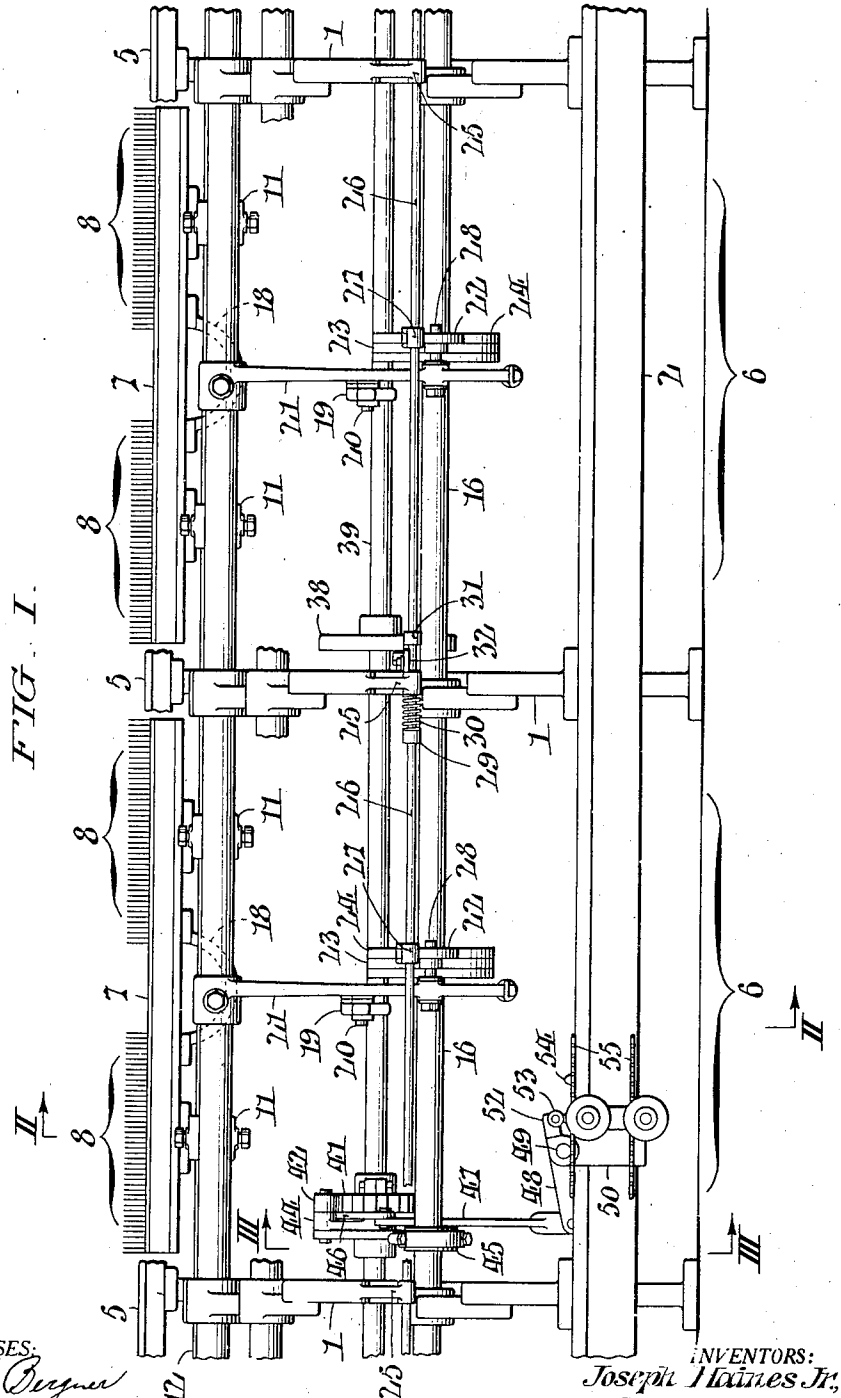
May 5, 1936. J. HAINES, JR., ET AL 2,040,047

NEEDLE BAR RETRACTING MECHANISM FOR FLAT KNITTING MACHINES

Filed Sept. 28, 1934 5 Sheets-Sheet 1

FIG. I.



WITNESSES:
John C. Bergner
Thomas W. Kerr, Jr.

