

Sept. 2, 1969

R. G. BASSIST
KNITTING MACHINE EMPLOYING COMPENSATING MOTION
FOR KNITTING EFFECT THREAD

3,464,236

Filed Jan. 31, 1968

5 Sheets-Sheet 1

FIG. 1

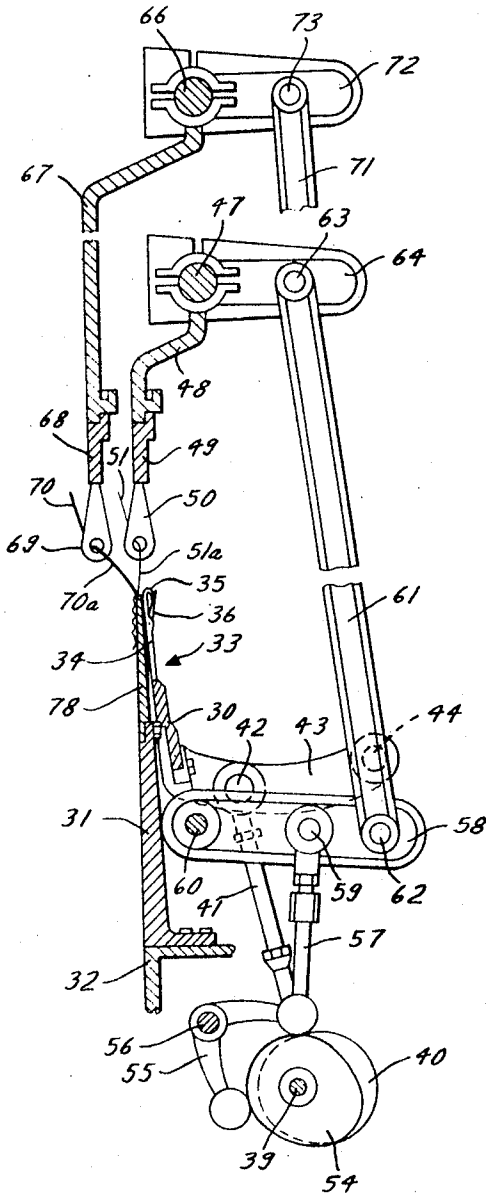


FIG. 8

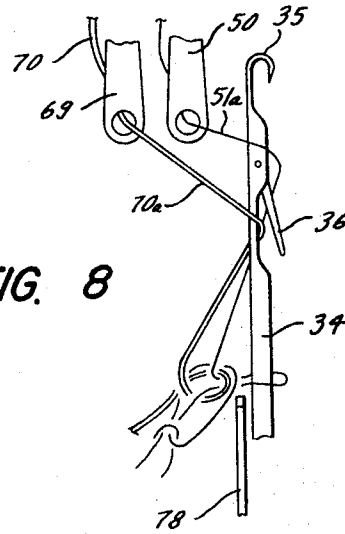
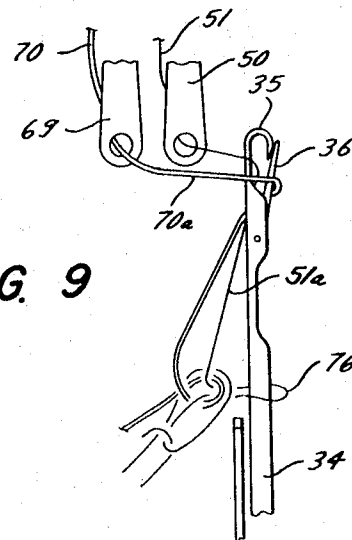


