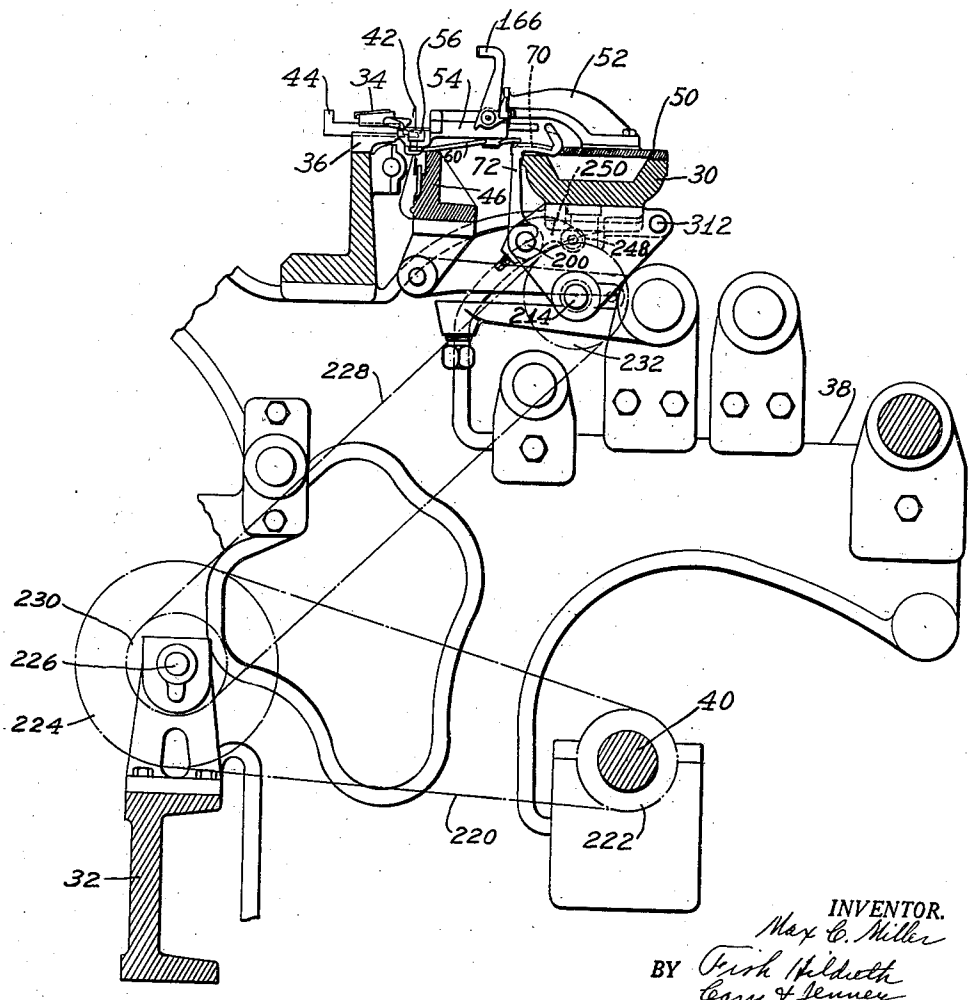
Nov. 30, 1937. M. C. MILLER 2,100,345

KNITTING MACHINE

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Fig. 1

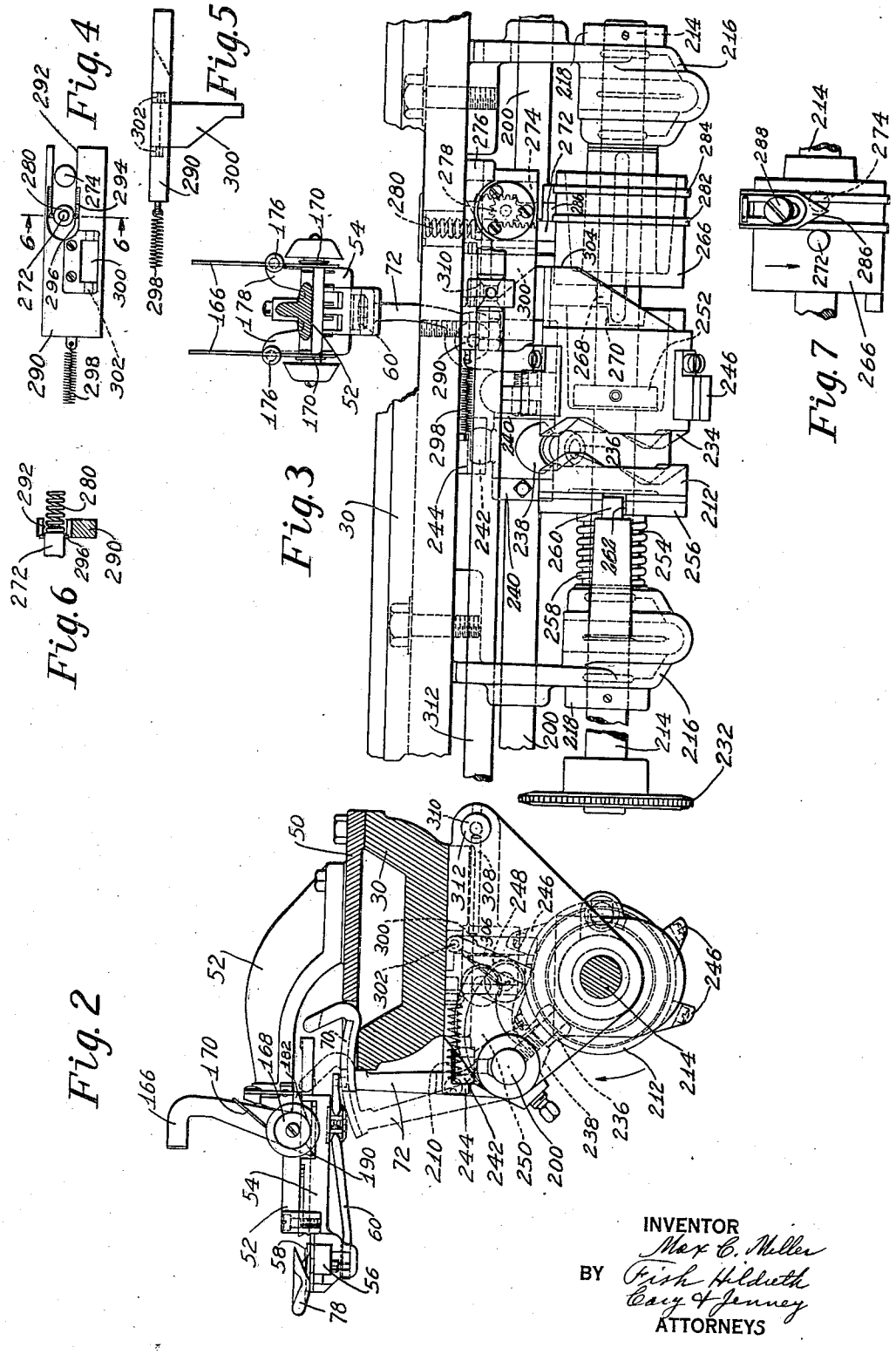


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Fig. 8

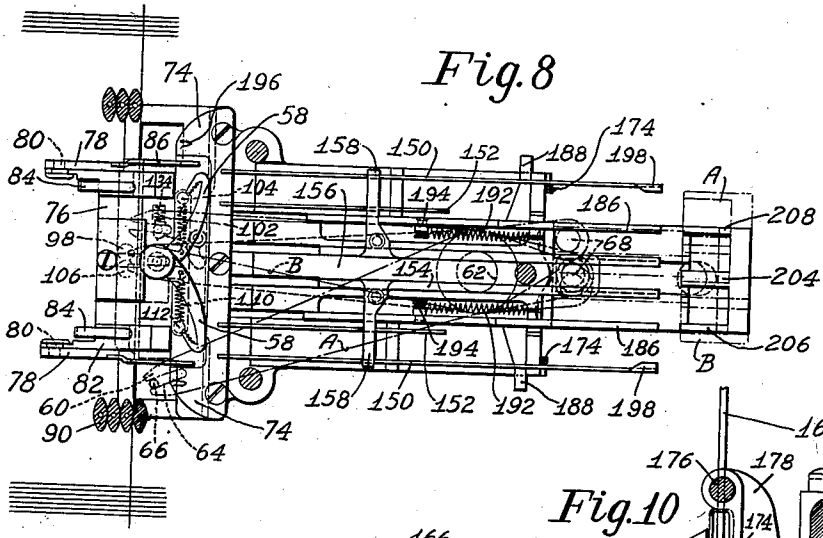


Fig. 10

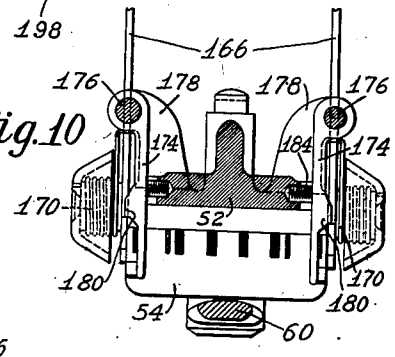


Fig. 9

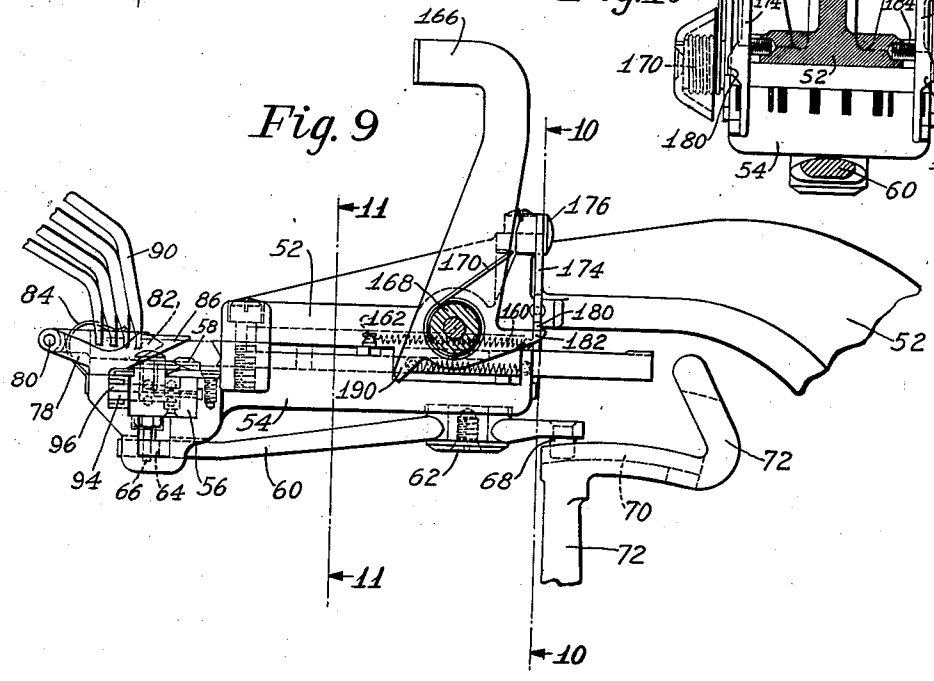
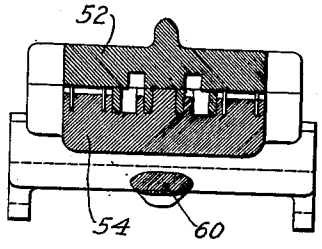


Fig. 11



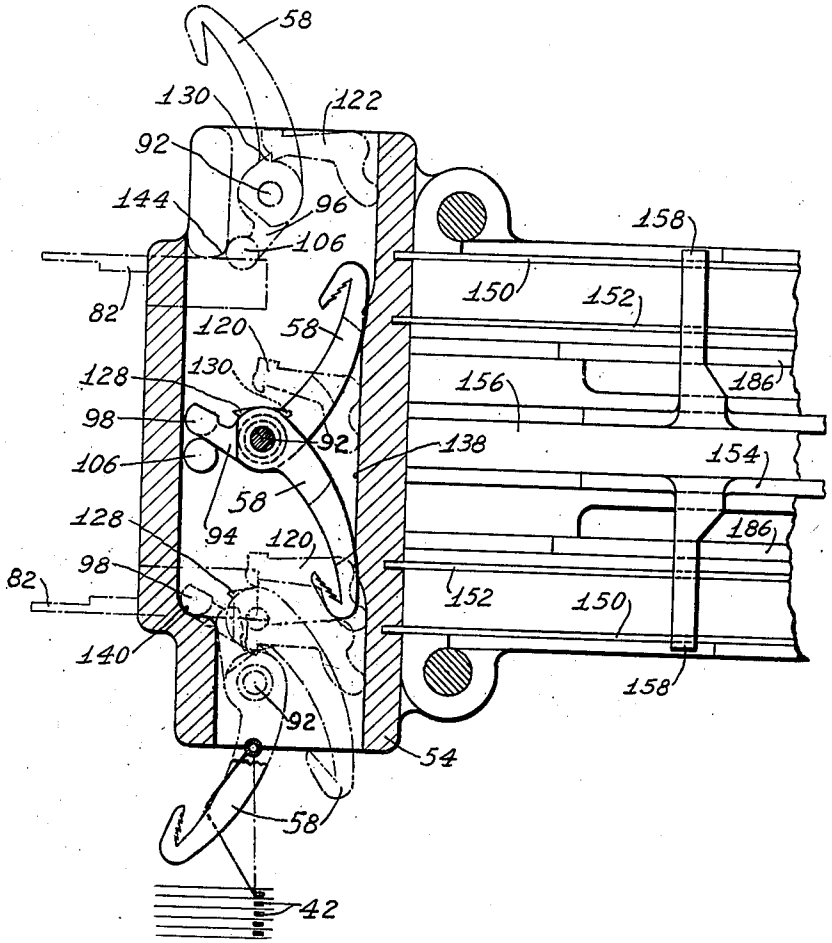
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Fig. 12



