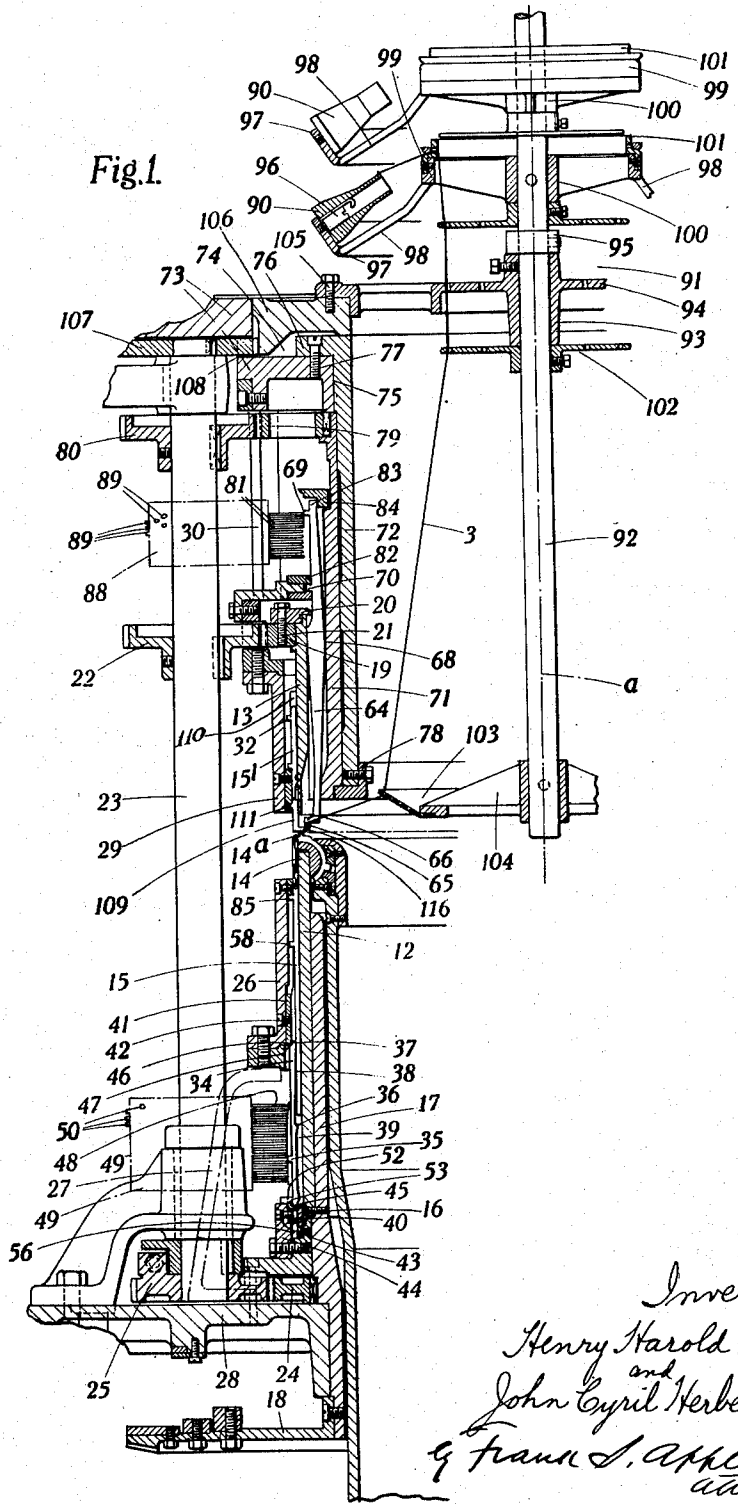
Oct. 7, 1941. H. H. HOLMES ET AL 2,258,569

METHOD OF AND MACHINE FOR PRODUCING KNITTED FABRICS

Original Filed Dec. 14, 1939 3 Sheets-Sheet 1

Fig. 1.