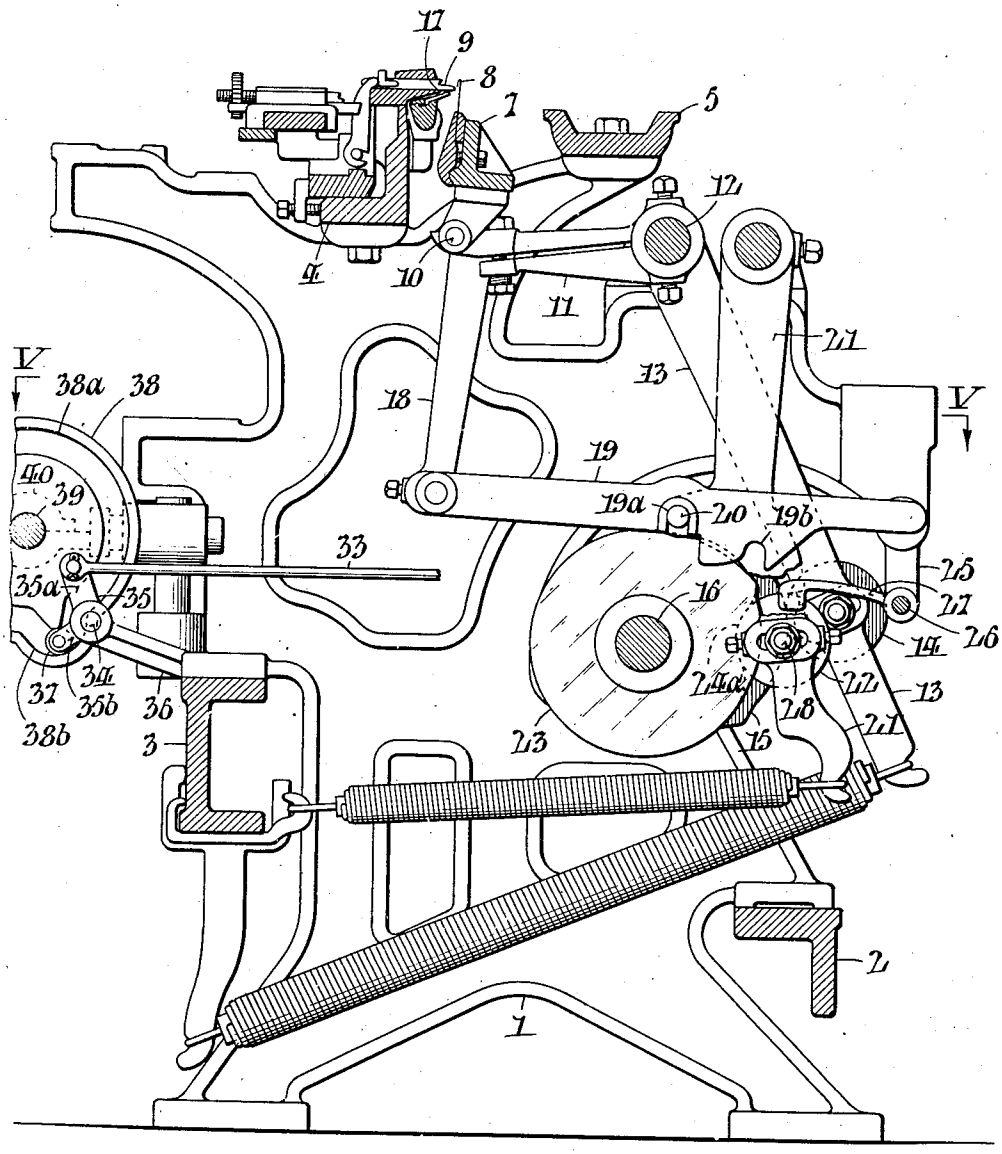
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FIG. II.



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NEEDLE BAR RETRACTING MECHANISM FOR FLAT KNITTING MACHINES

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FIG. III.

