

March 29, 1966

M. HARRISON ETAL

3,242,697

STRAIGHT BAR KNITTING MACHINES

Filed Jan. 11, 1962

7 Sheets-Sheet 1

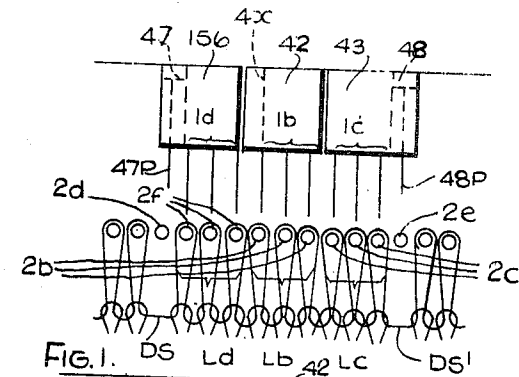


FIG. 1.

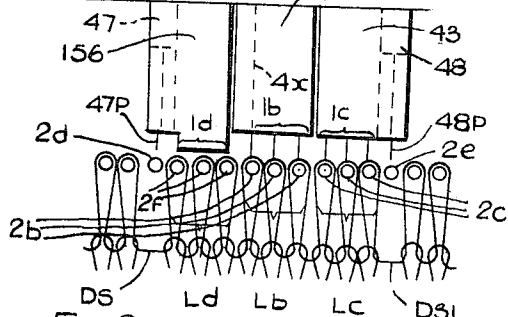


FIG. 2.

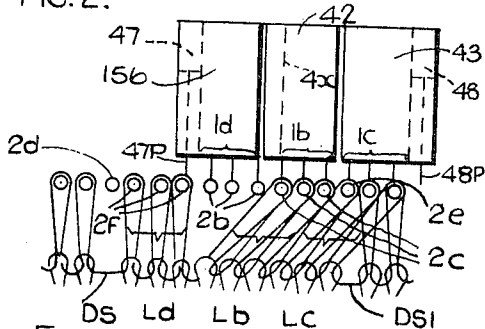


FIG. 3.

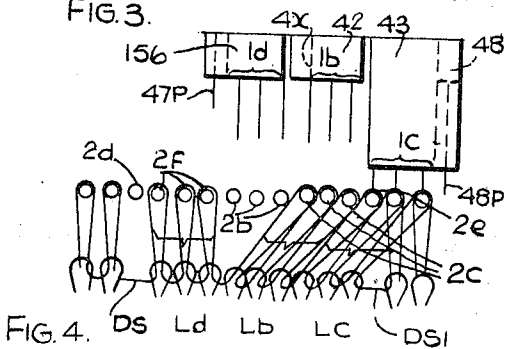


FIG. 4.

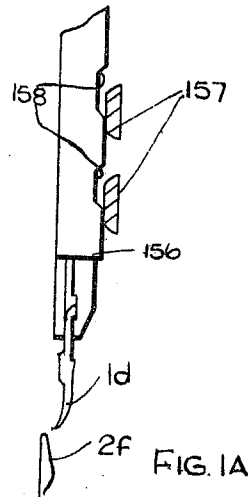


FIG. 1A

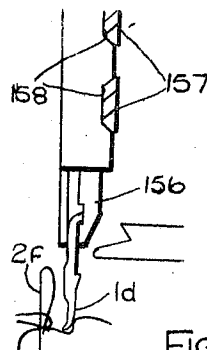


FIG. 2A.

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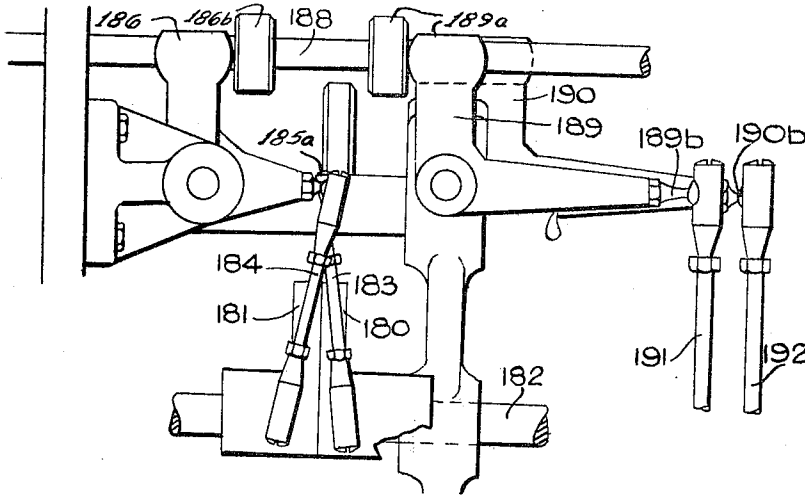