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METHOD OF AND MACHINE FOR PRODUCING KNITTED FABRICS

Original Filed Dec. 14, 1939 3 Sheets-Sheet 2

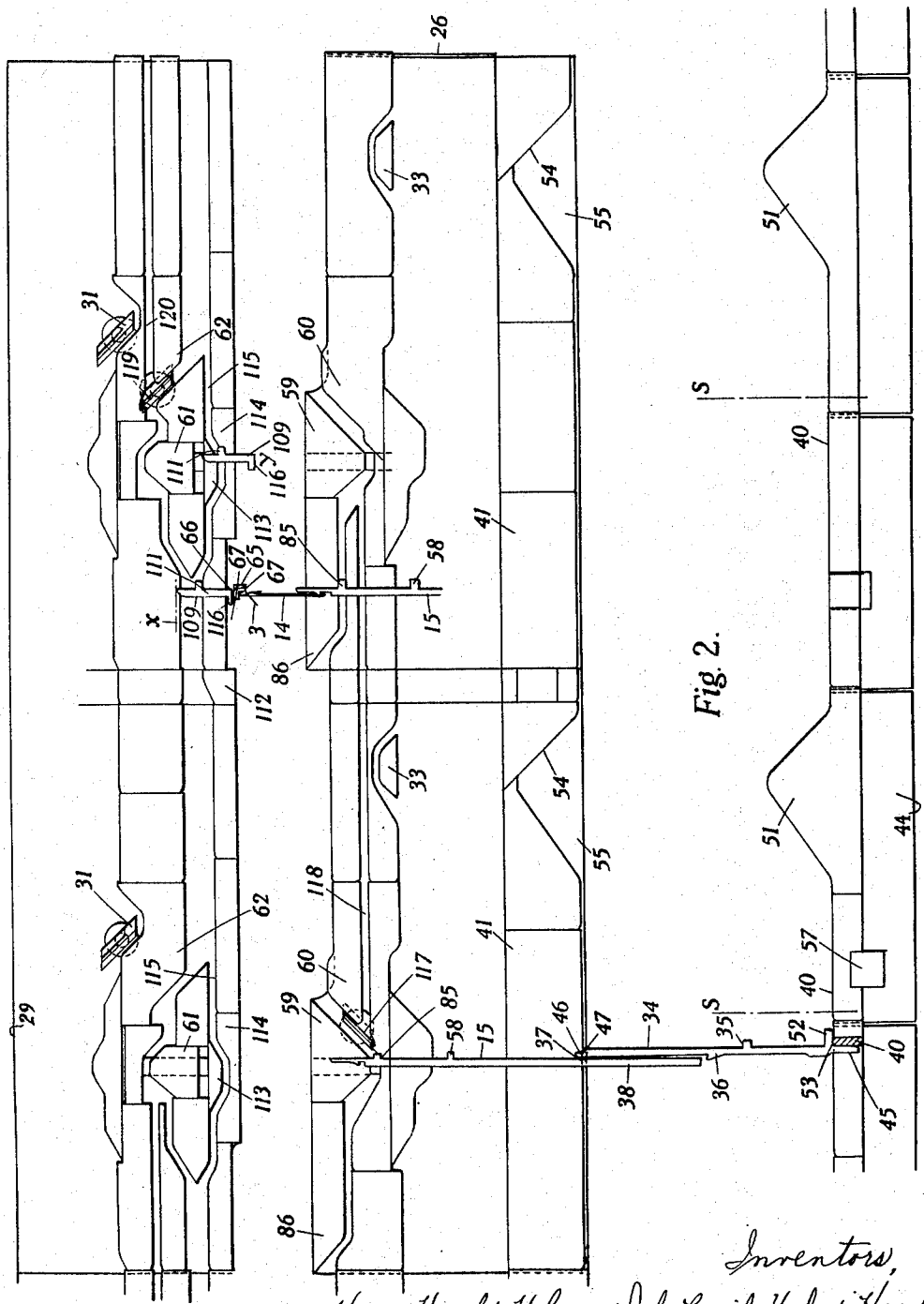


Fig. 2.

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Oct. 7, 1941. H. H. HOLMES ET AL 2,258,569

METHOD OF AND MACHINE FOR PRODUCING KNITTED FABRICS

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Fig. 3.

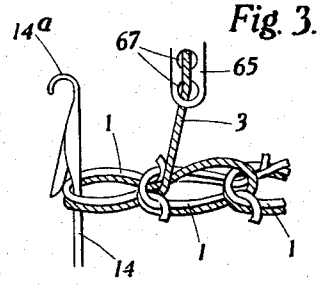


Fig. 4.

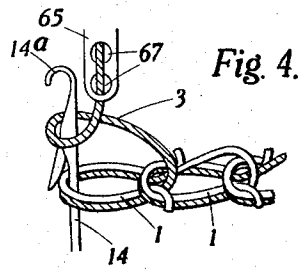


Fig. 5.

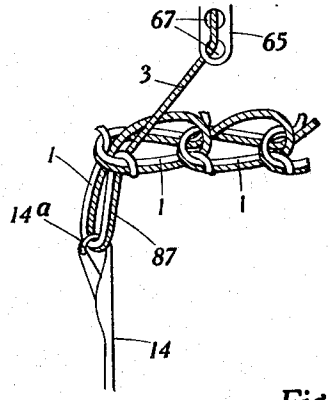
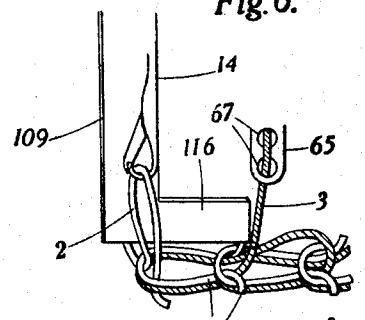


Fig. 6.