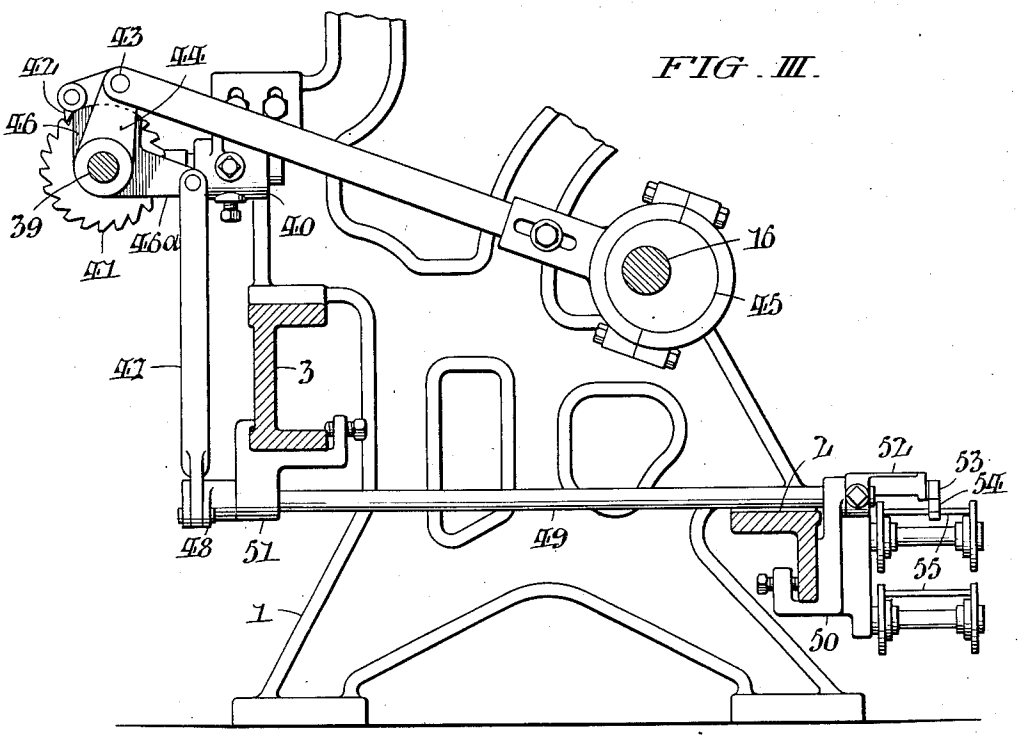
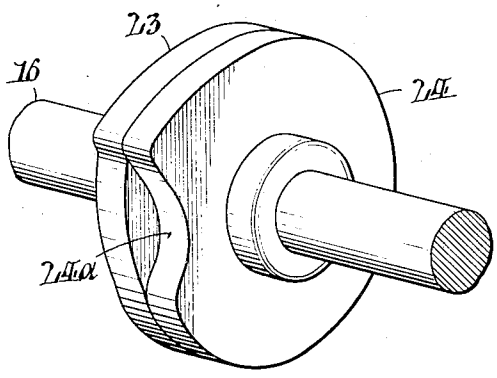


FIG. IV.



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NEEDLE BAR RETRACTING MECHANISM FOR FLAT KNITTING MACHINES

Filed Sept. 28, 1934 5 Sheets-Sheet 4

FIG. V.

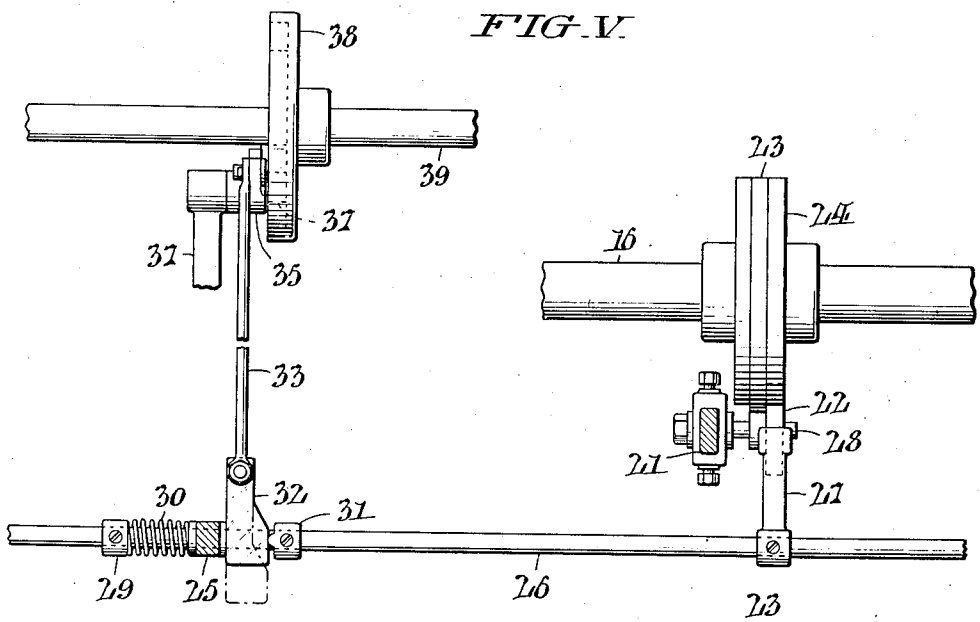


FIG. VII.

