March 7, 1939. W. H. LASCH 2,150,100

KNITTING MACHINE

Filed July 11, 1934 4 Sheets-Sheet 1

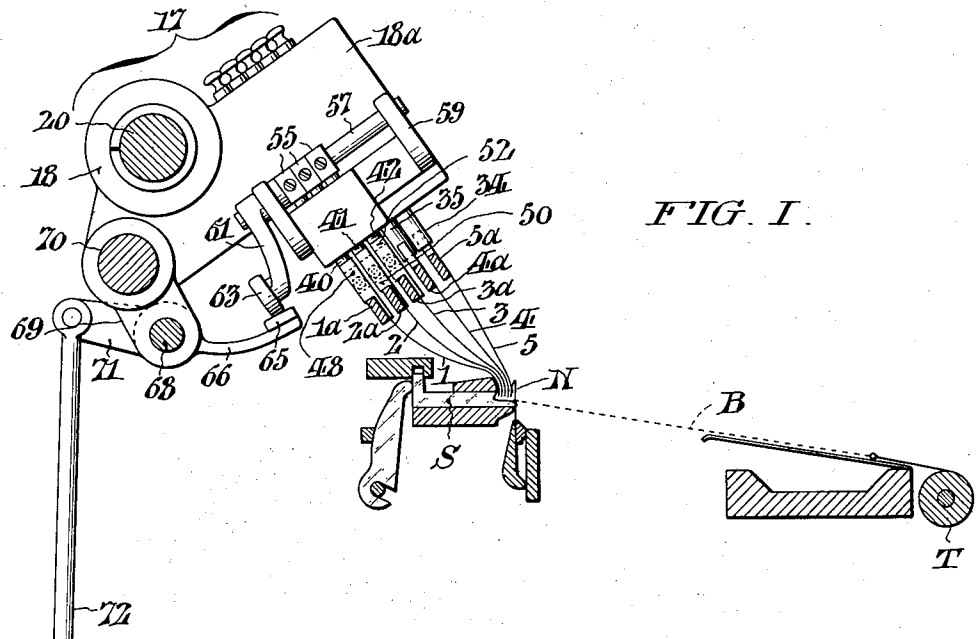
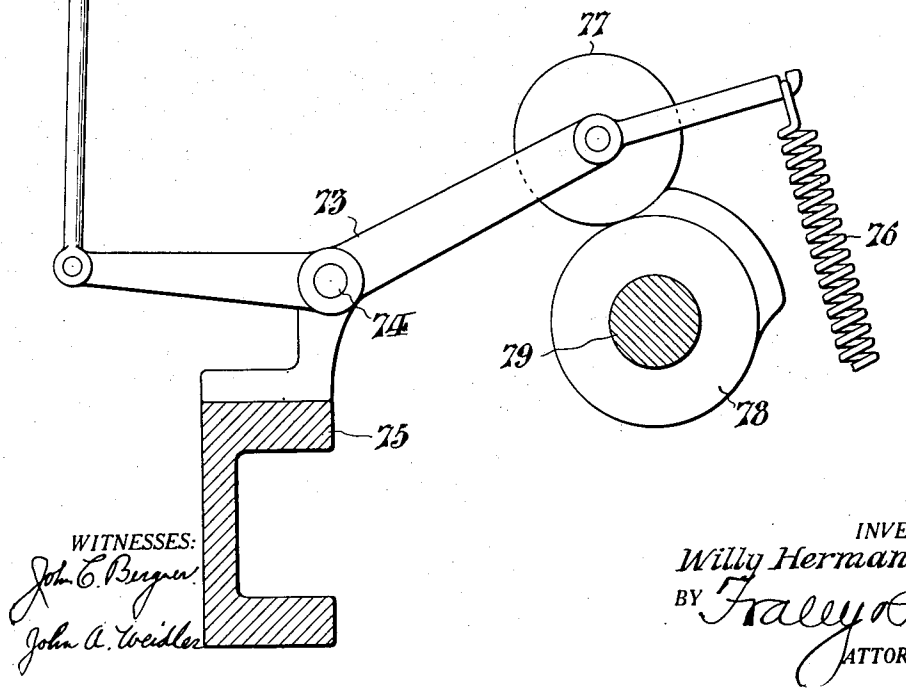


FIG. I.