FIG. 8

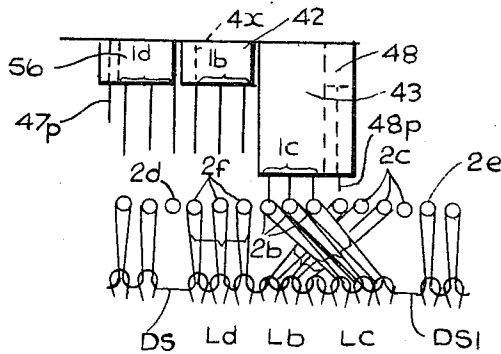


FIG. 5

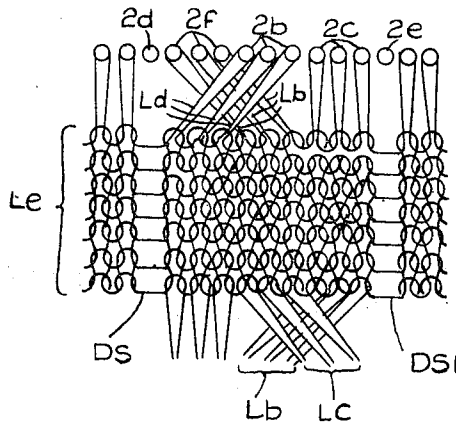


FIG. 6

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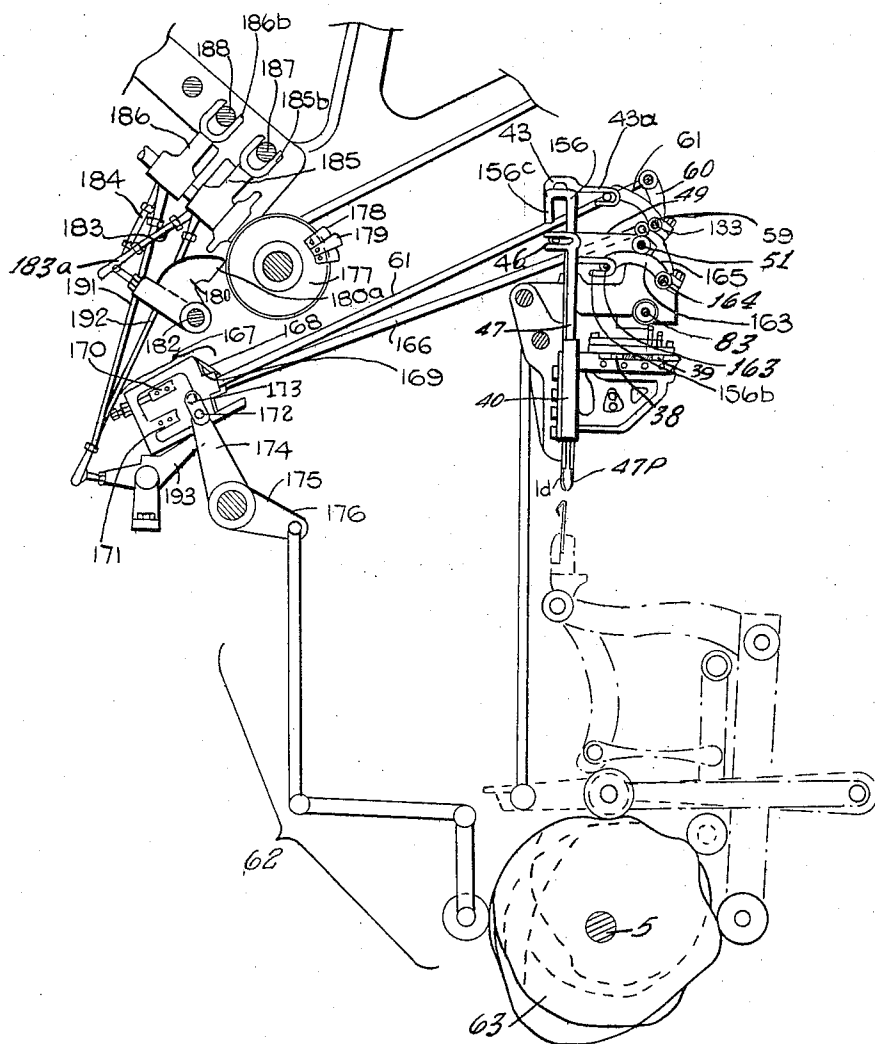


