April 1, 1941. B. DERI ET AL 2,236,995

FLAT KNITTING MACHINE

Filed June 2, 1939 3 Sheets-Sheet 1

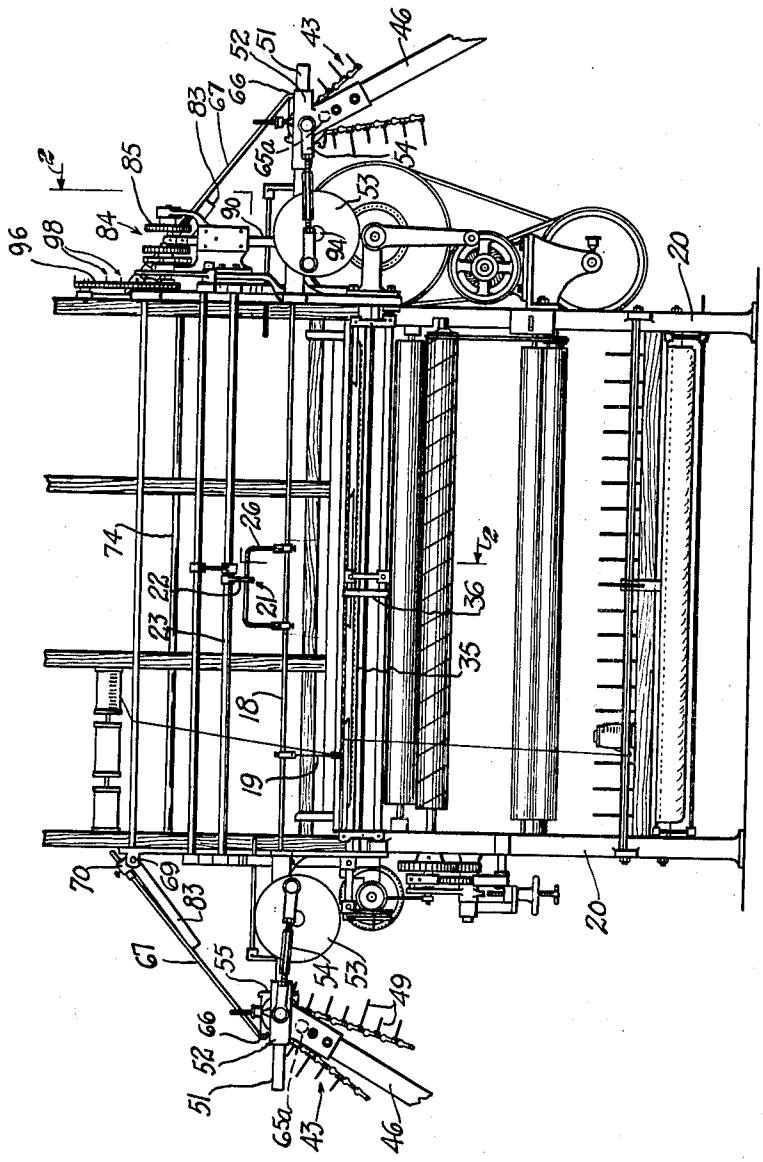


Fig. 1

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FLAT KNITTING MACHINE

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Fig. 2

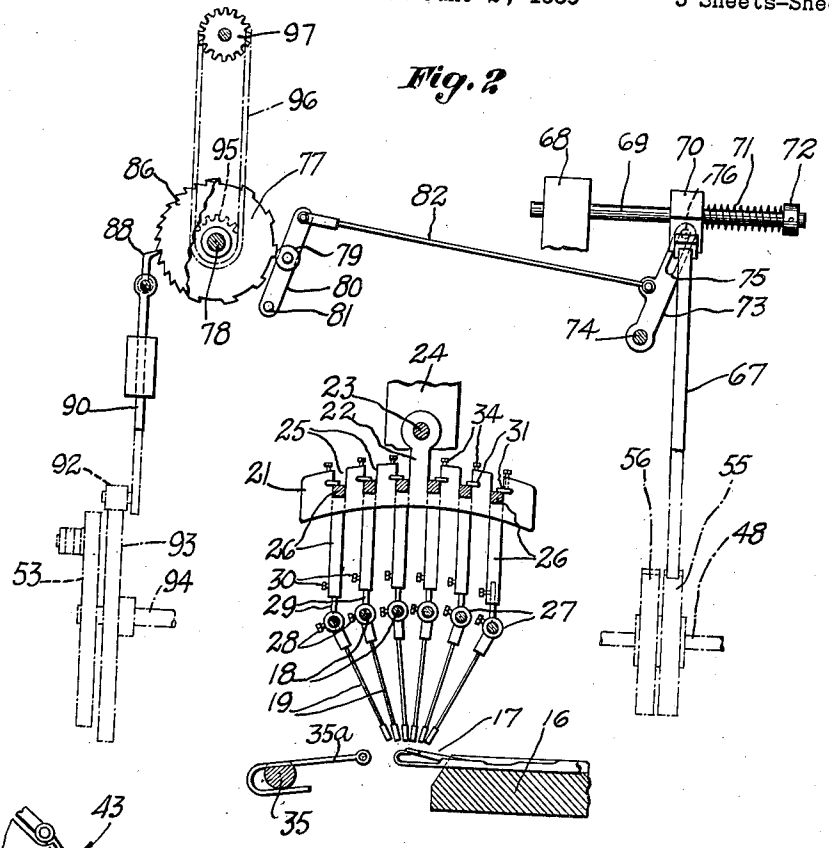


Fig. 3

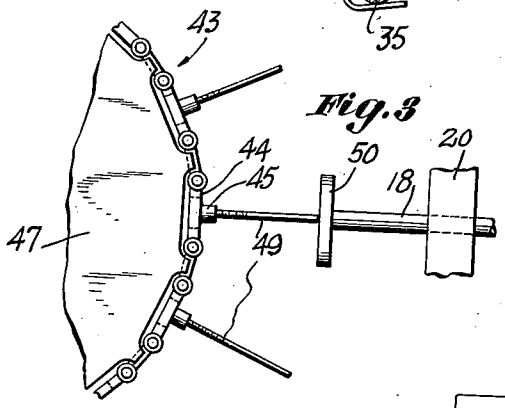


Fig. 6