WITNESSES:
John C. Berger
John A. Weidler

INVENTOR:
Willy Hermann Lasch,
BY Fraley & Paul
ATTORNEYS.

March 7, 1939. W. H. LASCH 2,150,100

KNITTING MACHINE

Filed July 11, 1934 4 Sheets-Sheet 2

FIG. II.

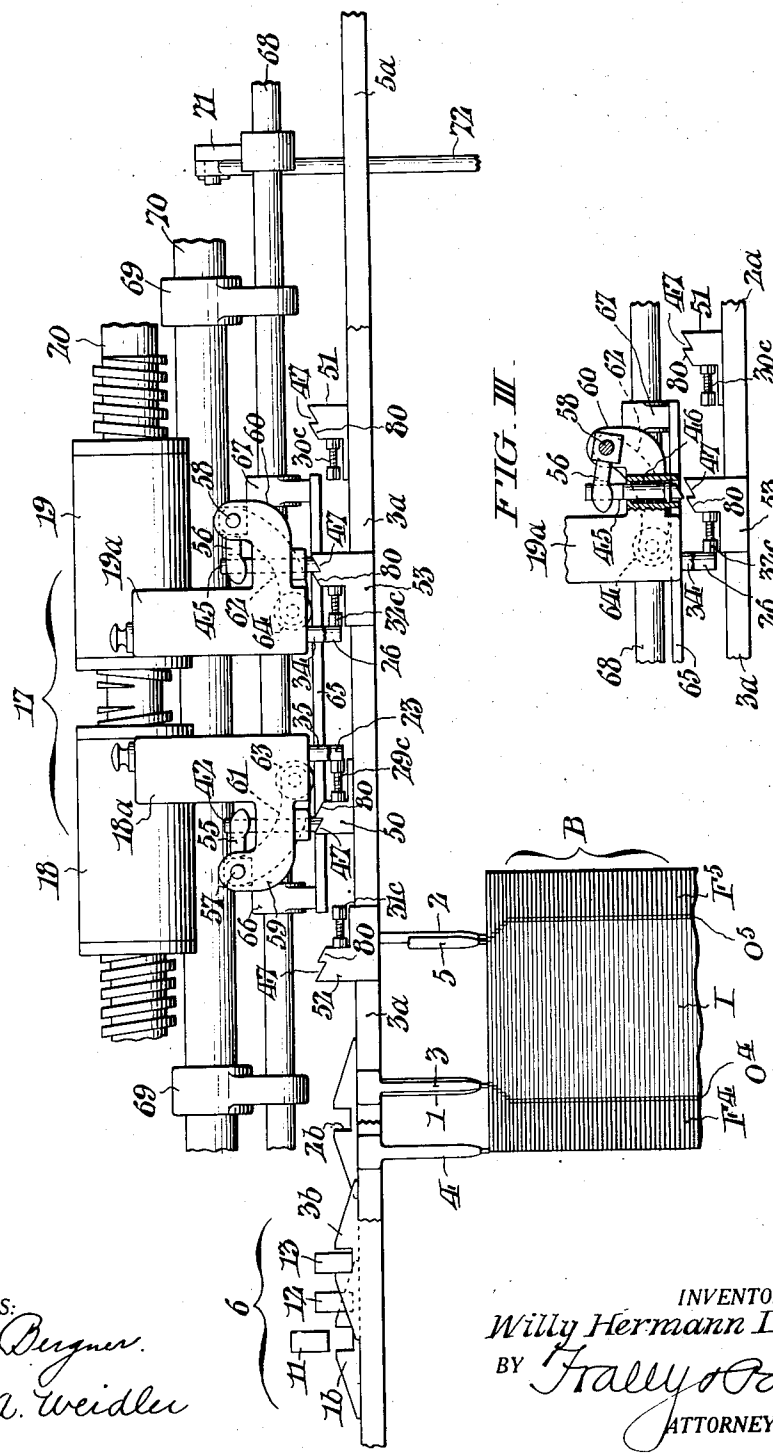


FIG. III.

