wheels with jacks unalterable during operation of the knitting machine, a practical limit has been reached as to the size of a pattern area, i.e., the total number of needles which may be controlled during each repeat of the pattern. This invention provides a means, using a standard cut cylinder and standard cut pattern wheels, i.e., each with evenly spaced slots, for increasing the pattern area many times. Using the needle selecting device of this invention which remains unaltered during the operation of the machine, a knitting machine is thus

available which can knit fabrics at high rates of production, with patterns covering such large areas that when the fabric is made up into a finished product, the patterns look as though every needle had its own separate control. Such separate needle control has been heretofore available only on very expensive machines capable of producing fabric at only a small fraction of the rate obtainable by the use of pattern wheel knitting machines.

For utilization of the pattern wheel jacks in regular order, it is advisable that the total number of needles in the cylinder be a multiple of the number of different groups of needles. Furthermore, if the total number of needles in the cylinder is not divisible evenly by the total number of jacks in all of the pattern wheels at any one yarn feeding station, then the jacks will control different needles on successive cylinder rotations. With such an arrangement, selection of differently shaped areas of pattern is possible by use of those principles of pattern layout which are well known when a single pattern wheel is used at each feeding station. With the greatly enlarged pattern areas made possible by this invention, the compatibility with established pattern layout systems for preselecting the shape of the pattern area provides for tremendous variety in the fabric patterns which are made available by this invention.

Many other advantages may be obtained by the use of this invention. For instance, the pattern wheels at any one feed need not have the same number of jack accommodating slots. Such an arrangement wherein at any feed one pattern wheel gains and another loses a given number of needles makes possible the production of argyles and plaids much more vivid and distinct and with an appreciable reduction in the required amount of yarn than is possible with known pattern wheel machines in which a gain or loss of needles is possible only of pattern wheels on adjacent feeds.

Having set forth the nature of this invention, what I claim herein is:

1. A knitting machine having a circularly arranged bank of evenly spaced knitting needles, a hook formed on each knitting needle and a butt associated with each knitting needle in spaced relation to the hook, said knitting needles being arranged in said bank in a plurality of like groups, each group having a spaced relation between the knitting needle hook and the butt differing from that of the other groups, a yarn feeding station for said knitting needles, a plurality of pattern wheels at said yarn feeding station, one for each of said groups of knitting needles, said pattern wheels each provided with jack accommodating slots having an even spacing at least as closely spaced as said bank of knitting needles, jacks arranged in selected ones of said jack accommodating slots, the jack accommodating slots of each of said pattern wheels cooperating with the butts of one of said groups of knitting needles, and each of said pattern wheels having a total number of jack accommodating slots which is not divisible exactly by any prime factor of said number of groups of knitting needles.

2. A knitting machine as set forth in claim 1, in which at least two of the pattern wheels at said yarn feeding station are provided with different total numbers of jack accommodating slots.

3. A knitting machine as set forth in claim 1 in which the total number of knitting needles in said circular bank is a multiple of said number of groups of knitting needles.

4. A knitting machine as set forth in claim 3 in which the total number of knitting needles in said circular bank is not divisible exactly by the total number of jack accommodating slots in all of said pattern wheels at said yarn feeding station.

5. A circular knitting machine having a cylinder cut with evenly spaced, substantially parallel needle accommodating slots, knitting needles each formed with a hook and a butt associated with each knitting needle in spaced relation to the hook, said knitting needles being arranged

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one in each of said needle accommodating slots in said cylinder in a plurality of like groups, each group having a spaced relation between the knitting needle hook and the butt differing from that of the other groups, a yarn feeding station for said knitting needles, a plurality of pattern wheels at said yarn feeding station, one for each of said groups of knitting needles, said pattern wheels each cut with jack accommodating slots having an even spacing equal to that of said needle accommodating slots in said cylinder, means supporting each of said pattern wheels with the jack accommodating slots thereof co-operating with the butts of one of said groups of knitting needles, said jack accommodating slots being selectively vacant, filled with low jacks, or filled with high jacks to

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provide respectively welt, tuck and knit stitches in accordance with a predetermined pattern, and each of said pattern wheels having a total number of jack accommodating slots which is not divisible exactly by any prime factor of said number of groups of knitting needles.

References Cited in the file of this patent

UNITED STATES PATENTS

2,030,815	Feineman	Feb. 11, 1936
2,127,224	Lombardi	Aug. 16, 1938
3,075,372	Philip	Jan. 29, 1963

FOREIGN PATENTS

272,307	Great Britain	June 15, 1927
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