Jan. 7, 1936. S. W. LIPPITT 2,026,744

KNITTING MACHINE

Filed Feb. 25, 1933 3 Sheets-Sheet 1

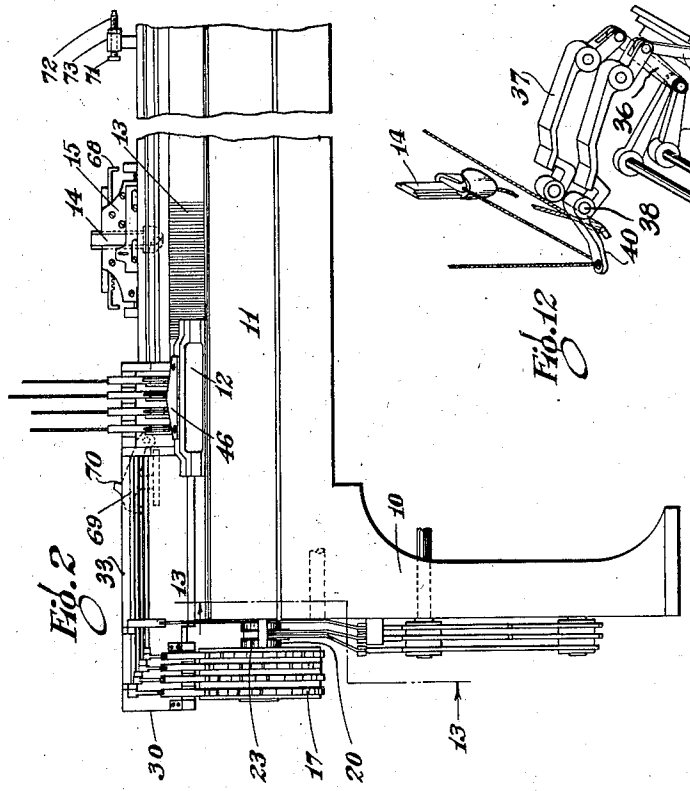


Fig. 2

Fig. 12

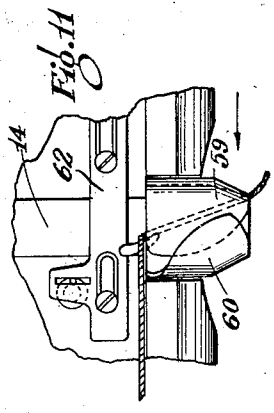


Fig. 11

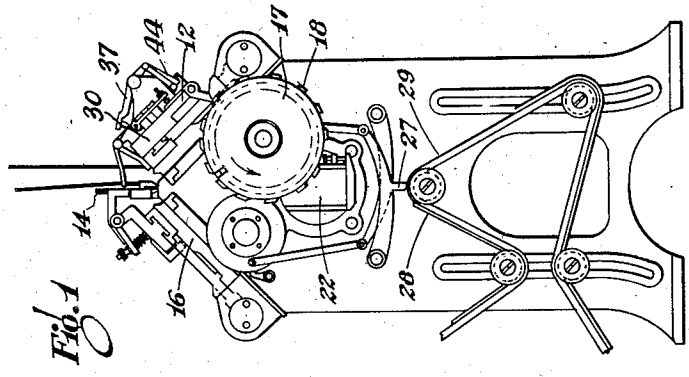


Fig. 1

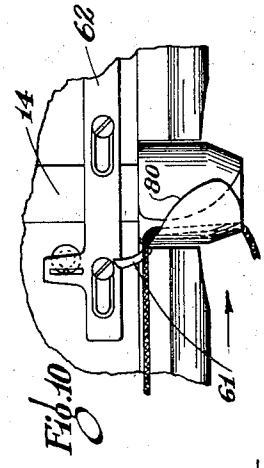


Fig. 10

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KNITTING MACHINE