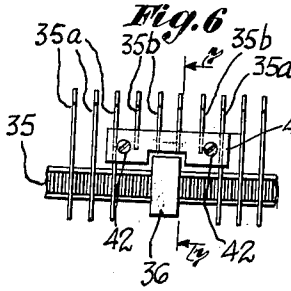


Fig. 7

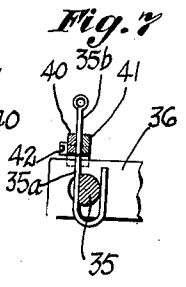


Fig. 5

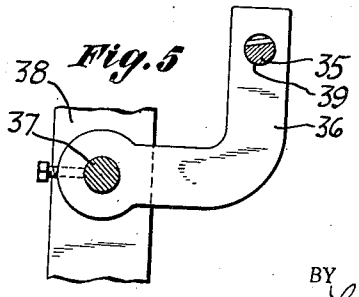
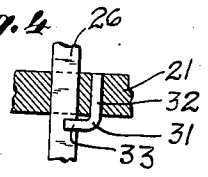


Fig. 4



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FLAT KNITTING MACHINE

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Fig. 8

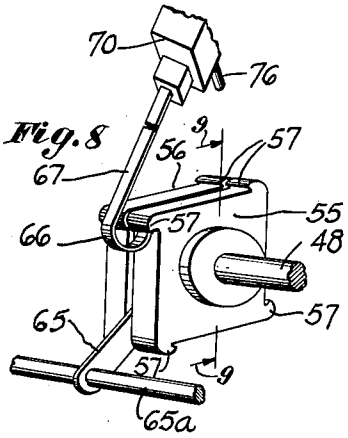
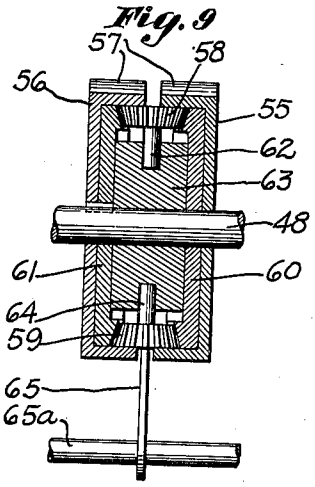