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UNITED STATES PATENT OFFICE

2,258,569

METHOD OF AND MACHINE FOR PRODUCING KNITTED FABRICS

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Original application December 14, 1939, Serial No. 309,282. Divided and this application May 28, 1940, Serial No. 337,726. In Great Britain December 20, 1938

8 Claims. (Cl. 66—135)

This invention concerns subject-matter divided out from our co-pending United States application Serial No. 309,282, filed Decembe · 14, 1939, and relates to a method of and machine for producing the improved knitted fabric disclosed in said application.

The fabric constituting the subject-matter of our co-pending application is characterised in that it has pattern effects which are produced by purl stitch effects and embroidery plating, such, for example, as lap or wrap striping effects.

Conveniently the fabric may be produced on any knitting machine of the type adapted to produce knitted fabric with purl effects.

In the accompanying drawings,

Figure 1 is a vertical sectional view of so much of a circular knitting machine of the superimposed needle cylinder type as is necessary to show the combination, in such a machine, of means for enabling fabric of the patterned or fancy character described in our co-pending application aforesaid to be produced thereon,

Figure 2 is a developed schematic lay-out of a portion of the cam system of said machine—at two feeds—for the purpose of showing means including needle transfer cams for effecting selective transference of needles from one needle cylinder to the other,

Figures 3–5 are enlarged detail views illustrating a portion both of a plain needle and of an associated lap or wrap thread guide at respectively different stages during the production of a lap or wrap striping effect, and

Figure 6 is a somewhat similar view but shows a purl loop in the course of being drawn by a rib needle over a knocking-over bit or sinker of a form hereinafter to be described.

Like parts are designated by similar reference characters throughout the drawings.

Broadly considered the method of making the fabric concerned on a knitting machine of the type adapted to produce purl stitches in knitted fabric which consists of supplying a main yarn or yarns to the needles of the machine, causing desired needles to produce purl stitches, supplying lap or wrap striping or embroidery yarn or thread to desired needles and causing said needles to knit the lap or wrap striping or embroidery yarn or thread in addition to or instead of the main yarn or yarns, with or without operation of the needles to knit a rib course or courses, with or without operation of the needles in suchwise as to form welts, and with or without operation of certain needles to produce separating or parting courses or incorporation of a draw thread into the knitted fabric.

Although the fabric may be produced on either a flat or a circular links and links knitting machine furnished with means of any character suitable for the intended purposes, a multi-feeder so-called body machine of the superimposed rotary needle cylinder type embodying mechanism for selectively transferring needles from either cylinder to the other and equipped with lap or wrap striping or embroidery mechanism will now be described with reference to Figures 1 and 2.

This machine comprises axially opposed rotary plain or bottom and rib or top cylinders 12 and 13 respectively equipped with double ended needles 14 and associated needle operating sliders 15 and 15¹. The plain or bottom cylinder 12 is attached by screws 16 to an inner cylindrical sleeve 17 to the lower end of which is secured a bevel wheel 18. This wheel is adapted to mesh with a bevel pinion (not shown) on a continuously rotating, e. g. main, shaft of the machine whereby the cylinder 12 is driven. The rib or top cylinder 13 is driven by gearing from the cylinder 12. Conveniently for this purpose a spur gear wheel 19 secured to the upper end of the cylinder 13, for instance by means of an annular securing member or ring 20 and screws such as 21, is arranged to mesh with a pinion 22 which is keyed to a shaft 23 disposed parallel with the axis a of the opposed cylinders. The shaft 23 is rotated from a spur gear wheel 24 which is keyed to the sleeve 17 and adapted to mesh with another pinion 25 secured to the lower end of said shaft. Since the gear wheels 19 and 24 are of the same diameter and the pinions 22 and 25 are likewise of the same size it will therefore be appreciated that the opposed cylinders rotate together at the same speed. The cam box of the plain or bottom cylinder 12 is indicated at 26 and mounted on brackets or like supports such as 27 which are in turn fastened on a bed plate 28. On the other hand the cam box 29 of the rib component is attached to or suspended from a supporting or top plate by means of somewhat similar brackets or supports such as that indicated at 30. Alternatively, however, the cam boxes 26 and 29 may be attached directly to the aforesaid bed plate and supporting or top plates respectively.

Now, by appropriate prearranged or selective transfer of needles 14 from one needle cylinder to the other certain needles can be caused to produce purl stitches while others knit plain