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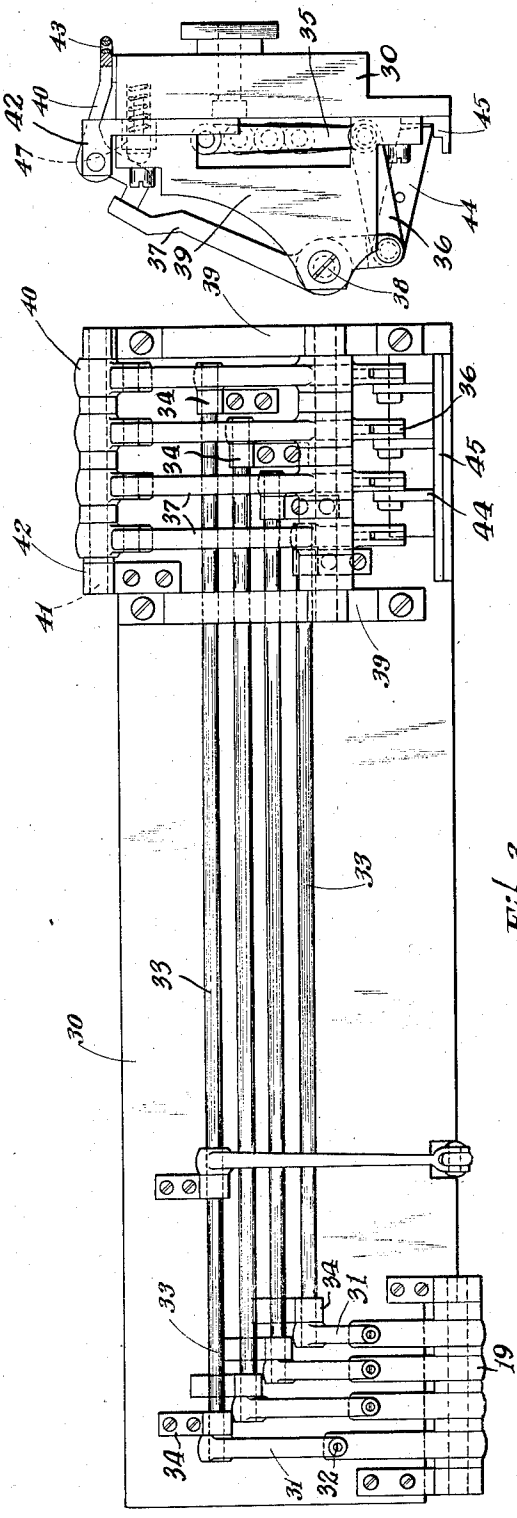


Fig. 3

Fig. 4

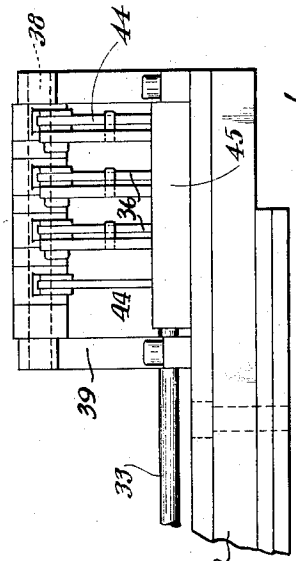


Fig. 6

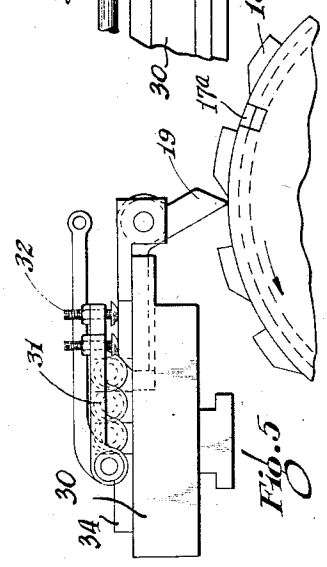


Fig. 5

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KNITTING MACHINE

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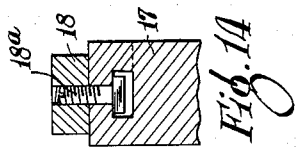