FIG. 7

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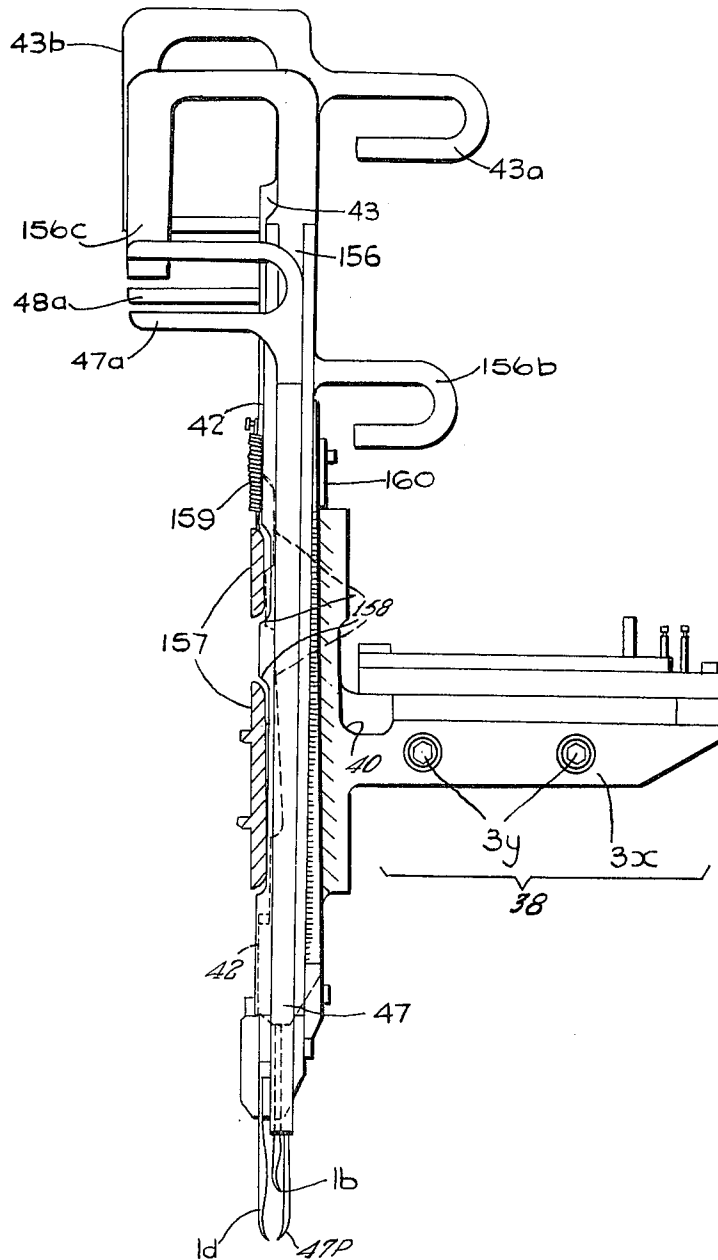


FIG. 9.

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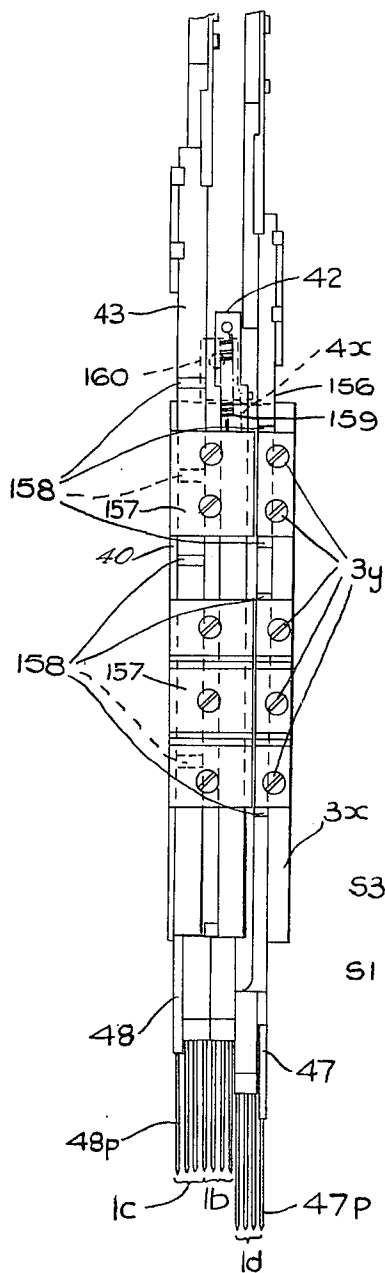


FIG. 10

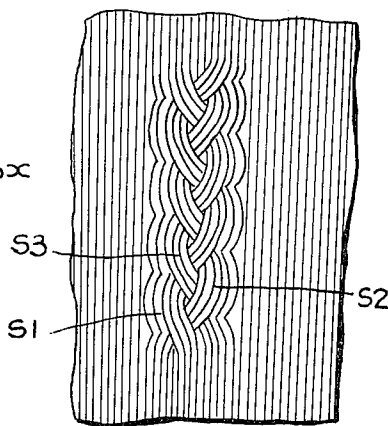


FIG. 11.

