Jan. 27, 1942. C. MOSES 2,271,302

KNITTING MACHINE

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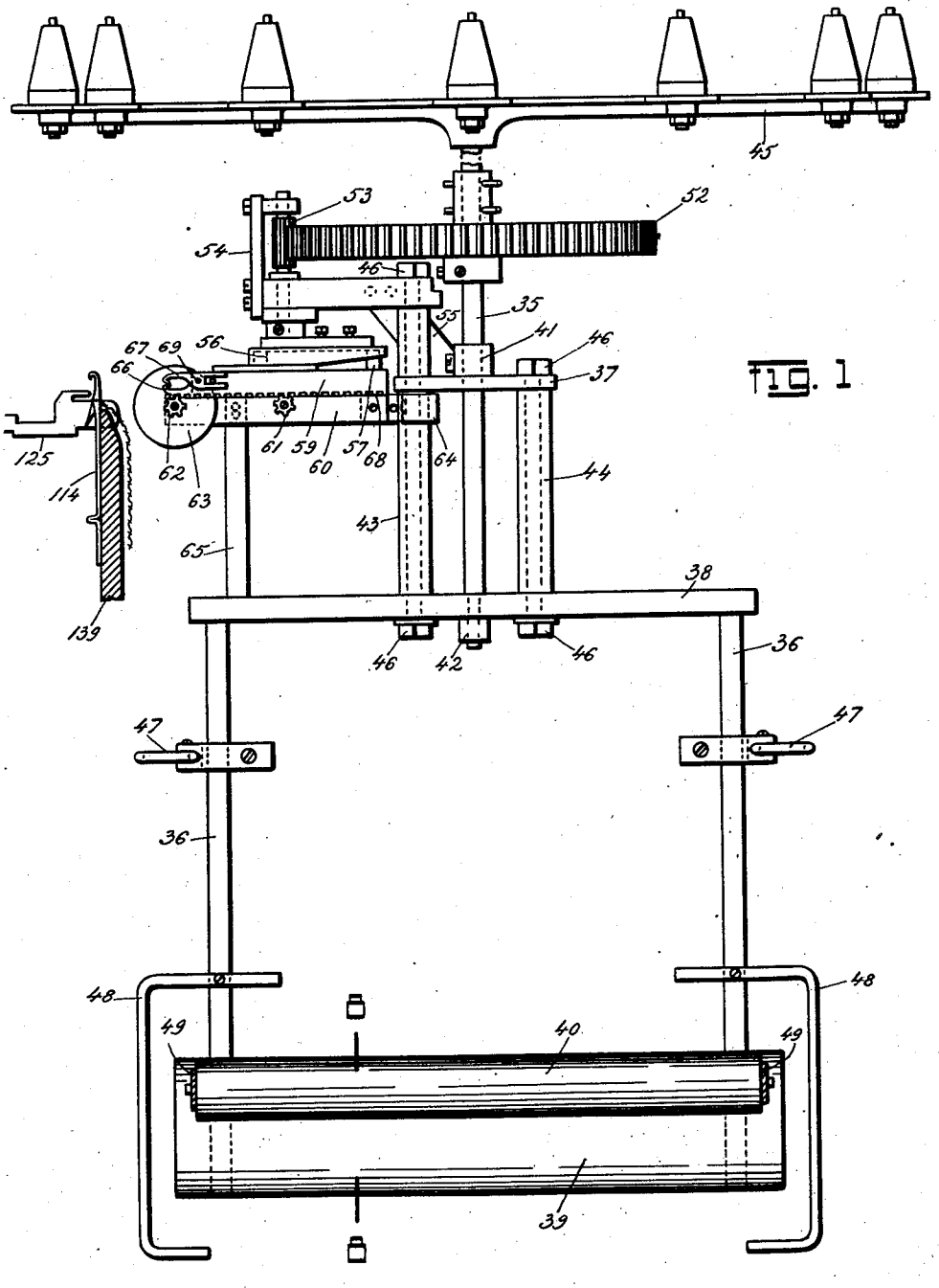


FIG. 1



FIG. 2a

INVENTOR.
CHARLES MOSES

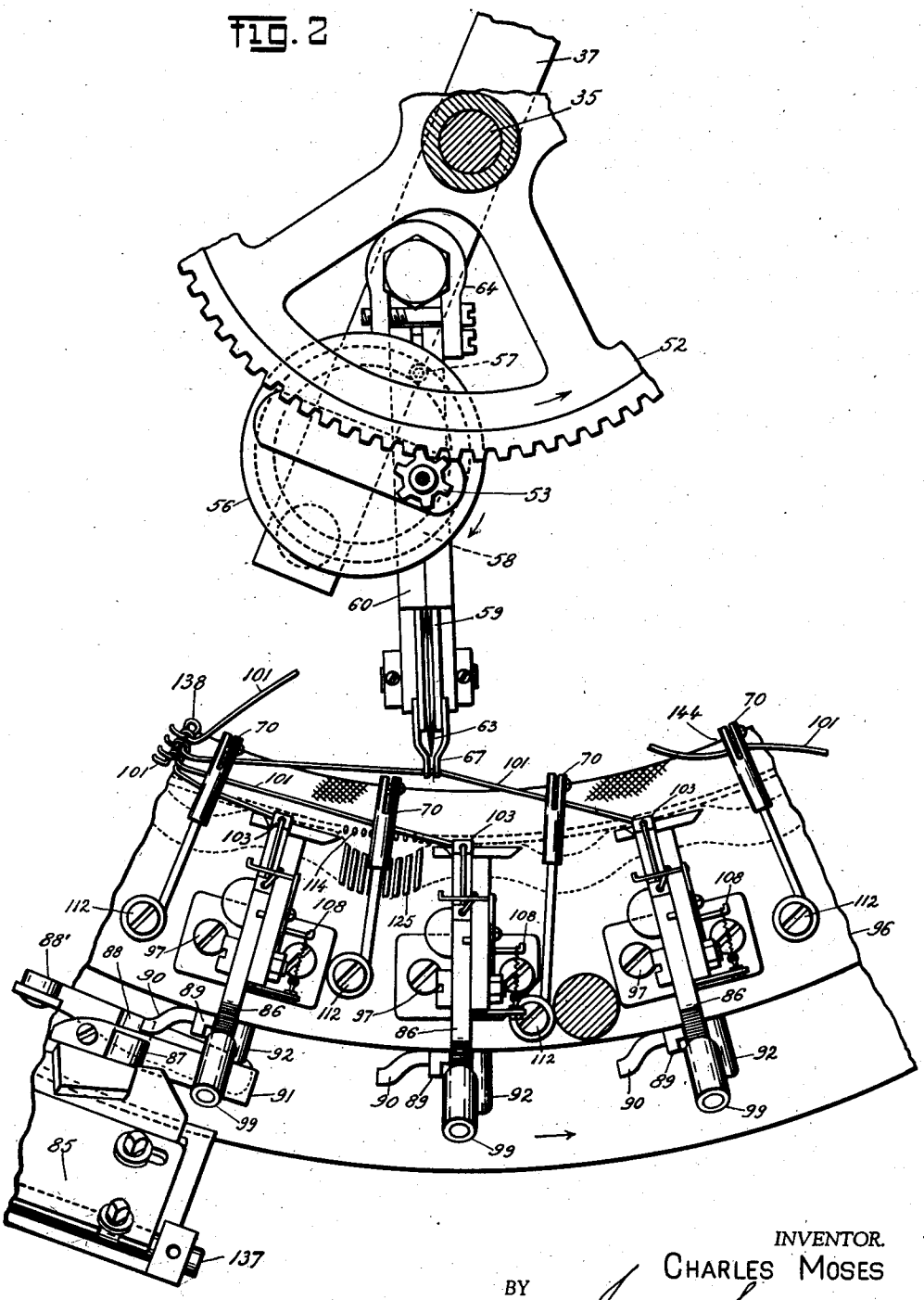
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KNITTING MACHINE