stitches and consequently many and diverse purl stitch effects can be produced. For this purpose the machine illustrated is equipped with top transfer cams 31 (Figure 2)—one at each feed—and, in association with the sliders 15 in the plain or bottom cylinder 12, selective needle transfer mechanism, preferably of the particular character hereinafter to be described. The transfer cams 31, which, when operative act upon the transfer butts 32 of the top sliders 15¹, are of the bolt type being movable radially in the top cam box 29 and spring controlled. Means of any suitable conventional character may be provided for operating said cams automatically suchwise as to effect at a desired feed or feeds transference of prearranged needles 14 in the rib or top cylinder 13 to the opposed cylinder 12 at appropriate times in the manner well understood in the art. With regard to the aforesaid selective needle transfer mechanism this may either be employed to effect complete transference of selected needles from the plain or bottom cylinder 12 to the rib or top cylinder 13, or, as shown, said mechanism may be used simply to initiate such transference, the action in this instance being completed at a desired feed or at each of two or more feeds by a corresponding fixed transfer cam 33. Considered generally the selective needle transfer mechanism is of the character described in prior United States Patent No. 2,143,832. Thus, as will be seen in Figures 1 and 2, said mechanism includes selecting elements such as 34 each of which is provided with a frontal selecting butt 35 and a rearwardly projecting formation 36 remote from its upper end. There is one element 34 in association with each needle-operating slider 15, and each of said elements is provided at the back and at its upper end with a fulcrum point 37. Associated with the selecting elements 34 are jack-like extensions 38, one on each slider, to be acted upon for patterning purposes. Each extension 38, together with the slider 15 of which it forms a part, is located at the back of the groove or trick 39 (Figure 1) in which it is to work, and the companion selecting element 34 works in the same trick or groove with its fulcrum point 37 in contact or engagement with the front edge of the extension. It is convenient to mention here that one complete slider 15 and companion selecting element 34 have been shown at the left-hand side of Figure 2, and that although these parts ought properly to be shown edgewise they are nevertheless shown in side elevation for convenience in illustration. The same applies to the needles 14 and portions of associated instrumentalities shown near the right-hand side of Figure 2. When in normal position, the selecting elements 34 are prevented from falling out of the grooves or tricks 39 by a sectional carrier ring 40 and a sectional ring 41 which latter is attached by screws such as 42 (see Figure 1) to the inside of the bottom cam box 26. The ring 40 is attached by screws 43 to the inside of a cylindrical carrier 44 which is in turn secured to any appropriate fixed part of the machine. Each of the elements 34, besides being provided with a tail portion 45 which normally rests against the inner edge of the ring 40, is formed at its upper end with a reduced portion 46 the front edge of which rests at all times against the inner surface of the ring 41 while the adjacent shouldered portion 47 of the element permanently engages beneath the lower edge of said last mentioned ring. For selectively operating the selecting elements 34 there is provided at each feed of the machine a bank of as many spring-controlled selector cams 48 as there are butt positions on the elements, and a patterning controlling unit such as that indicated at 49 in dot-and-dash lines in Figure 1, said unit being in the form of a drum, cylinder or like body furnished with cam actuating pins 50 or, alternatively, with screws or selector strips, prearranged and removable and interchangeable according to patterning requirements. Conveniently the unit 49 at each feed is mounted on a spindle and operated by cam operated pawl and ratchet mechanism in accordance with now well known practice. Instead of employing units such as 49 these may, of course, be replaced by jacquard or equivalent mechanisms of any known form. In any event the selecting means are adapted to operate selectively upon the butts 35 for the purpose of determining which of the corresponding sliders 15 shall be subsequently raised by associated actuating means for transfer purposes. Conveniently the actuating means at each feed consist of an upthrow or raising cam 51 which is formed or provided on the carrier ring 40 and shaped as shown in Figure 2. The selecting elements 34 and the actuating cams 51 are formed and arranged so that all of said elements make contact with the cams but only those which are selected, i. e. engaged by an operative selector cam 48 and pressed inwards to bring their rear formations 36 beneath the associated jack-like extensions 38, function to operate corresponding needles 14, while the remainder are merely moved idly by the cams 51 so that they do not affect the associated sliders and needles. The portion of each selecting element adapted to be acted upon by an actuating cam 51 is designated by the reference numeral 52, this portion being in the form of a frontal butt or shoulder and formed at its lower edge with a notch or recess 53 the purpose of which is to prevent the element—in the event of it being unselected at a selecting point S (Figure 2—from accidentally moving into operative position. The arrangement is therefore such that immediately an unselected element 34 commences to travel over an actuating cam 51 the upper edge of the latter enters the notch or recess 53 and thereby holds the element in its normal inoperative position while it is being raised. On the other hand whenever a selected element 34 commences to travel over an actuating cam 51 its rear formation 36 is brought into engagement with the lower extremity of the adjacent jack-like extension 38 with the result that the corresponding slider 15 is raised and transference from the cylinder 12 to the cylinder 13 of a needle engaged with said slider is thereby initiated.