Fig. 9



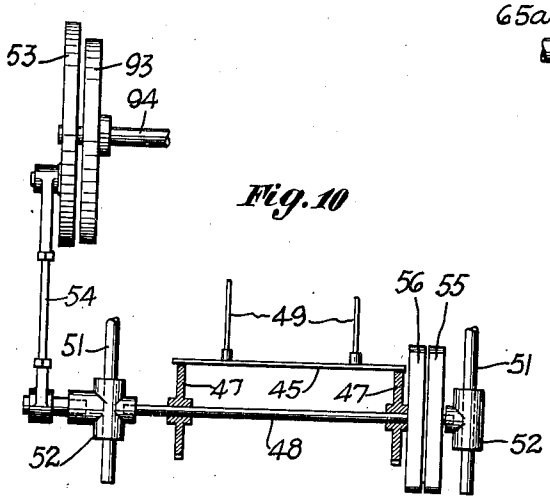


Fig. 10

Fig. 12

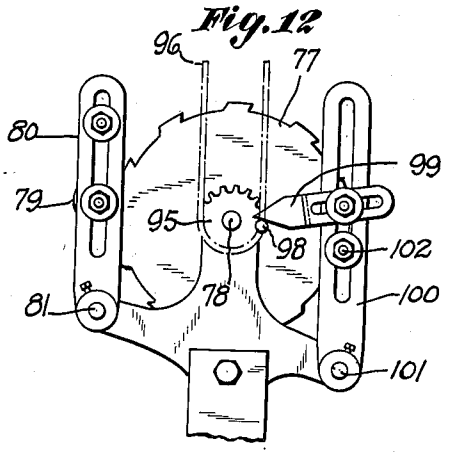
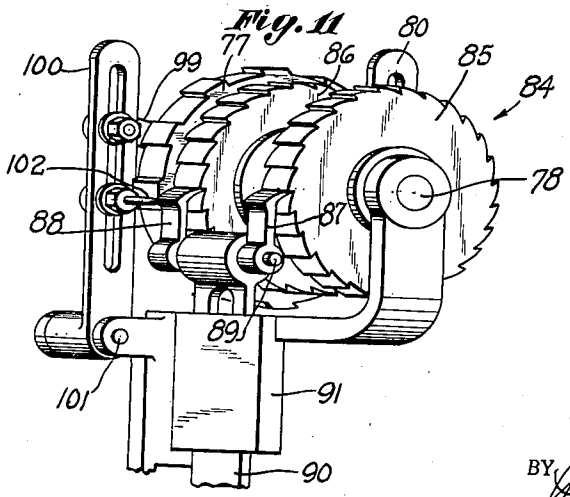


Fig. 11



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Patented Apr. 1, 1941 2,236,995

UNITED STATES PATENT OFFICE

2,236,995

FLAT KNITTING MACHINE

Bruno Deri, Brooklyn, and Sebastian Gangi, New York, N. Y.

Application June 2, 1939, Serial No. 276,954

13 Claims. (Cl. 66—85)

This invention relates to flat knitting machines of the type having yarn carrier rods selectively reciprocable longitudinally of the machines by means of pattern chains.

Heretofore such pattern chains have been mounted on long pivoted frames or arms which were oscillated during the travel of the chains so as to bring fingers of different lengths and positions into alinement with said yarn carrier rods to push selected rods to varying extents in relation to the needles for knitting different patterns. Naturally extreme accuracy is required in the extent of movement of the yarn carrier rods for proper coordination with the required needles. A machine of this general type is disclosed, for example, in Patent No. 2,103,852, issued December 28, 1937, to J. Kessler.

If the pattern chains are moved more or less than the required amount the pattern will be affected, especially as the needles are closely spaced; and, in fact, certain of the yarn carrier elements may cause breakage of the needles. If there should be any springiness in the frame arm that carries the pattern chain, the pattern produced will obviously be haphazard, and differences in repeat patterns will be apparent; also breakage of needles may occur as above indicated. The pivoted frame arm must be relatively light in weight, and may not be made so heavy as to avoid springiness because it would cause undue vibration of the machine. The machine of the above mentioned Kessler patent, with its pivoted frames for the pattern chains, was subject to these and other difficulties hereinafter stated.

An even more fruitful cause of pattern variation and breakage of needles is the possible looseness in the pivotal bearing of the frame arm of the pattern chain. The bearing clearance, however slight, is multiplied because of the length of the frame arm; the bearing being at the bottom end of the frame arm, and the yarn carrier rods being actuated at the upper end of the frame arm. In fact, this variation in the bearing leads to a still further difficulty that will now be described.

The operator attempts to adjust the machine for the effect of variation or clearance in the bearing of the pattern chain frame arm. Yet when the machine is loaded with yarn and is in operation, the action is different, so that the adjustment is found to be inaccurate. Accordingly the machine must be stopped and repeatedly readjusted. This method leaves must to be desired, and is time consuming.

Due to the pivotal movement of the frame arm that carries the pattern chain, the rods or fingers carried by the chain links for actuating the yarn carrier rods strike the same at an angle, instead of in alined relation. This angular impingement varies with the different fingers, because they must necessarily be of different lengths. Accordingly spring occurs, and some fingers will spring more than others. The points at which the fingers will impinge will necessarily vary, so that another element of uncertainty is introduced in respect to the length of required travel of the yarn carrier rods. Naturally, this will be different according to whether the machine is or is not loaded with yarn.

Finally, it is frequently desired to operate a machine of this type at different speeds. To attempt this would be to multiply and accentuate the difficulties noted, with the additional effect of greatly increasing the vibration of the machine when the latter is speeded up. In other words, all adjustments will be affected when the speed of the machine is changed, due to spring in the frame arm and in the pattern chain fingers and due to any variation or clearance at the frame arm pivot. With increasing vibration, the possibilities of jamming and breakage of the needles is further increased.

It is therefore an object of the invention to provide a machine of this general type which shall avoid the difficulties mentioned.

Another object of the invention is to provide improved means for carrying the pattern chains with the successive fingers in alinement with the different yarn carrier rods.