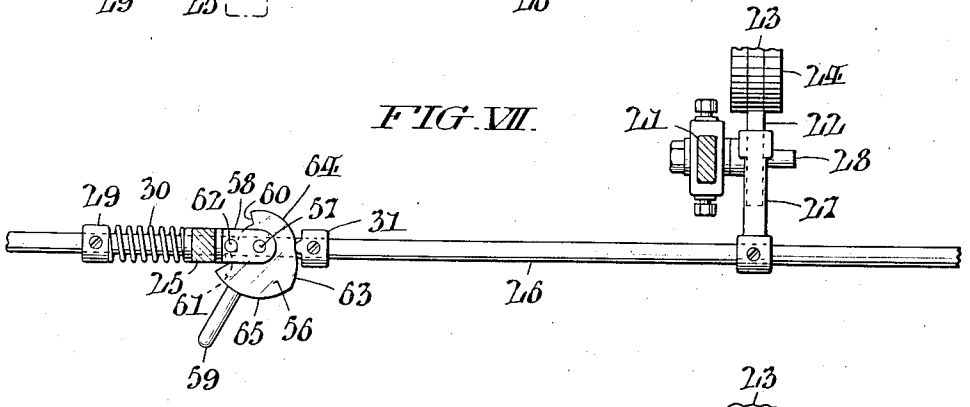
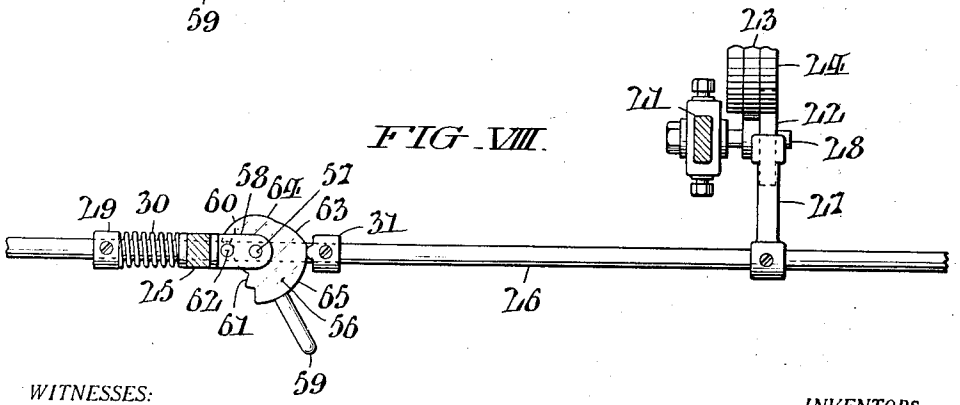


FIG. VIII.



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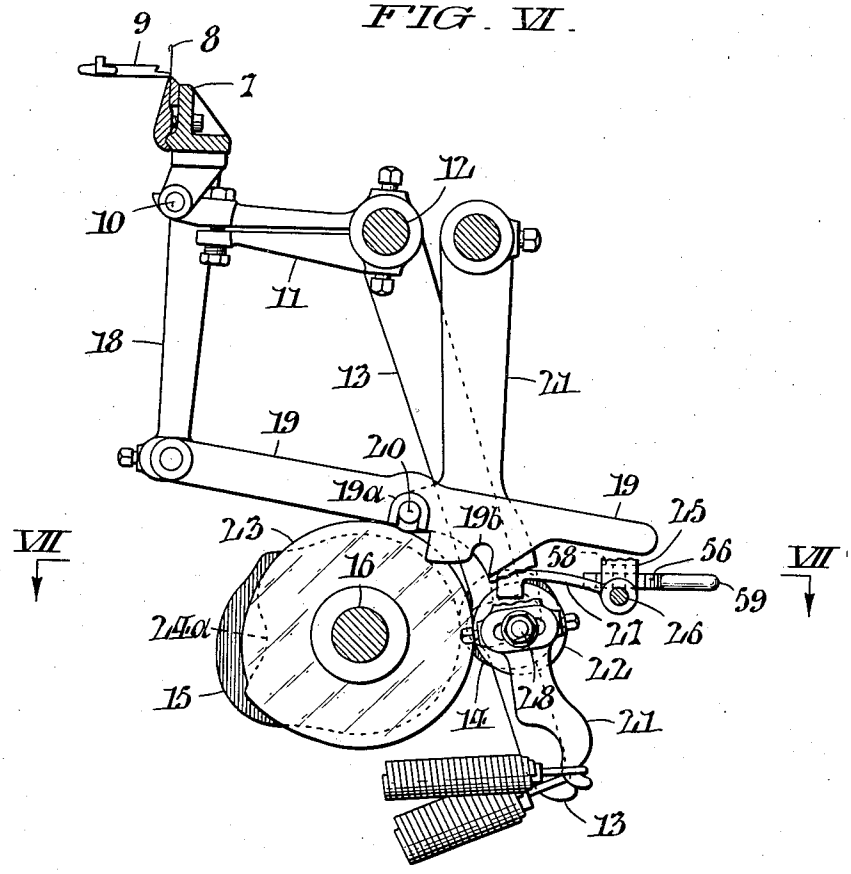
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NEEDLE BAR RETRACTING MECHANISM FOR FLAT KNITTING MACHINES

