July 5, 1938. G. W. RAULSTON ET AL 2,122,845

YARN CHANGER FOR KNITTING MACHINES

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Fig. 1.

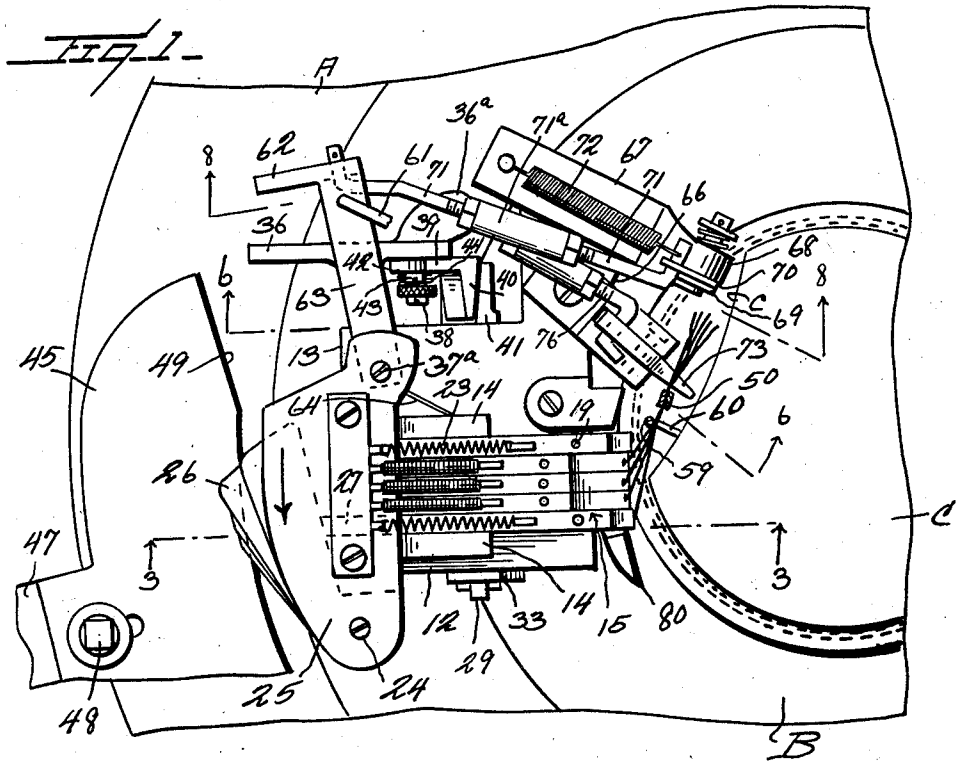


Fig. 3.

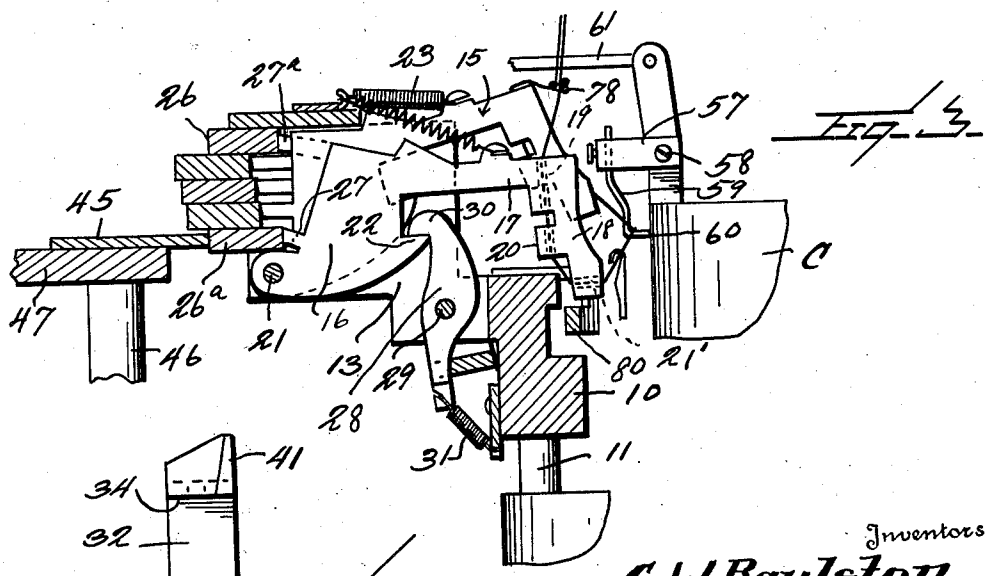
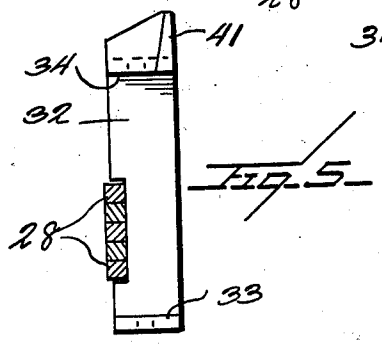


Fig. 5.