FIG. 9



INVENTOR:
RUDOLPH G. BASSIST

BY
Breitenfeld & Lennie
ATTORNEYS

Sept. 2, 1969

R. G. BASSIST
KNITTING MACHINE EMPLOYING COMPENSATING MOTION
FOR KNITTING EFFECT THREAD

3,464,236

Filed Jan. 31, 1968

5 Sheets-Sheet 2

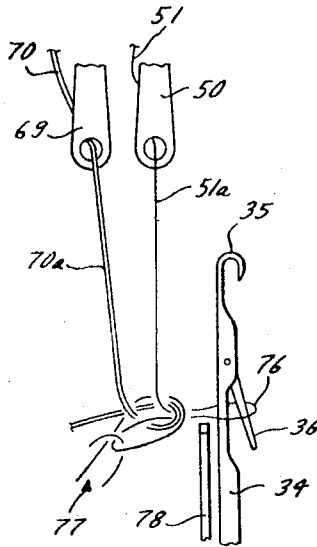


FIG. 2

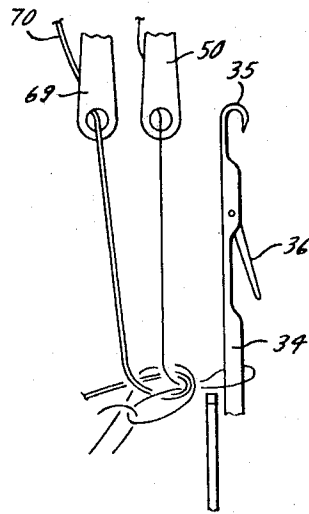


FIG. 3

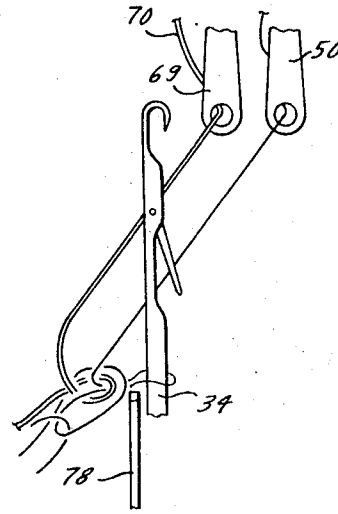


FIG. 4

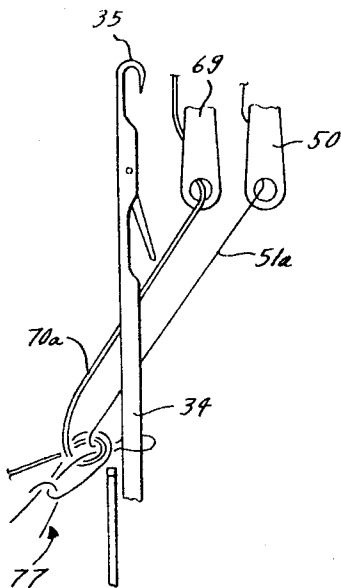


FIG. 5

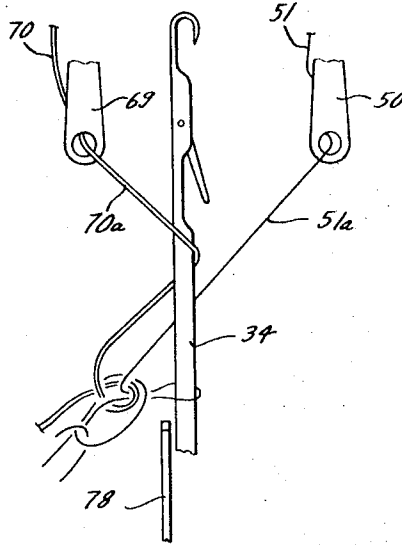


FIG. 6

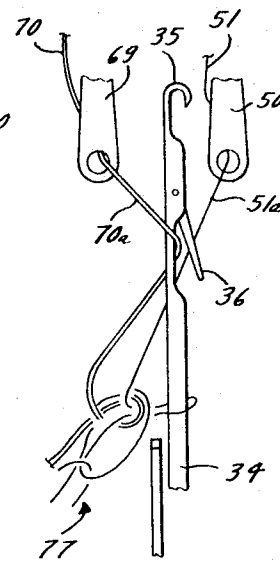


FIG. 7