Fig. 14

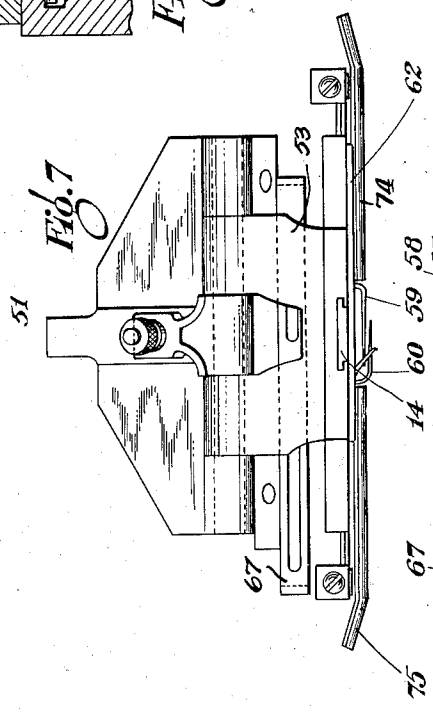


Fig. 7

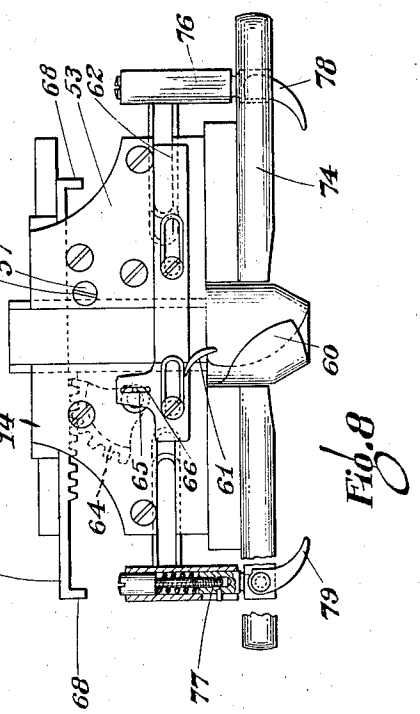


Fig. 8

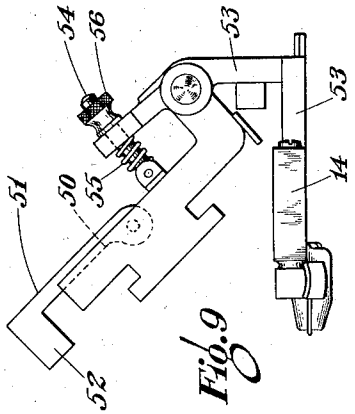


Fig. 9

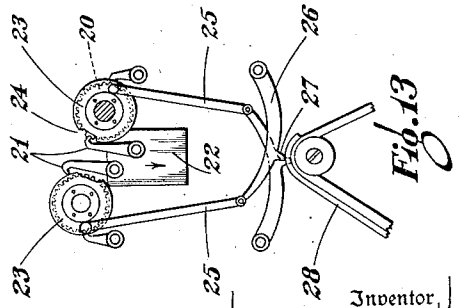


Fig. 13

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Patented Jan. 7, 1936 2,026,744

UNITED STATES PATENT OFFICE

2,026,744

KNITTING MACHINE

Stephen W. Lippitt, Cleveland, Ohio

Application February 25, 1933, Serial No. 658,526

13 Claims. (Cl. 66—127)

This invention relates broadly to knitting machines and more specifically to improvements in yarn feeding mechanisms therefor.

One of the objects of this invention is to provide a thread guiding device which comprehends mechanism for effectuating the successive movement of a plurality of threads into adjustment for engagement within the yarn carrier and for the cyclic delivery thereof during the operation of the machine.