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Fig. 2.

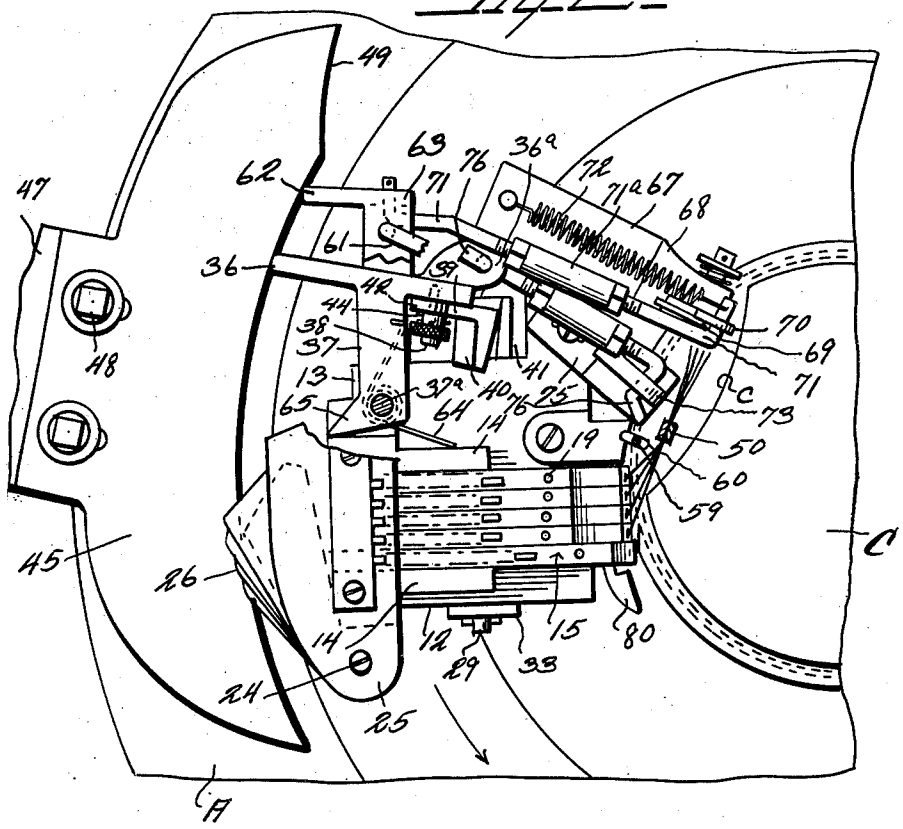


Fig. 5.

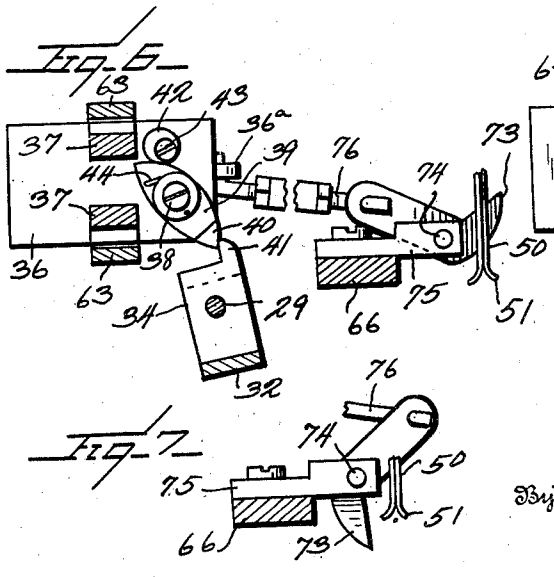


Fig. 8.