INVENTOR:
RUDOLPH G. BASSIST
BY
Breitenfeld & Henne
ATTORNEYS

Sept. 2, 1969

R. G. BASSIST
KNITTING MACHINE EMPLOYING COMPENSATING MOTION
FOR KNITTING EFFECT THREAD

3,464,236

Filed Jan. 31, 1968

5 Sheets-Sheet 3

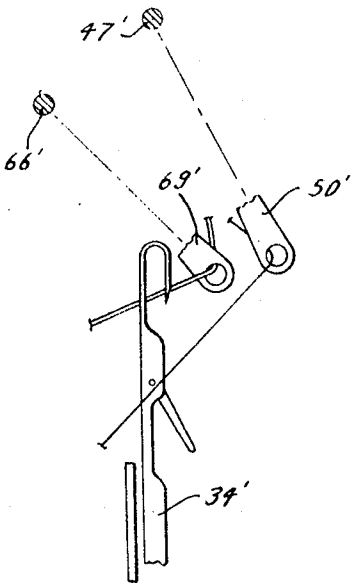


FIG. 10

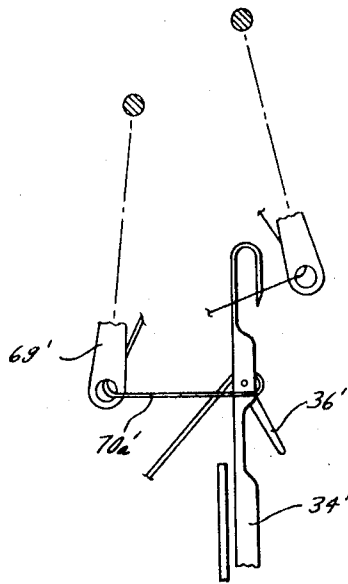


FIG. 11

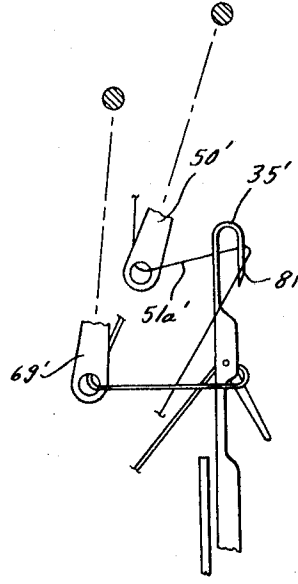


FIG. 12

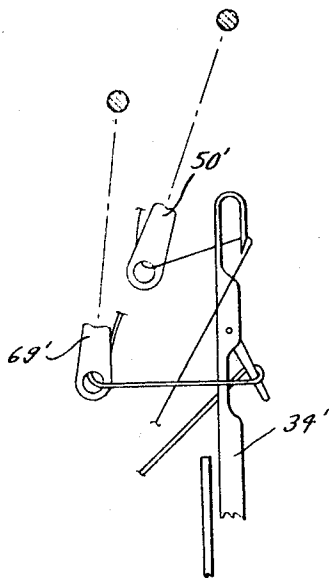


FIG. 13

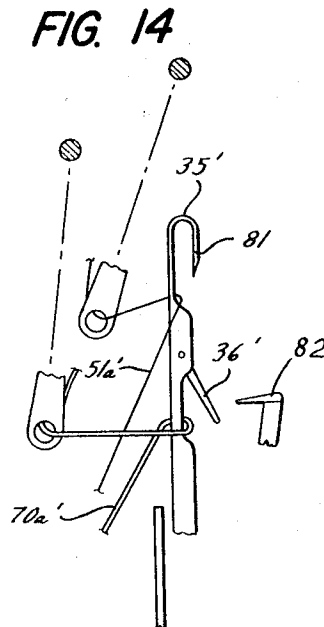


FIG. 14

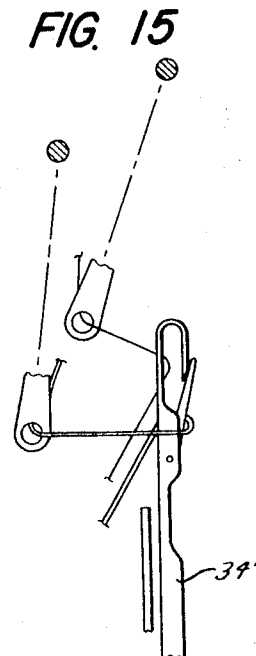


FIG. 15

INVENTOR:

RUDDOLPH G. BASSIST

BY

Braitfeld & Lennie

ATTORNEYS

Sept. 2, 1969

R. G. BASSIST
KNITTING MACHINE EMPLOYING COMPENSATING MOTION
FOR KNITTING EFFECT THREAD

3,464,236

Filed Jan. 31, 1968

5 Sheets-Sheet 4

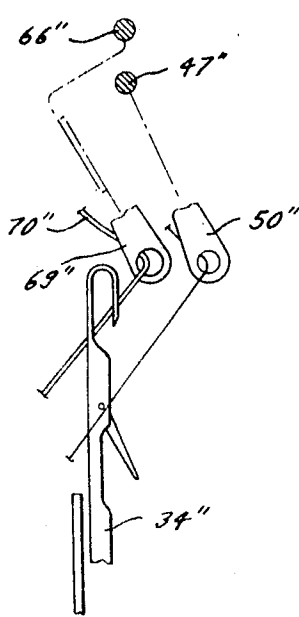


FIG. 16

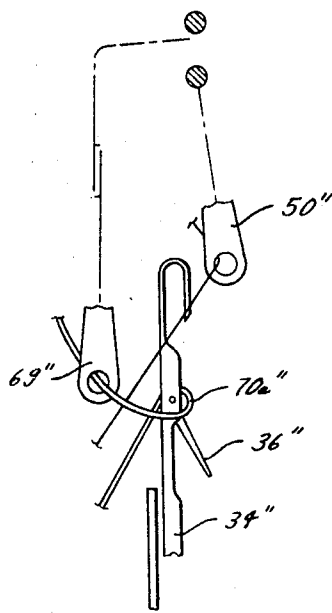


FIG. 17

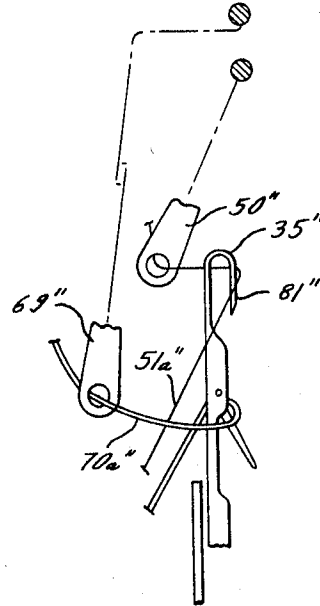


FIG. 18

FIG. 19

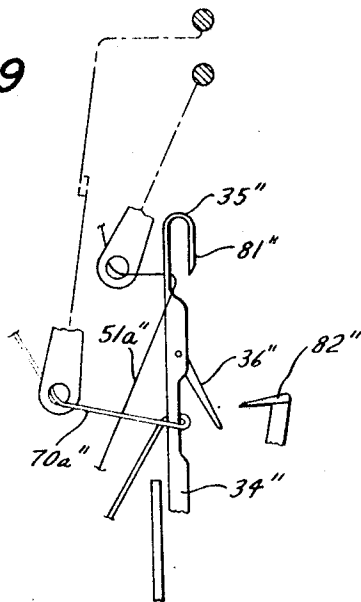
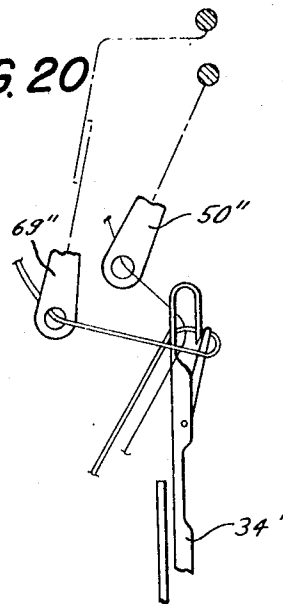


FIG. 20



INVENTOR:

RUDOLPH G. BASSIST

BY

Bretonfeld & Rennie
ATTORNEYS

Filed Jan. 31, 1968

R. G. BASSIST
KNITTING MACHINE EMPLOYING COMPENSATING MOTION
FOR KNITTING EFFECT THREAD

3,464,236

5 Sheets-Sheet 5

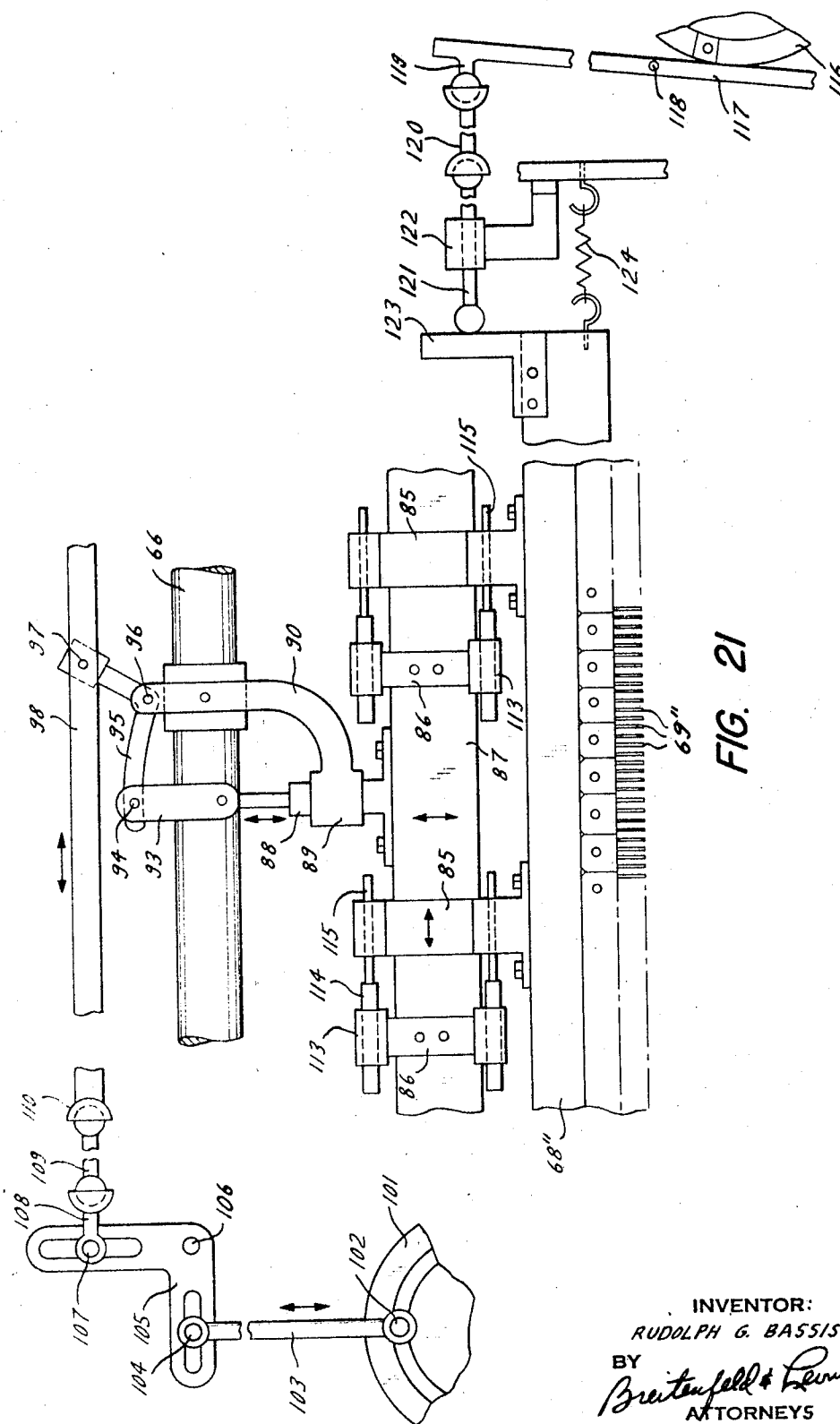


FIG. 21

INVENTOR:
RUDOLPH G. BASSIST
BY
Breitenfeldt & Levine
ATTORNEYS

1

3,464,236

KNITTING MACHINE EMPLOYING COMPENSATING MOTION FOR KNITTING EFFECT THREAD

Rudolph G. Bassist, Bronx, N.Y., assignor of one-half to
Travis Mills Corporation, a corporation of New York