Another object of the invention is to provide a yarn carrier which will engage a prepositioned thread, feed the same to the knitting needles and upon completion of the reciprocative translation of the carrier eject the strand, seize another and automatically repeat the yarn feeding operation.

A further object of the invention is to provide mechanism which may be readily adjusted to effect the allocation of the threads and consequent order of application thereof within the operative cycle of the machine.

Another object of the invention is to provide a thread guard or latching device coordinated for operable control with the yarn carrier which will retain the thread within the carrier during the reciprocative movement of the carriage and will automatically release the thread at the end of the translation thereof.

Another object of this invention is to construct a thread guiding mechanism which is adapted to successively shift a plurality of threads into and out of operative engagement with the yarn carrier and to sustain respectively the position of each thread guide during the knitting event of the machine. Furthermore, the organization of this mechanism contemplates the automatic release of the prepositioned thread guide and the control thereof through the carriage at the completion of the knitting cycle.

Other objects and advantages reside in the specific construction and agroupment of elements peculiar to the structure embodied in the present invention, as will become apparent from a more complete examination of the following specification and appended claims wherein there is assembled and pointed out certain combinations of parts and specific construction indicative of the scope and spirit of the invention.

In the drawings which illustrate the preferred embodiment of the invention—

Figure 1 is an end elevational view of a knitting machine embodying the present invention and illustrating the arrangement of the thread shifting mechanism.

Figure 2 is a fragmentary view of a front elevation of the machine illustrated in Figure 1.

Figure 3 is a plan view of a portion of the thread shifting mechanism illustrating in a somewhat enlarged scale a portion of the thread shifting device.

Figure 4 is an end elevation of the mechanism shown in Figure 3.

Figure 5 is an end elevational view of the device illustrated in Figure 3 showing the opposed end of the mechanism illustrated in Figure 4.

Figure 6 is a front elevational view of a fragmentary portion of the device illustrated in Figure 3.

Figure 7 is a detail plan view of the yarn carrier and its appurtenances.

Figure 8 is an elevational view of the mechanism illustrated in Figure 7.

Figure 9 is an end view of the yarn carrier including a portion of the frame therefor illustrated in Figure 7.

Figures 10 and 11 are detail views of the yarn carrier illustrating the latch adjusted in its open and closed positions.

Figure 12 is a view in perspective illustrating somewhat diagrammatically a portion of the thread shifting mechanism and the yarn carrier.

Figure 13 is a detail view in section illustrating the arrangement of the ratchet control for the thread shifting mechanism, the section shown herein being taken on a plane indicated by the line 13—13 in Figure 2.

Figure 14 is a transverse sectional view taken through the cam plate illustrating the adjustable support of the lugs thereon.

Referring to Figures 1 and 2 the knitting machine with which the present invention is associated for purposes of illustration is of a flat bed type embodying a frame 10 upon which is mounted a bed 11 having a reciprocating carriage 12 thereon formed to support the cam plates which control the movement of the knitting needles. Within the bed 11 there is a pair of oppositely disposed needle plates 13 in the grooved body whereof the knitting needles are guided. The improved yarn carrier 14 embodied in the present invention is supported on a frame 15 which is mounted upon the carriage 16 arranged for reciprocative movement over the rearward needle plate 13.

As illustrated in Figure 2 the thread shifting mechanism comprises a plurality of cam plates 17 having lugs 18 thereon which may be adjustably positioned to effect the operation of the bell cranks 19 at the desired operating intervals. The