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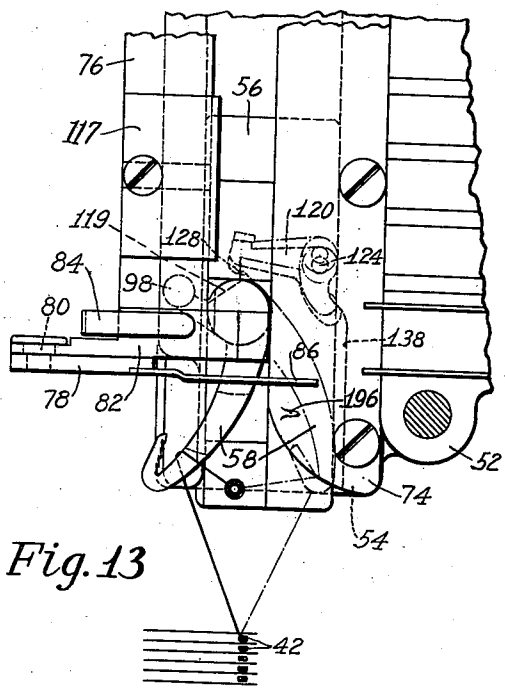


Fig. 13

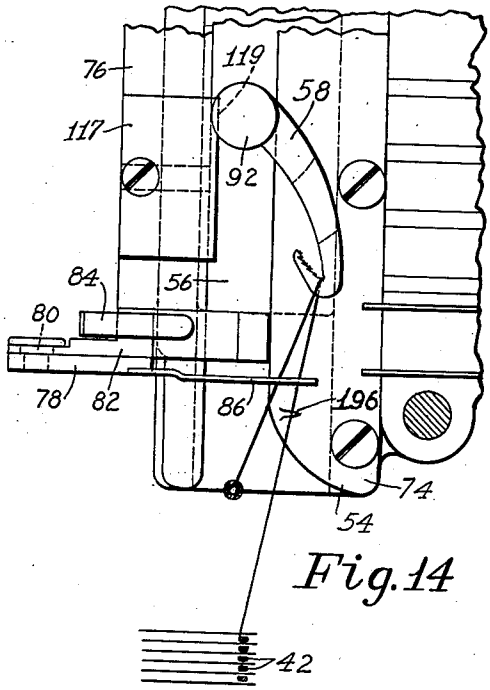


Fig. 14

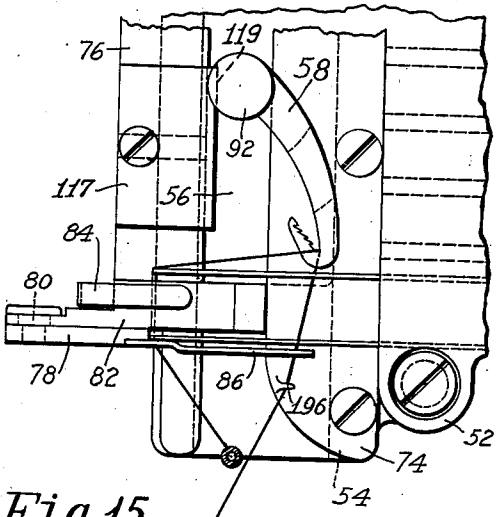


Fig. 15

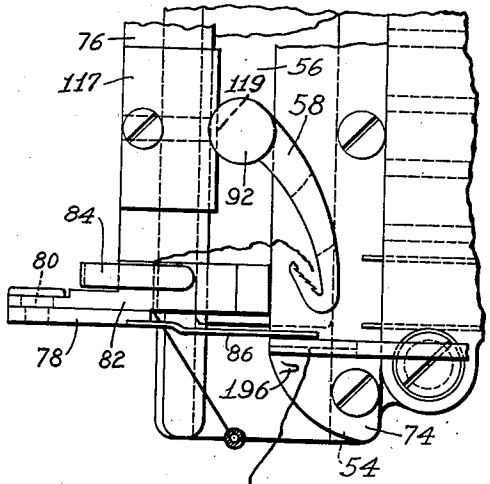


Fig. 16

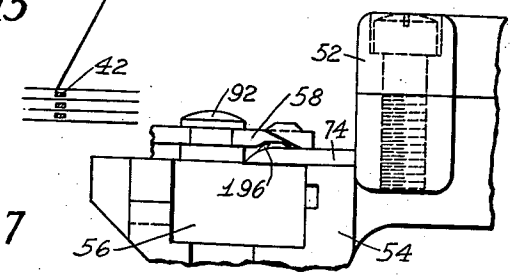


Fig. 17

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Fig. 19

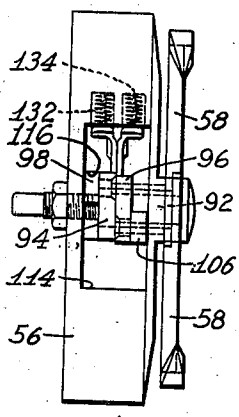


Fig. 18

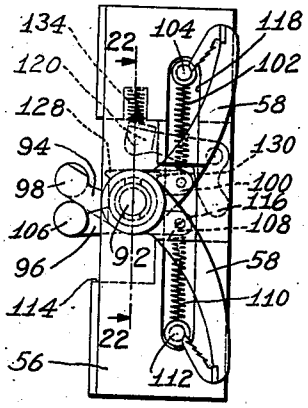
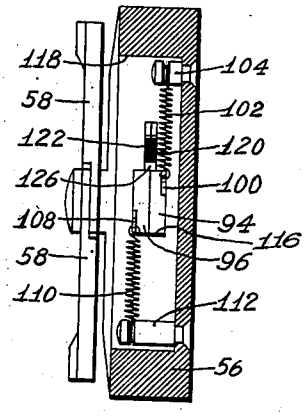