WITNESSES:
John C. Bergner.
John A. Weidler

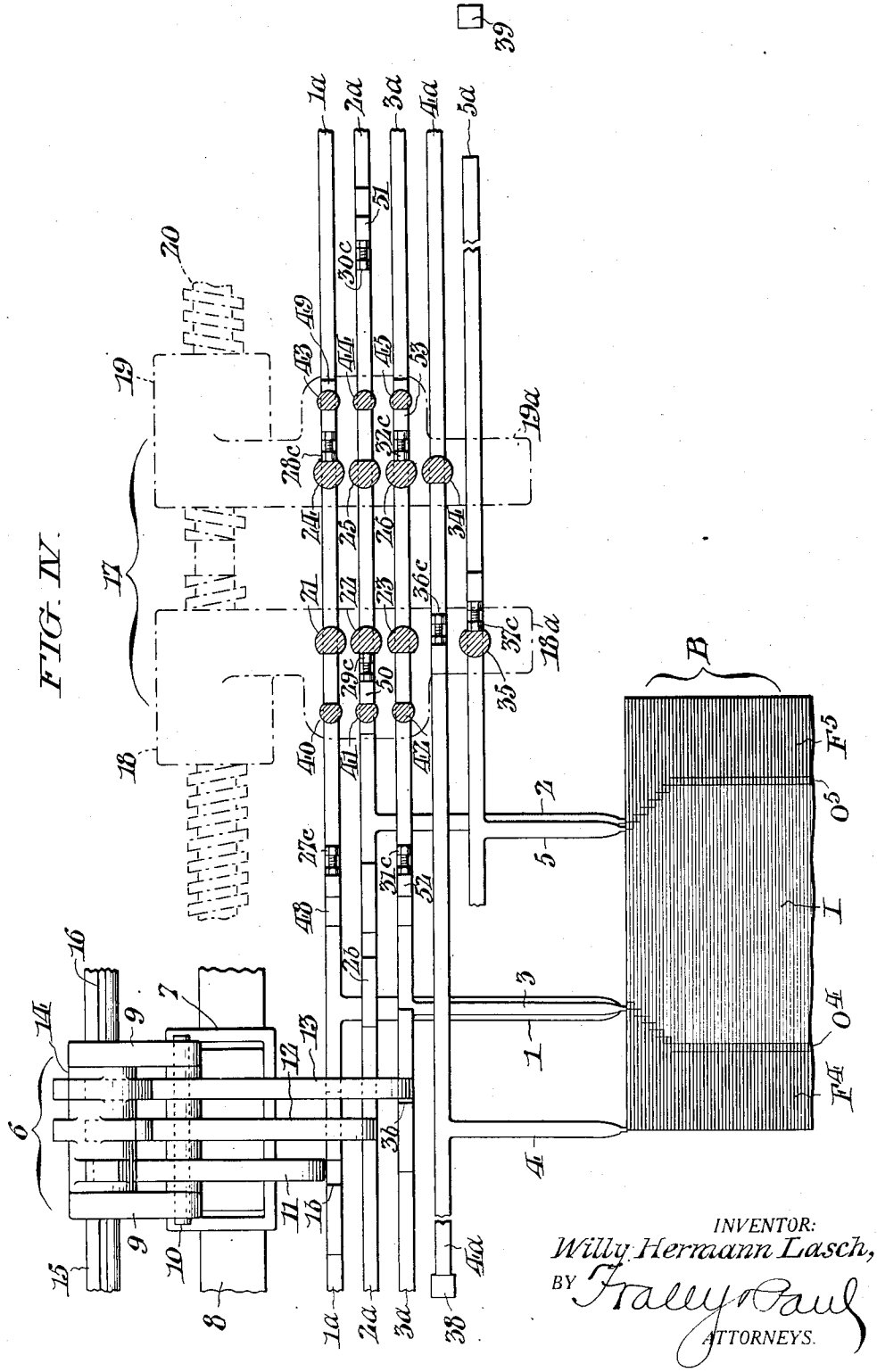
INVENTOR:
Willy Hermann Lasch,
BY Frally & Paul
ATTORNEYS.

March 7, 1939. W. H. LASCH 2,150,100

KNITTING MACHINE

Filed July 11, 1934 4 Sheets-Sheet 3

FIG. IV.