Another object of the invention is the provision of improved actuator means for the endless pattern chain for causing intermittent travel thereof in opposite directions in knitting repeat patterns, said actuator means being simple, compact, light in weight, capable of eliminating a complicated drive, and being adapted for substantially direct actuation of the pattern chain in both directions.

Another object of the invention is the provision of improved supporting means for elements of the machine to avoid deflection due to the weight thereof, without interfering with the clearances necessary for adjoining parts of the machine.

Other objects and advantages of the invention will become apparent as the specification proceeds.

With the aforesaid objects in view, the invention consists in the novel combinations and

arrangements of parts hereinafter described in their preferred embodiments, pointed out in the subjoined claims, and illustrated in the annexed drawings, wherein like parts are designated by the same reference characters throughout the several views.

In the drawings:

Figure 1 is a view in front elevation with parts removed showing a flat knitting machine embodying the invention.

Fig. 2 is an enlarged sectional view taken approximately on the broken line 2—2 of Fig. 1, with certain parts shown in dot-dash lines.

Fig. 3 is a fragmentary view showing certain parts related to the pattern chain.

Fig. 4 is an enlarged fragmentary sectional detail view of a locking device for a weft carrier rod.

Fig. 5 is an enlarged fragmentary sectional view of a warp bar support.

Fig. 6 is an enlarged fragmentary plan view of the warp bar carrier and associated parts.

Fig. 7 is a sectional view taken on the line 7—7 of Fig. 6.

Fig. 8 is an isometric view of a part of the mechanism for causing reverse travel of the pattern chain.

Fig. 9 is a sectional view thereof.

Fig. 10 is a fragmentary plan view with parts in section showing details related to the pattern chain and the drive therefor.

Fig. 11 is an isometric view of a motion multiplying mechanism used in the operation of the pattern chain.

Fig. 12 is a fragmentary view in end elevation thereof.

The advantages of the invention as here outlined are best realized when all of its features and instrumentalities are combined in one and the same structure, but, useful devices may be produced embodying less than the whole.

It will be obvious to those skilled in the art to which the invention appertains, that the same may be incorporated in several different constructions. The accompanying drawings, therefore, are submitted merely as showing the preferred exemplification of the invention.

Referring in detail to the drawings, we show a flat knitting machine embodying the invention. The same may include a needle bed 16 for a row of reciprocatory needles 17, in parallel relation with which extend a series of weft carrier rods 18 which are individually longitudinally reciprocable to varying extents. Each of these rods 18 directly carries a series of adjustably spaced tubes or guides 19 for feeding the weft to the needles. Accordingly weft yarns are fed to different needles according to the movement of the weft carrier rods 18 to thus produce knitted fabrics having predetermined designs. All of the weft rods 18 or a required number thereof may travel simultaneously in the same or in different directions, and stop at the same time, but the different weft rods cause yarn to be laid into different respective groups of needles by means of the tubes 19 whose lower ends lie spaced along an area within the path of movement of the needles. Thus each weft rod 18 corresponds to a different pattern element or section. This structure is conventional.

In order to assure uniform feed of weft yarn to the needles 17, it is desirable to dispose the weft rods 18 along an arc as shown in Fig. 2, thus permitting the weft tubes 19 to be of substantially equal length for equal frictional resistance with the yarn. The center of the arc referred to accordingly lies preferably in the vertical plane of the front edge of the needle bed 16.

Heretofore, the weft rods 18 have been slidably supported only at the extreme ends of the machine, as on the main frame 20 thereof, see Fig. 3. This resulted in considerable vibration and deflection of the rod due to the weight of the tubes 19 and the yarn. Accordingly the clearance between the lower ends of the tubes 19 of the different weft rods was unduly diminished, as well as the clearance with respect to the needles 17, so that breakage would sometimes occur. This is overcome in the present instance by the provision of supporting means intermediate of the ends of the weft rods. For example, a guide bar 21, see Fig. 2, is formed with a central bracket arm 22 fixedly mounted on a stationary bar 23 rigidly mounted in any suitable manner on end portions 24 of the main frame of the machine. Formed in the weft rod support 21 are a plurality of upwardly opening vertical spaced slots 25, each adapted to receive an inverted U-shaped carrier 26, that may be made of metal of square or oblong cross section to snugly slidably fit in the slots 25. To permit all of the carriers 26 to be alike, the carrier bar 21 is arc shaped to correspond to the arc of the weft rods 18. The latter may be secured to the ends of the carriers 26 in any suitable manner; for instance, collars 27 are affixed to the weft rods 18 by set screws 28, each collar having a pin 29 inserted into a tubular end portion of the carrier 26 and secured therein by a set screw 30. In this manner, each weft rod is removably fixed at each end of a carrier 26.