Fig. 21



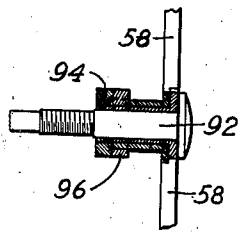


Fig. 22

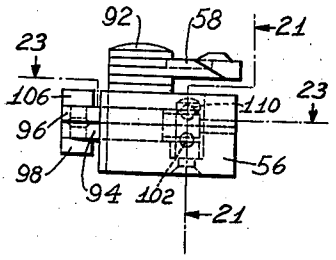
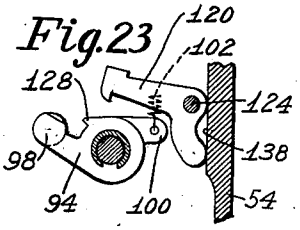


Fig. 20

Fig. 23



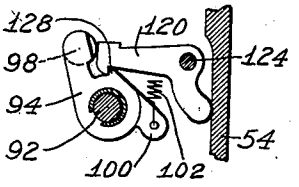


Fig. 24

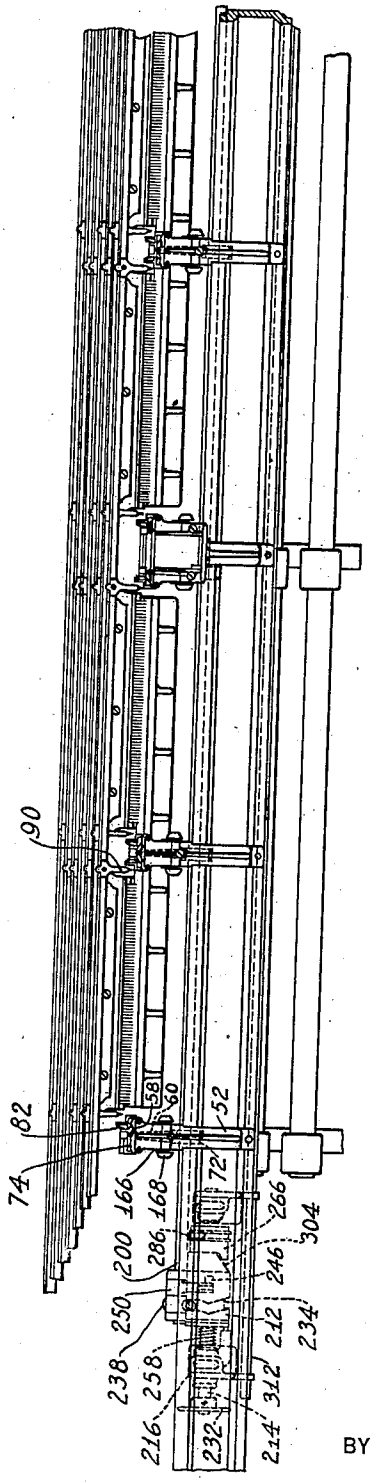
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KNITTING MACHINE

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Fig. 25



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UNITED STATES PATENT OFFICE

2,100,345

KNITTING MACHINE

Max C. Miller, Cumberland, R. I.

Application June 8, 1934, Serial No. 729,553

43 Claims. (Cl. 66—145)

The present invention relates to improvements in knitting machines, and is concerned more particularly with the provision in a flat knitting machine employing a multiplicity of yarn feeds, of a device for cutting and clamping the idled yarns.

The invention is herein disclosed as embodied in a flat full-fashioned multiple section hosiery machine of the Cotton type which is provided with the usual seven yarn feed bars and yarn carriers secured thereto for each section of the machine. The present disclosure further follows the usual practice in that three of the yarn carriers provided with each section are idle at the left hand end of the section, the other four being idled at the right hand end of the section.

In operating machines of this general description, when it is desired to change yarns, the machine is stopped and the yarn and one or more yarn feeding bars, as the case may be, are disconnected and permitted to remain with the corresponding yarn carriers in their idled position, and the new yarn feed bars are connected so that upon again starting the machine, a new yarn or yarns will be fed to the sinkers and needles of each section. The yarn from the idled carriers remains connected to the selvage edge of the fabric, so that it is subsequently necessary for the operator, while the machine is running, and in certain instances, before again starting the machine, to go the length of the machine cutting off the selvage connected yarns which would otherwise interfere with the normal operation of the machine.

It is a principal object of the present invention to provide mechanism to enable the operator to cut the loose ends simultaneously on all the sections of the machine, and thus to effect a valuable saving in the time which would ordinarily be required for the operator to perform this operation manually on each section, and in instances where it would be otherwise necessary to arrest the operation of the machine to materially increase the productivity of the machine over any given period of time.

It is another object of the present invention to provide in combination with a yarn cutting mechanism, additional mechanism for clamping the severed end of the yarn between the carrier and the fabric, so that the yarn will be held in position for the subsequent laying of yarn by the carrier when it is again put in active operation.

It is a further object of the present invention to provide yarn cutting and clamping devices to cooperate with the carriers idled at each end of each section of the machine, which may be operated simultaneously and in timed relation to the operation of the machine, so that only a simple operation is required, which may be performed either manually or automatically, upon changing carriers to bring into operation said devices to sever and clamp the ends of the idled yarns.

With these and other objects in view, as may hereinafter appear, the several features of the invention consist in the devices, combinations and arrangement of parts hereinafter described and claimed, which together with the advantages to be obtained thereby will be readily understood by one skilled in the art from the following description when taken in connection with the accompanying drawings, in which Fig. 1 is a sectional view of a flat full-fashioned machine embodying in a preferred form the several features of the present invention, only so much of the machine being shown as is thought necessary to illustrate the connection of the present invention therewith; Fig. 2 is a detail sectional view looking from the left end of the machine, illustrating particularly the mechanism for operating the cutter and clamp; Fig. 3 is a front elevation of the control mechanism for operating the cutter and clamp illustrating substantially the parts shown in Fig. 2; Fig. 4 is a detail plan view of the clutch pin operating slide; Fig. 5 is a side elevation of the parts shown in Fig. 4; Fig. 6 is a sectional view taken on the line 6—6 of Fig. 4; Fig. 7 is a detail view on an enlarged scale showing the movement of the revolution clutch into and out of operation; Fig. 8 is a detail plan view of the cutter and clamp mechanism with certain parts removed to show more clearly the parts that operate the yarn grabs, pushers, clamps and cutters; Fig. 9 is a detail side view of the cutter and clamp mechanism illustrating substantially the parts shown in Fig. 8; Fig. 10 is a detail sectional view taken on the line 10—10 of Fig. 9; Fig. 11 is a sectional view taken on the line 11—11 of Fig 9; Fig. 12 is an enlarged detail plan view partly in section illustrating particularly the yarn grabs in their several different operating positions; Figs. 13 to 16 inclusive, are detail views on an enlarged scale illustrating different positions of one of the yarn grabs of a cutting and clamping unit, Fig. 13 showing the grab in position after it has engaged with the yarn to be idled, Fig. 14 showing a subsequent position of the yarn grab positioning the yarn in the line of the yarn pushers, Fig. 15 showing the grab still engaged with the idled yarn and with the yarn pushers advanced to position the yarn under the yarn clamp, and Fig. 16 showing the position of the parts after the yarn has been cut

by the advance of the hammer; Fig. 17 is a fragmentary end view illustrating substantially the parts shown in Fig. 16; Fig. 18 is a detail plan view of the yarn grabs and their operating mechanisms; Fig. 19 is an end view looking from the right of the mechanism shown in Fig. 18; Fig. 20 is an end view of the parts shown in Fig. 18; Fig. 21 is a sectional view taken on the line 21—21 of Fig. 20; Fig. 22 is a detail sectional view taken on the line 22—22 of Fig. 18 to illustrate particularly the structure of the pivotal support for the yarn grabs; Fig. 23 is a fragmentary sectional plan view taken on the line 23—23 of Fig. 20 illustrating particularly the latch used for locking the left hand grab out of action in the position shown in Fig. 13, so that the grab is permitted to take the position illustrated in Fig. 14; Fig. 24 is a view similar to Fig. 23 with the latch shown as locking the left hand grab in the position shown in Fig. 13; and Fig. 25 is a partial front view of the machine illustrating particularly the application of the cutter and clamping mechanism to each end of several sections.

In order to illustrate in a preferred form the several features of the present invention, a yarn cutting and clamping mechanism has been devised which is particularly adapted for use with and is herein illustrated as embodied in a flat full-fashioned multiple section hosiery machine of the Cotton type for cutting and clamping the ends of the idled yarns simultaneously on all the sections of the machine. The mechanisms for cutting and clamping the idled yarns are assembled in units which are supported for convenience on the usual table between each two sections of the machine and at the outer ends of the two end sections. These units each comprise two grab members which are arranged to engage respectively with yarns leading from the newly idled carrier or carriers to the fabric selvage edges at the adjacent ends of the abutting sections, cooperating devices for positioning and clamping the yarns engaged by the grabs, and hammers for cutting the clamped ends free from the fabric.

In accordance with certain features of the present invention, a control mechanism is provided for simultaneously operating the several cutting and clamping units to clamp and cut any newly idled yarns first at one end and then at the other end of each section of the machine. This mechanism comprises essentially a control rod which extends the length of the machine, and has mounted thereon a control lever for each unit which is arranged for an axial movement with the rod in either direction from a central or neutral position, and for rotational movements with the shaft to perform the required cutting and clamping operations. With the construction shown, axial movement of the rod and control levers to the left as viewed from the front of the machine, will cause the grabs associated with the right hand ends of the several sections to advance and seize the newly idled yarns, and a subsequent rocking movement of the shaft and levers will operate the clamping and cutting mechanisms to clamp and cut the idled yarns. Similarly, the movement of the shaft to the right with the subsequent rocking of the shaft and levers supported thereon, will cause any idled yarns at the left hand ends of each section to be clamped and cut free from the fabric.

With the present construction, mechanism is provided which is operated in timed relation to the operation of the machine to impart the required axial and turning movements to the control shaft above described, so that only a very simple trip motion is required to set in motion the train of mechanism which will operate to cut and clamp the idled yarns at both ends of each section in two succeeding cycles of operation of the machine.