Cam means are provided for action upon elements 34 selected at any of the points S to restore same to normal position preparatory to re-selection being effected at a subsequent selecting point. In the example illustrated the said means include downwardly inclined cam surfaces 54 one of which is located above each actuating cam 51. Each surface 54 by reason of the engagement therewith of the shouldered portions 47 of the elements 34 serves to return all of the latter to the normal level after they have been fully raised by the corresponding actuating cam 51. Moreover, a cam (not shown) located behind the elements 34 at or adjacent to their tail ends is provided at each feed for pushing previously selected elements outwards preparatory to reselection. The aforesaid cam surfaces 54 are

formed on sections of the ring 41 and the latter is cut away as at 55 to permit the selecting elements to rise as the portions 52 ride up the cams 51. All the elements 34, after passing a cam 51, are held in the normal inoperative position shown in Figure 1 until they again approach a selecting point S. Conveniently for this purpose there is provided between feeds an annular recess or track 56 for reception of the tail portions 45 of the elements.

Means may be provided for automatically nullifying selective action by the pattern controlling unit 49 at any one or at each of desired feeds for predetermined intervals according to patterning requirements. Conveniently for this purpose there is provided at the feed or at each feed at which selective action is to be nullified at appropriate times a cam which is located between the selecting point S at that feed and the corresponding actuating cam 51 behind the selecting elements 34 at or adjacent to their tail ends, said cam being normally inoperative but adapted to be rendered operative for predetermined intervals for causing all selected elements to be pushed outwards again so that they are all moved idly by said actuating cam. For purpose of illustration one such nullifying cam is provided at the position designated by the reference numeral 57. Said cam may be of the radially movable bolt type and automatically operable in conventional manner. A similar cam may, if desired, also be provided in advance of that cam 51 shown at the right-hand side of Figure 2. If the machine has more than two feeds then a controlling unit and actuating and transfer cams, with or without an associated nullifying cam, may be provided at each feed or at only certain of said feeds according to requirements. At this stage in the description it is convenient to mention that in the case of a multi-feeder machine selective needle transfer mechanism may, in some instances, be provided at one feed only. Moreover, although the particular example herein described is applied to a multi-feeder machine, it is nevertheless within the scope of the invention to apply the mechanisms herein described to a single feeder machine. However, returning to the description, transfer butts 58 are provided on the sliders 15 and it is these butts which are acted upon by the fixed transfer cams 33. As will be understood, the function of selected elements 34 is to raise the corresponding sliders 15 to an extent sufficient to bring their butts 58 into the range of the appropriate cam 33 by means of which latter transference of desired needles is completed.

In Figure 2 the customary knitting cams of the plain and rib cam systems are shown. Thus, at each feed, the bottom stitch cam is shown at 59, the associated clearing cam at 60, the top stitch cam at 61 and the top clearing cam at 62.

The mechanism for transferring needles from one cylinder to the other may, instead of being of the specific form herein described, be of the general character described in prior United Kingdom specification No. 391,212.

In pursuance of the invention the illustrated machine is also equipped with lap or wrap striping or embroidery mechanism of the general character described in United States Patent No. 2,065,469. This mechanism is associated with the rib or top cylinder component for co-operation with needles in the plain or bottom cylinder 12 and is used for lapping or wrapping embroidery threads 3 around associated needles in desired courses. Broadly considered said mechanism comprises any suitable number of individually operable thread guides like that indicated at 64 in Figure 1—say one for each needle or a plurality of needles, means hereinafter to be described for selectively operating the guides and means for operating the needles so that selected threads 3 are lapped or wrapped around corresponding needles, whereby when said needles are caused to knit, embroidery stitches are produced by said needles in addition to stitches formed of the main yarn or yarns ordinarily supplied.

Each of the thread guides has a thread holding extremity 65 constituted by a downwardly directed extension located at the free end of a portion 66 formed at right angles to the main body portion of the guide. This extremity or the portion 66 is laterally bent or cranked. As shown more clearly in each of Figures 2–6, two thread receiving holes 67 are provided in the extremity 65. In addition the guide is fulcrumed at 68 and has a frontal butt 69 on the opposite side of the fulcrum to the thread guiding extremity 65, and a main butt 70. For the sake of convenience in this description the butt 69 will be referred to as a pressure butt. The guides are provided in a longitudinally tricked cylindrical carrier 71 which is mounted on a sleeve 72 depending from the top plate 73 of the machine. As will be seen, therefore, the carrier 71 is above and concentrically disposed with respect to the plain or bottom cylinder 12. Conveniently the top plate 73, which serves to support the entire rib component and the associated lap or wrap striping mechanism, is formed with a central recess 74 having a hole 75 formed concentrically therein, the diameter of the said hole being substantially the same as the external diameter of the sleeve 72, and the latter, which is formed with a flange 76, is fitted into the hole so as to extend axially from the plate 73 with the flange 76 in the recess, the two parts being secured together by means of screws such as 77 passed through the flange into the part of the top plate forming the bottom of the recess 74. The cylindrical carrier 71 is supported at its lower end upon a flanged annular part 78 which is secured to the corresponding end of the depending sleeve 72. At its upper end the said carrier has keyed thereto a gear wheel 79 arranged to mesh with a pinion 80 on the aforesaid shaft 23. In this way the carrier containing the thread guides 64 is driven at the same speed as the needle cylinders. The thread guiding extremities of the guides project radially from the carrier 71 at the lower end thereof. A bank of selector levers or cams 81 is provided for action selectively upon the pressure butts 69, above the fulcrum points 68, so that selected guides 64 are pressed inwards at their upper ends and are projected radially at their lower ends. A track or like cam 82 is provided for action on the main butts 70 of the guides seriatim, the formation of the track being such that the guides are slightly lowered and then raised. As the result of being lowered in this way a guide is moved slightly towards the associated needle to be lapped or wrapped, for the purpose of facilitating the lapping or wrapping action. The guides are re-positioned in a longitudinal direction before re-selection. The reason that each guide is laterally bent or cranked as hereinbefore mentioned is so that said guide shall be deflected laterally as the result of contact with the adjacent needle during the radial movement. Each thread guide has an upwardly extending butt 83