INVENTOR:
Willy Herrmann Lasch,
BY Fally & Paul
ATTORNEYS.

March 7, 1939. W. H. LASCH 2,150,100

KNITTING MACHINE

Filed July 11, 1934 4 Sheets-Sheet 4

FIG. V.

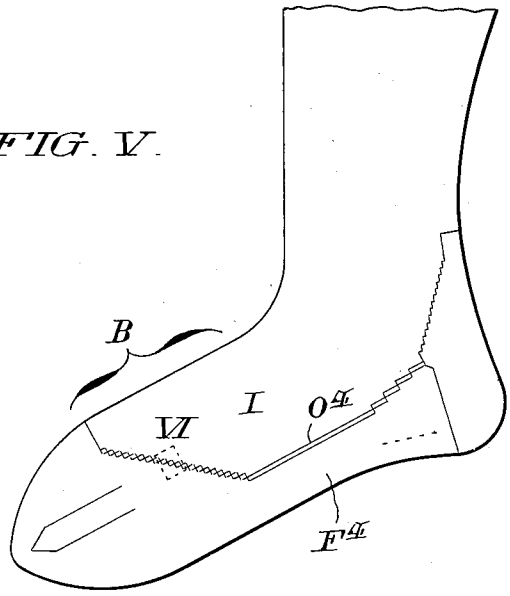
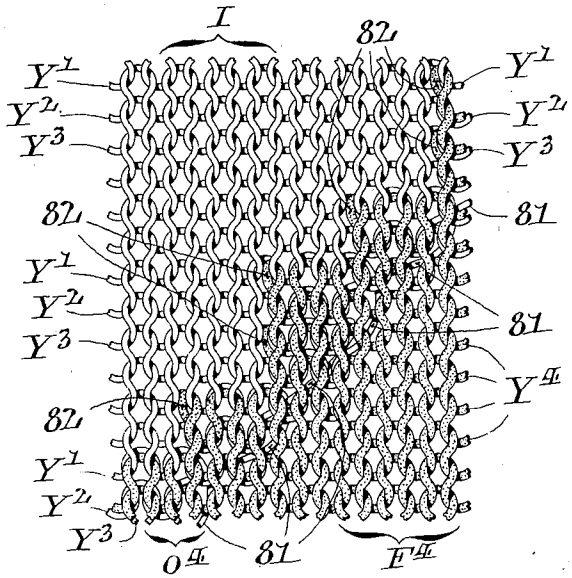


FIG. VI.



WITNESSES:
John C. Bergner.
John A. Weidler

INVENTOR:
Willy Hermann Lasch,
BY Fraley & Paul
ATTORNEYS.

Patented Mar. 7, 1939 2,150,100

UNITED STATES PATENT OFFICE

2,150,100

KNITTING MACHINE

Willy Hermann Lasch, Philadelphia, Pa., assignor to Rosedale Knitting Co., Inc., Rosedale, Reading, Pa., a corporation of Pennsylvania

Application July 11, 1934, Serial No. 734,567

9 Claims. (Cl. 66—128)

This invention relates to knitting machines and also to knitted fabrics. It is concerned more especially with flat knitting machines of the "Cotton" type ordinarily used in the manufacture of full fashioned hosiery, as well as with fabrics produced by such machines.

For the determination of different ornamental effects like tapering high heels, "cradle" feet, etc., in ordinary stocking blanks by split knitting, machines of the kind referred to are equipped with auxiliary stop mechanism whereby the endwise movements of a main yarn carrier rod and of a pair of supplemental or reinforcing yarn carrier rods are limited concurrently with formation of straight or stepped overlap junctures between the fabric areas respectively produced from the yarns served to the knitting needles by said main and supplemental yarn carriers.

The production of ringless fabric or hosiery, on the other hand, entails the use of a plurality of main yarn carriers (instead of a single one as ordinarily) which must be actuated in a definite predetermined repeating sequence so that the imperfections in the several main yarns employed are distributed, with resultant production of fabric which is substantially uniform as to texture, and therefore ringless.

My invention has for its chief aim to make possible economic and rapid production of ringless fabric or hosiery on flat machines of the aforementioned type.