cam plates are formed with an annular T-slot having a transversely disposed opening 17a to receive headed bolts 18a which are screw threaded into the adjustable cam blocks 18. The outer ends of the bolts 18a are formed with screw driver slots to facilitate the ready adjustment of the screws. The cam plates 17 are rotatably driven through a ratchet 20 which is driven through pawls 21 mounted upon a reciprocating plate 22 guided in an opening formed in the end portion of the bed 11. Adjacent the ratchet wheel 20 there is a disc 23 having a notch 24 formed in the perimeter thereof to facilitate the engagement of the pawls 21 with the teeth of the ratchet during the operation of the cam plates. The circumference of the body of the discs 23 adjacent the notched portion thereof is formed to overlie the faces of the ratchet teeth radially and is disposed upon rotative adjustment to abut the inner faces of the pawls and retract the same from the ratchet wheel. The discs 23 are secured to the cam plates 17 this assembly being loosely mounted upon stub shafts supported in the frame. This assembly is rotatably actuated by links 25 which are pivotally connected to the face of the discs and to a rocker arm 26 formed with a finger 27 adapted to engage lugs 28 provided upon certain links in a series of endless chains 29. The chains are rotatively driven through gearing, not shown, connected with the driving unit of the machine. As the chains 29 are advanced over the sprockets upon which they are mounted, the lugs 28 thereon engage the finger 27, thus elevating the rocker arm and effecting the rotative movement of the discs 23 which in turn positions the disc so that the circumferential portion thereof will engage the pawl 21 and thus restrain further rotation of the ratchet 20.

As illustrated herein there are four cam plates or discs 17 which operably control the movement of the bell cranks 19. These bell cranks are pivotally supported upon a shaft mounted in brackets extended from a plate 30 which is secured to the bed 11 of the machine. The bell cranks 19 engage levers 31 having adjustable tappet pins 32 mounted in the end portions thereof. The levers 31 are keyed upon shafts 33 paraxially disposed and mounted in brackets 34 at the opposite ends of the plate 30. Keyed upon the inner end of each of the shafts 33 are arms 35 having links 36 pivotally connected to the yoked end of a rocker arm 37 fulcrumed upon a shaft 38 supported in brackets 39 borne by the plate 30. The free ends of the rocker arm 37 are engageable with levers 40 fulcrumed intermediate their ends upon a shaft 41 journalled in bearings 42 mounted on the plate 30. The outer ends of the levers 40 are apertured to receive a strand of yarn which is drawn from an overhead guide and supply cones, in the usual manner. As shown in Figure 4 the aperture through which the yarn passes is bushed with an agate or porcelain eyelet 43 which is provided to avoid undue cutting or scoring of the guide by the passage of the yarn therethrough. Within the yoked end of the arm 37 there is a freely pivoted link 44 which is organized to swing, under the influence of gravity, into abutting engagement with a ledge 45 mounted adjacent the forward edge of the plate 30. Upon the face of the carriage 12 there is a cam plate 46, the inner face whereof is formed with rearwardly inclined edges which merge in the central portion of the plate at an adequate altitude to engage the links 44 and disengage the same from their seated position within the ledges 45 upon the reciprocative translation of the carriage.

As the discs 17 are rotated the lugs 18 thereon progressively trip the bell cranks 19 thereby effecting the elevation of the levers 35, the oscillation of the arm 37 and the alternate elevation and depression of the guide arms 40. The allocation of the lugs 18 upon each of the cam discs and the operative movement of the discs as controlled by the arrangement of the lugs 28 upon the chains 29 are suitably coordinated, in timed relation to the reciprocative movement of the carriage 16 to effectuate the elevation of a single guide arm 40 coincident with any reciprocative translation of the carriage. Since links 44 are disposed to fall by gravity into the ledge 45 when the lever 37 is rocked to its elevated position the adjustment of the guides 40 is positively sustained while the carriage moves through its reciprocative cycle. As the carriage 12 approaches the end of the machine upon which the rocker arms 37 are mounted the cam plate 46 impinges the supporting link 44 and effects the release thereof which then permits the guide 40 to be depressed under the influence of the spring plunger 47, which is coordinated with the inner end of the guide, as illustrated in Figure 4. Each of the guides 40 remain in the retracted or depressed position, as shown, until the bell crank 19 with which it is associated is engaged with the next adjacent cam 18 on the respective cam discs whereupon the guide then actuated will be elevated and held in its extended position during the movement of the carriage.