To so rigidly secure the carriers 26 to the carrier bar 21 as to avoid any possibility of vibration, locking means is provided, which may desirably take the form of angle members 31, arranged as in Fig. 4, so that one arm 32 is swiveled in the carrier 21, and the other arm 33 is swingable downward to closely overlie a weft carrier bar 26, a set screw 34 in the carrier 21 serving to lock the arm 32 of the angular member in position. When so locked, the carriers 26 are still slidingly movable in the slots 25 by means of the yarn rods 18. To remove a carrier 26, it is merely necessary to loosen the set screw 34, and swing the angle member 31 to move the arm 33 so as to extend upward to clear the carrier.

Similar deflection and vibrational difficulties have been encountered in connection with the longitudinal reciprocable rocking bar 35 which carries the fingers 35a having eyes for feeding warp yarn to the needle 17. This bar 35 and the fingers 35a function in the general manner described for the parts 91, 92 of our pending application Serial No. 265,162 filed March 31, 1939, for Jacquard knitting machines; and other parts herein described will also be found to be more fully described in said application.

We therefore provide a bracket arm 36 fixed on a bar 37 that is rigidly secured to end portions 38 of the main frame 20 of the machine. In the upper end of this arm is an opening 39 which receives the warp bar 35 with only enough clearance to permit the slight amount of rocking motion that this bar has, said bar resting on the lower edge of said opening, as shown in Fig. 5. In order to permit an uninterrupted series of the fingers 35a to be mounted in operative position, without interference by the bracket arm 36, there is provided a holder comprising a pair of like

plates 40, 41, secured together as by set screws 42, see Figs. 6 and 7. Between these plates 40, 41 are clamped a plurality of fingers, whereby these plates are rigidly mounted on the rock bar 35. Adjoining fingers 35b are similarly clamped between the plates 40, 41 but with their hook portions cut off so that they do not engage the rock bar 35 and do not interfere with the bracket arm 36, but otherwise function in the same manner as the other fingers 35a. Any number of these bracket arms 36 may be spaced along the rock bar.

Our improved mechanism for operation of the weft carrier rods 18 without requiring swinging motion of the pattern chain frame will now be described. Like mechanisms are provided at each end of the machine, so that a description of one will apply to the other. Each includes a pattern chain 43 of substantial width so as to have links 44 having relatively long cross bars 45. The chain is mounted on suitable upper and lower sprocket wheels, on a rectangular or other suitable frame 46, only the upper sprockets 47 being the driving elements for the chain. These upper sprockets are fixed on a drive shaft 48. Mounted on selected link bars 45 are the pins or fingers 49 which are of different lengths and variably positioned to actuate weft bars 18 to predetermined extents as hereinbefore described. Desirably each weft rod 18 is provided at each end with an impact plate 50, for increasing the area available for abutment with the fingers 49. These plates 50 also serve to allow for the arcuate arrangement of the weft bars 18. As thus far described, the pattern chain and its frame and sprockets are conventional.

Mounted on the main frame 20, we provide horizontal guide means for the pattern chain frames 46. For example, powerful bars 51 extend therefrom, for carrying the sliding sleeves or cross heads 52 which may be reciprocated in any suitable manner, as by the eccentrics 53 and the interconnecting rods 54. Rigidly fixed to these cross heads is the frame 46, in which is journaled the shaft 48 for the sprocket wheels 47.

It will now be seen that the frames 46 and their pattern chains 43 are reciprocated in a horizontal direction, so as to move in one or an opposite direction for each knitting operation of the machine. Since the fingers 49 are in general alinement with their respective weft bars 18, they will strike squarely, and will not tend to bend or spring. Since the fingers 49 further lie in the horizontal plane of the sprocket shaft 48, the latter directly assumes the entire reaction. By the reciprocatory movement of the pattern chain and its frame, there are no parts to spring and cause vibration, and these advantages are further carried through the fingers 49 as described. Hence the speed of the machine may be substantially increased. Further, the weight of the frame 46 may be reduced, since it is not subjected to springing, and consequently the effect of vibration due to rapid reciprocation of the frame 46 is diminished, to thus permit the loom to knit with a high degree of reliability. In fact, these advantages are further realized by reason of the supporting devices 26 and 36 hereinbefore described, since they permit the reciprocatory elements 18 and 35 to be made relatively light in weight to keep vibration at a minimum.

For actuating the pattern chains 43 and their frames 46, a plurality of ratchet members 55, 56, as shown particularly in Figs. 8 and 9, are provided, both of which members are mounted on the pattern chain shaft 48. Of these members, 55 may be an idler, while 56 may be fixed to the shaft 48. Each of these members may have ratchet teeth 57, all of which are equally spaced, with the teeth of the different ratchet members being normally alined as shown. Interengaging the ratchet members 55, 56 is a reversing means, such as one or more bevel gears 58, 59 which may be between said members and may interengage bevel gears 60, 61 coaxial with and fixed to the respective members 55, 56 which may be hollow to enclose the same. One gear 58 may have a stub shaft 62 journaled in a bearing member 63 idle on the shaft 48, and the other gear 59 may be idle on a shaft 64, engaging the bearing member 63, and having a flattened portion 65 projecting outward between the ratchet members 55, 56 and being fixed to an element 65a of the pattern chain frame 46 to thus hold the bearing member 63 against rotation while permitting free rotation of the gears 58, 59.