This desideratum I attain as hereinafter more fully disclosed through incorporation with the auxiliary yarn carrier control mechanism, of special abutments to coact with stops on the several main yarn carrier rods, and through the further incorporation of detents for positively locking the idled main yarn carrier rods against accidental movement through jarring of the mechanism incident to stoppages of the active main and supplemental yarn carrier rods, thereby preventing fouling of the sinkers and the formation of imperfect split lap sutures by entanglement or feeding of the yarns of the idled carriers to the needles over which the laps are made.

Another object of my invention is to provide in a knitting machine organization such as above outlined, means for momentarily retracting the detents upon completion of each course of the knitting to permit substitution of the main yarn carrier rods as required for ringless knitting.

Other objects and attendant advantages of this invention will be manifest from the detailed description following of the attached drawings, wherein

Fig. I is a skeletonized cross sectional view of a typical full fashioned stocking knitting machine conveniently embodying the present improvements.

Fig. II is a fragmentary front elevation of the machine showing the auxiliary yarn control mechanism with the detents for the main yarn carrier rods, and the means for momentarily retracting the detents incident to selection between said main yarn carrier rods, certain parts having been broken away for exposure of others in the rear.

Fig. III is a fragmentary view corresponding to Fig. II and showing how the detents are retracted.

Fig. IV is a diagrammatic view showing the action of the yarn carrier rods incident to the knitting of a ringless cradle foot stocking blank in accordance with my invention

Fig. V is a fragmentary view showing the foot of the stocking formed from the blank; and

Fig. VI is a diagrammatic view showing the texture of the knitted fabric within the area bounded by the dotted rectangle VI in Fig. V.

With more detailed reference first more particularly to Figs. I–IV of these illustrations, the yarn fingers 1, 2 and 3 are employed to individually feed different main yarns to the needles N of the machine; while the yarn fingers 4 and 5 are employed to feed the supplemental or reinforcing yarns, said fingers being respectively secured to the yarn carrier rods 1*a*, 2*a*, 3*a* and 5*a*, 6*a*, which are supported, as ordinarily, for longitudinal sliding movement by the framework of the machine. The sinkers which cooperate in the well known manner with the needles N are shown at S in Fig. I and the takeup for the stocking blank B which is being knitted at T.

The means for selecting between the main yarn carriers 1, 2 and 3 for the purpose of ringless knitting, is generally designated by the numeral 6 in Fig. IV, and illustrated as comprising a friction box 7 which is mounted on the slur cock bar 8 of the machine. Extending rearwardly from the friction box 7 is a pair of arms 9 supporting a fulcrum pin 10 for a series of fingers 11, 12 and 13 which are adapted to engage notched lugs 1*b*, 2*b* and 3*b* on the main yarn carrier rods 1*a*, 2*a* and 3*a*. The fingers 11–13 are actuated by means of a rotary cam drum 14 which is held between the arms 9 on the friction box 7 and which is slidingly mounted on a shaft 15 extending longitudinally of the ma-

chine. The cam drum 14 is prevented from independent rotation on the shaft 15 by virtue of a sliding key connection engaging a longitudinal groove or slot 16 in said shaft. By suitable means (not illustrated) the shaft 15 is intermittently rotated so that the circumferential rises on the cam 14 are successively brought into position to operate the fingers 11–13 sequentially as required for ringless knitting.