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Fig. 2



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KNITTING MACHINE

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Fig. 8

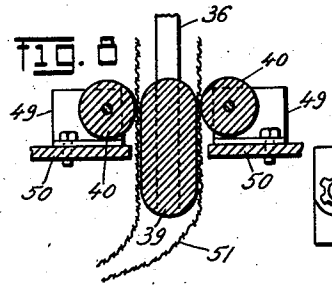


Fig. 3

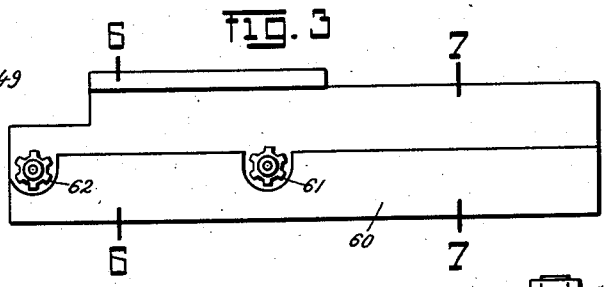


Fig. 4

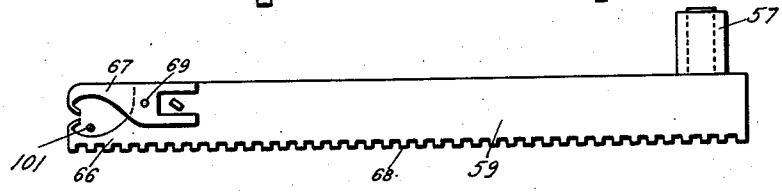


Fig. 5

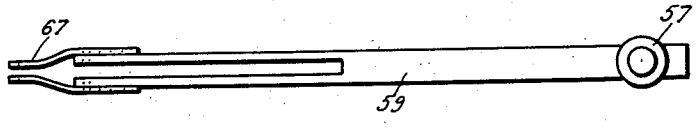


Fig. 6

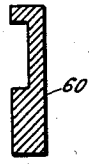


Fig. 7

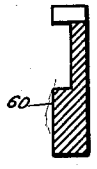
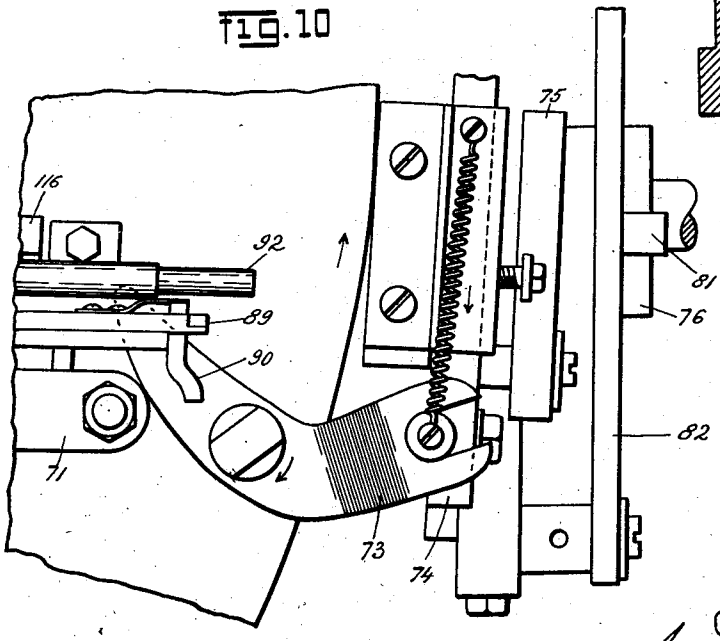


Fig. 10



INVENTOR.
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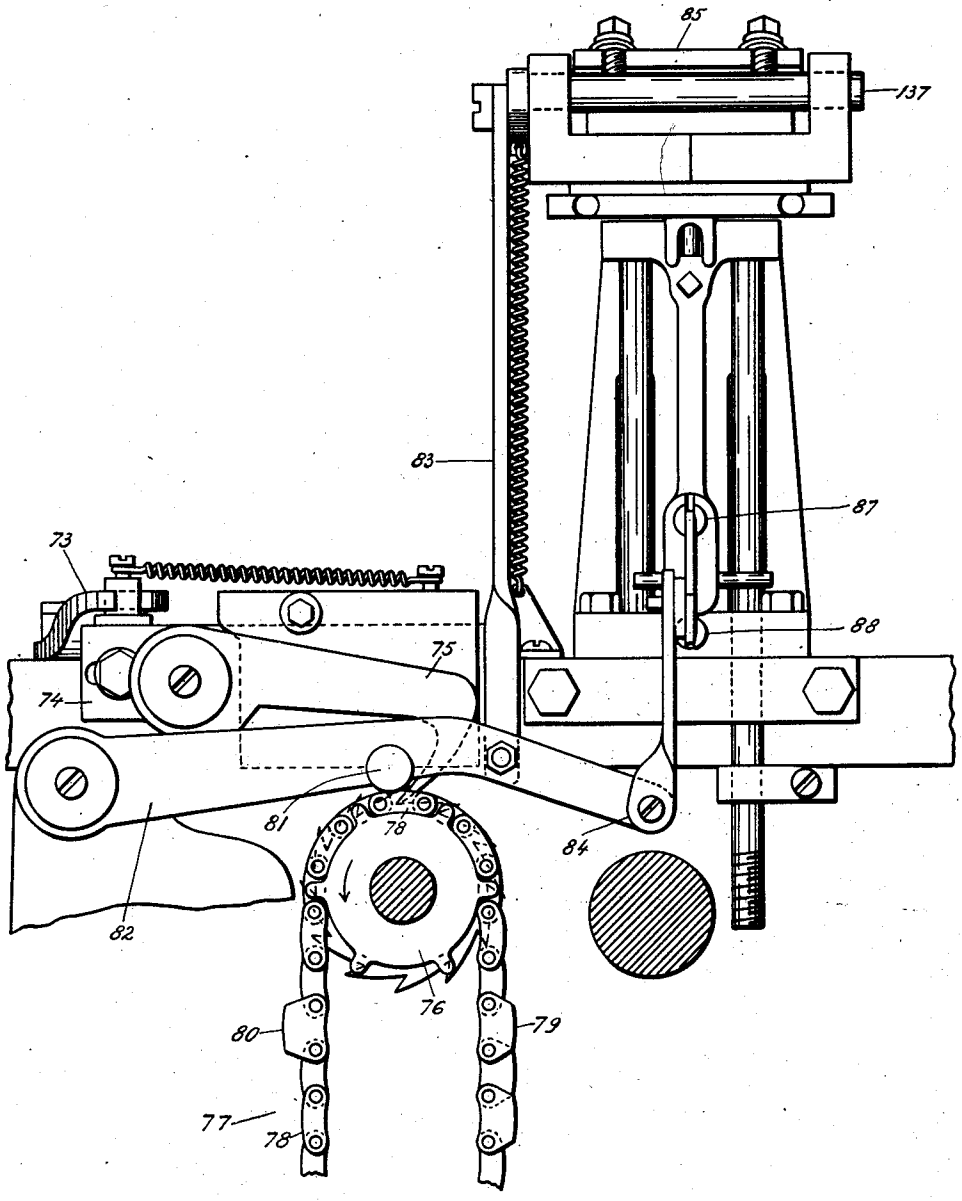
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FIG. 5



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Fig. 11

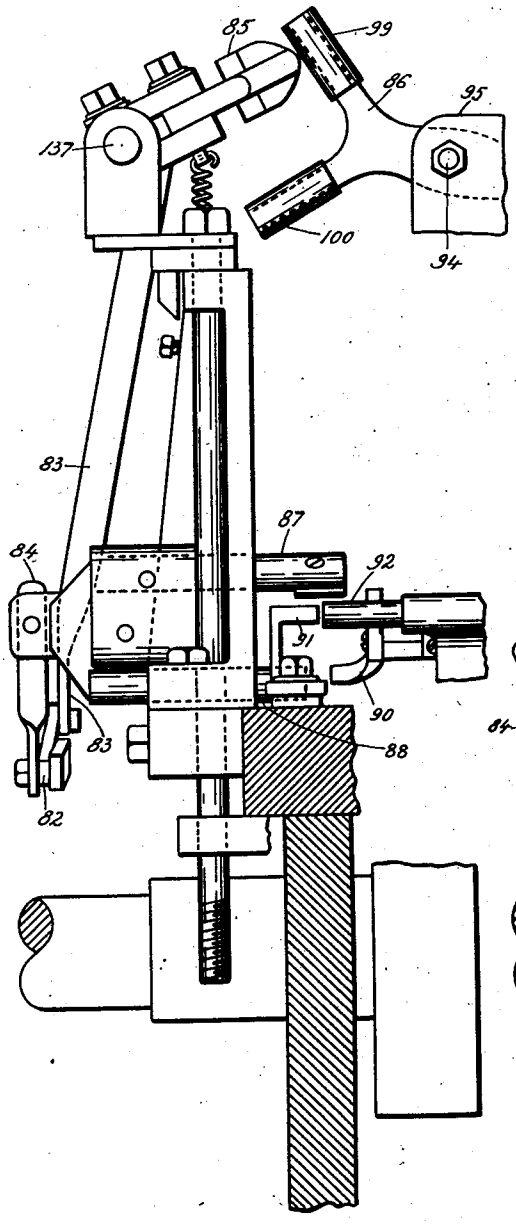
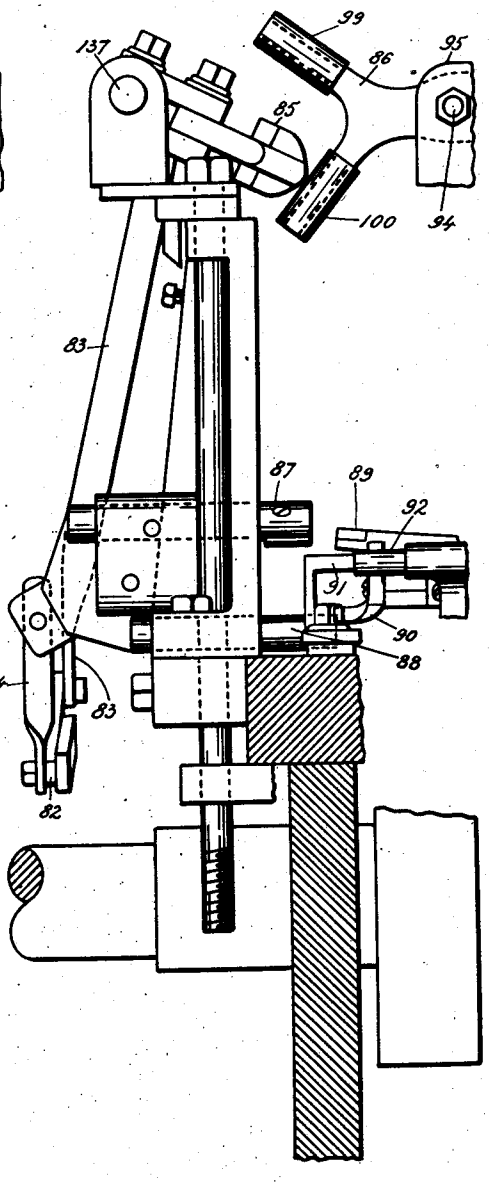