The yarn carrier embodies a plate 50 adjustably secured to the carriage 16 through a clamping plate 51 which is formed with a tongue 52 thereon adapted for engagement within a recess in the carriage. Upon the inner end of the plate 50 there is a vertically disposed bracket upon which there is fulcrumed a yarn carrier supporting member 53, the inner end thereof being apertured to receive a pivotally mounted stud 54 having a compression spring 55 thereon intermediate the inner face of the supporting member 53 and the plate 50. The outer end of the stud is provided with an adjusting nut 56 which facilitates the adjustment of a variable spring load upon the outer end of the lever 53 and the outward accurate adjustment of the supporting member. The supporting member 53 is formed with a vertical dovetail guideway in the face thereof which receives the yarn carrier 14. The yarn carrier is secured within the guide by the frictional engagement of a screw 57 mounted in the face of the support 53.

The yarn carrier 14 is formed with oppositely disposed intermeshed webs or hooks 59 and 60, the hook 60 partially enveloping the hook 59 and laterally spaced therefrom. The free ends of the webs 59 and 60 are formed with receding edges curved to facilitate the reentrant engagement of the yarn therein and machined with fully rounded corners to avoid shearing the yarn when guided therein and carried thereby. The inner web 59 tapers downwardly merging with the end wall of the hook at the bottom edge thereof while the outer web tapers upwardly and downwardly merging with the end wall of the hook adjacent the top and bottom portions of said end wall. Above the loop or hook portion of the yarn carrier there is a finger 61 disposed to overlie the forward face of the hook 59 when the finger is adjusted in its inwardly position and to pass over the inclined

edge of the hook 60 when it is moved to its outwardly adjusted position. The finger 61 depends from a sliding plate 62 which is mounted in the forward face of the yarn carrier supporting member 53. Rearwardly of the plate 62 there is a segmental gear 64 pivotally mounted upon the plate 53 and having a pintle 65 eccentrically disposed on the hub portion thereof for engagement within a slot 66 in a lug formed in the plate 62. The gear 64 is intermeshed with a rack 67 reciprocatively mounted within a guideway formed in the supporting member 53. The outer ends of the rack 67 are provided with depending ears 68 which are disposed for engagement with buffer blocks 69 and 71 mounted adjacent the opposed ends of the bed of the machine. The buffer 69 embodies a spring pressed lever fulcrumed on the bed of the machine and provided with a lug 70 which is positioned to abut the ear 68 upon the inward reciprocative movement of the carriage. The lever 69 is disposed by engagement of the angulated outer face of the lug 70 upon the outward travel of the carriage. The opposed ear 68 of the rack will engage the buffer 71 which embodies a screw threaded bolt 72 mounted in a boss 73 formed in the bed 11.

When the carriage 16 is at the end of its inner reciprocated travel, the thread operatively positioned by the then extended lever 40 will lie in the path of the hook 60 of the yarn carrier. To assure alignment thereof with the forward face of the hook there is a guide plate 74 having inclined end portions 75 which are disposed to engage and deflect the thread into the plane of the hook. The plate 74 is supported by the forward face of the arm 53 and vertically disposed adjacent the central portions of the faces of the hooks 59 and 60.

Upon the forward face of the plate 53 there is a pair of opposed brackets 76 which retain spring pressed plungers 77 engageable with pivotally mounted fingers 78 and 79 which are arranged to drag upon the surface of the yarn interlaced into the hooks of the knitting needles. Upon the outward translation of the carriage the finger 78 will drag over the crossed threads within the knitting needles, and maintain the necessary tension upon the threads to prevent the escapement of the yarn from the hooked portions of the knitting needles. During this event the finger 79 will be revolved about its pivotal connection, the end portion thereof engaging the surface of the threads but without exerting any appreciable tension thereon.