While with the construction illustrated, this trip motion is operated manually, it will be obvious that it can readily be controlled by mechanical timing mechanism such as the pattern chain in machines in which automatic means might be used to dictate and automatically change yarns. Inasmuch, however, as Cotton type machines are not regularly equipped with automatic yarn changers, a manual control only is provided which is readily accessible to the operator when changing yarns in the usual manner. The trip mechanism disclosed is so arranged that it is merely necessary for the operator, when he has stopped the machine and changed the yarn carriers, to move the control rod for the cutting and clamping mechanism to operating position, and thereafter to start the machine. The mechanism for controlling the operation of the cutting and clamping mechanisms then operates at the end of one revolution of the cam shaft to cut and clamp the idled yarns at the right hand end of each section, and at the end of the second revolution to cut and clamp the idled yarns at the left hand end of each section, finally returning the mechanism to inoperative position until it again becomes necessary to cut and clamp yarns.

Referring more specifically to the drawings, Fig. 1 illustrates in a fragmentary form a flat full-fashioned machine of ordinary description, to which the present invention has been applied. The table is designated at 30, the back rail at 32, the top sinker bed at 34, and the bottom sinker bed at 36, these parts being rigidly secured to a series of cross frames, one of which is generally indicated at 38. The main driving shaft of the machine is generally indicated at 40, and the usual knitting elements including the needles at 42, the sinkers at 44 and a needle bed for one section of the machine at 46.

The cutter and clamp assembly located between each two sections of the machine, as best shown in Figs. 1, 2, 8, and 9, comprises a supporting frame including a base plate 50 bolted to the table 30, an overhanging arm 52 secured to the plate, and a cutter and clamp support 54 secured to the arm 52. Mounted on the cutter and clamp support 54 is a cross slide 56 on which are carried two hooks or grabs 58 which are arranged as hereinafter more fully to be described upon movement of the cross slide 56 to move into engagement with and draw newly idled yarns into position for the operation of the cutting and clamping devices. The movement of the slide is controlled by means of a lever 60 which is pivoted at 62 on the under side of the support 54, and is provided at its outer end with a slot 64 to engage with a pin 66 secured to the under side of the cross slide 56. At its other end the lever 60 is fitted with a pin 68 which engages in a corresponding groove 70 in the cutter and clamp unit actuating lever 72 hereinafter more fully to be described. The cross slide 56 is held firmly in position in its guideway by means of a front cover 74 and a rear cover 76 bolted to the support 54. There are also formed at each end of the back cover 76, two ears 78 to which are secured pivot pins 80 for clamping levers 82 which are held yieldingly against the upper side of the back cover 76 by means of

springs 84. There is also secured to each of the ears 78 a yarn deflector in the form of a thin plate 86 provided at its forward end with an angled yarn engaging surface to engage with and guide the yarn engaged by the corresponding grab 58 into position for the subsequent clamping and cutting of the yarn.

In order that each yarn clamping and cutting unit may be operated to clamp and cut the idled yarns on the adjoining end of each adjacent section, the mechanism employed is duplicated to cause the mechanism to clamp and cut idled yarns on the right hand end of the adjacent section to the left of the cutting and clamping mechanism, and also to cut and clamp the idled yarns at the left hand end of the adjacent section to the right of the cutting and clamping mechanism. In view of structural limitations of existing machines to which it is proposed to apply the present yarn cutting and clamping unit, it has been found necessary to mount the entire mechanism beyond and out of the path of the movement of the yarn carriers 90 which are shown in section in their idled position in Fig. 8, four being idled in the customary manner at the right hand end of each section, and three being idled at the left hand end of each section. With the mechanism herein illustrated, the grabs 58 above mentioned, are rendered operative by the movement of the cross slide 56 to move outwardly and grab any yarn which extends from a carrier in its idled position to the selvage edge of the fabric. The subsequent movement of the slide to its normal or centralized position, causes the yarn to be carried into the path of the clamping and cutting devices, and at the same time withdraws the grab 58 to its inoperative position out of the path of the knitting mechanism and active feeding yarns.

The construction and mode of operation of the cross slide 56 and the grabs 58 to engage with and position the idled yarns, will be best understood in connection with Figs. 8 and 13 to 24 inclusive. The grabs 58 provided with each clamping and cutting unit comprise two similar oppositely positioned curved arms with large hooked ends provided with saw tooth edges to prevent escape of yarn therefrom, and are provided with sleeve hubs which fit one on the other on a pivot 92 centrally located on the cross slide 56. There are also secured respectively to the lower ends of the sleeve hubs of the grab for engaging the right hand idled yarns and the grab for engaging the left hand idled yarns of each section, the operating levers 94 and 96. The operating lever 94 is provided with a downwardly extending pin 98, and also has formed on the hub thereof a forwardly extending projection 100 which is connected by means of a tension spring 102 to a pin 104 mounted on the cross slide 56. The actuating lever 96 is similarly provided with an upwardly extending operating pin 106, and has formed on the hub thereof a forwardly extending projection 108 to which is secured a tension spring 110 connected at its other end to a pin 112 in the slide 56. In order to provide space for the locating and movement of the operating levers 94 and 96, an aperture 114 is formed in the slide 56, as best shown in Figs. 18 and 19. This aperture is provided with a narrowed portion 116 to receive the projections 100 and 108, and with a slot 118 extending lengthwise of the slide to receive the springs 102 and 110. For the rest position of the parts illustrated, for instance, in Fig. 18, the grabs 58 are held in their retracted inoperative position by the operation of the springs 102 and 110 which cause the projections 100 and 108 to engage respectively with the opposite walls of the narrowed portion 116 of the aperture. To further insure that the grabs will be held in their retracted positions as the cross slide 56 returns to its middle position, a grab holdout plate 117 is fastened to the top of the back cover 76 and engages with cammed portions 119 formed in the hubs of the grabs 58 to lock these parts against rotation in either direction.

For controlling the operation of the two grabs 58, there are also provided two latch levers 120 and 122 which are mounted one above the other on a pivot 124 in a recess 126 in the slide 56, and are arranged to engage respectively with notches 128 and 130 formed on the operating lever arms 94 and 96. Compression springs 132 and 134 mounted in recesses formed in the slide 56 engage respectively with the latch levers 120 and 122 to move the latches into engagement with the operating levers 94 and 96. The latches are normally held in retracted position against the pressure of the spring by means of similar tails which engage with a cam surface 138 which forms the forward vertical wall of the guideway for the slide 56. When the cross slide 56 is moved, for instance, to the left from its normal inoperative position, the mechanism above described is rendered operative to cause the corresponding grab 58 to advance and engage an idled yarn as follows:—The movement of the slide to the left, causes the pin 98 formed on the operating lever 94, to come into engagement with a cam-shaped abutment 140 on the rear vertical wall of the slide guideway, as shown in Fig. 12, to swing the corresponding grab 58 about its pivot in a clockwise direction against the pressure of its spring 102 to engage with the idled yarn. At the same time the tail of the latch lever 120 will have passed from the high portion to a low portion of its cam 138 as illustrated in Figs. 23 and 24, to permit the movement of the latch under the pressure of its spring 132 into latching engagement with the notch 128. During the return movement of the slide 56 from its position to the extreme left, as shown in Fig. 12, the grab 58 is maintained in its advanced position until the tail of the latch 120 again rides onto the high portion of the cam 138 when the grab 58 and corresponding operating lever 94 are released and permitted to turn in a counterclockwise direction to the inoperative position illustrated in full lines in Fig. 12. Similarly, the movement of the cross slide 56 to the right from its normal inoperative position, will cause the pin 106 formed on the actuating lever 96 to engage with a ledge or projection 144 formed on the under side of the rear cover 76, so that the grab is moved in a counterclockwise direction to engage with idled yarn at the left hand end of the adjacent section to the right. The grab 58 is then locked in its advanced position, and is held during a portion of the return movement of the slide 56 by the engagement of the latch 122 with the notch 130 on the operating lever 96 as the latch is permitted to move into operating position under the pressure of its spring 134 when its tail rides off the high portion of the cam 138, best shown in Fig. 12. As the slide is returned to its normal operating position, the latch 122 is again disengaged from the operating lever 96 to permit the grab to return to the normal inoperative position illustrated in full lines in Fig. 12.

After the grab 58 has completed its outward and return movements to engage with and draw the idled yarn into the path of the clamping and cutting mechanism as shown in Fig. 14, the leg of the bight of yarn thus formed leading from the yarn carrier, is engaged by a pair of pushers and placed firmly under the clamp 82. As best shown in Figs. 8 and 9, a pair of yarn pushers 150 and 152 are provided to cooperate with each yarn grab. These pushers comprise thin stampings which are mounted to slide in slots formed in the support 50, and are provided at their forward ends with V-shaped ends to certainly engage with and guide the yarn between the clamping lever 82 and its cooperating clamping surface. The movement of the pushers 150 and 152 is controlled by means of a slide 154 which is mounted for movement in a guideway formed in the side of a rib 156 on the cutter and clamp support 54, and has a lateral extension 158 to which the pusher members 150 and 152 are secured. As will readily be seen, there are provided with each clamping and cutting unit, two identical sets of pushers 150 and 152 and two slides 154 to cooperate with the two grabs 58. A tension spring 160 connected between a pin 162 on the slide and a stationary point on the support, is provided with each slide 154 to maintain the slide and pushers normally in the fully retracted position shown in Fig. 8.

There is also associated with each grab, a hammer or yarn severing blade 166, one of these hammers being mounted at each side of the unit on a stud 168, and yieldingly pressed into engagement with an anvil surface on the forward cover plate 74 by means of a torsion spring 170 coiled about the pivot 168, and secured at one end to the hammer 166.

Each hammer 166 is held in a raised position against the pressure of its spring 170 by means of a latch 174 pivoted at 176 on an upwardly extending ear 178 on the arm 52, and provided with a notched surface 180 arranged to engage with a corresponding projection 182 formed on the hub of the hammer 166. A compression spring 184 seated in a recess in the arm 52 tends to move the latch 174 outwardly to engage with and maintain the hammer in its raised position, as illustrated in Figs. 9 and 10.