Fig. 12



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KNITTING MACHINE

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Fig. 31

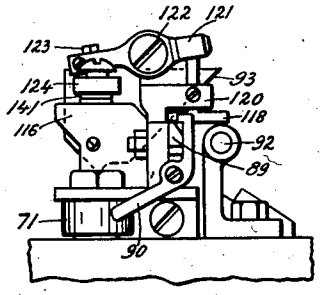


Fig. 13

Fig. 19

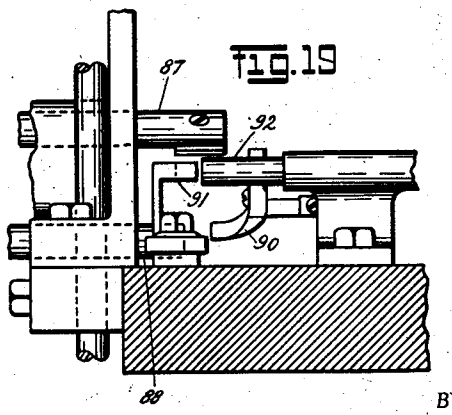
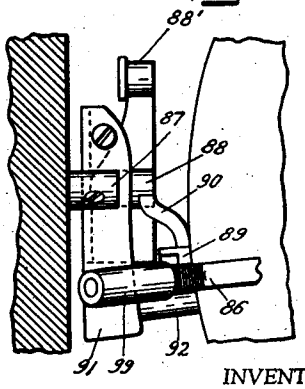


Fig. 20



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KNITTING MACHINE

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Fig. 14

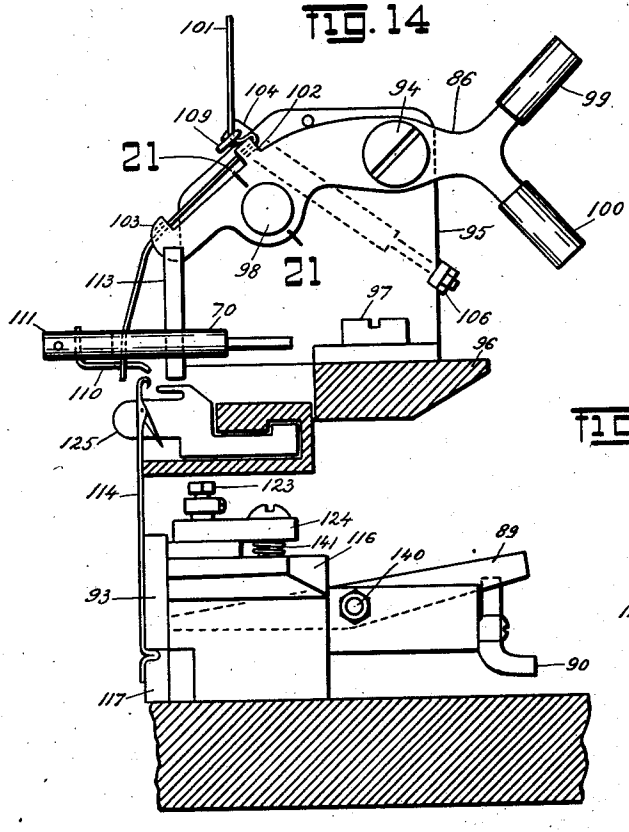


Fig. 21

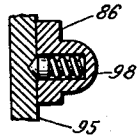


Fig. 25

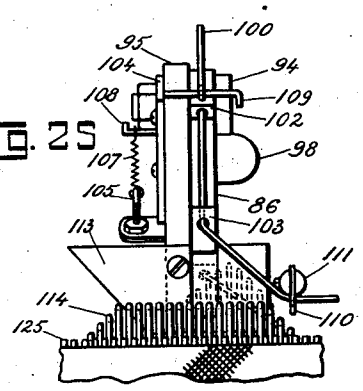


Fig. 22

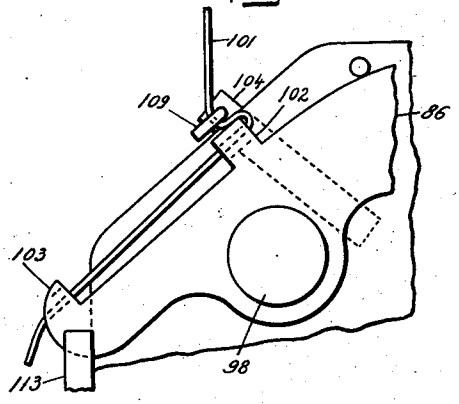
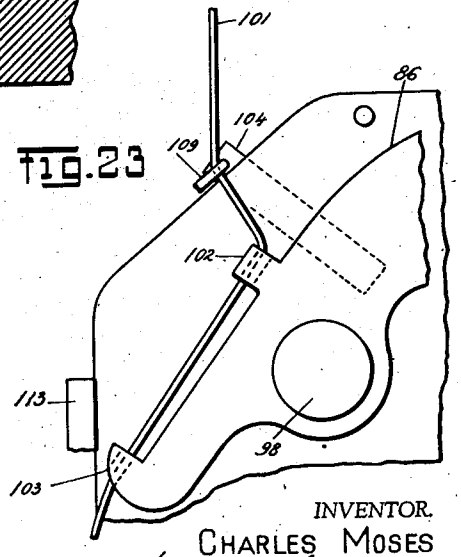


Fig. 23



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KNITTING MACHINE

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Fig. 15

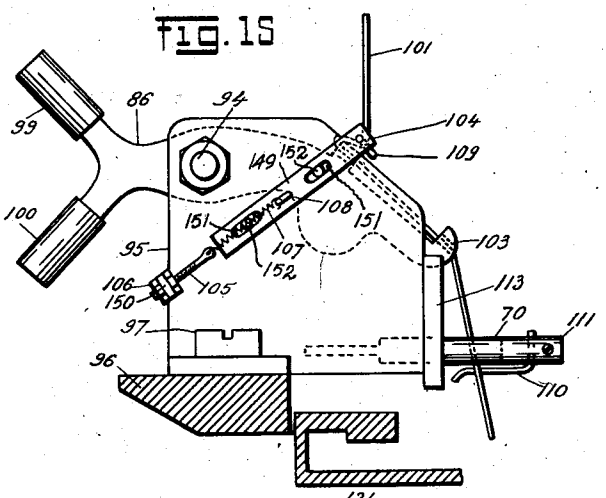


Fig. 17

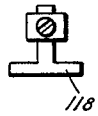
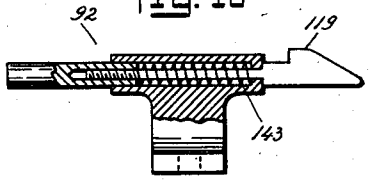