Filed Jan. 31, 1968, Ser. No. 701,938

Int. Cl. D04b 23/00, 27/02

U.S. Cl. 66—86

4 Claims

ABSTRACT OF THE DISCLOSURE

First and second yarn guides lead yarn for base fabric and effect threads, respectively, around knitting needles having hooked upper ends and pivoted latches. Yarn guides and needles move with respect to each other so that effect threads are positioned below latches and yarn positioned between latches and hooks. Guide bars may swing at different times when needles are in different vertical positions, or second guide bar may swing through arc below that of first guide bar, or second guide bar may be moved radially as it swings.

This invention relates to knitting machine, such as those of the raschel type, and in particular to such machines having the capability of introducing an effect thread into the fabric formed by the machine.

As is known, the operation of a knitting machine is based upon the relative movement of yarn guides and vertically reciprocating knitting needles. The yarn guides depend from one or more guide bars, and means are provided to swing or rock the guide bar about a longitudinal axis, and to simultaneously longitudinally reciprocate the guide bars. The reciprocating guide bars are caused to swing to and fro through a bed of the vertically reciprocating needles, mounted on a needle bar, so that thread is introduced when the needles are in the upward position, and a knitting operation is performed when the needles are moved downwardly.

Knitting machines of this type are often provided with a fall-plate or chopper-bar which is employed to introduce effect threads, generally of a higher denier, into the fabric. The chopper bar is a thin steel blade extending across the full width of the needle bar and is conventionally mounted centrally between the guide bars. The chopper bar is attached to a swing arm and therefore is given the same swinging motion as the guide bars. In addition, the chopper bar is also given a vertical motion, by means of a cam on the main camshaft of the knitting machine, which is timed to occur after the lapping movements are completed, and before the needle bar descends. The effect of the downward motion of the chopper bar is to carry below the level of the needle latches, all the warp threads carried by guide bars which are situated in front of the chopper bar. Because these front bar threads do not enter the needle hooks and are not formed into loops in the usual way, it is possible to introduce heavier deniers of yarn for producing desired effects in the fabric.

It is an object of the present invention to provide in a knitting machine all the functions of a conventional chopper bar without employing a chopper bar.

It is another object of the invention to provide in a knitting machine, knitting needles and a guide bar for effect threads whose movements are so related that they

2

produce the result ordinarily produced by a chopper bar.

According to this invention, these objectives are achieved by relating the movements of the usual guide bars and knitting needles in such a way that during the upward stroke of the needles, the effect threads are led around the needles below their latches and the base yarn is led around the needles between their latches and hook-shaped upper ends. Consequently, upon the descent of the needles, the yarn enters the hooks but the effect threads do not. This result may be accomplished in several ways.

In one embodiment of the invention, when the needles are at or near their uppermost position of travel, one guide bar swings to wrap the effect threads around the needles below the latches. Thereafter, when the needles have descended a short distance, the other guide bar swings to wrap the base yarn around the needles at a point above the latches but below the openings to the hooks. Continued downward movement of the needles then produces the desired effect.

According to another embodiment of the invention, the center of rotation of the effect thread guide bar is below and in front of the center of rotation of the yarn guide bar. Consequently, the arc of travel of the effect thread guide bar is below that of the yarn guide bar at the time they pass through the line of needles. Hence, the effect threads are led around the needles at a point below that at which the yarn is led around the needles.

In an additional embodiment of the invention, the effect thread guide bar is caused to move radially outwardly as it swings, thereby bringing the effect threads down below the needle latches.

Further objects and features of the present invention will become apparent from the following description in which reference is made to the accompanying drawings.

In the drawings:

FIG. 1 is a vertical cross-sectional view of a knitting machine incorporating the present invention;

FIGS. 2-9 are fragmentary elevational views showing the various stages of a knitting operation according to one embodiment of the invention;

FIGS. 10-15 are views similar to FIGS. 2-9 showing various knitting stages according to another embodiment of the invention;

FIGS. 16-20 are views similar to FIGS. 2-9 showing various knitting stages according to still another embodiment of the invention;

FIG. 21 is a fragmentary front elevational view of a knitting machine capable of effecting the knitting stages of FIGS. 16-20.

For the sake of simplicity of illustration, only a single needle bar, a single guide bar for base fabric yarn, and a single guide bar for effect threads, have been depicted in the drawings. Also, since warp knitting machines are known, the details of the main drive, of the cams controlling the various movements and their timing, and the mechanisms and supporting structure in general, have been illustrated in simplified fashion. It is to be understood that there are appropriate warp beams and yarn feeding means well known in the art.