In order to raise the hammers 166 to the position shown in Fig. 9, there is provided with each hammer, a slide 186 which has mounted thereon a laterally extending arm 188 adapted to engage with a projection 190 on the hammer 166. A tension spring 192 connected at one end to a pin 194 on the slide 186, and at its other end to the support 54, tends normally to hold the slide 186 and arm 188 in the retracted position illustrated in Figs. 8 and 9. It will readily be seen that with the hammer in its lowered or cutting position, the forward movement of the slide 186 will cause the arm 188 to engage with the projection 190 to turn the hammer 166 in a clockwise direction about its pivot against the pressure of its spring 170 until the position illustrated in Figs. 9 and 10 is reached, when the notched portion 180 of the latch 174 moves into locking position over the projection 182. To insure that the idled yarn will be brought into position by the retracting movement of the grab 58 to be cut by the hammer, a hook 196 is formed on the forward cover plate 74 to engage with the leg of the bight of yarn leading from the grab to the selvage edge and to position this yarn certainly across the end of the surface above referred to. After the grab has been moved into position, and after the yarn has been securely positioned under the clamp 82, the latch 174 is tripped to permit the hammer 166 to fall and cut the yarn by the engagement of a cam surface 198 formed on the rear end of the pusher member 150 with a downwardly extending tip of the latch 174 as the pusher slide 154 and pushers 150 and 152 reach the limit of their advancing movement.

For actuating the clamping and cutting mechanisms above described, to cut and clamp idled yarns simultaneously upon all sections of the machine, there is provided with each cutting and clamping unit, an actutaing lever 72 which is rigidly secured to a control rod 200 which extends throughout the length of the machine, and is arranged for both rotational and axial movements to impart the required motions to the several actuating levers 72. An axial movement of the control shaft 200 and actuating levers 72 secured thereto, operates through the levers 60 provided with each unit, to move the cross slide 56 and grabs 58 to engage with and position the idled yarns adjacent both sides of the unit for subsequent cutting and clamping. Rocking movements are imparted to the shaft 200 and actuating levers 72 in each of several axial positions of the shaft 200, first to advance the slide 186 to reset the hammer, and thereafter to advance the pusher slide 154 to cause the yarns to be clamped and cut as above described. The actuating lever 72 is constructed and arranged, as will hereinafter be more fully described, to permit the operation first of one grab and its associated clamping and cutting mechanisms, and thereafter to operate the other grab 58 of each unit and its associated cutting and clamping mechanism, so that the mechanism may be operated first to cut and clamp newly idled yarns at one end of each section of the machine, and upon the knitting of the next course, to cut and clamp the idled yarns at the other end of each section of the machine.

Each of the actuating levers 72 is forked at its upper end to provide three contact members designated respectively at 204, 206, and 208, which are arranged when rendered operative to engage with and advance the two pusher slides 154 and the slides 186 for swinging the hammers 166 upwardly to operative position. The several operating positions of the operating levers 72 with relation to the slides of the respective yarn clamping and cutting units, are clearly indicated in full line and in dotted line positions illustrated in Fig. 8 of the drawings. The actuating levers 72 are normally held in retracted position against the table 30 and out of contact with the operating ends of the several slides, by means of tension springs 210 stretched between the operating levers and fixed points on the table.

The actuating levers 72 associated with each cutting and clamping unit, are operated as follows to cause the idled yarns idled at the right hand end of the adjacent section to the left, to be engaged by the corresponding grab 58, clamped, and cut, and are thereafter operated to cause idled yarns at the left hand end of the adjacent section to the right to be similarly clamped and cut. Starting from the neutral intermediate position illustrated in full lines in Fig. 8, the actuating levers 72 are advanced by the rotational movement of the control shaft 200 so that the slides 186 are engaged and advanced by the contact members 206 and 208 to raise the hammers 166 to operative position. The actuating levers 72 are then permitted to return to their original

positions. The actuating levers 72 and control shaft 200 are now given an axial movement to the right to the dotted line position marked A in Fig. 8, thus causing the cross slide 56 to be moved to the left by the operation of the lever 60, and advancing the corresponding grab 58 to engage the idled yarn or yarns as illustrated in Fig. 13. The control shaft 200 and actuating levers 72 are next given an axial movement in a reverse direction to the dotted line position marked B in Fig. 8 somewhat to the left of the normal stationary position of the parts, so that the grab 58 with a bight of yarn engaged therein is moved slightly beyond center to the right and out of the path of the cooperating yarn pushers 150 and 152. In this B position of the actuating levers 72, it will be noted that the central contact member 204 is in line with the left hand or cooperating pusher slide 154 while the contact members 206 and 208 are out of line with and cannot engage the slides 154. A rotational movement is now imparted to the control shaft 200, causing each of the actuating levers 72 to engage and advance the corresponding slide 154 and pushers 150 and 152 first to push the yarn into clamping position with relation to the clamping lever 82, and thereafter by the engagement of the cam 198 with the latch 174 to trip the hammer 166 and cut the yarn. The actuating levers are subsequently permitted to return to the full line position shown in Fig. 2 under the pressure of their springs 210, and are moved axially with the control shaft 200 to starting position to complete the cycle of operations.

During the knitting of the next following course, the control shaft 200 and actuating levers 72 are caused to pass through an exactly similar but opposite series of movements to cut and clamp any idled yarn or yarns at the left hand end of the adjacent section to the right of each cutting and clamping unit. The shaft 200 is rocked, causing the contact members 206 and 208 on the actuating levers 72 to engage with and advance the slides 154 to raise the hammers 166. The shaft 200 and levers 72 are then moved to their extreme position to the left, acting through the levers 60 to move each cross slide 56 to the right and causing the corresponding grabs 58 to move into engagement with the idled yarn or yarns. The shaft 200 and levers 72 are then moved in a reverse direction to the right slightly beyond central position, so that the active grabs 58 are moved to the left to position the bights of yarn for the subsequent clamping and severing operations. Finally the shaft 200 is again rocked to advance the actuating levers 72, bringing the central contact member 204 of each lever 72 into contact with the right hand pusher slide 154 of the corresponding unit to position and sever the idled yarns.

In accordance with certain features of the present invention, mechanism has been provided which acts automatically when thrown into operation to impart the required axial and rocking movements to the control shaft 200 and actuating levers 72, as above described, in timed relation to the operation of the machine, so that the yarn cutting and clamping units, and more particularly the grabs 58 will be operated in the same timed relationship to the operation of the knitting elements in successive courses to cut and clamp the idled yarns first at one end and then at the other end of each section of the machine. For imparting the required movements to the shaft 200 and levers 72, a separate operating unit is employed which is mounted at some point along the length of the shaft 200 beneath the table 30, and comprises a single revolution cam drum 212 and an auxiliary cam shaft 214 on which the drum is loosely supported and continuously driven at the rate of one revolution for each two of the main cam shaft. The auxiliary cam shaft 214 is rotatably supported in two bearing brackets 216, being held against endwise movement with relation thereto by the collars 218 secured to the shaft, and is driven from the main cam shaft 40 of the machine by means of connections which include a sprocket chain 220 which passes over sprockets 222 and 224 mounted respectively on the main cam shaft 40 and on a countershaft 226, and a sprocket 228 which passes over a sprocket 230 on the countershaft 226 and over a sprocket 232 on the auxiliary cam shaft 214.

For imparting axial movements to the control shaft 200 and actuating levers 72, a cam groove indicated at 234 in Fig. 3 is provided in the periphery of the cam drum 212 to engage a cam roll 236 on a follower 238 which is loosely sleeved to turn on the control shaft 200 being secured to move axially therewith by means of two collars 240 secured to the shaft 200. The follower 238 is maintained in a constant angular position in engagement with the cam groove 234 by the engagement of a roller 242 mounted on an upwardly extending arm of the follower with a guideway formed in a bracket 244 on the under side of the table 30.

Rocking or turning movements are imparted to the control shaft 200 and actuating levers 72 by means of four cams 246 which are bolted to the periphery of the cam drum 212 and are arranged for operative engagement with a roll 248 on a cam follower 250 rigidly secured to the shaft 200.

The cam drum 212 is held rigidly in position against endwise movement on the secondary cam shaft 214 while being permitted to turn with relation thereto by means of a collar 252 which bears against the drum at its right end as viewed in Fig. 3, and is provided at its left end with a sleeve extension or hub 254 which bears against the bearing support 216. With the construction illustrated, a friction brake is provided which acts to hold the drum 212 normally in a stationary position against rotation with the secondary cam shaft 214. The brake comprises a friction disk 256 which is loosely sleeved on the sleeve extension 254 and is held yieldingly against the end of the drum 212 by means of a heavy compression spring 258 which is coiled about the extension 254 between the friction disk 256 and the bearing support 216. A pin 260 rigidly secured to the bearing support 216 engages a slot 262 in the friction disk 256 to hold the disk in a fixed angular position.

With the construction herein disclosed there is provided a single revolution clutch mechanism which is arranged when tripped into operation to operatively connect the cam drum 212 to turn with the auxiliary cam shaft 214 through one revolution to impart the required axial and rocking movements to the control shaft 200 and actuating levers 72 to cut and clamp idled yarns successively at the right hand and left hand ends of each of the several sections of the machine, the drum being then disconnected at its original starting position shown in Fig. 3. There is mounted on the shaft 214 a driving clutch member in the form of a drum 266 which is keyed to turn with and to slide axially of the auxiliary cam shaft 214. The clutch member 266 is provided

on one face with a single clutch tooth **268** which is adapted for engagement with a corresponding recess **270** formed in the adjacent face of the cam drum **212**.