Fig. 16



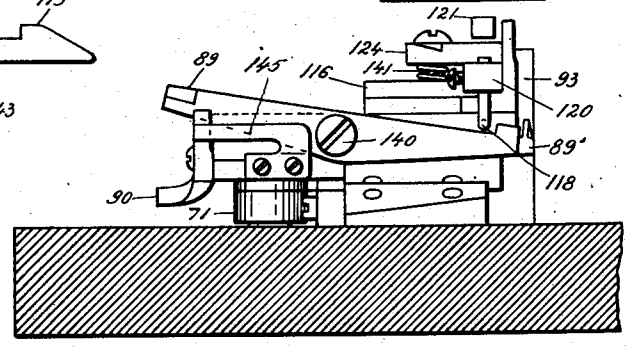


Fig. 18

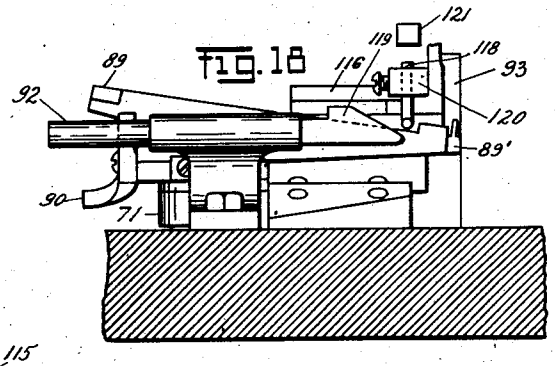
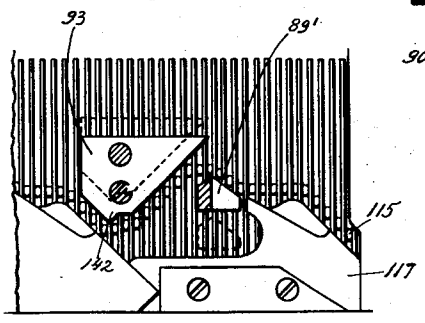


Fig. 24



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KNITTING MACHINE

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Fig. 27

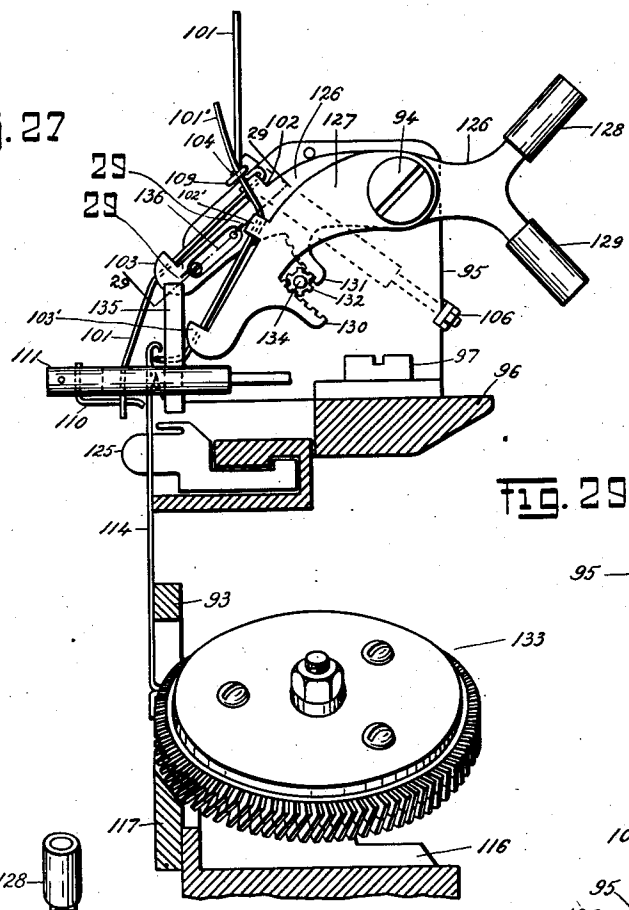


Fig. 29

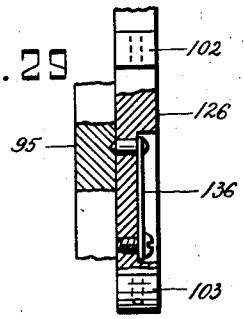


Fig. 28

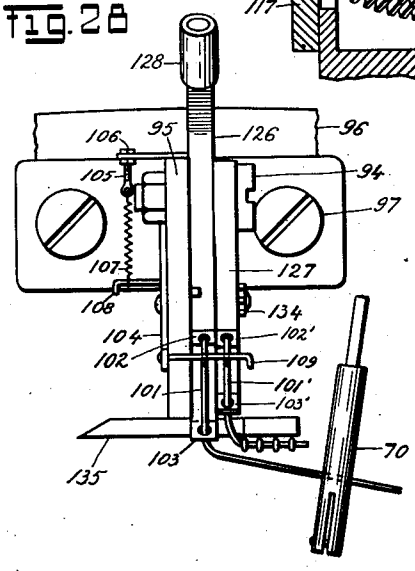
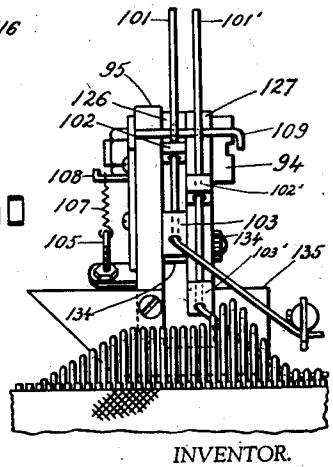


Fig. 30



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KNITTING MACHINE

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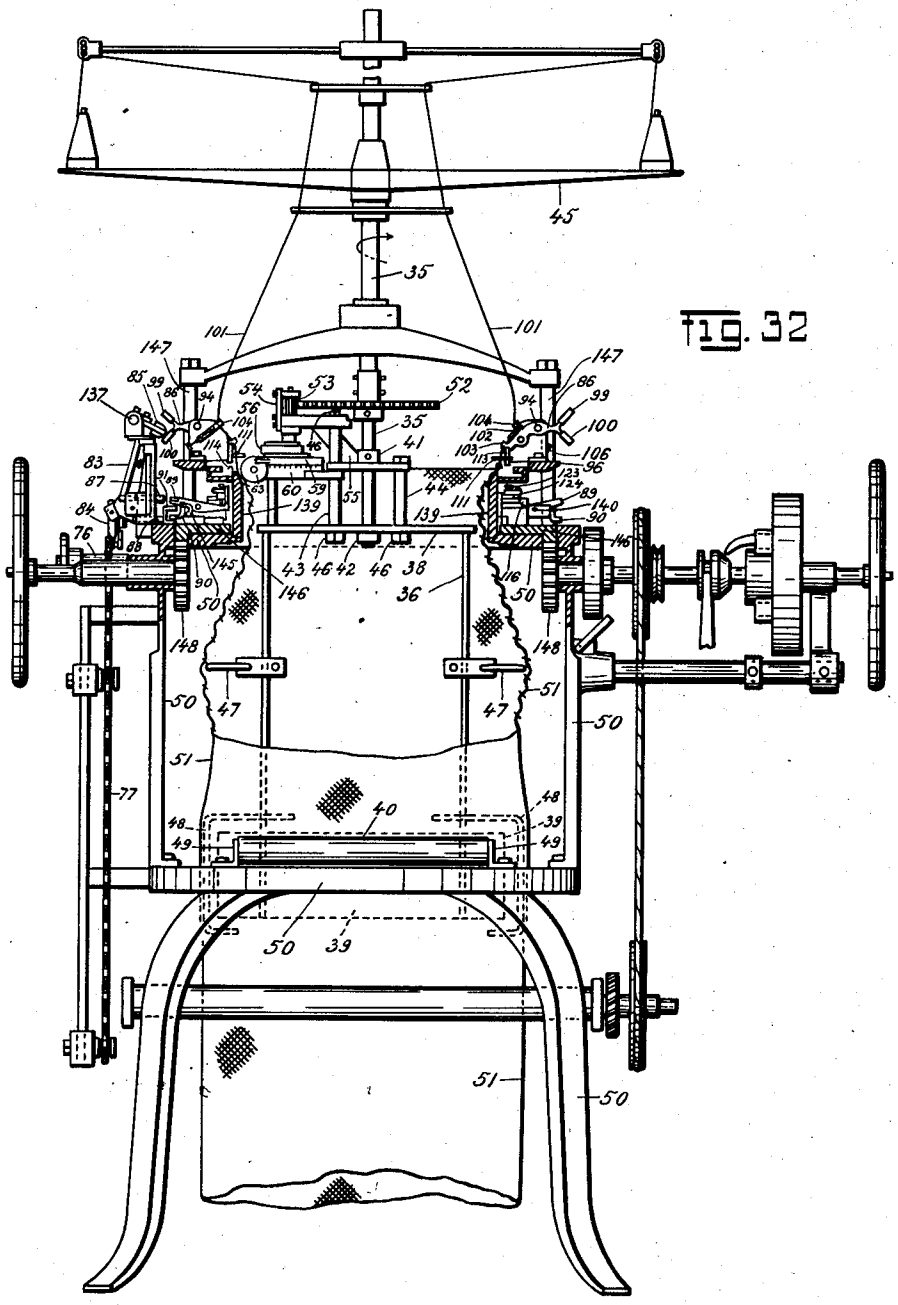


Fig. 32

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Patented Jan. 27, 1942 2,271,302

UNITED STATES PATENT OFFICE

2,271,302

KNITTING MACHINE

Charles Moses, New York, N. Y.

Application August 31, 1939, Serial No. 292,775

18 Claims. (Cl. 66—50)

This invention relates to improvements in multiple feed circular knitting machines adapted to produce horizontal striped knitted fabric.