FIGS. 1-9 illustrate one embodiment of the invention. A needle bar 30, reciprocable in a substantially vertical plane, is mounted on a support structure 31 positionally fixed on a stationary base 32. The needle bar 30 carries

a plurality of aligned needles, i.e., a needle bed 33, each needle 34 having a hook-shaped upper end 35 and a latch 36 pivoted to the needle at a point spaced below its upper end.

Movement of the needle bar 30 through successive knitting cycles is controlled by a cam 40 mounted on a main cam shaft 39. A follower (not shown) on the lower end of a rod 41 engages the cam 40, the upper end of the rod being articulated at 42 to a lever 43 mounted at one end on a pivot 44 fixed with respect to the base 32. The free end of the lever 43 engages the needle bar 30 and thereby raises and lowers the latter in accordance with the peripheral shape of the cam 40. The cam 40 is so designed that the needle bed 33 is, during each machine cycle, raised to the heights to be described and thereafter lowered. It may be pointed out that this embodiment of the invention contemplates raising the needles to a greater degree than usual in conventional knitting machines.

Suspended for swinging movement on a shaft 47 is a guide bar arm 48 carrying a guide bar 49 at its lower end. The guide bar 49 is slidable with respect to the guide bar arm 48 in a direction parallel to the longitudinal axis of the shaft 47. This sliding movement of the guide bar may be controlled in well known fashion by a pattern chain (not shown). Depending from the guide bar 49 is an aligned series of yarn guides 50, each guide having an eye through which relatively low denier yarn 51, for knitting the base fabric, passes from the warp beam to the needles 34. When the swing shaft 47 is pivoted, the yarn guides 50 move through an arcuate path whose center coincides with the axis of the shaft. Thus, by an appropriate timed relation between the arcuate and longitudinal shifting movements of the guide bar 49, the yarn 51 may be wrapped around the needles 34. The timed pivotal movements of the shaft 47 are controlled by a cam 54 mounted on the main cam shaft 39. Rotation of cam 54 causes rocking movement of a cam follower arrangement 55 secured to a shaft 56, and this movement is transmitted via a rod 57 to a rocker bar 58 to which the upper end of the rod is pivoted at 59. The rocker bar 58 is mounted at one end on a fixed pivot 60, and its other end is articulated to the lower end of an actuator 61 at 62. The upper end of the actuator 61 is pivoted at 63 to a rocker arm 64 fixed to the swing shaft 47. In this way, motion of the cam is transmitted to the shaft 47.

Suspended for swinging movement on another swing shaft 66 is a second guide bar arm 67 carrying a guide bar 68. The guide bar 68 is slidable with respect to its guide bar arm 67 in the same way as the guide bar 49. Depending from the guide bar 68 is a series of yarn guides 69, each guide having an eye through which a relatively high denier effect thread 70 passes from the warp beam to the needles 34. When the swing shaft 66 is pivoted the yarn guides 69 move through arcuate path whose center coincides with the axis of the shaft. Here again, therefore, by appropriate timed relation between the arcuate and shifting movements of the guide bar 68, effect threads 70 may be wrapped around the needles 34. The pivotal movements of the swing shaft 66 are effected in a manner similar to that described with respect to the swing shaft 47, i.e., the motion of a cam (not shown) on the cam shaft 39 is transmitted to the shaft 66 via mechanism including an actuator 71 and a rocker arm 72 articulated together at 73.

A knitting operation according to this embodiment of the invention is illustrated in diagrammatic form in FIGS. 2-9. Obviously, the single needle 34 represents the entire needle bed 33, and the individual yarn guides 50 and 69 each represent the entire series of yarn guides aligned with it. FIG. 2, the needle 34 is rising at the beginning of the knitting cycle through the loop 76, of the base fabric 77, which was formed during the previous cycle. During this rise, the loop 76 resting on the stationary trick plate 78 causes the latch 36 to pivot downwardly into its open condition. The yarn guides 50 and 69 are located in front of the needle bed. In FIG. 3, the

needle 34 has risen to about the height it usually reaches in conventional knitting machines, and thereafter (FIG. 4) the yarn guides 50 and 69 swing through the needle bed to a position behind the latter, whereupon the yarn guides shift in a direction toward the viewer.

The needle 34 continues to rise and eventually reaches a height (FIG. 5) at which the entire latch 36 is above the portion 70a of the effect thread extending between the fabric 77 and yarn guide 69. The yarn guide 69 then swings forwardly through the needle bed (FIG. 6) to wrap the effect thread portion 70a around the needle 34 at a point below the latch 36. In conventional knitting machines, a chopper bar is used to push the effect thread below the latch after the effect thread has been wrapped around the latch or a portion of the needle above the latch. In the present case, the needle has moved upwardly high enough to permit the yarn guide to place the effect thread around the needle below the latch without the aid of a chopper bar.