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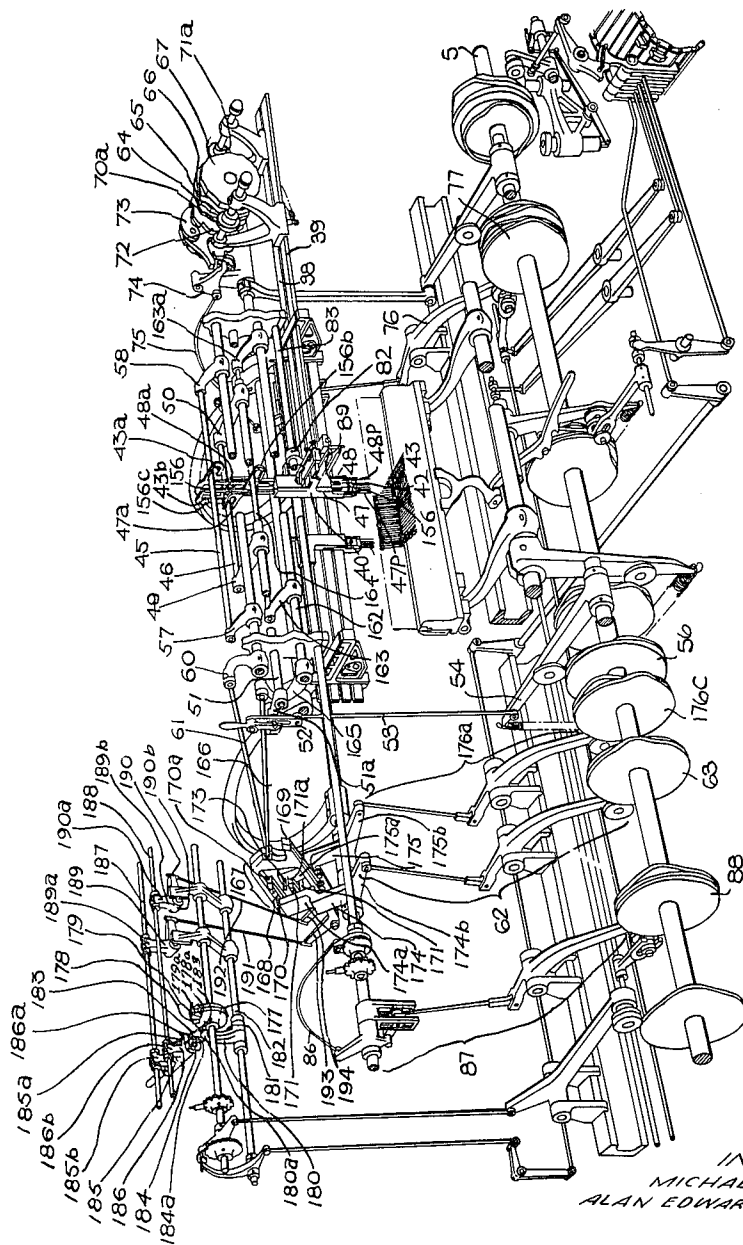


FIG. 12.

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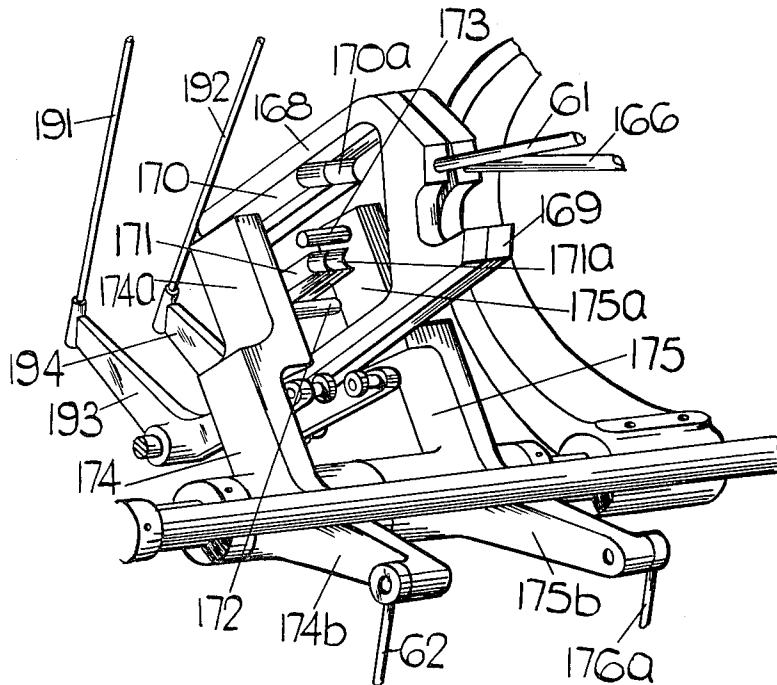


FIG. 13.

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STRAIGHT BAR KNITTING MACHINES

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Claims priority, application Great Britain, Jan. 11, 1961, 1,122/61

8 Claims. (Cl. 66—96)

The invention is for improvements in or relating to straight bar knitting machines and concerns improvements in or modifications of the inventions disclosed in the co-pending U.S. patent applications Ser. No. 849,091 now U.S. Patent No. 3,100,975 and 116,711. Application Ser. No. 849,091 provides for the production of knitted fabric with cable stitch patterns by the transference at spaced course intervals of adjacent groups of loops, in inwardly opposite directions, each from its own group of needles to another group of needles in cross-over relationship, the fabric being produced on a straight bar knitting machine wherein adjacent groups of loop transfer instruments are carried by the machine's narrowing head, the machine being controlled for fashioning motion operation with dips, rises and sideways displacements of the groups of instruments for association with the machine's bearded needles in the transference of loops, and the groups of instruments being mounted and controlled for movement relatively to the narrowing head, in addition to the sideways displacements, in causing the loop transference by each group of instruments to be effected between the appropriate groups of needles. Conveniently the machine is operable in double fashioning motions, and both groups of instruments pick up groups of loops from their groups of needles during the first dip and rise of the first fashioning motion, both groups of loops are sideways displaced in one direction and to such extent that during the second dip and rise of the first fashioning motion of the first group of instruments relinquishes its groups of loops to the second group of needles while the second group of instruments remains down in its group of loops, before starting the second fashioning motion the first group of instruments is rendered vertically inactive, during the first dip of the second fashioning motion the needle beards are not pressed so that for the rise after this first dip of the second fashioning motion the second group of instruments raises its loops, and both groups of instruments are again sideways displaced this time in the opposite direction and to such greater extent that the second group of instruments relinquishes its group of loops to the first group of needles during the second dip and rise in the second fashioning motion.