Broadly, it is an object of my invention to create horizontal striped knitted fabric on a multiple feed circular knitting machine by employing single cutting means irrespective of the number of yarn feeds, said cutting means being mounted upon the central shaft of the circular machine.

Heretofore, in the manufacture of horizontal striped knitted fabric upon circular knitting machines, one of the practices has been to employ a box unit containing a number of fingers, each finger controlling a different yarn. In knitting the striped material, the relative position of such fingers was changed so that certain colored predetermined yarn was knitting while all the other colored yarns were held out of engagement of the needles; the position of such fingers being again changed depending upon the color desired to be knitted. The different colored yarns which are not desired to be knitted are allowed to become wound around the central shaft of the knitting machine, such excess yarn being cut from time to time. This has two chief disadvantages in that a large percentage of waste occurs and the number of feeds knitting is limited and the machine must be constantly watched by the operator, since the non-knitting yarn may become entangled with the knitted fabric.

Another method employed in the manufacture of a horizontal striped knitted fabric is to employ a multiple feed machine for different colored yarns in certain predetermined feeds, and the feeds containing particular yarns which are not desired to be knitted are taken out of action by positioning the needles in the non-knitting position, known as tuck or welt position and the yarn in such feeds are temporarily held and cut. The means to hold and cut is done by individual cutting units located at each different colored yarn feed so that when the particular color is not desired to be knitted into the body of the fabric, the cutting unit at such particular colored yarn cuts the yarn at the particular feed and holds that yarn until it is desired to knit such colored yarn into the body of the knitted material. This is an expensive method, employing numerous parts at each feed so that there is great likelihood of the parts not functioning properly, at the same time necessitating constant supervision by a skilled operator.

Instead of holding and cutting the yarn as in the paragraph previously described, the non-knitting yarn may be floated across the diameter of the circular knitting machine and a tensioning means is employed for absorbing the slack of such yarns. This is also undesirable, since the non-knitting yarn is twisted, forming a spiral, thus producing a certain amount of waste with the possibility of constant breakage of yarn and necessitating careful and constant watching by a skilled operator. The finishing of such fabric containing a twisted yarn spiral makes it exceedingly difficult to finish such fabric to have the stripes run horizontally.

Therefore, the object of my invention is to provide a simple and single cutting means upon a multiple feed circular knitting machine irrespective of the number of different colored yarn feeds, said cutting means cutting the different colored yarns which are not desired to be knitted into the body of the fabric; the yarns so cut are held until such yarns are again desired to be knitted into the body of the fabric to create a predetermined colored horizontal stripe.

Another object of my invention is to provide new and novel type of fingers to carry the yarn across the cutting means.

Another object of my invention is to provide a cutting means in the form of a circular knife for use upon a circular knitting machine.

Another object of my invention is to provide a circular knife controlled by new and novel means to revolve said circular knife.

Another object of my invention is to provide a novel cam action to control means carrying yarn to cutting means for a circular knitting machine.

Another object of my invention is to provide a novel gear arrangement mounted upon the central shaft of a circular knitting machine, such gears having a direct relation to the number of feeds upon the circular knitting machine; the ratio between the driving gear and a cam gear being the same as the number of feeds upon the circular knitting machine is to one.

Another object of my invention is to provide stationary means in relation to the rotating frame of the knitting machine, such stationary means holding revolving cutting means.

Another object of my invention is to provide a novel mechanism for motivating the chain of links for controlling the changing mechanism for controlling the design of the fabric.

Another object is to provide a novel changing mechanism for disengaging the knitting yarn and for taking the feeds out of knitting action.

Another object is to provide a new and novel

changing mechanism for holding the yarn in knitting and non-knitting relationship.

A further object of my invention is to provide a new means for tensioning, holding and locking the yarn when in a non-knitting position.

Still another object of my invention is to hold the stitch cam of the non-knitting feed, during the changing from the knitting to non-knitting action, to the knitting position over the changing area and automatically releasing said stitch cam to the non-knitting position past such area for the purpose of preventing holes being made in the changing area or the point in the circular knitted fabric where the color change takes place.

For a fuller understanding of the nature and objects of my invention, reference is had to the following detailed description in connection with the accompanying drawings, in which:

Fig. 1 is an elevation of the central shaft of the knitting machine containing gears, the stationary frame-work in relation to the rotating frame, revolving cutting means upon the frame-work, yarn carrying means and the cam actuating the yarn carrying means.

Fig. 2 is a section of the top view of the circular knitting machine, showing the central gear wheel partly broken away, the cam and cam gear, the yarn carrying means and cutting means, the angular displacement of the cutting means in relation to the yarn changing means, the yarn holding means, the yarn feeding means and the yarn tautening means.

Fig. 3 is a side elevation of the frame-work with gears for the yarn carrying means shown in Fig. 4.

Fig. 4 is a side elevation of the yarn carrying means.

Fig. 5 is a top view of the yarn carrying means.

Fig. 6 is a section taken through 6—6 of Fig. 3.

Fig. 7 is a section taken through 7—7 of Fig. 3.

Fig. 8 is taken through 8—8 of Fig. 1.

Fig. 9 is an elevation of the changing mechanism for engaging the feeds in knitting and non-knitting position, and showing the chain for such control.

Fig. 10 is a top view of the cam mechanism actuating the chain for design control.

Fig. 11 is a side view of the changing mechanism in relation to the yarn feeding mechanism, and the knitting section in knitting position.

Fig. 12 is a side view of the changing mechanism in relation to the yarn feeding mechanism and the knitting section in non-knitting position.

Fig. 13 is a front elevation of the yarn feeding mechanism and knitting section mounted upon the knitting frame.

Fig. 14 is a left side elevation of the yarn feeding mechanism and knitting section in the non-knitting position.

Fig. 15 is a right side elevation of the yarn feeding mechanism and knitting section in the non-knitting position and showing the control of the yarn tautening mechanism.

Fig. 16 is a side elevation of the plunger partly broken away, which holds the stitch cam of the non-knitting feed during the changing from the knitting to the non-knitting action to the knitting position over the yarn changing area.

Fig. 17 is a front view of the stitch cam holding pin.

Fig. 18 is a side elevation showing the position of the plunger in the knitting section.

Fig. 19 is a side elevation showing part of the changing mechanism actuating the plunger.

Fig. 20 is a top view of the cam actuating the plunger.

Fig. 21 is an enlarged section of the bullet catch taken through line 21—21 of Fig. 14.

Fig. 22 is an enlarged view of part of the yarn feeding mechanism in the non-knitting position showing the knitting yarn in taut position.

Fig. 23 is a enlarged view of part of the yarn feeding mechanism in the knitting position showing the yarn in non-taut position.

Fig. 24 shows the position of the stitch cam and needle raising cam in the knitting position and by dotted line in the non-knitting position.

Fig. 25 is a front elevation of the yarn feeding means shown in the upper part of Fig. 14, the yarn being in a non-knitting position and the needles in the tuck or non-kitting position

Fig. 26 is a top view of the cloth spreader attached to the stationary framework of the machine.

Fig. 27 is a left side elevation of the yarn feeding mechanism and knitting section showing a modification of the yarn carrying means in the form of a double yarn carrier for use in conjunction with a jack wheel which is mounted upon a section.

Fig. 28 is a top view of the yarn feeding means shown in Fig. 27.

Fig. 29 is a section taken through line 29—29 of Fig. 27.

Fig. 30 is a section of a front view of the yarn feeding means shown in Fig. 27, showing the relation of the knitting and non-knitting yarns to the knitting needles.

Fig. 31 is a front elevation of the knitting section, partly broken away, showing the relation of the parts for knitting position.

Fig. 32 is an elevation of a circular knitting machine with certain parts omitted and many parts in section, showing the correlation of the various parts of my invention applied thereto.

Referring to Fig. 32, numeral 50 is the stationary part of a standard knitting machine to which is attached stationary cylinder 139 containing the usual needles and sinkers therein. A horizontally rotating gear base 146, having rigidly fixed thereon yarn table supporting posts 147, the usual needle actuating cams, rising cams 117 and stitch cams 93 (shown on Fig. 24), sections 116, yarn feeding mechanisms 86 and cams 71 which actuate chain mechanism (shown in Fig. 10). The gear base 146 is mounted in horizontal position upon stationary framework 50 and is rotated in the standard manner by driving gear 148.

Yarn table 45 is attached to supporting posts 147 by shaft 35, which extends sufficiently far down so that the driving gear 52 is rigidly attached thereto, and the yarn cutting mechanism and its supporting framework is freely mounted thereon, as shown in Fig. 1. The rotation of gear base 146 rotates driving gear 52 because of its rigid attachment to shaft 35.