As the cycle continues, the needle 34 moves downwardly (FIG. 7) and after the free end of the latch moves below the yarn portion 51a extending between the fabric 77 and the yarn guide 50, the latter swings forwardly through the needle bed (FIG. 8) to wrap the yarn portion 51a around the needle at a point between the latch 36 and the hook 35. Upon continued downward movement of the needle 34, the effect thread portion 70a slides past the latch 36 and closes it (FIG. 9) and the yarn portion 51a slides into the hook 35. The needle eventually passes downwardly completely through the loop 76, thereby forming a subsequent loop.

An alternative arrangement for achieving the same result as just described is illustrated diagrammatically in FIGS. 10-15. The mechanism for supporting and moving the needles 34' and yarn guides 50' and 69' is substantially as shown in FIG. 1, with a major exception. The swing shaft 66', carrying the yarn guides 69' is not located directly above the swing shaft 47', in the way that the shaft 66 is located directly over the shaft 47. Instead, the shaft 66' is located below and to the front of the shaft 47', as illustrated in FIGS. 10-15. As a result of this repositioning of the shaft 66', the yarn guide 69' swings through a much lower arc than the yarn guide 69, and thus carries the effect thread to a lower position.

In FIG. 10, the yarn guides 50' and 69' have already swung rearwardly through the needle bed, and the needle 34' is elevated to a height corresponding to that of needles in a conventional machine. The yarn guide 69' then swings forwardly (FIG. 11) to wrap the effect thread portion 70a' around the needle 34', but the effect thread is at this time above the latch 36'. This is followed by swinging of the yarn guide 50' forwardly (FIG. 12) to wrap the yarn portion 51a' around the relatively long beard 81 of the needle hook 35'. Although in FIGS. 11 and 12 swinging movement of the yarn guides is shown as taking place at different times, these movements could in the present embodiment occur simultaneously, since the yarn guide 69' due to its lower arc of travel, wraps the effect thread 70a' around the needle at a location below the point at which the yarn guide 50' wraps the yarn 51a' around the needle. The needle then moves upwardly through the position of FIG. 13 to the position of FIG. 14 wherein the yarn portion 51a' slips off the beard 81 into the hook 35', and the effect thread portion 70a' slides below the latch 36'. The highest position of the needle 34' in this case need not be as high as the needle 34 of FIGS. 1-9, since the effect thread portion 70a' is brought to a lower position than the portion 70a of FIGS. 2-9. This position is comparable to that shown in FIG. 8. The needle 34' then moves downwardly through the position shown in FIG. 15 until the knitting cycle is completed.

If desired, a pivotally mounted latch bar 82 (FIG. 14) may be provided, the latter being arranged to move close to latches 36' at the time the effect thread 70a' slides

past the latches to prevent the latter from snapping closed prematurely.

Another arrangement for achieving the result sought is shown diagrammatically in FIGS. 16-20. The mechanism for supporting and moving the needles 34" and yarn guides 50" and 69", including swing shafts 47" and 66", is substantially as shown in FIG. 1, with one major exception. The mechanism for supporting the guides 69" (which will be described in detail with reference to FIG. 21) for the effect threads 70" permits the guides 69" to be moved substantially radially with respect to their shaft 66", as well as arcuately and parallel to the shaft 66". Consequently, although at the beginning and end of each knitting cycle the guides 69" are in a position comparable to that of the guides 69 of FIG. 1, during the intermediate portion of the cycle, the guides 69" may be moved radially outwardly, and hence carry the effect thread downwardly to a position below the needle latch.

In FIG. 16, the yarn guides 50" and 69" have already swung rearwardly through the needle bed, and the needle 34" is elevated to a height corresponding to that of needles in a conventional machine. At this stage, the guide 69" is in a radially inward condition. The yarn guide 69" then moves radially outwardly and swings forwardly (FIG. 17) to wrap the effect thread portion 70a" around the needle 34", but the effect thread is at this time above the latch 36". This is followed by swinging of the guide 50" forwardly (FIG. 18) to wrap the yarn portion 51a" around the beard 81" of the needle hook 35". Here again, although the yarn guides are shown swinging at different times, they could swing simultaneously, since the guide 69", due to its radially outward movement, wraps the effect thread 70a" around the needle at a location below the point at which the guide 50" wraps the yarn 51a" around the needle. The needle then moves upwardly to the position of FIG. 19 wherein the yarn portion 51a" slips off the beard 81" into the hook 35", and the effect thread portion 70a" slides below the latch 36". Here again, the needle 34" need not move as high as the needle 34. The needle 34" then moves downwardly through the position shown in FIG. 20 until the knitting cycle is completed. During this latter portion of the cycle, the guide 69" is retracted to its radially inward position as shown in FIG. 20.