Filed Sept. 28, 1934 5 Sheets-Sheet 5

FIG. VI.



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Patented May 5, 1936 2,040,047

UNITED STATES PATENT OFFICE

2,040,047

NEEDLE BAR RETRACTING MECHANISM FOR FLAT KNITTING MACHINES

Joseph Haines, Jr., Meadowbrook, and Harold F. Paget, Philadelphia, Pa., assignors to Haines Hosiery Mills, Inc., Philadelphia, Pa., a corporation of Pennsylvania

Application September 28, 1934, Serial No. 745,840

7 Claims. (Cl. 66—82)

This invention relates to needle bar retracting mechanism for flat knitting machines; and it has reference more particularly to needle bar retracting means for flat knitting machines of the "cotton" type such as are used in the manufacture of full fashioned stockings and the like.

Knitting machines of the kind specifically referred to embody a series of knitting sections, usually eighteen to twenty-four of them, with single or double needle bars. These needle bars are pivotally supported by individual cam-actuating lifting arms so that they may be swung rearward from their normal plane of operation when fabric transfers are to be made to the needles as, for example, in applying pre-knit welt or rib tops, elastic fabrics, etc., to the needles of machines known as "leggers" whereby the stocking legs are knitted in continuation, or in applying stocking leg blanks knitted on the "leggers" to the needles of machines known as "footers" whereby the stocking feet are knit in continuation of the leg blanks. In preparation for transfers of the character indicated, the machines are brought to a stop, whereafter the operatives are required to individually unlatch the connecting link bars from the cam actuated presser arms by which the beard presser movement is induced in the latter, in effecting the retraction of said needle bars to facilitate application of rib tops, elastic fabric, or stocking leg blanks as the case may be by means of transfer bars, and after the transfers have been effected, to relatch said connecting links with the presser arms before knitting can be resumed. These steps entail the loss of a very considerable amount of time during which the machines are idle, with consequent curtailment of production to a corresponding degree.

Our invention is directed toward overcoming the drawbacks which have been pointed out, which object we realize in practice as hereinafter more fully explained, through provision of both manually and automatically operative mechanism whereby the several needle bars of a legger or a footer may be simultaneously retracted from their normal plane of operation for transfer purposes without necessitating the unlatching and relatching of the connecting links from the presser arms.

Fig. I of the drawings shows, in part, the front elevation of a flat knitting machine conveniently embodying our improved needle bar retracting mechanism in a form designed for automatic actuation.

Fig. II is a cross sectional view of the machine taken as indicated by the arrows II—II in Fig. I.

Fig. III is a fragmentary cross sectional view taken as indicated by the arrows III—III in Fig. I.

Fig. IV is a perspective view showing a special cam forming a part of our novel needle bar retracting mechanism.

Fig. V is a fragmentary plan sectional view taken as indicated by the arrows V—V in Fig. II.

Fig. VI is a fragmentary sectional view corresponding to Fig. II, of a flat knitting machine fitted with a manually-operable form of our needle bar retracting mechanism.

Fig. VII is a fragmentary plan section taken as indicated by the arrows VII—VII in Fig. VI; and

Fig. VIII is a view like Fig. VII with the parts differently positioned.