Referring to Fig. 1, upon shaft 35 is attached a stationary framework consisting of two framework plates 37 and 38, which are spaced horizontally and parallel to each other by pipes 43 and 44 of equal length and through which threaded bolts are passed capped by nuts 46. Plates 37 and 38 are held upon the central shaft 35 by upper collar 41 and lower collar 42 rigidly attached thereto. This construction prevents displacement of the framework from the horizontal position. The shaft 35 rotates freely in horizontal plates 37 and 38. The lower framework 36

is attached to horizontal framework plate 38. A cloth spreader 39, preferably made of wood, is attached to the lower ends of the vertical framework 36. Metal cloth spreaders 47 and 48 are also rigidly mounted upon vertical framework 36. A pair of rollers 40 are mounted by plates 49 to a stationary part 50 of the machine, as shown in Fig. 8 and are so mounted to allow knitted cloth 51 to pass between the wood spreader 39 and rollers 40. Since the distance between the rollers 40 and the spreader 39 is about one-eighth inch, the entire central framework is prevented from revolving with the rotating shaft 35 by the rollers 40. This construction comprising pipes 43 and 44 and rollers 40 maintains the framework in substantially rigid position, preventing displacement in any plane.

A horizontal driving gear 52 is firmly attached to the rotating shaft 35 between the rotating yarn table 45 and upper collar 41. Driving gear 52 rotates an eccentric cam gear 53 which is mounted upon cam gear bearing 54. Bearing 54 consisting of several parts is rigidly fixed upon the stationary framework by the bolt passing through pipe 43 and the angular plate 55. Cam gear 53 drives the eccentric cam 56. A roller pin 57 fixed to a yarn carrying member 59 rides within a circular cam grove 58 of the cam 56 causing a reciprocating motion of the yarn carrying member 59. Yarn carrying member 59 rides in a housing 60 rotating bearing wheel 61 and small driving wheel 62 by a rack gear 68. The driving wheel 62 rotates a cutting blade 63. The housing 60 is mounted to the stationary framework by a clamp 64 to pipe 43 and by plate 65 which is attached to horizontal plate 38.

The yarn carrying member 59 terminates in a pair of lower stationary fingers 66 and a pair of upper movable fingers 67 which are pivoted by pin 69.

The ratio of the central driving gear 52 to the cam gear 53 is the same as the number of feeds upon the knitting machine is to one so that there is a direct relation between the gears and the number of feeds upon the knitting machine. This gear ratio permits the yarn carrying member 59 to reciprocate between the yarn holders 70, as shown in Fig. 2.

Referring to Figs. 9 to 12, inclusive, cams 71, attached to any desired section 116, motivate lever 73 which in turn moves plate 74. Hook 75 is attached to plate 74 and is moved reciprocally by plate 74. Hook 75 rotates chain wheel 76 upon which rests a chain 77 comprised of links of different heights; small links 78, medium links 79, and large links 80. The small links 78 change the knitting position parts to non-knitting position. The medium links 79 cause no change in the position of any of the parts. The large links 80 change the parts from non-knitting to knitting position. The chain 77 operates pin 81 on lever 82 causing lever 82 to be elevated or dropped vertically, depending upon the height of the links of chain 77. Lever 82 moves links 83 and 84. Link 83 moves plate 85 which in turn moves the yarn feeding mechanism 86. Link 84 actuates upper and lower tucking bar plungers 87 and 88, respectively, which in turn operates tucking bar 89, and tucking bar release 90, respectively. Tucking bar 89 terminates in a tucking bar cam 89', which moves the needles into knitting position. A plunger cam 91 is attached to lower tucking bar plunger 88 which operates stitch cam control plunger 92.

Referring to Figs. 13 to 24, inclusive, numeral 86 shows the yarn feeding mechanism pivoting about pivot pin 94 which is mounted upon plate 95 which is mounted to the carrier ring 96 by screws 97. The feeding mechanism 86 has a bullet catch 98 to maintain the yarn feeding mechanism 86 in two positions; the knitting position and non-knitting position. The yarn feeding mechanism has a pair of fingers upon which are mounted upper roller 99 and lower roller 100. The yarn 101 is fed to the knitting needles through openings 102 and 103 of the yarn feeding mechanism 86. Referring to Fig. 15, a mechanism 104 is mounted on plate 95 for holding the yarn 101 taut. This mechanism comprises a moveable plate 149, a spring 107 attached to a lug 108 on plate 149, the opposite end of spring 107 is attached to a regulating screw 105, said screw 105 passes through a lug 150 on plate 95 and is adjusted by nuts 106 on both sides of lug 105, thus regulating the tautness of spring 107. Moveable plate 149 has openings 151 for pins 152 to maintain plate 149 in its reciprocal movement. Yarn 101 passes underneath hook 109 which is mounted upon mechanism 104 and through openings 102 and 103 and is held by spring 110 which is mounted in yarn holding mechanism 111 attached to carrier ring 96 by screw 112.

Carrier knife 113 is mounted vertically upon plate 95. Knife 113 helps to completely open the latches of the needles 114 and helps to feed the yarn to the hooks of the needles 114. The cams of a feed are held upon a block constituting a section of the cam ring and here indicated as 116. Such a section includes in this case, a stitch cam 93, a rising cam 117, a tucking bar 89, a tucking bar release 90, plunger 92 and stitch control mechanism. The stitch control mechanism comprises a T shaped pin 118, one leg of which rests upon tucking bar 89 and the other leg upon the head 119 of plunger 92. Pin 118 rests within housing 120 and acts upon one end of pivot lever 121, pivoting about screw pivot 122 which is screwed to housing 120. Adjustable screw 123, mounted upon the opposite end of lever 121 rests upon stitch cam lug 124.

In order to obtain different horizontal stripes of various colors, certain feeds in the knitting machine will feed a particular colored yarn to the knitting needles to produce a horizontal stripe of that color. The subsequent colored horizontal stripe in the knitted fabric is produced by placing feeds containing the desired colored yarn into knitting position and placing the other yarn feeds into non-knitting position.

To obtain this result, I will describe the operation of my improved knitting machine. I will first describe the manner of disengaging the knitting feeds and placing such feeds in the non-knitting position.

Referring to Fig. 10, a cam 71 actuates lever 73 causing the movement of plate 74 to move hook 75. Referring to Fig. 9, hook 75 moves chain wheel 76 which revolves design chain 77 containing links of three different heights. As illustrated in Fig. 9, pin 81 rests upon small link 79 so that lever 82 drops causing links 83 and 84 to move to their downward positions. Referring to Fig. 12, link 83, shown in downward position, causes plate 85 to descend and pivot about pin 137. The yarn feeds 86 are mounted upon revolving carrier ring 96, shown in Fig. 14, so that when plate 85 is in its downward position, lower rollers 100 of the yarn feeding mechanisms 86 will strike plate 85 in their revolutions, caus-

ing the yarn feeding mechanisms 86 to move about pivot pin 94. This movement causes the yarn 101 to be tensioned between hook 109 and the yarn feed opening 102. The yarn 101 is moved away from needles 114 by the lower opening 103 of the yarn feed mechanism 86, shown in Figs. 14, 16, 22 and 25. The tensioning of yarn 101 is accomplished by causing hook 109 to be held in close proximity to opening 102 by the mechanism 104. The taut yarn leaves the needles at one point of the circumference of the circular cylinder 139; as shown in Fig. 1, such point being designated at 138 of Fig. 2.

The rotation of the knitting frame, as shown in Fig. 2, causes an angular displacement of the yarn 101 between point 138 and the lower openings 103 of the yarn feed mechanism 86. Such angular displacement becomes greater and greater as lower feed mechanism openings 103 move away circumferentially from point 138. As yarn 101 moves away from point 138, the yarn carrying member 59 advances and catches the taut yarn 101 between the fingers 66 and 67. As the yarn carrying member 59 recedes, the taut yarn 101 is pulled back by lower fingers 66 so that the yarn 101 is pulled into the spring 110 of the yarn holding mechanism 111, as best shown in Fig. 14, thus holding and locking the yarn 101 between spring 110 and the yarn holder 70. As the yarn carrying member 59 recedes still further, it carries the yarn 101 across the cutting blade 63, thus cutting the yarn 101; one end of the yarn being held by the yarn holding mechanism 111, as shown at point 144, Fig. 2, until it is again required for knitting and the other end remains hanging loosely from the knitted fabric, as shown at point 138, Fig. 2.

As link 83 is moved downward by lever 82, link 84 is also moved downward causing lower tucking bar plunger 88 to move inward, as shown in Fig. 12. At the same time that lower roller 100 of the yarn feeding mechanism 86 strikes plate 85 in its lower position, the tucking bar release 90 strikes roller 88' (Fig. 20) mounted upon lower tucking bar plunger 88. This action causes tucking bar 89 to move about pivot pin 140 as shown in Figs. 14 and 15, so that tucking bar cam 89' at the other end of tucking bar 89 (Fig. 15) moves downward, allowing the needles 114 to remain in tuck or non-knitting position, as shown in Fig. 24.

Referring to Figs. 13 and 15, as tucking bar cam 89' moves downward, pin 118 descends releasing lever 121, which pivots about screw pivot 122. This frees the compressed spring 141, causing an upward movement of stitch cam lug 124. As stitch cam lug 124 moves upward, it also moves stitch cam 93 upward, since it is attached thereto (as shown in Figs. 13 and 24).