Accordingly it will be noted that the ratchet elements 55, 56 are constrained by the gear train 58, 59, 60, 61 to rotate in opposite directions. Hence a single actuator such as a hook 66 may engage one or the other of the ratchet members to cause the pattern chain to travel in one or an opposite direction, even though the hook operates in each case in the same direction. More specifically, if the hook 66 actuates the ratchet member 56 clockwise, it will turn the same and hence the shaft 48 and cause the sprocket chain in the same direction. But if the hook 66 be laterally shifted to actuate the ratchet member 55 clockwise, then since the latter is an idler, the gear train 58 to 61 will become effective to turn the ratchet member 56 in the counterclockwise direction, with a corresponding change in direction of the pattern chain 43. When the hook 66 actuates the ratchet member 56, the idler ratchet member 55 and the rear train rotate but have no effect on the shaft 48. It will be understood that the gear ratios are such that the ratchet members 55, 56 always travel through equal opposite angles, and the motion may be equal to the pitch of one tooth 57. If desired, any suitable spring stop (not shown) to prevent overrunning of the shaft 48 may be provided.

It will now be seen that a single actuator 66 may be utilized to cause travel of a pattern chain in required amounts in opposite directions. Desirably the hook 66 may be part of a rod 67, actuable by a means shown in Fig. 2. For example, on a portion 68 of the machine frame is fixedly mounted a horizontal guide means such as bar 69 on which is slidable a head 70. Taking around the bar 69 is an expansion coil spring 71 which bears at one end on the head 70 and at its other end against the collar 72 fixed on the bar 69, so that the spring tends to move the head and hence the rod 67 in one direction. For moving said head in the opposite direction, an arm 73 is fixed on a rock shaft 74, and is formed with a slot 75 for engaging a pin 76 on the head 70. This arm 73 may be controlled by a cam wheel 77, rotatable on a shaft 78. Responsive to the lobes of the cam wheel is a roller 79 carried by a lever 80 having a fixed pivot 81. Interconnecting said lever with the arm 73 is a link 82. Accordingly when the roller 79 engages a lobe of the cam wheel, the lever 80 is swung clockwise to cause similar movement of the arm 73 to move the head 70 against the force of the spring 71, to thus shift the rod 67 and its hook 66 to engage one of the ratchet members such as the member

55. When the roller 79 is received in a valley between the lobes of the cam wheel 77, motion in opposite direction occurs under the force of the spring 71 so that the hook 66 engages the other ratchet member such as the ratchet member 56. It will be noted that the pin and slot engagement at 75, 76 is so designed as not to be influenced by any angular movement of the head 70 incident to the tilting of the rod 67 as the hook 66 rides over the ratchet wheels 55, 56. Any suitable means schematically shown at 83 may be provided to limit the downward tilting of the rod 67 to operative position.

Since the rock shaft 74 extends from end to end of the machine, heads such as 70 may be operated at both ends of the machine simultaneously for like purposes and in like manner. Hence only one mechanism including the parts 77 to 82 need be provided at one end of the machine.

Any suitable means may be provided for actuating the cam wheel 77. The means provided is conventional in principle, but improved in design, as shown in Figs. 11 and 12. Said means 84 may include like ratchet wheels 85, 86 mounted on the shaft 78, the former being fixed thereto, and the ratchet wheel 86 being an idler and having the cam wheel 77 fixed thereto. Cooperating with the respective ratchet wheels 85, 86 are the pawls 87, 88 mounted for individual tilting motion on a common rod 89 and being pressed toward their ratchet wheels by any suitable springs (not shown). The rod 89 is carried by a slide member 90 guided for vertical movement in any fixed frame structure 91, and the lower end of the slide having a roller 92 for engaging a cam 93 (see Figs. 2 and 10), fixed on a shaft 94, which also carries the eccentric 53. Also fixed to the shaft 78 is a sprocket wheel 95, for a sprocket chain 96, which engages an idler sprocket wheel 97 mounted on any fixed part of the machine frame. This sprocket chain carries a series of variably spaced pins 98 which project laterally to successively engage a cam finger 99 carried by an arm 100 having a fixed pivot at 101 and a spring (not shown) for urging the same toward the ratchet wheel. Fixed on the arm 100 is a pin 102 which normally underlies the pawl 88 so as to move the latter away from its ratchet wheel 86 when the arm 100 is swung by engagement of a chain pin 98 with the finger cam 99.