at the upper end, and a retracting cam 84 is provided for action upon these butts seriatim for the purpose of restoring selected guides to the normal position. Normally the lower ends of the guides 64 occupy a position just to the rear of and above the needle hooks 14a (see Figure 1). Prior to a needle having a thread 3 passed around it, however, said needle is first cleared and then lowered slightly into what may be termed a "normal wrapping" position. To lower a needle to this position the knitting butt 85 of the corresponding slider 15 is engaged with and depressed by a cam 86 which is disposed in advance of and adjacent to a bottom stitch cam 59. A needle in the normal wrapping position is shown in each of Figures 6 and 7. Figure 3 shows the relative positions of a guide and its associated needle 14 immediately before said guide is projected by the appropriate one of the selector levers or cams 81. The relative positions after the guide has been projected are represented in Figure 2. At this stage the thread 3 to be lapped or wrapped passes on one side only of the needle 14. The guide is subsequently retracted by the cam 84 taking its thread 3 with it, and during this movement the laterally bent or cranked extremity 2 of said guide engages the side of the needle whereupon the guide (and maybe also the needle) yields or is deflected laterally. After passing the needle on the return movement, the thread guiding extremity 65 springs back to its normal position with the result that the thread 3 is lapped or wrapped around the said needle, as shown in Figure 4, and is formed into a stitch 87 when the needle next knits by reason of the knitting butt 85 of the corresponding slider 15 being engaged by a stitch cam 59. In Figure 5 the needle is shown in the course of simultaneously drawing two stitches, viz. a plain stitch of the main yarn and an embroidery stitch 87.

The selecting levers or cams 81 are operated selectively by means of a drum or equivalent unit such as 88 having pins or pegs 89 prearranged therein according to pattern requirements and racked around, say by cam actuated pawl and ratchet mechanism (not shown).

The threads 3 are supplied to the thread guides 64 from a number of bobbins 90 or the equivalent carried by a structure 91 arranged co-axially with the cylindrical carrier 71. The bobbins are arranged in tiers about a vertical rod 92 which is mounted in a bearing 93 formed on a horizontal supporting member 94. The said rod, moreover, is supported by a collar 95 which is secured thereto and rests on the top of the bearing 93. The bobbins of each tier are placed on spindles 96 carried by a circular support 97 having radial arms 98 formed integrally with an inner circular part 99 which is associated with a hub 100 rigidly secured on the rod 92. To the top of each inner circular part 99 is attached a ring 101 having formed therein perforations through which the threads 3 pass and are led to the guides 64 through any suitable guiding means arranged within the sleeve 72. Conveniently these means comprise an appropriately perforated disc 102 having a central hub which fits on and is secured to the rod 92, below the bearing 93, and also a similarly perforated dished member 103. The member 103 is carried by a supporting circular part 104 also secured to the said rod. The supporting member 94 is attached by screws 105 to a gear 106 which is located in the recess 74 in the top plate 73 and arranged to mesh with a pinion 107 keyed on the top of the shaft 23. A gap 108 is provided in the top plate 73 to enable the pinion 107 to mesh with the gear 106. By these means the bobbin carrier or superstructure 91 is driven at the same speed as the needle cylinders and the lap or wrap striping head.

As an alternative to the specific form of lap or wrap striping mechanism just described, mechanism of a somewhat similar form but including means for selectively operating needles for reception of the embroidery thread or threads may be provided.

Means may be furnished in the improved machine for effecting shogging movement of the lap or wrap thread supplying means and the appropriate needle bed one in relation to the other, i. e. varying the relative positions of the thread supplying means or guides and the associated needles laterally so that different threads may be supplied to the same needles in order to produce contrasting, e. g. different coloured effects in the same needle wales. For instance, in the particular knitting machine illustrated this result may be achieved by shogging the thread guides 64 circumferentially over one or more needles in the plain or bottom cylinder 12. The shogging movement may be effected by any convenient means, such for example as of a character similar to those disclosed in the aforesaid United States Patent No. 2,065,469.