Application Ser. No. 116, 711 provides for the production of a repetitive drop stitch at each side of the cable stitch by operation of single points on the outsides of the groups of loop transfer instruments, and also for displacement of the groups of instruments into and out of operative position manually or automatically in desired manner.

An object of the invention is to enable the production on the machine of fabric with a triple cable stitch pattern.

The invention provides an improvement in or modification of the invention disclosed in the U.S. application Ser. No. 844,091 or as modified by the U.S. application Ser. No. 116,711 and provides an additional group of said instruments in the narrowing head, and first a cross-over loop arrangement at one side is carried out by the employment of an intermediate group of the three groups of in-

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struments together with one of the outer groups thereof. After a suitable course-producing interval a second cross-over loop arrangement is made at the other side by again employing the intermediate group of instruments this time together with the other outer group of instruments.

Conveniently each outer group of instruments is mounted for longitudinal and transverse displacements relatively to the other groups of instruments, operating means are provided for independently effecting said displacements, and patterning means are adapted to selectively control the operating means to determine the relative timing of the displacements.

Conveniently the longitudinal displacements of the group of instruments are to a lower level than that of the remainder and this causes the transverse displacements by which the lowered instruments are held clear of the needles.

For causing the transverse displacements by the longitudinal displacements there may be projections and recesses co-acting between a mounting for the groups of instruments and each outer group of instruments respectively.

The operating means conveniently comprise independent cam operating mechanisms, and the pattern means comprises a pattern device which is adapted to control selecting means associated with said cam operating mechanisms.

More specifically the additional group of instruments may be slidably mounted in an additional housing, and this additional housing may be removably attached to the housing for the other two groups of instruments so that the unit can be used either for double cabling or triple cabling according to whether or not the additional instruments are fitted. Where drop stitch points are used with the double cabling unit, the additional instruments can still be fitted, one of the drop stitch points being transferred to be associated with the additional instruments.

The above and other features of the invention set out in the appended claims are incorporated in the construction which will not be described, as a specific embodiment with reference to the drawings:

FIGURES 1 and 1A illustrate diagrammatically one step in the production of a triple cable stitch, according to the invention.

FIGURES 2 and 2A illustrate a further step in said production.

FIGURES 3 to 5 illustrate still further step in said production.

FIGURE 6 illustrates a completed triple cable stitch pattern.

FIGURE 7 is a cross sectional view of a relevant parts of a straight bar knitting machine according to the invention.

FIGURE 8 is a detail view of part of FIGURE 12 looking in the direction of arrow B.

FIGURE 9 is a detail side view of transfer instrument slide bars according to the invention.

FIGURE 10 is a rear view of said slide bars.

FIGURE 11 is a diagrammatic illustration of a repeat triple cable pattern produced according to the invention.

FIGURE 12 is a perspective view of the knitting machine.

FIGURE 13 is an enlarged perspective view of a selection device of FIGURE 12.

The following is a brief description, with reference to the FIGURES 1 to 6, of the prior arrangement according to said U.S. Patent No. 3,100,975 to which reference is directed for further details.

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Side by side groups 1b, 1c of loop transfer instruments, FIGURE 1, are carried by slide bars 4, 5 which are operated first for both groups 1b, 1c of instruments to lower the same, FIGURE 2, to take on them loops from corresponding needles 2b, 2c. After the points next rise with the loops on them, the points are shifted sideways to the right, as in FIGURE 3, and then the points move down permitting points 1b to transfer their loops to the needles 2c. At this stage the points 1b rise to leave their loops on the needles whereas the points 1c remain down FIGURE 4. Next the points 1c rise with their loops on them and all the points are shifted in the opposite direction, followed by the points 1c going down FIGURE 5 to transfer their loops onto the needles 2b. Then a plurality of courses (such as LE in FIGURE 6) are produced without transferring loops, and in this prior arrangement the whole cycle is repeated after returning the points to the starting position.

In the modification of application Ser. No. 116,711 to which reference is directed for full details, single drop stitch points 47P, 48P, FIGURE 1, are operated at the outsides of the groups of points 1b, 1c i.e. in the slide bars 42, 43, to close the beards of their associated needles and cause the needles to cast off their yarn thereby forming a series of drop stitches at each side of the cable pattern.

According to the present invention, there is provided in addition to the group of loop transfer instruments 1b, 1c, a group of loop transfer instruments 1d, which, in this example of a right hand unit, is to the left (looking from the front of the machine) of groups 1b and 1c and is carried by an additional outer slide bar 156.