On each reciprocation of the bar 90 by the cam 93, the pawls 87, 88 are reciprocated, and the ratchet wheel 85 is turned one tooth to correspondingly move the shaft 78 and hence the sprocket wheel 95, and the sprocket chain 96. If the pins 98 are remote from the finger cam 99, the pin 102 will lie in the path of the pawl 86 and prevent it from oscillating toward its ratchet wheel 86, so that the latter and its cam wheel 77 will be stationary. But if a pin 98 engages the finger cam 99, the pin 102 is moved away from the path of the pawl 88, as at an adjacent lateral cut out thereof (not shown), and hence the pawl 88 engages its ratchet wheel 86, so that the latter, and the cam wheel are rotated to a degree equal to that of the ratchet wheel 85. Suitable detent or friction means (not shown) may be provided to prevent overrunning. Desirably the pitch of the cam wheel lobes is double that of the sprocket wheel teeth as shown. The spacing of the pins 98 is of course adjusted according to the pattern that is to be knitted. The cam 93 may cause one or more reciprocations of the pawl carrier 90 upon each rotation thereof.

We claim:

1. A flat knitting machine comprising a reciprocatory rockable bar for carrying eye fingers for feeding warp yarn to the needles of the machine, said bar being mounted adjacent to its ends on the frame of the machine, and means for supporting said bar at an intermediate point to prevent sagging of the bar, comprising a bearing element for the bar, and a bridge member mounted on said bar and extending partially along the bearing element, said bridge member having means for operatively mounting finger elements at the area along the bar occupied by the bearing element.

2. A flat knitting machine comprising weft carrier rods reciprocable in parallel relation to the needle bed to feed weft to selected needles for the knitting of patterns, said rods directly carrying adjustably spaced weft carriers, said rods being slidably mounted adjacent to their ends on the frame of the machine, and means for supporting said rods at an intermediate point to prevent sagging of the rods, comprising an inverted U-shaped member for each of said rods, each member having its arms adjustably fixedly connected at their lower ends to an individual rod, with the member lying in the vertical plane of the rod, and fixed means slidingly engaging the upper portions of the members to carry the same and thus support said rods, each member having means for individual adjustment of the length of its arms.

3. A flat knitting machine comprising weft carrier rods reciprocable to feed weft to selected needles for the knitting of patterns, said rods being slidably mounted adjacent to their ends on the frame of the machine, and means for supporting said rods at an intermediate point to prevent sagging of the rods, comprising an inverted U-shaped member for each of said rods, each member being fixedly connected at its lower end to an individual rod, with the member lying in the vertical plane of the rod, and fixed means slidingly engaging the upper portions of the members to carry the same and thus support said rods, said fixed means including a member extending transversely of the U-shaped members and having upward opening slots for receiving said upper portions, and means for releasably closing the slots at the open ends thereof.

4. A flat knitting machine comprising a reciprocatory rockable bar for carrying eye fingers for feeding warp yarn to the needles of the machine, said bar being mounted adjacent to its ends on the frame of the machine, and means for supporting said bar at an intermediate point to prevent sagging of the bar, comprising a bearing element for the bar, and a bridge member extending partially along the bearing element, warp guide fingers mounted on said bar, said bridge being mounted on certain of the warp guide fingers located at the sides of the bearing element, and other warp guide fingers free of said bar and bearing element and operatively mounted on said bridge.

5. A flat knitting machine comprising a reciprocatory rockable bar for carrying eye fingers for feeding warp yarn to the needles of the machine, said bar being mounted adjacent to its ends on the frame of the machine, and means for supporting said bar at an intermediate point to prevent sagging of the bar, comprising a bearing element for the bar, and a bridge member extending partially along said bearing element, warp guide fingers mounted on said bar, said bridge including a pair of plates clamped on

fingers at the sides of the bearing element to thus mount the bridge on said bar, and other warp yarn fingers free of said bar and spaced from the bearing element and being clamped between said plates so as to be operatively mounted on said bridge.

6. A flat knitting machine comprising parallel yarn carrier rods reciprocable longitudinally to different extents to feed yarn to selected needles of the machine, means for actuating said rods comprising an endless pattern chain, means for causing intermittent travel of the pattern chain in opposite directions, fingers of different lengths mounted in different positions on the pattern chain for impinging against the adjacent ends of the yarn carrier rods to actuate the latter, and means for mounting and bodily moving the chain toward and away from the adjacent ends of the yarn carrier rods, the mounting means cooperating with the pattern chain to cause the fingers that are in operative position to aline with the yarn carrier rods and to cause the fingers to move the rods, the means for causing intermittent travel of the pattern chain including a rotary means for said chain, a first rotary ratchet member fixed to the rotary means, a second rotary ratchet member idle on the rotary means, the different ratchet members having fixed thereto respective gears confronting each other, a third gear intermediate of said gears and interengaging the same to cause said members to rotate in opposite directions, said rotary means comprising a common shaft for the first and second rotary members, a body between the confronting gears freely journaled on said shaft, means for mounting the third gear on said body for rotation about an axis at right angles to said shaft, and means to prevent rotation of said body, and an element for actuating the first member to cause the chain to travel in one direction, said element being shiftable to engage the second member to thereby cause the gears to rotate the first member in a different direction for reversing the travel of the chain.