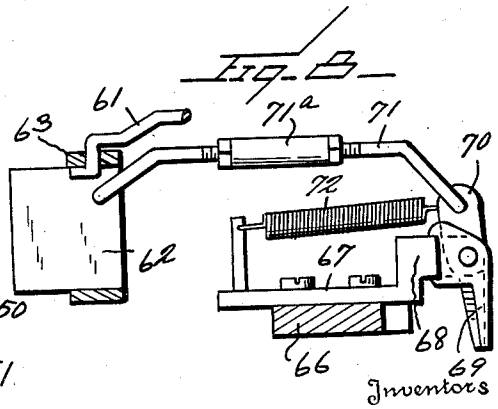


Fig. 7.

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Fig. 4

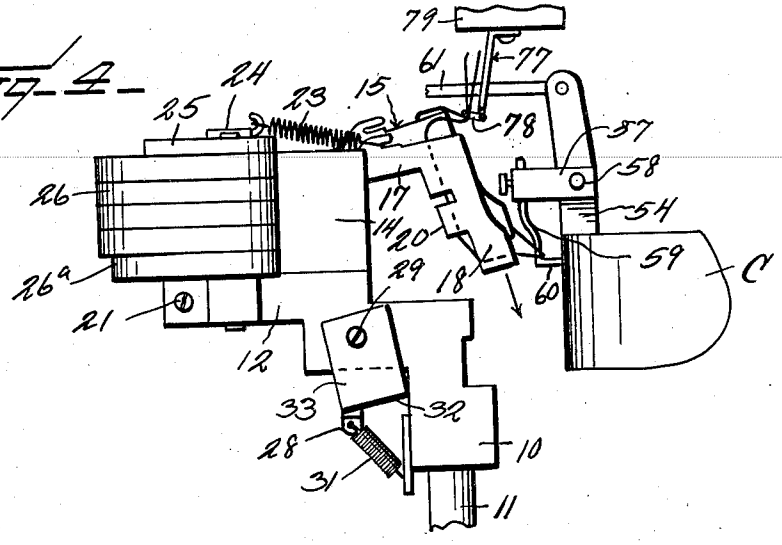


Fig. 11

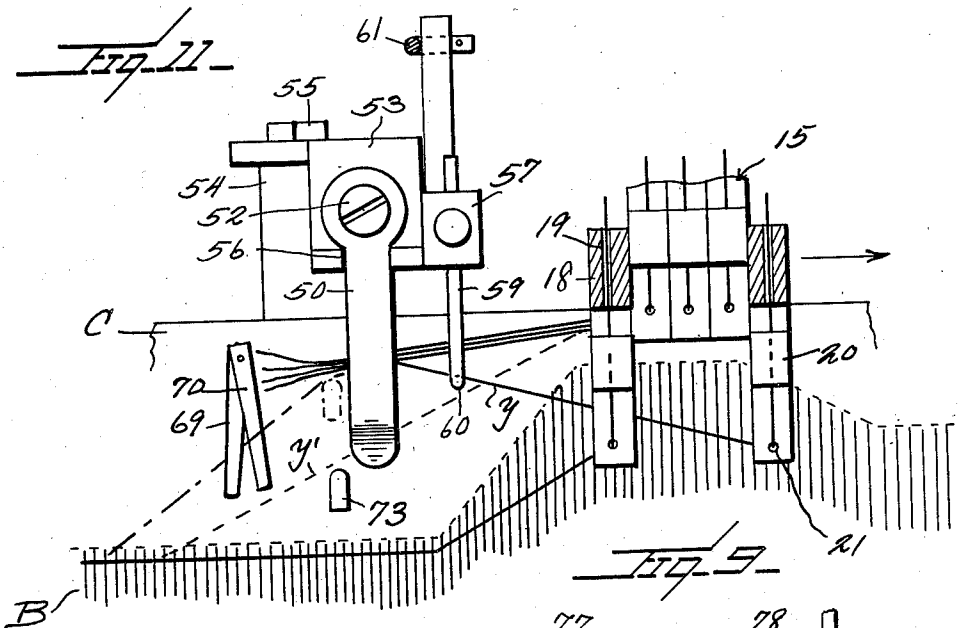
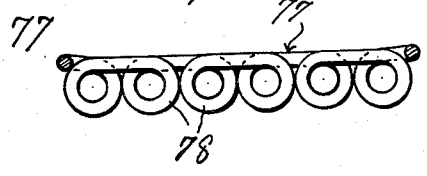


Fig. 9



Fig. 10



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UNITED STATES PATENT OFFICE

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YARN CHANGER FOR KNITTING MACHINES

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Application May 20, 1937, Serial No. 143,792

15 Claims. (Cl. 66—140)

This invention relates to yarn changing mechanism particularly designed for horizontal striping on a circular ribber of the dial and cylinder type.