In this instance, instead of the slide bar 42 having the drop stitch slide bar 47 associated with it as in said prior arrangement, the drop stitch slide bar 47 is associated in like manner with the outer slide bar 156 so that the drop stitch point 47P is associated with the outer instrument 1d instead of with the instruments 1b.

In the production of a triple cable stitch, first a cross-over loop arrangement is carried out as described for said prior arrangement including an operation as described for said modification during which the drop stitch point 48P, and of the drop stitch point 47P in its new position, form drop stitches at the outer sides of the three groups of needles 2f, 2b, 2c, so that the drop stitches are at positions wider apart than in the prior arrangement. While carrying out this first cross-over loop arrangement with the wide apart drop stitches, the instruments 1d are rendered ineffective by being displaced downwardly relative to the other instruments 1b, 1c, from an upper position, FIGURES 1 and 1A in which recesses 158 in the slide bar 156 are out of registry with relatively stationary projections 157 so that the instruments co-operate with the needles 2f, to a lowered position FIGURES 2 and 2A whereat the recesses 158 are in register with the projections 157 whereby the instruments do not co-operate with the needles.

During the following plain courses as in said prior arrangement, the drop stitches continue to be made by the points 47P, 48P but in this instance at the wider apart positions.

At the next course, a second cross-over loop arrangement is carried out, similar to that in said prior arrangement except that this time it is carried out in reverse at the left hand side, and the right hand group of points 1c, is rendered ineffective similarly to the manner in which the additional group 1d was rendered ineffective for the first cross-over, and this time again employing the intermediate group of instruments 1b but also employing with them the additional group 1d instead of the group 1c.

By these means, loops Lb are transferred to the left onto needles 2f and loops Ld are transferred to the right onto needles 2b as shown at the top of the fabric view FIGURE 6.

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During this time drop stitches Ds, Dsl continue to be formed by the drop stitch points 47P, 48P as in said modified arrangement.

The final result is that the wales of loops containing the transferred loops Lb, Lc and Ld respectively form three strands of a triple cable pattern as required and as indicated at S1, S2 and S3 in FIGURE 11.

For operation of the loop transfer instruments and drop stitch points of an apparatus as disclosed in application Ser. No. 116,711, the present invention provides an improved construction which will now be described with reference to basic mechanisms disclosed in said application to which reference is directed for full details and with further reference to FIGURES 7 to 10 and 12 of the present drawings.

A cable box or transfer unit 40 FIGURES 7 and 12 is secured on a pair of bars 38, 39 for opposite sideways displacements by cam followers 70a FIGURE 12 and 71a following cams 64 to 67, these cams being stepwise shifted by pawl and ratchet means 72, 73, a lever 74 and a link connection 75 to cam follower 76 following cams 77 on the main cam shaft 5.

In the transfer unit 40 there are slidably mounted the slide bars 42, 43 FIGURE 10 of which the bar 42 is a short bar and the bar 43 is a long bar. The slide bar 43 has a horizontal hook 43a FIGURES 7 and 12 for obtaining its raising and lowering movements by a rod 45 through supporting arms 57, 58, a mounting rod therefore 59 and arm 60 secured to the rod 59 and a link connection 61 to cam follower means 62 following cams 63 on the main shaft 5.

The slide bar 43 also has a vertical hook 43b FIGURES 7, 9 and 12 for displaceable engagement over a rod 46 for further control through arms 49, 50, a mounting rod 51 therefor and an arm connection 51a, FIGURE 12 to link connections 52, 53 to a cam follower 54 following cams 56.

The slide bar 43 has a drop stitch slide bar 48, FIGURE 10 slidably mounted in it and carrying the drop stitch point 48P. The drop stitch point slide bar 48 has a horizontal hook 48a engaging the rod 46 for operating the drop stitch point 48P.

The transfer unit 40 is capable of being rendered inoperative by operation of a cam 82 on a shaft 83 which is rotated when required through pawl and ratchet means 84 and a link connection 86 to cam follower means 87 following cams 88.

Referring to FIGURE 10 it will be seen that in accordance with the present invention, the cable box 40 is widened by an additional part 3x fastened to it by screws 3y to accommodate the additional slide bar 156 (note bar 156 is at the right in FIGURE 10 because this is a rear view), the short slide bar 42 being intermediate bar 156 and bar 43, not having an associated drop stitch point although having a groove 4x for a drop stitch point. The additional slide bar 156 is similar to the slide bar 43 and has a horizontal hook 156b (FIGURE 9) and a vertical hook 156c, and it further embodies the drop stitch slide bar 47 having the drop stitch point 47P. The slide bar 42 is spring biased downwardly by spring 159 as limited by a stop 160 bearing on top of the cable box 40 to assist in the slide bar 42 being controlled by the slide bar 43, the manner of this control being disclosed in said application Ser. No. 116,711.

The cable box 40 is provided with the aforesaid projection plates 157 for co-operation with the recesses 158 in the outer slide bars 43 and 156.