7. A device including a flat knitting machine comprising a plurality of parallel weft carrier rods longitudinally variably reciprocable to feed weft to selected needles, means for actuating said weft carrier rods, comprising an intermittently traveling finger carrying pattern chain, means for mounting said pattern chain for bodily movement thereof for actuating of the weft carrier rods by the fingers, and means for actuating the pattern chain, said mounting means comprising a rotary shaft for the pattern chain, said shaft having fixed thereon a sprocket wheel for the pattern chain, the actuating means comprising a first ratchet member fixed to the shaft, a second ratchet member idle on said shaft, gears coaxially fixed to the different ratchet members, gear means having an axis perpendicular to said shaft and interconnecting the gears of the first and second members for simultaneous rotation of the said gears in opposite directions relatively to each other and through equal angles with respect to each other, and means intermittently operative in one direction and engageable at will with either of the first and second members to cause rotation of said shaft in one or in an opposite direction.

8. A device including a flat knitting machine having weft carrier rod actuator means comprising a finger carrying pattern chain, a drive shaft therefor, a first ratchet member fixed on said shaft, a second ratchet member idle on said shaft, said ratchet members forming confronting housings each having an internal gear, a third gear at least partially enclosed in said housings and interconnecting said internal gears for causing rotation of the ratchet members in opposite directions, said third gear having a mounting providing a fixed axis of rotation for the third gear at right angles to said shaft, the teeth of the ratchet members projecting in one direction, and means operating in one direction and being movable to engage at will the first or the second member to thus cause rotation of the pattern chain in one or in an opposite direction.

9. A flat knitting machine comprising a reciprocatory rockable bar mounted at the ends of the machine and carrying fingers having at one end eyes for feeding warp to the needles, said bar having transverse grooves and said fingers having at their other end spring hooks partially engaging around said bar and seated in individual grooves of said bar for mounting the fingers, said bar being free of said fingers at a point intermediate of its length to afford space for a bearing means, a bearing means at said point supporting said bar for reciprocatory and rockable motion, and a warp feeding finger at said point having at one end a warp feeding eye and terminating in a relatively straight shank, and means engaging said shank for mounting said finger in such coordination with said bar as to cause said finger to have the same motion as the other fingers.

10. A flat knitting machine comprising a reciprocatory rockable bar mounted at the ends of the machine and carrying fingers having at one end eyes for feeding warp to the needles, said bar having transverse grooves and said fingers having at their other end spring hooks partially engaging around said bar and seated in individual grooves of said bar for mounting the fingers, said bar being free of said fingers at a point intermediate of its length to afford space for a bearing means, a bearing means at said point supporting said bar for reciprocatory and rockable motion, and a warp feeding finger at said point, and grooved means at a side of said bar engaging said finger in its groove and mounting the finger in such coordination with the bar as to cause said finger to have the same motion as the other fingers.

11. A flat knitting machine comprising weft carrier rods reciprocable in parallel relation to the needle bed to feed weft to selected needles for the knitting of patterns, said rods being adapted for directly carrying adjustably spaced weft carriers, said rods being slidably mounted adjacent to their ends on the frame of the machine, and means for supporting said rods at an intermediate point to prevent sagging of the said rods, comprising inverted U-shaped frame elements respectively fixed at their lower ends to the individual rods and arranged so as not to affect weft guides carried by said rods, and means individually slidably mounting the upper sections of said frame elements for movement of the latter with the rods, each frame element having means for individual releasable connection with its rod so that the frame element is adjustable longitudinally of its rod.

12. A flat knitting machine comprising a plurality of weft carrier rods reciprocable to varying extents along the needle bed to cause the feeding of weft to selected needles, said rods being adapted to directly carry adjustably spaced weft carriers, said rods being slidably mounted

adjacent to their ends on the frame of the machine, and means for supporting said rods at an intermediate point, comprising an inverted U-shaped frame element for each rod having its arms adjustably fixed to its rod, and a common member transverse to said rods having openings for slidably engaging the top sections of the frame elements, said member having portions at least partially closing said openings for snugly retaining the said top sections in engagement with said member.

13. A flat knitting machine comprising a plurality of weft carrier rods reciprocable to varying extents along the needle bed to cause the feeding of weft to selected needles, said rods being adapted to directly carry adjustably spaced weft carriers, said rods being slidably mounted adjacent to their ends on the frame of the machine, and means for supporting said rods at an intermediate point, comprising an inverted U-shaped frame element for each rod having its arms fixed to its rod, and a common member transverse to said rods having openings for slidably engaging the top sections of the frame elements, said member having portions at least partially closing said openings for snugly retaining the said top sections in engagement with said member, and means providing for adjustment of the length of said arms.

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