In the specific machine illustrated a circular series of upper knocking-over bits or sinkers such as 109 is provided in association with the needles to facilitate production of purl stitches. These bits or sinkers are vertically and movably arranged in the lower portions of appropriate needle tricks or grooves 110 in the rib or top cylinder 13 and are each formed with a butt 111 for engagement with suitable cam means in the top cam box 29. The bits or sinkers 109 are controlled so as to enable them to be moved clear of the thread guides 64 when the latter are to function to produce embroidery stitches. Thus, as will be seen in Figure 2, there are provided in association with each feed a raising cam 112 for action on the butts 111 to move the bits or sinkers to a height x at which they are clear of the thread guides, a cam 113 at the knitting point to lower said bits or sinkers so that they are in a position y to enable purl loops to be drawn over them by rib needles, i. e. needles working in the cylinder 13, and another cam 114 to raise the bits or sinkers to a normal run position with their butts supported on a ledge 115. A purl loop 2 in the course of being drawn over a knocking-over bit or sinker 109 is shown in Figure 6. Now the machine shown in Figure 1 is not furnished with a verge in association with the rib or top cylinder 13, but for the purpose of holding down the fabric at such times as loops are being drawn by rib needles each of the bits or sinkers 109 is formed at the lower end with an inwardly directed radial extension 116. These extensions are disposed at right angles to the bits or sinkers and are of a length just sufficient for the intended purpose. The elements 109 may therefore be regarded as combined knocking-over and holding down bits or sinkers. Instead of a series of individually movable bits, however, a movably arranged and suitably arranged trick ring may be employed for the same purposes.

It will be understood that a links and links knitting machine is adapted to produce purl stitch effects and ordinary or/and fancy ribbed fabric as the result of appropriate control and operation of the needles, and accordingly in a

circular knitting machine of this type there may be provided as an alternative or in addition to individually movable bits or a movable trick ring, a verge of any appropriate form to facilitate the knitting of ribbed fabric and especially broad ribbed fabric. This verge may be constituted by a complete fixed trick ring or a series of individual elements appropriately carried.

Any convenient means may be employed in the machine for producing a welt, as for example in a circular machine as described in the said United Kingdom specification No. 391,212. Thus, referring to Figure 2, there is provided in the bottom cam box at one feed an automatically controlled welt cam 117 which when withdrawn opens the entrance to a welt track 118 for admission of the knitting butts 85 of bottom sliders 15, while in the top cam box at the other feed represented there is provided a similar welt cam 119 for controlling the admission at appropriate times of the knitting butts of top sliders 15^1 to a welt track 120. The cams 117 and 119 may be controlled so that knitting may proceed on rib and plain needles alternately for a number of courses to form a French welt, or knitting may be suspended on either set of needles to form an English or roll welt.

Since, as already alluded to herein, it may be desired to form separating or parting courses, e. g. on plain needles, or to supply a draw thread any conventional means suitably controlled and operated may be adopted in the improved machine for this purpose.

Provision may also be made in the machine for varying the quality of the fabric, e. g. for knitting areas with purl and embroidery effects slacker than rib courses, and in the machine shown in the drawings such means may be of the form disclosed in the said United Kingdom specification No. 391,212. That is to say, the stitch cams 59 and 61 may be adjustable to effect the varitions required.

As will be understood, the needles of the machine and the thread lapping or wrapping mechanism may be so controlled as to enable the purl stitch effects and embroidery effects to be restricted to a particular area or areas, and an area or areas of plain stitch fabric or any conventional stitch variation, such as tuck effects, miss-stitch effects, mock rib effects, or combination of stitch variations, as well understood in the art, or/and ordinary or fancy ribbed effects with or without welts and separating or parting courses or the introduction of draw threads to be produced in desired longitudinal sequence.

Patterning means of any appropriate form other than those hereinbefore described and of which there are now many known in the art, may be employed for producing the purl stitch and embroidery stitch effects and, if desired, similar patterning means may be provided for producing the other patterning effects mentioned.

Although lap or wrap striping or embroidery mechanism of a particular form has been described herein, the invention is not limited in this respect since there may be provided such mechanism of any appropriate character adapted to suit the requirements of the machine to which it is to be applied, for the purpose of supplying an embroidery thread or threads to prearranged or selected needles.

The improved knitted fabric may be produced on circular knitting machines of either the rotary or stationary needle cylinder type and having latch or bearded needles.

If desired, the machine may include means for effecting shogging movement of the needle beds one in relation to the other so as to enable racked rib and like effects to be produced.

For the production of the improved fabric in the form of a stocking, half-hose, child's or ankle stock or like article, such article may be made with a split foot and accordingly, in a circular seamless hose machine adapted to produce said articles, means may be provided for feeding separate yarns to the instep needles and the heel and toe needles respectively, and for causing certain needles of both groups to knit both yarns to join the two sections of fabric together.

What we claim then is:

1. A method of making patterned knitted fabric on a knitting machine of the type adapted to produce purl stitches in knitted fabric, which consists of supplying a main yarn to the needles of the machine, causing desired needles to produce purl stitches, supplying lap striping yarn to desired needles and causing said needles to knit the last mentioned yarn.