The driving clutch member **266** is moved into and out of clutching engagement with the cam drum **212** by means of two vertically movable clutch control pins **272** and **274** which are mounted to slide toward and away from the clutch member **266** in a bracket **276** mounted on the under side of the table **30** directly above the clutch member **266**. Rack teeth are formed on each of the clutch control pins **272** and **274** to mesh with opposite sides of a pinion **278**, so that movement of one of the clutch control pins into a depressed operating position will cause the other simultaneously to be raised, and vice versa. A compression spring **280** seated in a recess in the table **30** bears against the upper end of the pin **272** to hold this member normally in a depressed operative position corresponding to the open or disengaged position of the clutch member **266**.

To cooperate with the clutch control pins **272** and **274** to move the clutch member **266** into and out of operative engagement with the cam drum **212**, there are provided on the periphery of the clutch member **266**, two cam ribs **282** and **284** which are arranged for operative engagement respectively with the pins **272** and **274** to lock the clutch member **266** either out of or in engagement with the drum **212** as the case may be. There is also provided on the periphery of the cam member **266** between the cam ribs **282** and **284**, a V-shaped shift cam **286** which is adjustably secured by means of a clamping bolt **288** to permit an exact adjustment of the moment at which the clutch tooth **268** will be moved into and out of engagement with the corresponding recess **270** in the cam drum **212** as the clutch control pins **272** and **274** are alternatively dropped into operating position.

The positions of the clutch control pins **272** and **274** are shifted to engage the clutch and are then again shifted to return the clutch to inoperative position at the end of one revolution of the cam drum **212** by means of a clutch pin operating slide **290** best shown in Figs. 3 to 7 inclusive, which is mounted in guideways formed in the bracket **276** to slide lengthwise of the cam shaft **214**, and is provided with a slot **292** through which the clutch control pins **272** and **274** are arranged to pass.

Two parallel cam surfaces **294** are formed on opposite walls of the slot **292** to engage with two small pins **296** on the clutch control pin **272**, so that a movement of the slide **290** to the left as shown in Figs. 3 and 4, causes the clutch pin **272** to be raised against the pressure of its spring **280** and the clutch control pin **274** to be lowered to engage the clutch. A tension spring **298** secured to the slide **290** tends to hold the slide in a position to the extreme left.

During the normal operation of the machine, the slide **290** is maintained in a position to the extreme right against the pressure of its spring **298** by the engagement of a latch **300** pivotally secured at **302** to the slide, with the high portion of a face cam **304** formed on the end of the cam drum **212**. A bent wire spring **306**, see Fig. 2, tends to maintain the latch **300** normally in an operative vertical position in contact with the cam **304**.

When it is desired to trip the yarn cutting and clamping mechanism into operation, the latch **300** is moved to the dotted inclined position shown in Fig. 2 out of contact with the cam **304** to permit the movement of the slide **290** to the left as shown in Fig. 3, by means of a pin **308** which bears at one end against the latch **300**, and at its other end extends into the apex of a V-shaped cam **310** formed on the usual control rod **312** for the machine, so that a movement of the control rod **312** in either direction from the normal position shown in Fig. 3, will serve to advance the pin **308** and trip the latch.

In the operation of the machine, if it be assumed that the machine has been stopped in the usual position for changing yarns, with the needles **42** in their raised position prior to the yarn sinking, as shown in Fig. 1, and that certain of the carriers at either or both ends of each section have been disconnected from their driving means in the idled position shown in Fig. 8, and that other carrier or carriers have been substituted therefor, the operator then shifts the control rod **312** either to the right or to the left to advance the pin **308** and trip the latch **300** out of engagement with the high portion of the cam **304**. The slide **290** is now permitted to move to the left, as shown in Figs. 3 and 4, to raise the clutch control pin **272** against the pressure of its spring **280**, and at the same time depress the pin **274** against the upper surface of the rib **284**. As the machine is now put in operation, the rotation of the auxiliary cam shaft **214** and clutch member **266** in the direction of the arrow, as shown in Fig. 7, will cause the control pin **274** to engage with the shift cam **286** to shift the clutch member **266** to the left and engage the tooth **268** with the corresponding notch **270** in the cam drum **212**. During the subsequent rotation of the cam drum **212**, axial and rocking movements are imparted to the control rod **200** and to the yarn cutting and clamping unit actuating levers **72**, to cause these units to function as above described, during the knitting of the next course to clamp and cut any idled yarn or yarns at the right hand end of each section, and during the following course to perform a similar operation for any idled yarn or yarns at the left hand end of each section of the machine. At the end of a complete revolution of the cam drum **212** which will correspond to two revolutions of the main cam shaft, as above pointed out, the clutch member **266** is automatically shifted to the right to throw the mechanism out of operation. As the cam drum **212** nears the completion of a single revolution, the latch **300** which has been again permitted to drop into its vertical position under the influence of its spring **306**, comes into contact with a rise on the cam **304**, so that the slide **290** is moved to the right against the pressure of its spring **298**, thus permitting the clutch control pin **272** to be forced downwardly by its spring **280** into contact with the periphery of the rib **282** while the clutch control pin **274** is simultaneously raised to inoperative position. The continued rotation of the drive shaft **214** and clutch member **266** now causes the control pin **272** to be engaged by the V-shaped shift cam **286**, so that the clutch member **266** is shifted to the right to disengage the clutch tooth **268** from the notch **270** to arrest the further rotation of the cam drum **212** in its original starting position. The clutch control pin **272** now drops into engagement with the face of the rib **282** to lock the clutch member **266** in its inoperative position until the yarn cutting and clamping mechanism shall again be thrown into operation.

The mechanism above described for cutting and

clamping idled yarns, is automatic in operation, and is adapted for the efficient and certain handling of the idled yarns under any operating conditions which are likely to arise in a multiple section full-fashioned or other flat knitting machine in which a multiplicity of yarn carriers are employed which may be idled at both ends of each section of the machine. With the construction illustrated, for instance, newly idled yarns may be cut and clamped at either end of the machine without disturbing other yarns which may be held by the clamping devices. When one of the idled yarns is placed again in active operation, the end is, of course, held in the clamp until with the knitting of subsequent courses, the juncture of the yarn with the fabric has been moved far enough away from the needles to cause the end to be pulled out of the clamp. It will be noted also that the guard 86 serves to accurately position the yarn ends so that when a previously idled yarn carrier is again rendered operative, the yarn will be accurately fed into the path of the yarn engaging throat of the first sinker.

While the cutting and clamping mechanism herein shown and described, is applied to a multiple section cotton type full-fashioned machine, it is to be understood that it is applicable to any type of straight machine, and that certain features are applicable to other types of knitting machines.

I claim:

1. In a flat knitting machine, the combination with a series of needles movable as a unit and their cooperating knitting elements including yarn measuring sinkers to which the yarn is fed, of a plurality of yarn carriers each adapted for laying yarn along said needle series and for idling adjacent the same end thereof, a yarn severing device for severing yarn extending between the fabric and an idled carrier or carriers, mechanism operating in timed relation to the operation of the machine during the traverse of a selected active carrier to actuate said cutter to cut yarn extending between the fabric and said idled carrier or carriers, and means under the control of the operator for throwing said mechanism into operation to cut the idled yarn or yarns.

2. In a flat knitting machine, the combination with a series of needles movable as a unit and their cooperating knitting elements including yarn measuring sinkers to which the yarn is fed, of a plurality of yarn carriers selectively operable for laying yarn along said needle series and for idling adjacent the end thereof, a yarn severing and clamping device acting to clamp the idled yarn extending between an idle carrier and the fabric and to sever said clamped yarn from the fabric, mechanism operating in timed relation to the operation of the machine to actuate said device to clamp and cut idled yarn, and control means for throwing said mechanism into operation.

3. In a flat knitting machine, the combination with a series of needles movable as a unit and their cooperating knitting elements including yarn measuring sinkers to which the yarn is fed, of a plurality of yarn carriers selectively operable for laying yarn along said needle series and for idling adjacent thereto, and yarn severing and clamping means including means to clamp the yarn extending between an idled carrier and the fabric for subsequent feeding of the yarn by the carrier to the sinkers, and means to sever the clamped yarn from the fabric.

4. In a flat knitting machine, the combination with a series of needles movable as a unit and their cooperating knitting elements including yarn measuring sinkers to which the yarn is fed, of a plurality of yarn carriers selectively operable for laying yarn along said needle series and for idling adjacent thereto, yarn severing and clamping means including means to clamp the yarn extending between each idled carrier and the fabric for subsequent feeding of the yarn by the carrier to the sinkers, and means to sever the clamped yarn from the fabric, and mechanism for actuating the yarn cutting and clamping means in timed relation to the operation of the machine.

5. In a flat knitting machine, the combination with a series of needles movable as a unit and their cooperating knitting elements including yarn measuring sinkers to which the yarn is fed, of a plurality of yarn carriers selectively operable for laying yarn along said needle series and for idling adjacent one end thereof, yarn severing and clamping means located at the end of said needle series adjacent the idling position of said carriers, mechanism operating in timed relation to the operation of the machine during the laying of yarn by an active carrier to actuate said yarn severing and clamping means to clamp and sever yarn from an idled carrier, and means under the control of the operator for actuating said mechanism.

6. In a multiple section flat knitting machine, the combination in each section of a series of needles movable as a unit and their cooperating knitting elements including yarn measuring sinkers to which the yarn is fed, yarn carriers adapted for laying yarn along each of said needle series, yarn cutters associated with each of said sections, and means for simultaneously operating said cutters in timed relation to the traversing movement of a selected active carrier to cut yarns leading to the fabric from idled carriers of the several sections.

7. In a multiple section flat knitting machine, the combination in each section of a series of needles movable as a unit and their cooperating knitting elements including yarn measuring sinkers to which the yarn is fed, yarn carriers adapted for laying yarn along each of said needle series, yarn severing and clamping means associated with each of said sections, and means for simultaneously operating each of said yarn severing and clamping means to clamp and cut yarn extending between the fabric and idled carriers of the several sections.