For operation of the slide bar 156 FIGURES 7 and 12, an additional operating rod 162 FIGURES 7 and 12 is provided, rod 162 being connected by arms 163, 163a to a rod 164 with which the horizontal hook 156b of the additional slide bar 156 engages and which is also connected by an arm 165 to a link 166. The vertical hook 156c of slide bar 156 functions in like manner to its counterpart 43b, being displaceably engageable over rod 46

by which the slide bars 43, 156 are raised to inoperative height when fashioning the fabric.

From the foregoing description it will be understood that when making the first cross-over arrangement, slide bar 43 is required to be operative and the slide bar 156 is required to be lowered to be ineffective and when making the second cross-over arrangement the slide bar 156 is required to be operative and the slide bar 43 is required to be lowered to be ineffective.

It is therefore necessary to select the one slide bar to be operative while the other is ineffective and vice versa, and for this purpose, the aforesaid link 61 for imparting motions to the slide bar 43, and consequently to the slide bar 42 and the link 166 for the slide bar 156 are connected at their other ends to a selection device indicated generally at 167.

In this selection device, see particularly FIGURE 13, there are two variable frame shaped control devices 168, 169 connected to said links 61, 166 respectively and each mounts a cup bearing block 170, 170a and 171, 171a, which blocks are spaced transversely to the frame shaped devices, and are adjustably mounted in longitudinally offset relationship so that their cup shaped ends are contained in a plane substantially parallel to a plane containing two pegs 172, 173 which are spaced transversely to the frame-shaped devices a lesser distance than the blocks. Pegs 172, 173 are inwardly directed from a pair of arms 174a, 175a of bell crank arms 174, 175 the other arms 174b, 175b are connected to cam operated mechanisms respectively. The arm 174b is connected to the aforesaid cam follower means 62 and the arm 175b is connected to cam follower means 176a following cams 176, FIGURE 12, on the main shaft 5. Each peg 172, 173, FIGURE 13, is capable of operating the links 161, 166 through either frame-shaped devices 168, 169 according to the positions of the cup bearings 170, 170a, 171, 171a.

The positions of the cup bearings are changeable in relation to the pegs by displacing the frame shaped devices relatively to each stem. For this purpose, pattern means are provided comprising a pattern disc 177, FIGURE 12, having pattern bits such as 178, 179 of different heights and operable on noses such as 180a of separate pawls 180, 181 (see also FIGURE 8). The two pawls 180, 181 are mounted on a rod 182 and are connected by universal joints 183a, 184a to links 183, 184, the latter links being also connected by universal joints 185a, 186a to rocker arms 185, 186 which have fork-and-collar connections 185b, 186b to control rods 187, 188 respectively. These control rods 187, 188 also have fork-and-collar connections 189, 190a with rocker arms 189, 190 which in turn are connected by universal joints 189b, 190b to links 191, 192 respectively, and these links 191, 192 are connected to control arms 193, 194, FIGURE 13, respectively engaged with the frame shaped devices 168, 169.

In operation of this mechanism the bell cranks 175, 175a operate selectively on the frame shaped devices 168, 169 (through cam followers 62, 176b) according to which of the bearing blocks 170, 170a, 171, 171a of either of the frame shaped devices 168, 169 is presented to the bell crank's pegs 172, 173 and the frame shaped devices are selectively displaced as thus required by the control arms 193, 194 from the pattern disc 177 through the control rods 187, 188 and the links 191, 192.

For example when for the first cross-over stitch the slide bar 43 is to be operative and the slide bar 156 ineffective, a low pattern bit 178 on the pattern disc 177 moves rocker arm 181 to rock arm 185 which pushes rod 187 to rock lever 189 and, through link 191, to operate arm 193, whereby the frame shaped device 168 is lowered a short distance, while pegs 172, 173 are clear of cup bearings 170-171a, thereby registering the short cup bearing 171 of the frame shaped device 168 with the peg 172 of arm 174, but not sufficiently low for peg 173 of lever 175 to register with the long cup bearing 170, so that operation of the slide bar 43 through link 61 by cam 63

is with the slide bar 43 in its normal operative position relative to the slide bar 156. During this time the other frame shaped device 169 is lowered, while the pegs 172, 173 are clear of the cup bearings 170-171a, a greater distance than the frame shaped device 168 by a high pattern bit 178a, through rocker arm 186, rod 188, lever 190, link 192, and arm 194, so that the peg 173 of lever 175 registers with the long cup bearing 170a of the frame shaped device 169, without the peg 172 of lever 174 registering with the short cup bearing 171a of the frame shaped device 169, so that operation of the slide bar 156 through link 166 by cam 167 is with the slide bar 156 in the lowered ineffective position relatively to the slide bar 43.

Reversal of this arrangement for the second cross-over stitch is occasioned as well be appreciated by a reverse arrangement of low and high pattern bits 179, 179a on disc 177 being presented to the rocker arms 180, 181 to lower the frame shaped device 168 to the lower position while the frame shaped device 169 is raised to higher position, so that the slide bar 156 operates in the normal position and the slide bar 43 operates in the lowered ineffective position.