The auxiliary carrier rod machanism is comprehensively indicated at 17 in Fig. IV, the same including in this instance a pair of follower sleeves 18 and 19 which respectively engage right and left hand threads of a screw spindle 20 which is suitably journalled in bearings (not shown) on the machine frame, and intermittently rotated under the governance of the pattern chain of the machine or otherwise, by racking means such as ordinarily provided in mechanism of this sort. Supported by forwardly-reaching extremities 18*a* and 19*a* of the follower sleeves are abutment pins 21, 22, 23 and 24, 25, 26. The abutment pins 21 and 24 are adapted to cooperate with spaced screw stops 27*c* and 28*c* on the main yarn carrier rod 1*a*, the abutment pins 22 and 25 with spaced screw stops 29*c* and 30*c* on the main yarn carrier rod 2*a*; and the abutment pins 23 and 26 with spaced screw stops 31*c* and 32*c* on the main carrier rod 3*a*; said stops being adjustable in upstanding lugs on the respective carrier rods. The follower sleeves 18 and 19 also carry abutment pins 34 and 35 for cooperation with screw stops 36*c* and 37*c* respectively adjustable in upstanding lugs on the supplemental yarn carrier rods 4*a*, 5*a* to limit the inward movements of the supplemental yarn feeding fingers 4 and 5 in respect to the stocking blank B. The outward movement of the supplemental or sole yarn feed fingers 4 and 5 is controlled as ordinarily, by abutments which are associated with follower sleeves (not illustrated) on the spindles of the usual narrowing heads at opposite ends of the machine, the last mentioned abutments being conventionally shown at 38 and 39 in Fig. IV.

In order to positively hold the main yarn carrier rods 1*a*, 2*a* and 3*a* against movement when pairs of them are idled during the activity of the third one as successive courses of the stocking blank B are being knit, there are provided on the sleeves 18 and 19 in accordance with the present invention, six auxiliary detents in the form of pins 40, 41, 42 and 43, 44, 45. These detents 40, 41, 42 and 43, 44, 45 are vertically slidable in the extremities 18*a*, 19*a* of the follower sleeves 18 and 19 and urged downward by springs 46 individually associated with them, see Fig. III. The lower ends of the detents 40, 41, 42 and 43, 44, 45 are oppositely chamfered or beveled to engage in correspondingly disposed and similarly configured notches 47 in the upstanding lugs 48, 49; 50, 51; and 52, 53 of the main yarn carrier rods 1*a*, 2*a* and 3*a*. At their upper ends, the detents 40, 41, 42 and 43, 44, 45 are individually engaged by lifting fingers 55 and 56 which are respectively secured to axis pins 57 and 58 journalled in bearing brackets 59 and 60 which are attached to or integrally formed with the extremities 18*a* and 19*a* of said follower sleeves 18 and 19. Also secured to the axis pins 57 and 58 are downwardly curved arms 61 and 62 which are provided at their ends with rollers 63 and 64 that bear upon a plate 65. As shown in Figs. I and II, this plate 65 is supported crosswise between a pair of spaced arms 66 and 67 reaching forwardly from a rock shaft 68 which is journalled in spaced bearing collars 69 on the fixed guide rod 70 for the followers 18, 19. Another arm 71 secured to the rock shaft 68 is connected, by means of a vertical link 72, with an arm 73 fulcrumed at 74 to a bracket on one of the longitudinals 75 of the machine framework. The arm 73, it will be noted, is subject to a tension spring 76 so that a roller 77 thereon is yieldingly maintained in running contact with a special rotary cam 78 on the main cam shaft 79 of the machine.