8. In a multiple section flat knitting machine, the combination in each section of a series of needles movable as a unit and their cooperating knitting elements including yarn measuring sinkers to which the yarn is fed, yarn carriers adapted for laying yarn along each of said needle series and for idling adjacent thereto, yarn severing and clamping units associated with each of said sections including means to clamp a yarn extending between an idled carrier and the fabric associated therewith in position for subsequent laying of the yarn by the carrier, means to cut the yarn extending between the clamp and the fabric, and means for simultaneously operating each of said yarn severing and clamping units.

9. In a multiple section flat knitting machine, the combination in each section of a series of needles movable as a unit and their cooperating knitting elements including yarn measuring sinkers to which the yarn is fed, yarn carriers adapted for laying yarn along each of said needle series having idling positions at corresponding ends of

each section, yarn severing and clamping means located adjacent said idling positions of each of said carriers to cut and clamp the yarn from said carriers in idling position, and means under the control of the operator for simultaneously operating said yarn severing and clamping means to clamp and cut yarns extending between the fabrics and idled carriers of the several sections.

10. In a multiple section flat knitting machine, the combination in each section of a series of needles movable as a unit and their cooperating knitting elements including yarn measuring sinkers to which the yarn is fed, yarn carriers adapted for laying yarn along each of said needle series, yarn severing and clamping units associated with each of said sections including means to clamp a yarn extending between an idled carrier and the fabric associated therewith, means to cut the yarn between the clamp and the fabric, mechanism for actuating said yarn cutting and clamping units in timed relation to the operation of the machine, and independently operable control means for throwing said mechanism into operation to clamp and cut idled yarns of the several sections.

11. In a multiple section flat knitting machine, the combination in each section of a series of needles and their cooperating knitting elements, yarn carriers adapted for laying yarn along each section of said needle series, separate units associated with each section for cutting and clamping idled yarns, and means including a control shaft for simultaneously controlling said units to cut and clamp idled yarns.

12. In a multiple section flat knitting machine, the combination in each section of a series of needles and their cooperating knitting elements, yarn carriers adapted for laying yarn along each section of said needle series, separate units associated with each section for cutting and clamping idled yarns, means including a control shaft for simultaneously controlling said units to cut and clamp idled yarns, and mechanism acting when rendered operative in timed relation to the operation of the machine to cut and clamp idled yarns.

13. In a multiple section flat knitting machine, the combination in each section of a series of needles and their cooperating knitting elements, yarn carriers adapted for laying yarn along each section of said needle series, separate units associated with each section for cutting and clamping idled yarns, means including a control shaft for simultaneously actuating said units to cut and clamp the idled yarns, and driving connections including a single revolution clutch for actuating said control shaft to cut and clamp the idled yarns.

14. In a multiple section flat knitting machine, the combination in each section of a series of needles and their cooperating knitting elements, yarn carriers adapted for laying yarn along each of said needle series and having idle positions at each end thereof, separate units located between each two sections and at the ends of the machine for cutting and clamping idled yarns, and means including a control shaft and a connection therefrom to each of said units for actuating said units alternatively to cut the idled yarns simultaneously at the left hand or right hand end of each section.

15. In a multiple section flat knitting machine, the combination in each section of a series of needles and their cooperating knitting elements, yarn carriers adapted for laying yarn along each of said needle series and having idle positions at each end thereof, separate units located between each two sections and at the ends of the machine for cutting and clamping idled yarns, means including a control shaft and a connection therefrom to each of said units for actuating said units alternatively to cut the idled yarns simultaneously at the left hand or right hand end of each section, and connections acting when rendered operative in timed relation to the operation of the machine for actuating said control shaft to cut and clamp idled yarns simultaneously at one end and then at the other end of each section in following courses.

16. In a flat knitting machine, the combination with a knitting section comprising a series of needles and their cooperating knitting elements, of a plurality of yarn carriers selectively operable for laying yarn along the needle series and having idling positions adjacent one end thereof, and means for cutting and clamping the yarns between the fabric and selected carriers moved to inoperative position including means for cutting the yarn, and a clamp for clamping the severed yarn from each of said successively idled carrier or carriers for subsequent laying of the yarn by a selected carrier or carriers, said clamp acting to add the newly idled and severed yarns to the group held by said clamp, and to permit the removal from the clamped group of yarn ends knitted into the fabric.

17. In a flat knitting machine, the combination with a series of needles and their cooperating knitting elements, of a plurality of yarn carriers selectively operable for laying yarn along the needle series and having idling positions adjacent one end thereof, means for cutting and clamping the yarns between the fabric and selected carriers moved to inoperative position including a clamp for clamping yarns leading from successively idled carriers to the fabric for subsequent laying of the yarn by a selected carrier or carriers, said clamp acting to add the newly idled yarn to the group held by said clamp, means to sever the clamped yarn from the fabric, and mechanism acting in timed relation to the operation of the machine for actuating said yarn severing and clamping device.

18. In a flat knitting machine, the combination with a series of knitting needles movable as a unit and their cooperating knitting elements including yarn measuring sinkers to which the yarn is fed, of a plurality of yarn carriers selectively operable for laying yarn along the needle series and for idling adjacent thereto, a yarn severing and clamping mechanism including means to clamp yarn extending between an idled carrier and the fabric for subsequent feeding of the yarn by said carrier, said clamping means acting to position the additionally idled yarns with the clamped group, means to sever the clamped yarn from the fabric, and means for rendering said mechanism operative to clamp and cut idled yarns.

19. In a flat knitting machine, the combination with a knitting section comprising a series of needles and their cooperating knitting elements, of a plurality of yarn carriers having idling positions adjacent one end thereof, and cutting and clamping units adjacent said idled carriers including a cutter, a clamp, and means for positioning added yarns in said clamp.

20. In a flat knitting machine, the combination with a knitting section comprising a series of

needles and their cooperating knitting elements, of a yarn carrier adapted for laying yarn along said needle series and having an idling position adjacent one end thereof, a unit for cutting and clamping the idled yarn between said carrier and the fabric comprising a cutter, a yarn grab, and a pusher device for positioning the yarn held by the grab in the clamp.

21. In a flat knitting machine, the combination with a knitting section comprising a series of needles and their cooperating knitting elements, of a yarn carrier adapted for laying yarn along said needle series and having an idling position adjacent one end thereof, a unit for cutting and clamping the idled yarn between said carrier and the fabric comprising a cutter, a yarn clamp, a device for pushing the yarn into clamping position in said clamp, and a yarn grab to engage with the yarn between the carrier and the fabric to position said yarn for the operation of said pushing device and cutter.

22. In a flat knitting machine, the combination with a knitting section comprising a series of needles movable as a unit and their cooperating knitting elements including yarn measuring sinkers to which the yarn is fed, of a plurality of yarn carriers having idling positions adjacent each end thereof, of a yarn severing and clamping unit located adjacent each end of the section arranged to cut and clamp yarns extending between the fabric and carrier or carriers standing idle adjacent the corresponding end of the section for subsequent feeding of the yarn by said carrier or carriers to the sinkers, connections acting when rendered operative in timed relation to the operation of the machine for operating said yarn severing and clamping devices successively during the knitting of two succeeding courses to cut and clamp the idle yarns first at one end and then at the other end of said section, and means for rendering said connections operative to clamp and cut the idled yarns.

23. In a flat knitting machine, the combination with a series of needles movable as a unit and their cooperating knitting elements including yarn measuring sinkers to which the yarn is fed, of a plurality of yarn carriers having idling positions adjacent each end thereof, of a yarn severing and clamping unit located at each end of the section arranged to cut and clamp yarns extending between the fabric and carrier or carriers standing idle adjacent the corresponding end of the section, said clamping means being arranged to permit the addition or subtraction of selected yarns to the clamped group, and connections acting when rendered operative in timed relation to the operation of the machine for operating said yarn severing and clamping devices successively during the knitting of two succeeding courses to cut and clamp the idle yarns first at one end and then at the other end of said section.

24. In a flat knitting machine, the combination with a knitting section comprising a series of needles movable as a unit and their cooperating knitting elements including yarn measuring sinkers to which the yarn is fed, of a plurality of yarn carriers having idling positions adjacent the end of the needle series, and means for cutting and clamping idled yarns between the fabric and an idled carrier or carriers comprising a yarn cutter, a yarn clamp, a yarn grab for engaging with and drawing the idled yarn into position for cutting and clamping, and means for actuating said grab, and thereafter for actuating said cutter and clamp to sever and clamp the idled yarn.

25. In a flat knitting machine, the combination with a knitting section comprising a series of needles movable as a unit and their cooperating knitting elements including yarn measuring sinkers to which the yarn is fed, of a plurality of yarn carriers associated therewith selectively operable for laying yarn along the needle series and for idling adjacent the end thereof, and a yarn severing and clamping unit comprising a yarn clamping device, a yarn severing device, a grab, means for actuating said grab to engage the idled yarn between an idled carrier and the fabric and to position the leg of the bight formed by the grab leading to the fabric in position for severing, and the leg of the bight leading from the carrier in position for engagement by said clamping device, and means for thereafter actuating the clamping and severing devices to clamp and sever the idled yarn.

26. In a flat knitting machine, the combination with a knitting section comprising a series of needles and their cooperating knitting elements, of a plurality of yarn carriers associated therewith selectively operable for laying yarn along the needle series and for idling adjacent the end thereof, and a cutter and clamping unit comprising a yielding clamping member, a cutter, a pusher device for engaging properly positioned yarn in said clamp, a grab arranged to take a bight of the yarn extending between the fabric and a carrier and to position the leg thereof leading from the carrier in the path of said pusher device, and to position the leg thereof leading from the carrier to the fabric for severing by said cutter to leave a substantial length of yarn passing through the clamp, means for actuating the grab, and thereafter for actuating said cutter and clamp to sever and clamp the idled yarn.