The rising action of stitch cam 93 of the non-knitting section 116 permits the needles 114 to be drawn down to a position not as low as the knitting position, thus avoiding undue tension of the wales on the needles 114 while passing the non-knitting feeds. This positioning of cam 93 prevents distortion of the wales of the knitted fabric.

Referring to Fig. 24, the distance between tucking bar cam 89' and knitting point 142 is known as the changing area, i. e. from knitting to non-knitting. As tucking bar cam 89' is moved downward, cam 93 automatically moves upward to the dotted position shown in Fig. 24, causing the knitting needles over this changing area to knit very tight wales caused by the stitch cam 93 being in a higher position. Such tight wales cause damage to the knitted fabric over this changing area. In order to prevent such damage, plunger 92, which is attached to section 116, is moved forward by cam 91 attached to lower tucking bar plunger 88 (Fig. 20). One leg of the T shaped pin 118 lies in the path of the head 119 of plunger 92 (Fig. 18). Cam 91 pushes plunger 92 inward, so that head 119 prevents pin 118 from dropping when the tucking bar cam 89' is being lowered. Pin 118 holds pivot lever 121 in the knitting position, so that the stitch cam 93 is held in the said position over the changing area. When the plunger 92 passes plunger cam 91, compression plunger spring 143 causes the head 119 to return to its former position allowing pin 118 to drop so that the stitch cam 93 is permitted to rise to the non-knitting position.

I will now describe the manner of engaging the non-knitting feeds and placing such feeds in the knitting position.

Referring to Fig. 9, when large link 80 of chain 77 is moved into position by hook 75 under pin 81, it raises pin 81 which in turn lifts lever 82, causing links 83 and 84 to move upwardly. Referring to Fig. 11, when link 83 is moved to an upward position, it causes plate 85 to rise so that upper rollers 99 of the yarn feeding mechanism 86 are caused to pivot about pivot screw 94 upon passing plate 85 in their revolutions around the cylinder. Such action places the yarn feeding means 86 into the knitting position, as shown in Fig. 23, and in this position the tensioning of the yarn 101 is automatically released when the yarn feed opening 102 is moved away from hook 109.

As link 83 is moved upward by lever 82, link 84 is also moved upward, causing upper tucking bar plunger 87 to move outward, as shown in Fig. 11. At the same time that upper roller 99 of the yarn feeding mechanism 86 strikes plate 85 in its upper position, upper tucking bar plunger 87 strikes tucking bar 89, moving it downward about pivot point 140. Spring 145, acting on tucking bar release 90 causes the release 90 to lock tucking bar 89, as shown in Fig. 31. The movement of the tucking bar 89 causes the bar cam 89' at the other end of the tucking bar 89 (Fig. 15) to move upward, thus placing the needles 114 into knitting position, as shown in Fig. 24.

Referring to Fig. 31, as tucking bar cam 89' (Fig. 15) moves upward, pin 118 is moved upward and raises lever 121 which pivots about screw pivot 122, causing the adjustable stitch screw 123 to descend and depress the stitch cam lug 124, which in turn lowers the stitch cam 93 to the desired knitting level.

As the yarn feeding mechanism 86 is moved into knitting position, as shown in Fig. 23, the yarn opening 103 brings the yarn across the path of the cylinder needles 114, raised by tucking bar cam 89', so that the hooks of the needles 114 cross and take the yarn 101, as shown in dotted lines in Fig. 25, and knit the yarn 101 into the fabric. As the needles 114 draw the yarn 101 to be knitted into the fabric, the yarn 101 is automatically drawn from beneath the spring 110 of the yarn holding mechanism 111.

Referring to Fig. 9, whenever pin 81 rests upon medium link 79 of chain 77, lever 82 actuates links 83 and 84 so that plate 85 is in a neutral or non-acting position between rollers 99 and 100 of yarn holding mechanism 86 and the tuck-

ing bar plungers 87 and 88 and plunger cam 91 are so positioned that they do not contact plunger 92, tucking bar release 90 or tucking bar 89.

For further clarification regarding the method of producing horizontal stripes, I will set forth the knitting of a two color horizontal striped fabric, each having sixty knitted courses. Assuming for the purpose of illustration that we have a twenty-four feed machine, the first twelve feeds of said machine containing yarns of the first color and the following twelve feeds containing yarns of the second color. Assuming, also, that all the feeds are in a non-knitting position at the commencement of operation.

At the beginning of each section of the two colors, a cam 71 is placed in a section 116, thus having two cams 71 in my example. When the first cam 71 actuates the chain mechanism, a large chain link 80, of a design chain 77 predeterminedly arranged, causes the feeds following said cam 71 to move into knitting position as aforedescribed, until the second cam 71 again actuates the chain mechanism to a medium chain link 79, which permits the feeds following the second cam to remain as originally, that is, in non-knitting position, also as previously described.

At the end of the first revolution of the machine, we will thus have twelve knitted courses of the first color. For the following four revolutions, the cams 71 will actuate the chain mechanism each time they pass lever 73. Since the eight chain links 79 following these movements are of medium height, all the feeds will thus remain unchanged as in the first revolution. This will make forty-eight knitted courses (four times twelve knitted courses) in addition to the twelve knitted courses of the first revolution, so that we have the desired sixty knitted courses of the first color. As the gear base 146 makes its next, or sixth revolution, the first cam 71 moves the chain mechanism to a low link 78, causing the knitting feeds following the said cam to move to a non-knitting position, as previously described; the second cam 71 moves the chain mechanism to a large link 80, causing the non-knitting feeds following this cam to move to a knitting position. This revolution of the gear base 146 causes the disengagement of the feeds containing the first color and the knitting of twelve courses of the second color.

For the following four revolutions, the cams 71 will actuate the chain mechanism each time they pass lever 73. Since the eight chain links 79 following these movements are of medium height, all the feeds will thus remain unchanged, as in the sixth revolution. This will make it forty-eight knitted courses, in addition to the twelve knitted courses of the sixth revolution, so that we have the desired sixty knitted courses of the second color. These colored stripes are knitted repetitiously in the same manner.

It can thus be readily seen that any combination of horizontal stripes are possible by placing different colors in different feeds in the machine and placing cams 71 before each such section of feeds containing a different color.

In order to increase production and obtain a greater combination of different colored stripes with the same number of feeds, as hereinbefore described, a new yarn feeding mechanism 126, as shown in Fig. 27, is used in place of the yarn feeding mechanism 86. This yarn feeding mechanism 126, feeds two knitting yarns 101 and 101' alternately to the knitting needles 114 in the same feed section. This doubles the number of knitting yarns upon the machine so that a greater number of combinations of yarns and colors can be obtained and permits a greater number of feeds to be operated at the same time because of the greater number of knitting yarns, thus increasing production. The yarn feeding mechanism 126 can be used to greater advantage in combination with my jack wheel 133 as shown and described in my Patent Number 2,000,837, or with other types of jack wheels so as to obtain a combination of stripes and design patterns.

Yarn feeding mechanism 126 is controlled in a similar manner as yarn feeding mechanism 86, previously described. The positive positioning of said feeding mechanism 126 is accomplished by detent and spring control 136. When plate 85 is in the highest position, it strikes upper roller 128, causing the yarn holding finger of feeding mechanism 126 to move downward. Ratchet extension 131 on finger 126 revolves gear 132 which in turn moves ratchet extension 130 on finger 127, causing finger 127 to move outward about pivot point 94. This operation places yarn 101 to the knitting position and yarn 101' to the non-knitting position. The tautening, holding and cutting of the non-knitting yarn is accomplished in the same manner as hereinbefore described. When plate 85 strikes lower roller 129, the above action is reversed. It is also possible to actuate roller 129 so that both fingers 126 and 127 are in a non-knitting position. This is accomplished by stopping the yarn feeding mechanism 126 at a position where fingers 126 and 127 are congruous. When both fingers 126 and 127 are congruous and not knitting, both non-knitting yarns are held taut and cut at the same time and by the same means.

It is obvious that various changes and modifications may be made in the details of construction, such as, the use of electrical means to reciprocate the yarn carrier between the yarn feeds, independent electrical means to revolve the cutting means, electrical or mechanical means to carry the yarn for cutting to the cutting means and other equivalent structures without departing from the general spirit of the invention, as set forth in the appended claims.

I claim:

1. In a multiple feed circular knitting machine, a stationary needle cylinder mounted upon a stationary framework, a rotating frame rotatable relative to said needle cylinder and having mounted thereon needle operating means, yarn feeding means, chain actuating means and yarn table supporting means, a single stationary cutting means mounted upon said rotating framework for cutting singular inoperative yarns, irrespective of the number of yarn feeds upon the machine.

2. In a multiple feed circular knitting machine, a stationary needle cylinder mounted upon a stationary framework, a rotating frame rotatable relative to said needle cylinder and having mounted thereon needle operating means, yarn feeding means, chain actuating means and yarn table supporting means, cutting means and yarn carrying means mounted upon an inner stationary framework, said framework mounted upon said rotating frame of said knitting machine.