The operation of the machine is as follows: Let it be assumed that the machine is knitting the frontal foot portion, for example, the cradle foot stocking blank B, and that the yarn feed fingers 1, 4 and 5 have just completed a movement toward the left as shown in Figs. II and IV. At this instant, the cam drum 14 of the mechanism 6 is racked to effect the withdrawal of the finger 11 from the notched projection 1*b* of the main yarn carrier rod 1*a*, and to lower the finger 13 into the notched projection 3*b* of the main yarn carrier rod 3*a*. Also at this instant, the special cam 78 on the main cam shaft 79 actuates the roller arm 73, which, through the link 72, the arm 71 and the plate 65, causes lifting of the curved arms 61 and 62 to simultaneously withdraw the detents 40, 41, 42 and 43, 44, 45 after the manner shown in Fig. III. Upon subsequent initiation of the movement of the friction box 7 of the mechanism 6 to the right in Figs. II and IV, the yarn carrier rods 3*a*, 4*a* and 5*a* are carried along so that the fingers 3, 4 and 5 lay their yarns crosswise of the needles N in readiness to be knit by them. Immediately upon initiation of this rightward movement of the carrier rods 3*a*, 4*a* and 5*a*, the high point of the cam 78 on the main cam shaft 79 of the machine passes beyond the roller 77 with the result that the detents 40, 41, 42 and 43, 44, 45 are released and instantly depressed by their springs 46, to lock the main yarn carrier rods 2*a* and 3*a* against accidental movement. The supplemental yarn carrier rod 4*a* is eventually arrested by striking of its stop screw 36*c* with the abutment pin 34 on the follower sleeve 19, and the supplemental yarn carrier rod 5*a* through engagement of its right hand end with the usual end abutment 39, while the movement of the carrier rod 3*a* continues somewhat longer until its stop screw 31*c* strikes the abutment pin 23 of the follower sleeve 18. Concurrently with the movement of the main yarn carrier rod 3*a* to the right as just explained, the incline 80 of its lug 52 automatically lifts the detent 42 in the follower sleeve 18, until at the completion of the movement, said detent drops into the notch 47 of said lug. In the knitting of the next course of the fabric, the yarn carrier rod 2*a* is moved to the left together with the supplemental yarn carrier rods 4*a* and 5*a*. On the third course the main yarn carrier rod 1*a* is moved to the right concurrently with the supplemental yarn carrier rods 4*a* and 5*a* and so on. By successive repetitions of this cycle with incidental rotation of the screw spindle 20 of the mechanism 17, the distance between the follower sleeves is progressively widened and the movement of the main carrier rods 1*a*, 2*a* and 3*a* correspondingly decreased, while that of the supplemental yarn carrier rods 4*a* and 5*a* is compensatively increased.

The foregoing procedure results in the split knit cradle foot stocking blank B wherein the foot sole

areas F^4 and F^5 formed from the supplemental yarns fed by the fingers **4** and **5** respectively are joined with instep portion I formed from the main yarns fed by the fingers **1**, **2** and **3** by split overlap sutures O^4 and O^5 which are partly straight and partly stepped. In Fig. V which shows the foot of the stocking made from the blank B, and in Fig. VI which shows the texture of the fabric at the region of one of the split sutures, the corresponding parts are identified with the same reference numerals previously employed. For further clarification in Fig. VI, the three main yarns employed in the knitting are indicated by the characters Y^1, Y^2 and Y^3, and the supplemental yarn by the character Y^4. Furthermore in Fig. VI, the long skip selvage floats between the ends of courses knit with the respective main yarns Y^1, Y^2 and Y^3 are indicated at **81**, and the usual selvage floats between adjacent courses knit with the supplemental yarn Y^4 are indicated at **82**.

Through provision of the automatically actuated detents **40**, **41**, **42** and **43**, **44**, **45** it will be seen that the idled pairs of the main yarn carrier rods are positively held against being displaced through jarring of the follower sleeves **18** and **19** incident to stoppage of the active yarn carrier rods, and thereby prevented from fouling the sinkers or from laying their yarns across the needles.

Thus, with a flat machine modified in accordance with my invention, it is possible to successfully produce ringless split-knit fabrics or stockings in which the sutures are absolutely regular and as sharply defined as shown in Fig. VI.

Many varieties of ornamentation other than those herein mentioned and shown may be determined by prescribed actuation of the auxiliary control mechanism **17** in a manner well known to skilled knitters.

Having thus described my invention, I claim:

1. A flat knitting machine for producing split ringless fabric, comprising in combination, a plurality of carrier rods with means for selecting them successively for actuation in a predetermined repeating sequence to feed as many different main yarns to the needles of the machine; a carrier rod for independently feeding a supplemental yarn; and mechanism for controlling variant movement of the supplemental yarn carrier rod, said mechanism including abutments for concurrently limiting the movement of the main yarn carrier rods compensatively, with determination of split overlap sutures between the fabric areas respectively knit from the main and supplemental yarns; and means for positively locking the idled main yarn carrier rods against accidental movement.

2. A flat knitting machine for producing ornamented split ringless fabric, comprising in combination, a plurality of carrier rods with means for selecting them successively for actuation in a predetermined repeating sequence to feed as many different main yarns to the needles of the machine; a carrier rod for independently feeding a supplemental yarn; and mechanism for controlling variant movement of the supplemental yarn carrier rod to produce an ornamental area in the fabric, said mechanism including abutments for concurrently limiting the movement of the main yarn carrier rods compensatively with determination of stepped split overlap sutures between the fabric areas respectively knit from the main and the supplemental yarns; and means for positively locking the idled main yarn carrier rods against accidental movement.