27. In a flat knitting machine, the combination with a knitting section comprising a series of needles and their cooperating knitting elements, of a plurality of yarn carriers associated therewith selectively operable for laying yarn along the needle series and for idling adjacent the end thereof, and a cutter and clamping unit comprising a yielding clamping member, a cutter, a pusher device for engaging properly positioned yarn in said clamp, a grab, a slide movable in a direction lengthwise of the needle series and having a pivotal mounting for said grab, cam means rendered operable by the movement of said slide for pivotally moving said grab to engage an idled yarn extending between the fabric and a carrier, and during the return movement of said slide to position the leg of the bight held by the grab extending from the carrier for engagement by said pusher and clamp, and to position the leg thereof leading from the fabric in the path of the knife, means rendered operative by the advance of the pusher to clamp yarn to trip the knife, and actuating connections including a member arranged for reciprocatory movements in one direction to advance and return said slide, and fully reciprocatory movements in another direction to advance and retract said pusher device.

28. In a flat knitting machine, the combination with a knitting section comprising a series of needles and their cooperating knitting elements, of a plurality of yarn carriers associated therewith selectively operable for laying yarn along the needle series and for idling adjacent the end thereof, and a cutter and clamping unit comprising a yielding clamping member, a cutter, a pusher device for engaging properly positioned yarn in said clamp, a slide movable in a direction

lengthwise of the needle series and having a pivotal mounting for said grab, cam means rendered operable by the movement of said slide for pivotally moving said grab to engage an idled yarn extending between the fabric and a carrier, and during the return movement of said slide to position the leg of the bight held by the grab extending from the carrier for engagement by said pusher and clamp, and to position the leg thereof leading from the fabric in the path of the cutter, means rendered operative by the advance of the pusher to clamp yarn to trip the cutter, and actuating connections for reciprocating said slide, and thereafter for advancing and retracting the pusher member to clamp and sever the yarn.

29. In a flat knitting machine, the combination with a knitting section comprising a series of needles and their cooperating knitting elements, and a plurality of yarn carriers associated therewith selectively operable for laying yarn along the needle series and having idling positions adjacent the end thereof, of a yarn severing and clamping unit comprising a yarn clamping device, a yarn severing device, a yarn grab acting when rendered operative to engage with and position an idled yarn or yarns for the operation of the yarn clamping and severing devices, and an actuating mechanism therefor comprising an axially movable and rotatable shaft, and connections rendered operative by the axial movement of the shaft for actuating the grab and by a rotational movement of the shaft for actuating said clamping and severing devices.

30. In a flat knitting machine, the combination with a knitting section comprising a series of needles and their cooperating knitting elements, and a plurality of yarn carriers associated therewith selectively operable for laying yarn along the needle series and having idling positions adjacent the end thereof, of a yarn severing and clamping unit comprising a yarn severing device, a yarn clamping device, a yarn grab, an actuating mechanism therefor comprising an axially movable and rotatable shaft, connections actuated by the axial movement of the shaft for actuating the grab, connections rendered operative by the rotational movement of the shaft for operating the yarn clamping and severing devices, and cam actuated means for imparting axial and rocking movements to the shaft to actuate the grab, and thereafter to operate said clamping and severing devices to clamp and to sever the clamped yarn.

31. In a flat knitting machine, the combination with a knitting section comprising a series of needles and their cooperating knitting elements, and a plurality of yarn carriers associated therewith selectively operable for laying yarn along the needle series and for idling adjacent the end thereof, of a yarn severing and clamping unit comprising a yarn severing device, a yarn clamping device, a yarn grab to engage and position an idled yarn for the operation of said devices, an actuating mechanism therefor comprising a control shaft, connections rendered operative by the axial movement of the shaft to actuate the grab, and by rocking movements of the shaft for actuating the yarn severing and clamping devices to clamp and cut the idled yarn, and devices for controlling the operation of said control shaft comprising control shaft axial shifting and rocking cams, a driving member continuously driven in timed relation to the machine, means for clutching the cams to the driving member, and means rendered operative at the completion of the cutting and clamping operation to disconnect the clutch.

32. In a flat knitting machine, the combination with a knitting section comprising a series of needles and their cooperating knitting elements, and a plurality of yarn carriers associated therewith selectively operable for laying yarn along the needle series and for idling adjacent each end thereof, of a yarn severing and clamping unit mounted at each end of the section, each of said units comprising a clamping member comprising a yarn clamping device, a yarn severing device, a yarn grab for engaging and positioning an idled yarn for the operation of said devices, an actuating mechanism therefor comprising a control shaft, connections from said shaft associated with each of said units rendered operative by the axial movement of the shaft in one direction to actuate the grab associated with one of said units, and by movement axially in the other direction to operate the grab associated with the other of said units, and by rocking movements of the shaft to operate the yarn clamping and severing devices associated with the active grab to clamp and cut the yarn held by said grab.

33. In a flat knitting machine, the combination with a series of needles and their cooperating knitting elements, of a yarn carrier adapted for laying yarn along the needle series and having an idling position adjacent one end thereof, and a yarn severing and clamping device comprising means independently of the carrier for clamping an idled yarn leading from the idled carrier to the fabric at a point beyond the end of the needle series and beyond the idle position of the carrier for subsequent laying of the yarn by the carrier, and means for severing the idled yarn between the clamp and the fabric.

34. In a flat knitting machine, the combination with a series of needles and their cooperating knitting elements, of a yarn carrier adapted for laying yarn along the needle series and having an idling position adjacent one end thereof, and a yarn severing and clamping device comprising means independent of the carrier for clamping an idled yarn leading from the idled carrier to the fabric at a point beyond the end of the needle series and beyond the idled position of the carrier for subsequent laying of the yarn by the carrier, means for severing the idled yarn between the clamp and the fabric, and means for actuating the yarn severing and clamping device.

35. In a flat knitting machine, the combination with a series of needles and their cooperating knitting elements, of a yarn carrier adapted for laying yarn along the needle series and having an idling position adjacent one end thereof, and a yarn severing and clamping device comprising means for clamping an idled yarn leading from the idled carrier to the fabric at a point beyond the end of the needle series and beyond the idle position of the carrier for subsequent laying of the yarn by the carrier, means for severing the idled yarn between the clamp and the fabric, and means for positioning the idled yarn for the operation of the yarn severing and clamping device.

36. In a flat knitting machine, the combination with a series of needles movable as a unit and their cooperating knitting elements including yarn measuring sinkers to which the yarn is fed, of a yarn carrier adapted for laying yarn along the needle series and having an idle posi-

tion adjacent one end thereof, and a yarn severing and clamping device comprising means for clamping an idled yarn leading from the idled carrier to the fabric at a point beyond the end of the needle series and beyond the idle position of the carrier for subsequent laying by the carrier, means for severing the idled yarn between the clamp and the fabric, and a yarn grab for positioning the idled yarn for the operation of the yarn severing and clamping device.

37. In a flat knitting machine, the combination with a knitting section comprising a series of needles movable as a unit and their cooperating knitting elements including yarn measuring sinkers to which the yarn is fed, of a plurality of yarn carriers selectively operable for laying yarn along the needle series and having idling positions adjacent one end thereof, a yarn severing and clamping device adapted to sever and clamp idled yarn presented thereto, and a yarn grab acting when rendered operative to engage with and present to said yarn severing and clamping device yarn leading from an idled carrier to the fabric.

38. In a flat knitting machine, the combination with a knitting section comprising a series of needles movable as a unit and their cooperating knitting elements including yarn measuring sinkers to which the yarn is fed, of a plurality of yarn carriers selectively operable for laying yarn along the needle series and having idling positions adjacent the end thereof, a yarn severing and clamping device acting when rendered operative to engage in the clamp and to sever yarn extending between an idled carrier and the fabric, and means for actuating said device during the operation of a selected carrier to lay yarn.

39. In a flat knitting machine, the combination with a knitting section comprising a series of needles movable as a unit and their cooperating knitting elements including yarn measuring sinkers to which the yarn is fed, of a plurality of yarn carriers selectively operable for laying a yarn or yarns along the needle series and having idling positions adjacent the end thereof, a yarn severing and clamping device acting when rendered operative to engage in the clamp and to sever yarn extending between an idled carrier or carriers and the fabric, and cam means for actuating said device in timed relation to the operation of the machine to clamp and sever yarns from a previously idled carrier or carriers during the operation of a selected active carrier.

40. In a flat knitting machine, the combination with a knitting section comprising a series of needles and their cooperating knitting elements, of a plurality of yarn carriers selectively operable for laying yarn along the needle series and having idling positions adjacent the end thereof, a yarn severing and clamping device acting when rendered operative to engage in the clamp and to sever yarn extending between an idled carrier and the fabric, cam means for actuating said device in timed relation to the operation of the machine during the operation of a selected active carrier, and means under the control of the operator for rendering said cam means operative to sever and clamp idled yarn.

41. In a flat knitting machine, the combination with a knitting section comprising a series of needles and their cooperating knitting elements, of a plurality of yarn carriers selectively operable for laying a yarn or yarns along the needle series and having idling positions adjacent the end thereof, a yarn severing and clamping device acting when rendered operative to engage in the clamp and to sever yarns extending between an idled carrier or carriers and the fabric, actuating connections including a cam member for operating said yarn severing and clamping device, and a single revolution clutch acting when rendered operative to drive said cam member in timed relation to the operation of the machine.

42. In a flat knitting machine, the combination with a series of needles movable as a unit and their cooperating knitting elements including yarn measuring sinkers to which the yarn is fed, of a plurality of yarn carriers selectively operable for laying yarn along said needle series and for idling adjacent thereto, yarn severing and clamping means including means to clamp the yarn extending between an idled carrier and the fabric for subsequent feeding of the yarn by the carrier to the sinkers, and means to sever the clamped yarn from the fabric, and control means for rendering said severing and clamping means operative to clamp and sever idled yarn.

43. In a multiple section flat knitting machine, the combination in each section of a series of needles movable as a unit and their cooperating knitting elements including yarn measuring sinkers to which the yarn is fed, yarn carriers adapted for laying yarn along each of said needle series, yarn severing and clamping means associated with each of said sections, a yarn grab associated with each of said sections to engage with and present a portion of yarn extending between the carrier and the fabric to said yarn severing and clamping means, and means for simultaneously operating each of said grabs and said yarn severing and clamping means to clamp and cut yarn extending between the fabric and idled carriers of the several sections.

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