With reference first more particularly to Figs. I–V of these illustrations, the knitting machine therein delineated comprises spaced cross frames 1 which are connected by longitudinals 2, 3, 4 and 5 and which set apart a multiplicity of knitting sections 6 with needle bars 7, each such section having, in this instance, two aligned banks of needles 8 for knitting as many stocking blanks. Each section 6 of the machine is moreover provided with two aligned rows of sinkers 9 (Fig. II) which cooperate with the needles 8 in the knitting, and which are horizontally slidable in heads supported on the frame longitudinal 4. Also as usual, the needle bar 7 of each knitting section 6 is pivotally supported at 10 by a pair of lifting arms 11 reaching horizontally inward from a longitudinal rock shaft 12 which is journaled in suitable bearings on the frames 1. Secured to the rock shaft 12 in each knitting section 6, is a spring-pulled cam lever 13 carrying a roller 14 which runs in peripheral contact with a rotary cam 15 on the main cam shaft 16 of the machine. By the parts just described, the needle bars 7 of the several knitting sections 6 are moved up and down during each rotation of the cam shaft 16 to lift and depress the needles relative to the sinkers incident to the formation of fabric loops in the well known manner. Concurrently with this up and down movement the needle bars 7 are given an in and out movement relative to the beard closing edges 17 afforded by the sinker heads through rocking of the needle bars on the pivots 10, the parts for effecting this movement including drop arms 18 on the needle bars, which are coupled, by means of links 19, with lateral studs 20 on spring-pulled presser

arms 21, the latter carrying rollers 22 which run in peripheral contact with individual presser cams 23 on the main cam shaft 16

When pre-formed fabrics are to be transferred to the needles 8, it is necessary that the needle bars be retracted from their normal plane of operation to provide sufficient clearance between the needles and the needle beard pressing edges 17 of the sinker heads as shown in Fig. II, for insertion of the points of the transfer bars. This is ordinarily accomplished by manually lifting the links 19 in the several knitting sections 6 successively to disengage their notches 19*a* from the studs 20 on the presser arms 21 and then shifting the links forward to engage their notches 19*b* with said studs 20 to hold the needle bars temporarily retracted.

As hereinbefore stated, our invention is directed toward making it possible to retract all the needle bars 7 simultaneously for the purposes of fabric transfers. In order that this may be accomplished automatically, we have provided mechanism as follows: Secured to the main cam shaft 16 immediately adjacent the presser cam 23 in each knitting section 6 is a special cam 24 which has a deep peripheral recess 24*a*. Guided in bearings 25 on the frames 1 is a longitudinal shift rod 26 which carries a series of forks 27 that individually engage the rollers 22 of the presser arms 21, and which, during the shifting of said rod, moves said rollers from the presser cams 23 to the special cams 24 and vice versa, said rollers being accordingly slidable on the roller studs 28 of the presser arms. Interposed between a collar 29 on the rod 26 and one of the bearings 25, is a helical compression spring 30 which tends to urge the rod toward the left in Figs. I and V, thereby to maintain another collar 31 on said rod in contact with the edge of a wedge cam 32. By means of a connecting rod 33, this wedge cam 32 is coupled with the arm 35*a* of a bell crank lever 35 which is fulcrumed at 34 to a bearing bracket 36 rigidly secured to the frame longitudinal 3, see Figs. II and V. The other arm 35*b* of the bell crank lever 35 carries a roller 37 which engages the side face groove 38*a* of a rotary cam 38 on an auxiliary cam shaft 39 having journal support in bearing brackets 40 also rigidly secured to the frame longitudinals 3, the groove 38*a* of said cam 38 having in the illustrated instance, a single circumferential offset 38*b*. The auxiliary cam shaft 39 is intermittently rotated by means of a ratchet wheel 41 thereon (Figs. I and III) which is adapted to be racked by a pawl 42 pivotally connected at 43 with a pawl arm 44 on said shaft, said pawl arm being vibrated through an eccentric 45 connected with the main cam shaft 16 of the machine. The racking of the ratchet wheel 41 is controlled by a pawl guard 46 which is in the form of a bell crank lever having an arcuate surface concentric with the auxiliary shaft 39 whereon the pawl 42 normally rides idly. However, when the pawl guard 46 is actuated, the pawl drops from the idling surface into engagement with the ratchet wheel and racks the latter to the extent of one tooth each time. By means of a drop link 47, the arm 46*a* of the pawl guard 46 is coordinated with an arm 48 on one end of a shaft 49 extending transversely of the machine and journaled in bearings 50, 51 which are respectively clamped rigidly to the lower front and rear longitudinals 2 and 3 of the machine framework. At the forward end of the shaft 49 is a finger 52 having a roller 53 at the end thereof to cooperate with special links 54 on the control chain of the machine, which latter is shown in part at 55 in Figs. I and III. A sufficient number of the special lugs 54 are provided on the chain 55 to determine a complete rotation of the auxiliary cam shaft 39 for each knitting cycle of the machine. When the rotary cam 38 on the auxiliary shaft 39 is brought to the position shown in Fig. II to actuate the bell crank lever 35, the wedge cam 32 is drawn rearwardly through induced pull on the link 33, whereby the rod 27 is shifted to the position shown in Fig. V with attendant movement of the presser arm rollers 22 from the presser cams 23 to the special cams 24. This action is timed to occur just before the depressions 24*a* on the special cams 24 reach the rollers 22, so that when the machine is automatically stopped under control of the usual stop mechanism (not illustrated) of the machine, said rollers rest in the depressions 24*a* of the cams 24 with the needle bars 7 all retracted with the needles 8 clearing the beard pressing edges 17 of the sinker heads as shown in Fig. II, whereupon the preformed fabrics may be transferred to said needles as ordinarily. With initiation of the first rotation of the cam shaft 16 upon restarting the machine for resumption of the knitting after the transfers have been made, the rollers 22 ride out of the depressions 24*a* of the special cams 24. At the same time, the ratchet 41 on the cam shaft 39 is racked another tooth from the position shown in Fig. II, with attendant actuation of the bell crank 35 and the rod 33 by the cam 38 to advance the wedge cam 32 to the dot and dash line position in Fig. V thus permitting the rod 26 to be shifted leftward by the spring 30, whereby the rollers 22 are returned to the presser cams 23.