3. In a multiple feed circular knitting machine, a stationary needle cylinder mounted upon a stationary framework, a rotating frame rotatable relative to said needle cylinder and having

mounted thereon needle operating means, yarn feeding means, chain actuating means and yarn table supporting means, cutting means and yarn carrying means mounted upon an inner stationary framework, said inner framework mounted upon said rotating frame of said knitting machine, said cutting means cutting the non-knitting yarns.

4. In a multiple feed circular knitting machine, a stationary needle cylinder mounted upon a stationary framework, a rotating frame rotatable relative to said needle cylinder and having mounted thereon needle operating means, yarn feeding means, chain actuating means and yarn table supporting means, cutting means mounted upon an inner stationary framework, said inner framework mounted upon said rotating frame of said knitting machine, said cutting means being situated within the cylinder of said knitting machine, said cutting means being independent of the number of feeds mounted upon said knitting machine, said cutting means cutting the yarn from any of said yarn feeds when said yarn feeds are out of knitting relation.

5. In a multiple feed circular knitting machine, a stationary needle cylinder mounted upon a stationary framework, a rotating frame rotatable relative to said needle cylinder and having mounted thereon needle operating means, yarn feeding means, chain actuating means and yarn table supporting means, yarn cutting means mounted upon an inner stationary framework, said inner framework mounted upon said rotating frame, means for carrying the non-knitting yarn from different feeds across said yarn cutting means, means for holding said cut yarns frictionally until said yarns are taken by the knitting needles for knitting, and means for feeding said yarn to said needles.

6. In a multiple feed circular knitting machine, a stationary needle cylinder mounted upon a stationary framework, a rotating frame rotatable relative to said needle cylinder and having mounted thereon needle operating means, yarn feeding means, chain actuating means and yarn table supporting means, cutting means and yarn carrying means mounted upon an inner stationary framework, said inner framework mounted upon said rotating frame of said knitting machine, yarn feeding means, yarn tautening means to tauten the non-knitting yarn, said taut yarn tripping fingers of said yarn carrying means and becoming caught within said yarn carrying means, said yarn carrying means carrying said caught yarn across said cutting means and into holding means, said cutting means cutting said yarn, said yarn holding means retaining said yarn until taken by the knitting needles for knitting.

7. In a multiple feed circular knitting machine, a stationary needle cylinder mounted upon a stationary framework, a rotating frame rotatable relative to said needle cylinder and having mounted thereon needle operating means, yarn feeding means, chain actuating means and yarn table supporting means, cutting means and yarn carrying means mounted upon an inner stationary framework, said inner framework mounted upon said rotating frame of said knitting machine, said cutting means and yarn carrying means displaced angularly in relation to the yarn changing means, said yarn carrying means catching taut yarn within said yarn carrying means, and yarn carrying means carrying said caught yarn across said cutting means and into holding means, said cutting means cutting said yarn, said yarn holding means retaining said yarn until taken by the knitting needles for knitting.

8. In a multiple feed circular knitting machine, a stationary needle cylinder mounted upon a stationary framework, a rotating frame rotatable relative to said needle cylinder and having mounted thereon needle operating means, yarn feeding means, chain actuating means and yarn table supporting means, a driving gear mounted upon said rotating frame of said knitting machine, said driving gear driving a smaller gear, said smaller gear driving an eccentric cam, said eccentric cam actuating a yarn carrying means, said yarn carrying means actuating a cutting means.

9. In a multiple feed circular knitting machine, a stationary needle cylinder mounted upon a stationary framework, a rotating frame rotatable relative to said needle cylinder and having mounted thereon needle operating means, yarn feeding means, chain actuating means and yarn table supporting means, a small gear actuating a cam, said cam actuating yarn carrying means, said yarn carrying means actuating yarn cutting means, said gear, cam, yarn carrying means and cutting means mounted upon an inner stationary framework on said rotating frame of said knitting machine, a central driving gear mounted upon said rotating frame of said knitting machine, said central gear driving said small gear in the same ratio as the number of feeds upon said circular knitting machine is to one.

10. In a knitting machine, a pivoted yarn feeding mechanism for positioning yarn in knitting and non-knitting position, means for holding said yarn taut when in non-knitting position and non-taut when in knitting position, means for regulating the tautness of said yarn, spring means for holding said yarn away from the knitting needles when said yarn is in non-knitting position, said yarn being removed from said spring means when the knitting needles are moved to the knitting position.

11. In a knitting machine, a means for regulating the tautness of yarn, comprising a movable plate mounted upon said machine, a spring attached to a lug on said plate, the opposite end of said spring attached to a screw, said screw passing through a lug on said machine, regulating nuts on both sides of said last named lug, a passage for said yarn at the end of said plate opposite said spring, an opening in said plate for a pin on said machine to maintain said plate in its movement.

12. In a multiple feed circular knitting machine, a stationary needle cylinder mounted upon a stationary framework, a rotating frame rotatable relative to said needle cylinder and having mounted thereon needle operating means, yarn feeding means, chain actuating means and yarn table supporting means, a cam mounted upon a section, said section containing needle operating means and mounted upon said rotating frame, said cam operating a lever, said lever causing a chain wheel to rotate, said lever and said chain wheel mounted upon said stationary framework, and upon said chain wheel, a chain having links of different heights, said links operating a lever terminating in an actuating cam, said cam holding a stitch cam control plunger on said section, said plunger holding said stitch cam of said section in a knitting position during the changing of said section from knitting to non-knitting, said stitch cam being automatically released to

the non-knitting position when said stitch cam control plunger passes said actuating cam.

13. In a knitting machine, a pivoted yarn feeding mechanism terminating in two fingers, at one end, a roller on each of said fingers, means in said yarn feeding mechanism for releasably holding said feeding mechanism in feeding or non-feeding position of said yarn feeding mechanism, and means for feeding yarn at the opposite end, means for positively positioning said yarn feeding mechanism for moving said yarn to knitting and non-knitting position.

14. In a knitting machine, a pivoted yarn feeding mechanism terminating in two fingers at one end, a roller on each of said fingers, means in said yarn feeding mechanism for releasably holding said feeding mechanism in feeding or non-feeding yarn at the opposite end, and means for positively positioning said yarn feeding mechanism for moving said yarn to knitting and non-knitting position, a hook and adjustable spring means for holding said yarn taut, said yarn being passed between said hook and a projection containing a yarn feed opening for holding said yarn taut in non-knitting, and non-taut in knitting position.

15. In a multiple feed circular knitting machine a stationary needle cylinder mounted upon a stationary framework, a rotating frame rotatable relative to said needle cylinder and having mounted thereon needle operating means, yarn feeding means, chain actuating means and yarn table supporting means, an inner stationary framework mounted upon said rotating frame of said knitting machine, a pair of rollers on opposite sides of a central cloth spreader on said inner framework, said rollers secured to the stationary framework of the machine to prevent said inner framework from displacement relative to the rotating part of the machine.

16. In a multiple feed circular knitting machine, a stationary needle cylinder mounted upon a stationary framework, a rotating frame rotatable relative to said needle cylinder and having mounted thereon needle operating means, yarn feeding means, chain actuating means, yarn table supporting means, a cutting means mounted upon an inner stationary framework, a driving gear mounted upon said rotating frame of said knitting machine, said driving gear driving a smaller gear, said smaller gear driving a series of gears rotating a cutting blade within said cutting means.

17. In a knitting machine, a pivoted yarn holding mechanism comprising two rollers at one end, a yarn holding finger at the opposite end for feeding yarn, and an auxiliary yarn holding finger, said yarn holding finger operating said auxiliary yarn holding finger for feeding other yarn, said auxiliary yarn holding finger pivoted at the same point as the first named yarn holding finger, whereby when the first named yarn holding finger is moved to knitting position, said auxiliary yarn holding finger is automatically moved to non-knitting position and when said first named yarn holding finger is moved to non-knitting position, said auxiliary yarn holding finger is automatically moved to knitting position.

18. In a knitting machine, a pivoted yarn holding mechanism comprising two rollers at one end, a yarn holding finger at the opposite end for feeding yarn, and an auxiliary yarn holding finger, said yarn holding finger operating said auxiliary yarn holding finger for feeding other yarn, said auxiliary yarn holding finger pivoted at the same point as the first named yarn holding finger, whereby when the first named yarn holding finger is moved to knitting position, said auxiliary yarn holding finger is automatically moved to non-knitting position and when said first named yarn holding finger is moved to non-knitting position, said auxiliary yarn holding finger is automatically moved to knitting position, spring means comprising a detent within an opening in said yarn holding finger, said detent actuated by a flat spring, for positive positioning said yarn holding mechanism for moving said yarns to knitting and non-knitting position, means for holding non-knitting yarn in taut position and knitting yarn in non-taut position, means for regulating the tautness of said non-knitting yarn, means for holding said non-knitting yarn away from the knitting needles.

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