It is the general object of this invention to provide means for this purpose which includes a plurality of fingers shifted by a pre-arranged pattern mechanism to thereby change the yarns supplied to the needles of the machine, and provide means whereby just before a previously used yarn is cut off, a new yarn of different character is lowered into position to be engaged by the cylinder needles and drawn into operative engagement with said needles.

A particular object of this invention is to provide means for this purpose which is relatively simple, direct acting and positive in its operation.

Another object is to provide means whereby upon a descent of a finger, the yarn carried thereby shall be so held in such position that the needles shall engage the yarn without any chance of mixing the yarn and to provide a yarn clamp for the idle yarns so constructed and arranged as to permit the withdrawal of a yarn end therefrom with the least possible friction while at the same time holding the idle yarns firmly in place, and in this connection to so construct the yarn clamp and the coacting parts that when any one yarn is being withdrawn from the yarn clamp, it will not cause the withdrawal of any of the idle yarns.

Still another object is to provide a yarn guiding hooked member disposed between the depressed finger and the clamp, over which the yarn is guided as the finger descends, so that as the needles successively engage the yarn, a loop will be formed between the finger, the needles and the guide, which will cause the yarn to draw from the finger and also through the guide and out of the clamp either or both. This yarn guide is movable automatically to an open or closed position to release a yarn which has just been put in or engage beneath the yarn which has just been taken out.

A further object is to provide means for raising the yarn which is being taken out of the needles and positively lift it into the clamp and provide means for cutting off the yarn which is being taken out of the needles at such a distance beyond the clamp as to provide relatively long ends for the idle yarns extending beyond the clamp.

A still further object is to provide a thread guide through which the yarns from the cones pass so arranged with relation to the fingers and so constructed that as a finger is depressed, the yarn will be slackened to prevent the yarn from being pulled out of the clamp before it reaches the knitting position and to place a frictional tension on the yarn when a finger is raised so that the yarn between the finger and the needles will be under tension and not slack.

Other objects will appear more in detail in the following description.

Our invention is illustrated in the accompanying drawings wherein:

Fig. 1 is a top plan view of a rib knitting machine showing our attachment applied thereto and showing the position of the parts when two of the fingers are depressed and before the originally depressed finger has been released.

Fig. 2 is a like view to Fig. 1 showing the position of the parts when the previously depressed finger has been released.

Fig. 3 is a section on the line 3—3 of Fig. 1.

Fig. 4 is a fragmentary end elevation of the attachment with the parts in the same position as in Fig. 3, but showing the knuckles in elevation.

Fig. 5 is a top plan view of the latch releasing bar, the tails of the latches being shown in section.

Fig. 6 is a section on the line 6—6 of Fig. 1.

Fig. 7 is a detailed elevation showing the lifter in a lowered position.

Fig. 8 is a section on the line 8—8 of Fig. 1.

Fig. 9 is a top plan view of the thread guide which is disposed immediately above the fingers.

Fig. 10 is a plan view of the thread guide.

Fig. 11 is a diagrammatic elevation of the needle cylinder showing the fingers in raised and lowered positions and the action of the yarn guide, the yarn lifter, clamp and the shears.

Referring to these drawings, A designates the bed plate of a rib knitting machine or ribber. B designates the revolving needle cylinder and C the dial thereof. All of these parts are of a conventional form and such as are commonly found in ribbers. Our attachment is mounted upon the rotary cam box and rotates therewith around the needle bank.

Referring particularly to Figs. 1 and 3, 10 designates a supporting block having downwardly projecting pins 11 adapted to be inserted in corresponding vertical bores in the cam box B. This block has two outwardly extending arms 12 and 13, these arms supporting the two upwardly extending parallel lugs 14. Pivoted between these lugs 14 are a plurality of fingers 15 shown as five in number, it being understood, of course, that a greater or less number of fingers within certain

limits might be used. The fingers are all alike and each has a rear relatively wide base portion 16, a horizontally inwardly extending portion 17 and a downwardly extending portion 18. The yarn passes down through this downwardly extending portion at the forward end of the finger. To this end, the portion 18 is formed with an eye 19 through which the yarn passes, a yarn guide 20 and a bore or eye 21' extending radially to the circular series of needles B. Each finger is pivoted at its rear end upon a pin 21 which extends between the arms 12 and 13. Below the juncture of the rear portion 16 with portion 17, each finger is formed with a detent tooth 22. A spring 23 is connected to each finger to retract or raise it.