In operation when one of the lugs 18 engage the bell crank 19 coordinated therewith and elevates the guide lever 40 the yarn retained thereby is moved in the path of the guide plate 74 which deflects the same for entry within the hook 60 where the thread is fed to the hooks of the knitting needles as the carrier is conveyed across the bed of the machine, as illustrated in Figure 10. At this time the remaining arms 40 are depressed or lowered thereby deflecting the threads to an obtuse angle which is in a plane beneath the path of translation of the hooked portion of the yarn carrier. When the cams 18 are positioned to effect the actuation of one of the arms 40 or considered in respect to the knitting function, when the cycle comprehends dropping the thread then guided and seizing another, the thread carried through the return translation of the carrier is ejected from the carrier by actuation of the latch finger 61 which is adjusted through its engagement with the buffer 69 to a position forwardly of the opening in the hooked members of the carrier, as shown in Figure 10. Coincident with the adjustment the cam plate 46 will disengage the supporting link 44 from its seat and the lever arm 40 will oscillate to its lowered position thus deflecting the thread carried thereby to an adjustment, the angle whereof then urges the thread outwardly and downwardly over the inclined marginal edge 80 of the hooked member 60 which member is suitably configured to permit the escapement of the thread. As the yarn carrier continues its outer reciprocative movement the next arm 40 pre-selected through the actuation of the cam discs 17 is elevated to position the thread carried thereby into an acute angle in relation to the carrier and in the path of travel of the yarn carrier, so that upon the return movement of the carriage the hook member 60 will engage the thread and feed it into the knitting needles, as shown in Figure 11.

When the thread is engaged within the hook 60 the finger 61 is positioned to extend beyond the throat of the hook. Upon the reverse movement of the carriage, the finger 61 is adjusted through the engagement with the buffer 71 which causes it to overlie the upper opening of the hook 59 and thus guide and retain the thread within the hook 59 the tapered or inclined edges of the hook form the guiding surfaces for the thread during the cycle in which the thread is ejected from the hook. The edge of the outer web 60 constituting the guiding surface for the thread at the beginning of the thread ejecting event and the lower edge of the inner web 59 constituting the guiding surface for the thread at the end of the thread ejecting event. Sequential operating cycles of the thread carrier are similar to the foregoing except that movement of each of the cam discs 17 occurs adjacent the completion of the inward reciprocation of the carriage and the actuation of coordinated parts will cause the thread formerly positioned for engagement with the hook to be depressed and the arm 40 under the pre-selected cam arranged to be then elevated to position the thread carried thereby for engagement within the hook coincident with the reverse movement of the carriage.

Although the foregoing description is necessarily of a detailed character, in order that the invention may be completely set forth, it is to be understood that the specific terminology is not intended to be restrictive or confining, and that various rearrangements of parts and modifications of structural detail may be resorted to without departing from the scope or spirit of the invention as herein claimed.

I claim:

1. In a knitting machine a yarn carrier comprising a double opposed hook, the free end of one member thereof extending beyond the end of the other and a latch finger disposed above said hook for retaining a thread within the looped portion of one of the hook members during the reciprocative movement of the yarn carrier.

2. In a knitting machine a yarn carrier comprising a double opposed hook, a latch finger therefor, and means associated therewith for reciprocating the finger into a thread retaining position within the hook and a thread ejectment position from the hook.

3. In a knitting machine a yarn carrier comprising opposed hook members, the free ends thereof being transversely spaced and laterally extended one beyond the other, one of the hook members having an inclined marginal edge for

ejectively guiding the thread therefrom, a latch finger for retaining the thread within the other hook member and means for shifting the said latch finger into thread retaining and ejecting position.

4. In a knitting machine a thread carrier comprising a double hook having the free end portion of one member thereof disposed intermediate the walls of the other hook members, a latch finger associated with said yarn carrier and means for shifting said finger to alternately open and close the passage into the inner hook member.