The mechanism for effecting radial movement of the yarn guides 69" is shown in FIG. 21. The yarn guides are carried by a guide bar 68" depending from guide bar arms 85. Each arm 85 is carried by a guide bar arm support 86 fixed to a plate 87, the plate being secured to the lower end of a rod 88 slidable within a collar 89 formed at one end of a swing arm 90. The swing arm is fixed on the swing shaft 66". The upper end of the rod 88 is rigidly secured to a member 93, and the latter is pivoted at 94 to one end of a bellcrank 95. The bellcrank is pivotally mounted on the swing arm 90 at 96, and its other end is pivoted at 97 to a traverse rod 98. It will be seen that longitudinal movements of the traverse rod 98 serve to pivot the bellcrank 95 which in turn moves the rod 88 vertically in FIG. 21, or substantially radially with respect to the swing shaft 66". These movements are transmitted, via the plate 87, supports 86, arms 85, and guide bar 68" to the yarn guides 69".

Longitudinal movements of the traverse rod 98 are effected by a cam 101 having a track which slidably retains a follower 102 carried by the lower end of a link 103. The upper end of link 103 is pivoted at 104 to one arm of a lever 105 pivoted at 106 to the machine frame. The other arm of the lever 105 is pivoted at 107 to a socket extension 108, the socket of extension 108 engaging the ball at one end of an arm 109. The ball at the other end of arm 109 is engaged by a socket 110 on the end of traverse rod 98. The pivots 104 and 107 are adjustable along their respective slots in the arms of lever 105 to vary the amount of travel of the rod 98.

The guide bar 68", carrying the yarn guides 69", par-

takes of three separate types of movement, namely, radial, arcuate, and longitudinal. The manner in which radial movement is accomplished has just been described. Arcuate movement is effected by pivoting the swing shaft 66". This movement causes the swing arm 90 to rock, and since the guide bar 68" is carried by the swing arm, the guide bar moves arcuately about the axis of the swing shaft.

Longitudinal movement of the guide bar is permitted by virtue of sleeve bearings 113 carried by each guide bar arm support 86. Within the bearings are guide sleeves 114 by means of which rods 115, projecting from the upper and lower ends of the respective guide bar arm 85, are slidably secured to the guide bar arm support 86. Longitudinal movement is effected by the usual pattern chain 116 arranged to slide past a lever 117 pivoted at 118 to the machine frame. A spring (not shown) constantly urges the lever 117 in a counterclockwise direction and the pattern chain pivots the lever in a clockwise direction an amount dependent upon the height of the chain link passing the lever. At the upper end of lever 117, a ball extension 119 projects laterally and a socket arm 120, having opposed sockets formed at its ends, engages the ball of extension 119. The other end of the socket arm 120 engages a ball at one end of rod 121 slidably arranged in a fixed bearing 122. The other end of the rod 121 engages an extension 123 fixed to the guide bar 68". Thus, it will be seen that pivotal movements of the lever 117, in response to the pattern chain, are transmitted to the guide bar to effect longitudinal movement of the latter. The spring 124 constantly urges the guide bar toward the right in FIG. 21.

The invention has been shown and described in preferred form only, and by way of example, and many variations may be made in the invention which will still be comprised within its spirit. It is understood, therefore that the invention is not limited to any specific form or embodiment except insofar as such limitations are included in the appended claims.

What is claimed is:

1. In a knitting machine, a plurality of horizontally aligned and vertically reciprocable knitting needles, each of said needles having a hook-shaped upper end and carrying a latch pivoted to the needle at a point spaced from its upper end, first and second parallel guide bars movable transversely of and parallel to said line of needles, yarn guides carried by said first guide bar for leading yarn to be knitted around said needles, yarn guides carried by said second guide bar for leading effect threads around said needles, portions of the yarn and effect threads extending from the fabric already knitted to their respective yarn guides, means for moving said first guide bar to lead said yarn portions around each of their respective needles at a point between said hooked end and said latch, and means for moving said second guide bar including a swing shaft carrying said second guide bar and pivotable about its longitudinal axis, and means for moving said second guide bar radially as said swing shaft moves it transversely with respect to said needles so as to bring said effect thread portions below their respective needle latches, whereby when said needles descend said yarn portions enter said hook-shaped needle ends and said effect thread portions are prevented from entering said hook-shaped needle ends by causing said latches to swing closed.

2. In a knitting machine, the arrangement defined in claim 1 including a guide bar arm fixed with respect to said swing shaft and carrying said second guide bar, and an extension projecting from said second guide bar and slidable with respect to said guide bar arm, said extension serving to transmit motion from said means for moving said second guide bar radially to said second guide bar.

3. In a knitting machine, the arrangement defined in claim 1 wherein when said second guide bar is in its radi-

7

ally innermost position said effect thread portions are above the openings to the hook-shaped ends of said needles, and said means for moving said second guide bar radially includes a control means for operating said radially moving means only during selected cycles of the machine, whereby said effect thread portions may be brought below said needle latches only during selected cycles and may remain unaffected by said needles during other cycles.

4. In a knitting machine, the arrangement defined in claim 2 wherein said control means is a pattern chain.

5

10

8

References Cited

UNITED STATES PATENTS

2,155,145	4/1939	Morton et al.	66—86
2,604,768	7/1952	Schuster	66—86
3,171,271	3/1965	Noe	66—85

FOREIGN PATENTS

1,498,533	9/1967	France.
-----------	--------	---------

RONALD FELDBAUM, Primary Examiner