3. A flat knitting machine for producing ornamented split ringless fabric, comprising in combination, a plurality of main yarn carrier rods with means for selecting them successively for actuation in a predetermined repeating sequence to feed as many different main yarns to the needles of the machine; a carrier rod for independently feeeding a supplemental yarn; and yarn carrier control mechanism including a pair of relatively shiftable elements, abutments on said elements to limit the movement of the supplemental yarn carrier rod for the formation of ornamental areas in the fabric, other abutments on said relatively shiftable elements for concurrently limiting the movement of the main yarn carrier rods compensatively to determine split overlap sutures between the fabric areas respectively knit with said main and supplemental yarns, and means also on said elements for positively locking the idled main yarn carriers against accidental movement.

4. A flat knitting machine in accordance with claim 3, wherein the locking means are in the form of detents to engage notches in the idled main yarn carrier rods, and wherein means is provided for retracting the detents momentarily at the completion of each knitted course to release a substitute main yarn carrier in readiness for actuation.

5. A flat knitting machine in accordance with claim 3, wherein the relatively shiftable elements are provided with detents to positively lock the idled main yarn carrier rods against accidental movement, and wherein means is provided for retracting the detents momentarily for release of a substitute main yarn carrier for actuation at the completion of each knitted course, the latter means including a rotary cam and interposed connections between the rotary cam and the detents.

6. A flat knitting machine in accordance with claim 3, wherein the relatively shiftable elements of the control mechanism are provided with spring pressed detents to lock the idled main yarn carrier rods against accidental movement; and wherein means is provided for retracting the detents momentarily for releasing a substitute main yarn carrier at the completion of each course of the knitting, including fingers for retracting the detents, a roller arm for rocking the fingers, a pivotally supported plate engaged by rollers on arms secured to the axes of the fingers, and means for swinging the plate.

7. A machine for producing split cradle foot ringless full fashioned stockings, comprising in combination, a plurality of main yarn carrier rods with means for selecting them successively for actuation in a predetermined repeating sequence to feed as many different main yarns to the needles of the machine; a pair of carrier rods for independently feeding supplemental yarns to form reinforced sole areas along opposite sides of the foot portions of the stockings; end abutments for the supplemental yarn carrier rods; mechanism for controlling variant inward movement of the supplemental yarn carrier rods to produce the cradle effect; means embodied in the mechanism aforesaid for concurrently limiting the movement of the main yarn carrier rods in opposite directions compensatively to determine split stepped overlap sutures between the fabric areas respectively knit with the main and the supplemental yarns; and means also embodied in said mechanism to positively lock the idled main yarn carriers against accidental movement.

8. A machine for producing split cradle foot

ringless full fashioned stockings, comprising in combination, a plurality of main yarn carrier rods with means for selecting them successively for actuation in a predetermined repeating sequence to feed as many different main yarns to the needles of the machine; a pair of carrier rods for independently feeding supplemental yarns to form reinforced sole areas along opposite sides of the foot portion of the stockings; and stops for the supplemental yarn carrier rods; yarn carrier control mechanism including a pair of intermittently actuated relatively shiftable elements, abutments on said elements to limit the inward movement of the sole yarn carrier rods, and other abutments also on said elements for concurrently limiting the movement of the main yarn carrier rods compensatively in opposite directions to determine split stepped overlap sutures between the fabric areas respectively knit with said main and sole yarns; and means to positively lock the idled main yarn carrier rods against accidental movement.

9. A flat knitting machine in accordance with claim 3, wherein the relatively shiftable elements of the control mechanism are provided with spring-pressed detents to lock the idled main yarn carrier rods against accidental movement; wherein means is provided for retracting the detents momentarily to release the substitute main yarn carrier at the completion of each course of the knitting, including fingers for retracting the detents, a roller arm for rocking the fingers, a pivotally supported plate engaged by the rollers on arms secured to the axes of the fingers, and means for swinging the plate; and wherein the roller arm actuating plate is operated through connections with a rotary cam on the main cam shaft of the machine.

WILLY HERMANN LASCH.