5. In a knitting machine a thread carrier comprising a double hook having the free end portion of one member thereof disposed between the walls of the other hook member, the wall of the outer hook having a tapered marginal edge for permitting the ejectment of a thread within said outer hook member, a latch finger disposed above the opening of the inner hook member and means to shift said finger across the opening in said inner hook member.

6. In a knitting machine, a thread guiding mechanism comprising a plurality of thread guiding arms, a thread carrier embodying oppositely disposed hook members, a latch finger associated with said thread carrier for retaining the thread within one of the hook members through the reciprocation of said thread carrier, means for positioning one of said arms so that the thread carried thereby will be engaged within one of the hook members of said thread carrier, and means for positioning the remaining arms so that the threads carried thereby will be retracted from the path of translation of the thread carrier.

7. In a knitting machine a thread guiding mechanism comprising a plurality of thread positioning arms, a reciprocating thread carrier embodying a double opposed hook, mechanism for positioning the thread guided by said arms into and out of the path of the hook portion of said thread carrier, means for controlling the movement of said thread positioning mechanism comprising cams having adjustable lugs thereon for elevating said arms, rocker arms associated with said arms, operative connections between said cams and said rocker arms, links connected to said rocker arms adapted to support said arms in elevated position and springs associated with said arms for compressively retaining said links in a downward position.

8. In a knitting machine comprising a bed, hook knitting needles therein, a carriage adapted to reciprocate above said knitting needles, a thread carrier mounted upon said carriage, a plurality of thread guiding arms, cams having adjustable lugs thereon for actuating said arms one at a time into position for guiding the thread carried thereby into engagement with said thread carrier and means comprising a chain having lugs thereon for controlling the movement of said cams.

9. In a knitting machine, a yarn carrier comprising a pair of spaced webs one overlapping the other, the outer web tapering upwardly from a point above the bottom of the carrier and merging with the end wall at the top of the carrier, the lower portion of the outer web tapering downwardly and merging with the end wall of the carrier at the bottom thereof, the inner web tapering downwardly and merging with the end wall at the bottom of the carrier so that the thread will be ejectively guided from said carrier over the inclined upper edge of the outer web and the inclined edge of the inner web.

10. In a knitting machine a thread carrier comprising a double hook embodying opposed webs, the free ends thereof being disposed in lateral spaced relation, the marginal edge of the outer web extending angularly downwardly and overlapping the edge of the inner web, the marginal edge of the inner web diverging from the bottom of the end wall of the carrier upwardly and disposed to overlap a portion of the outer web and terminating in spaced relation with the upper end wall of the carrier adjacent the outer web, the edge of the outer web constituting the guiding surface for the thread at the beginning of the thread ejecting event and the lower edge of the inner web constituting the guiding surface for the thread at the end of the thread ejecting event of the carrier.

11. In a knitting machine comprising a bed, hooked knitting needles therein, a carriage adapted to reciprocate above said knitting needles, a thread carrier mounted upon said carriage, a plurality of thread guiding arms, means for actuating said arms one at a time into position for guiding the thread carried thereby into engagement with said thread carrier, and a depending finger associated with said thread carrier for ejecting the thread carried thereby.

12. In a knitting machine, a thread carrier comprising a hook member constituting a split band the free ends whereof are laterally spaced and extended one beyond the other, the upper edges of each end of the hook member being configured to effect the engagement of the thread therebetween at the initial ejectment event of the thread, the lower edges of each end of the hook member being inclined and merged with the end wall at the bottom thereof whereby the thread will be guided from the carrier by the lower inclined edges of said hooked member.

13. In a knitting machine, a thread carrier comprising a pair of spaced webs one overlapping the other, the outer web tapered upwardly and downwardly to merge at its top and bottom edges with the end wall of the carrier, the inner web tapered to merge with the end wall of the carrier at the bottom edge thereof and being configured to guide the thread from the carrier during the ejective operating cycle of the carrier.

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