Pattern disc 177 is stepwise turned by conventional ratchet means to present the different arrangements of pattern bits to the rocker arms 180, 181 in turn.

The cable box 40, FIGURES 9 and 10, is readily adaptable for use for alternatively making double cable stitches, if required, it being only necessary to remove the additional block part 3x, by removing the screws 3y, also removing the additional slide bar 156, and fitting the drop stitch point bar 47 into the slot 4x of the slide bar 42.

What we claim is:

1. In a straight bar knitting machine, in combination, a row of needles having beards; means for raising and lowering said needles; transfer means for picking up loops from needles of two selected groups of needles and for depositing loops picked up from each group of needles on the needles of the other group so that the groups of loops cross over; means for knitting a plurality of courses of plain knitted fabric; said transfer means including means cooperating with a third group of said needles to pick up together with loops from the needles of one of said groups, loops from needles of said third group of needles and for depositing the picked up loops of these two groups of needles on the needles of the other group so that these loops cross over, forming a three strand cable stitch pattern.

2. A machine as claimed in claim 1 having predetermined needles without loops located at the ends of said groups of needles; means for feeding yarn to said needles; and drop stitch means for closing the beards of said predetermined needles so that drop stitches are formed on the sides of said three strand cable stitch pattern.

3. In a straight bar knitting machine, in combination, a row of needles having beards; means for raising and lowering said needles; transfer means for picking up loops from needles of two selected groups of needles and for depositing picked up loops from each group of needles on the needles of the other group, so that the groups of loops cross over; means for knitting a plurality of courses of plain knitted fabric; said transfer means including a transfer finger having transfer points cooperating with a third group of said needles, and means for operating said transfer finger so that said transfer points pick up together with loops from the needles of one of said groups, loops from the needles of said third group of needles and deposit picked up loops of these two groups of needles on the needles of the other group thereof so that these loops cross over, forming a three strand cable stitch pattern.

4. In a straight bar knitting machine, in combination, a row of needles, means for raising and lowering said

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needles, a transfer unit, means for raising and lowering said transfer unit, means for sideways displacing said transfer unit, central and first and second opposite side transfer fingers slidably mounted in said transfer unit, a group of transfer points carried by each transfer finger cooperating with a third group of said needles, and means for controlling raising and lowering movements of said transfer fingers in timed relation to the raising and lowering movements of said transfer unit, and including pattern controlled selector means operatively connected with said first and second opposite side transfer fingers to operate each of said first and second opposite side transfer fingers in turn with said central transfer finger so that loops from three groups of needles are transferred and cross whereby a three strand cable stitch pattern is produced.

5. In a straight bar knitting machine, in combination, a row of needles, means for raising and lowering said needles, a transfer unit, means for raising and lowering said transfer unit, means for sideways displacing said transfer unit, central and first and second opposite side transfer fingers slidably mounted in said transfer unit, a first operating means for raising and lowering one of said side transfer fingers and including a selection device and pattern means controlling said selection device, and a second operating means for raising and lowering the other side transfer finger including a second selection device and a second pattern means controlling said second selection device.

6. In a straight bar knitting machine, in combination, a row of needles, means for raising and lowering said needles, a transfer unit, means for sideways displacing said transfer unit, central and first and second opposite side transfer fingers, each having a group of transfer points slidably mounted in said transfer unit, first and second cam operating means, first and second selection devices operatively connected between said first and second cam operating means and said first and second opposite side transfer fingers, a first pattern means operable to actuate said second selection device so that said first and second transfer fingers are operable by either of said first and second cam operating means according to pattern requirements.

7. A machine as claimed in claim 6 wherein each selector device has differently disposed adjusted abutments, and each of said first and second cam operating

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means includes a peg for engagement with any of said abutments according to different positions in which the abutments are disposed by the pattern operation of the selection devices.

8. In a straight bar knitting machine, in combination, a row of needles, means for raising and lowering said needles, a transfer unit, means for sideways displacing said transfer unit, central and first and second opposite side transfer fingers slidably mounted in said transfer unit and each having a group of transfer points, a first operating means comprising a first selection device operably connected with said first side transfer finger, a first pattern means controlling said first selection device, and a first cam operating device operable to actuate said central and first side transfer fingers to pick up loops from needles of the central group and one side group of needles and to deposit the picked up loops on the needles of the other group, means for knitting a plurality of plain knitted courses, and a second operating means comprising on a second selection device operably connected with the second side transfer finger, a second pattern means controlling said second selection device, and a second cam operating device operable to actuate said central and the second side transfer fingers to pick up loops from needles of said central group and from a second opposite side groups of needles and to deposit the picked up loops on the needles of the other group of these two groups of needles to produce three strand cable stitch patterns.

References Cited by the Examiner

UNITED STATES PATENTS

2,295,794	9/1942	Kaufman	66—96
2,313,294	3/1943	Garric	66—96
2,716,877	9/1955	Wickardt	66—96
2,923,142	2/1960	Golaski	66—96
3,004,415	10/1961	Golaski	66—96

FOREIGN PATENTS

1,239,166	7/1960	France.
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