In the manually operable form of our needle bar retracting means illustrated in Figs. VI, VII, and VIII, an oscillatable wedge cam 56 is provided for shifting the rod 26 which carries the forks 27 for the cam follower rollers 22 of the needle bar presser cams 23 on the cam shaft 16 of the knitting machine. As shown, the cam 56 is fulcrumed at 57 on a bracket 58 secured to one of the guides 25 for the rod 26, and provided with a grasp handle 59 whereby it may be swung between the limits prescribed by coaction of edge stops 60 and 61 thereon with a fixed pin 62 on said bracket. Also as shown, the wedge cam 56 has an eccentrically durved edge portion 63 intermediate concentrically curved portions 64 and 65 respectively of small and large radius. While the wedge cam 56 occupies the normal position shown in Fig. VII, the collar 31 on the rod 26 abuts the short radius concentric portion 64 of said cam with the rollers 22 on the presser arms 21 riding the presser cams 23 on the cam shaft 16 of the knitting machine. When the needle bars 7 of the machine are to be retracted, the wedge cam 56 is swung to the position shown in Fig. VIII, incident to which the eccentrically-curved portion of said cam cooperates with the collar 31 and causes the rod 26 to be shifted rightward against the action of the spring 30 until, at the end of the swing, said collar rests on the concentric large radius curvature 65 of said cam. As a conseqence of this movement of the rod 27, the rollers 22 on the presser arms 21 are shifted from the presser cams 23 to the special cams 24. In order that the foregoing may be accomplished with surety, the machine is automatically brought to a stop with the cams 23 and 24 on the cam shaft 16 in the position shown in Fig. VI and the rollers 22 of the presser arms 21 riding on coinci-

dent edge portions of said cams. After the shifting of the rollers 22 as aforesaid, the machine is operated by hand until said rollers 22 rest within the recess 24a of the special cams 24 with the needle bars 7 all retracted and the needles 8 entirely clear of the sinkers 9 of the machine.

From the foregoing it will be seen that we have provided a very simple means both for automatic and manual operation whereby the several needle bars of a full fashioned stocking knitting machine or the like are simultaneously retracted for transfer purposes, thus obviating the necessity for individual unlatching of the links which connect the needle bar arms with the presser arms as is ordinarily required. This obviously results in a very considerable saving of time by which production costs are correspondingly reduced.