2. A method of making knitted fabric on a knitting machine of the type adapted to produce purl stitches in knitted fabric, which consists of supplying a main yarn to the needles of the machine, operating the needles to knit rib courses, causing desired needles to produce purl stitches, supplying lap striping yarn to desired needles and causing said needles to knit the last mentioned yarn.

3. A method of making knitted fabric on a knitting machine of the type adapted to produce purl stitches in knitted fabric, which consists of supplying a main yarn to the needles of the machine, operating the needles to knit rib courses, operating said needles suchwise as to form a welt, causing desired needles to produce purl stitches, supplying lap striping yarn to desired needles and causing said needles to knit the last mentioned yarn.

4. A method of making knitted fabric on a knitting machine of the type adapted to produce purl stitches in knitted fabric, which consists of supplying a main yarn to the needles of the machine, operating the needles to knit rib courses, operating said needles suchwise as to form welts, causing desired needles to produce purl stitches, supplying lap striping yarn to desired needles, causing said needles to knit the last mentioned yarn and operating certain needles to produce separating courses.

5. A knitting machine comprising, in combination, two needle beds, double-ended needles in said beds, instrumentalities for actuating said needles, means for supplying a main yarn to the needles, means adapted for action upon said needle-actuating instrumentalities so as to effect transference of predetermined needles from one bed to the other, a plurality of individually operable lap thread guides, means for supplying embroidery threads to said guides, means for causing desired threads to be lapped around corresponding needles whereby when said needles are caused to knit, embroidery stitches are produced thereby, in addition to stitches formed of the aforesaid main yarn, a series of movable knocking-over bits in association with the needles to facilitate production of purl stitches, and means for so controlling said bits that they are moved clear of the lap thread guides when the latter are to function in the production of embroidery stitches.

6. A knitting machine comprising, in combi-

nation, two needle beds, double-ended needles in said beds, instrumentalities for actuating said needles, means for supplying a main yarn to the needles, means adapted for action upon said needle-actuating instrumentalities so as to effect transference of predetermined needles from one bed to the other, a plurality of individually operable lap thread guides, means for supplying embroidery threads to said guides, means for causing desired threads to be lapped around corresponding needles whereby when said needles are caused to knit, embroidery stitches are produced thereby, in addition to stitches formed of the aforesaid main yarn, a series of movable knocking-over bits in association with the needles to facilitate production of purl stitches, each of said bits being provided with a formation adapted to assist in holding down the fabric at such times as purl loops are being drawn by appropriate needles, and means for controlling said bits so that they are moved clear of the lap thread guides when the latter are to function in the production of embroidery stitches.

7. A circular knitting machine comprising, in combination, a plain cylinder with needle grooves therein, a superimposed rib cylinder, double-ended needles in said cylinders, a series of needle-actuating instrumentalities in said plain cylinder, a corresponding series of similar instrumentalities in the rib cylinder, selective needle transfer mechanism for initiating transference of preselected needles from the plain cylinder to the rib cylinder, said mechanism comprising actuating means for effecting endwise movement of needles, selecting elements, one for each needle, adapted to be pivotally mounted in the aforesaid needle grooves and having selecting butts in different positions lengthwise thereon, selecting cam means adapted to operate upon said butts, a pattern device for controlling said selecting cam means so that the latter operate selectively upon the selecting butts for the purpose of determining which of the needles shall be subsequently moved endwise by the actuating means, each of said selecting elements being adapted at a region remote from its upper end to have operative relationship with the companion needle-actuating instrumentality in the plain cylinder, whereby when such elements are acted upon by the selecting cam means and make contact with the actuating means, endwise movement of the corresponding needles is effected, and lap striping mechanism including means for supplying embroidery threads to needles, said mechanism being associated with the rib cylinder for co-operation with needles in the plain cylinder and comprising individually movable thread guides consisting of blade-like elements which are contrastingly formed and each provided with a thread guiding extremity, a cylindrical bed in which the thread guides are mounted for rocking movement, a further series of selecting cams whereby thread guides are selected and moved radially in one direction for the purpose of carrying their threads across the needle circle conjointly with relative lateral movement between the thread guiding extremities and the adjacent ends of corresponding needles whereby the threads are lapped around desired needles, means for automatically selecting said last mentioned cams for action upon the thread guides according to pattern requirements, and cam means for moving selected guides radially in the opposite direction.

8. A knitting machine comprising, in combination, two needle beds, needles in said beds, means for supplying a main yarn to said needles, means adapted to effect transference of predetermined needles from one bed to the other suchwise as to enable purl stitches to be formed of the main yarn, lap striping means for lapping embroidery threads around desired needles, movable knocking-over elements in association with the needles to facilitate production of purl stitches, and means for so controlling said elements that they are prevented from interfering with the operation of the lap striping means at appropriate times.

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