Having thus described our invention, we claim:

1. In a flat knitting machine, a multiplicity of needle bars; a cam shaft; presser cams on said shaft respectively cooperating normally with follower rollers on actuating presser arms for the individual needle bars during the knitting; and automatic mechanism operative at the completion of each knitting cycle to place the several needle bars in a position retracted from their normal plane of operation for transfer purposes, including special cams on the cam shaft, and means for shifting the follower rollers on the presser arms from the presser cams to the special cams just before the machine is stopped so that the rollers come to rest in deep peripheral notches of the special cams with the needle bars retracted as aforesaid.

2. In a flat knitting machine, a multiplicity of needle bars; a cam shaft; presser cams on said shaft respectively cooperating normally with follower rollers on actuating presser arms for the individual needle bars during the knitting; and automatic mechanism operative at the completion of each knitting cycle to place the several needle bars in a position retracted from their normal plane of operation for transfer purposes, including special cams on the cam shaft, a shift rod with a series of forks thereon engaging the follower rollers, and means for actuating the rod to effect shifting of the follower rollers from the presser cams to the special cams just before stoppage of the machine so that the rollers come to rest in deep peripheral notches of the special cams with the needle bars retracted as aforesaid.

3. In a flat knitting machine, a multiplicity of needle bars; a cam shaft; presser cams on said shaft respectively cooperating normally with follower rollers on actuating presser arms for the individual needle bars during the knitting; and automatic mechanism operative at the completion of each knitting cycle to place the several needle bars in a position retracted from their normal plane of operation for transfer purposes, including special cams on the cam shaft, a spring influenced shift rod with a series of forks thereon engaging the follower rollers, a wedge cam to cooperate with a collar on the shift rod in moving the latter against spring pressure, and means for actuating the wedge cam to effect concurrent shifting of the follower rollers from the presser cams to the special cams just before stoppage of the machine so that the rollers come to rest in deep peripheral notches of the special cams with the needle bars retracted as aforesaid.

4. In a flat knitting machine, a multiplicity of needle bars; a cam shaft; presser cams on said shaft for respectively cooperating normally with follower rollers on actuating presser arms for the individual needle bars during the knitting; and automatic mechanism operative at the completion of each knitting cycle to place the several needle bars in a position retracted from their normal plane of operation for transfer purposes, including special cams on the cam shaft, a spring-influenced shift rod with a series of forks thereon engaging the follower rollers on the presser arms, a wedge cam to cooperate with a collar on the shift rod in moving the latter against spring pressure, an auxiliary cam shaft rotated by movement derived from the main cam shaft of the machine, and a cam on said auxiliary cam shaft for actuating the wedge cam to effect concurrent shifting of the follower rollers from the presser cams to the special cams just before stoppage of the machine so that the rollers come to rest in deep peripheral notches of the special cams with the needle bars retracted as aforesaid.

5. In a flat knitting machine, a multiplicity of needle bars; a cam shaft; presser cams on said shaft respectively cooperating normally with follower rollers on actuating presser arms for the individual needle bars during the knitting; a control chain; and automatic mechanism operative at the completion of each knitting cycle to place the several needle bars in a position retracted from their normal plane of operation for transfer purposes, including special cams on the cam shaft, a spring-influenced shift rod with a series of forks thereon engaging the follower rollers on the presser arms, a wedge cam to cooperate with a collar on the shift rod in moving the latter against spring pressure, an auxiliary cam shaft intermittently rotated by racking means from the main cam shaft of the machine and governed by the control chain aforesaid, and a cam on said auxiliary cam shaft to effect concurrent shifting of the follower rollers from the presser cams on the main cam shaft to the special cams aforesaid just before stoppage of the machine so that the rollers come to rest in deep peripheral notches of the special cams with the needle bars retracted as aforesaid.

6. In a flat knitting machine, a multiplicity of needle bars; cooperating fabric forming means; means for moving the needle bars back and forth laterally in respect to the cooperative fabric forming means during the knitting; and means automatically operative, upon stoppage of the machine at the completion of a knitting cycle, to withdraw the bars laterally to a retracted position clear of the cooperating fabric forming means for transfer purposes.

7. In a flat knitting machine, a multiplicity of needle bars; cooperating fabric forming means; arms supporting the needle bars with capacity for swinging movement back and forth laterally in respect to the cooperating fabric forming means; means for actuating the rocker arms; and means automatically operative, upon stoppage of the machine at the completion of a knitting cycle, to place the rocker arms in a position with the needle bars laterally retracted clear of the cooperating fabric forming means for transfer purposes.

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