Pivoted upon a vertical pin 24 extending downward from a plate 25 and extending into the arm 12 are a plurality of finger actuating knuckles 26 having curved outer edge faces. These knuckles are equal in number to the fingers 16 and each knuckle bears against a lug 27 on corresponding finger 15, as shown in Fig. 3.

Associated with each finger and pivotally mounted between the arms 12 and 13 is a latch 28. All of the latches are pivoted on a pin 29 extending between the lugs 14. The upper end of each latch has an outwardly extending latch tooth 30 having a rounded outside edge face against which the rounded outer face of the corresponding detent tooth 22 bears, as shown in Fig. 3, so that as a finger is forced downward, the rounded face of the tooth 22 cams against the rounded upper end face of the latch 28 and forces it inward toward the needles until the tooth 22 has passed the latch tooth 30 whereupon the latch will spring into engagement over the tooth 22 under the action of a spring 31 and latch the corresponding finger in its lowered position, as shown in Fig. 3.

For the purpose of releasing the latch of any finger which may be depressed, there is provided a latch releasing bar 32, as shown in Fig. 5, having upturned ends 33 and 34. This latch releasing bar is pivoted upon pin 29 extending into the outer faces of the arms 12 and 13. This latch releasing bar is disposed behind the tails of all of the latches 28 (see Figs. 3 and 5) and is notched to receive these tails. When this bar is shifted outward, it will shift the lower ends of all of the latches rearward and carry the upper detent ends of all the latches out of engagement with the teeth 22 of any previously depressed finger or fingers.

For the purpose of automatically shifting the releasing bar 32 to release any previously depressed latch, there is provided a radially extending trip plate 36 (Figs. 1 and 2) which is carried upon a pair of laterally extending arms 37 pivoted to plate 25 and to the arm 13 of block 10 by a pivot pin 37a. Pivoted upon the inner face of the plate 36 by a pivot screw 38 and disposed adjacent the inner end of the plate 36 is a short lever or arm 39 (see Fig. 6) whose lower end has a laterally projecting lug 40, the inner face of which is downwardly rounded. The adjacent upturned end 34 of the release bar 32 is formed with an upwardly projecting tooth 41. The upper end of the arm or lever 39 bears against a cam 42 held in adjusted position by a screw 43 extending through the cam and into the plate 36. A coiled spring 44 surrounds screw 43 and urges the arm 39 against the cam, which cam constitutes an abutment for the arm. It will be evident now that when the trip plate 36 is forced inward by means which will be described later, that lug 40 on arm 39 will bear against the tooth 41 and the bar 32 will be caused to turn in a clockwise direction (in Fig. 6) until the tooth 40 has slipped past the tooth 41, whereupon the release bar will be returned to its initial position by the springs 31. This oscillation of the release bar 32 will move the upper ends of all of the latches inward out of engagement with the detents 22 and then the springs 31 will return the release bar to its initial position and project the upper ends of the latches outward against the inner faces of the butt ends of the fingers.

Before describing the means for positively carrying the yarn from a depending finger into position to be engaged by a needle and before describing the yarn clamping means, the means for carrying the yarn into the clamping means upon the lifting of a previously depressed finger and the yarn cutting means, we will describe the means for actuating the knuckles 26 and thus actuating the several fingers.

The means for this purpose includes a rotatively stationary but vertically movable cam plate 45 mounted as usual in this class of devices, upon the bed plate of the machine and having a vertical post 46 which is shifted up or down to carry the cam plate to any one of a plurality of levels by pattern mechanism which is well known and not necessary to describe. This cam plate is shown as adjustably mounted on a support 47 for movement toward or from the center of the machine by screws 48. The cam plate 45 has a concavely curved inner edge and an outwardly extending entering edge portion 49. The cam plate is shifted by the pattern mechanism into any selected elevation where it will act upon a selected knuckle 26 and force this knuckle inward. Once the knuckle is forced inward and until the yarn is to be again changed, this cam plate drops down below all of the knuckles. When that particular course has been knitted and it is necessary to put in a new and different colored yarn, then the cam plate is again raised to the selected level by the pattern mechanism. The operation of the cam plate and the pattern mechanism is well known and requires no further description. When the rotating cam box carrying this attachment has moved around to a position where the raised cam plate 45 will engage a knuckle 26, it will act to force the selected knuckle inward, as shown in Figs. 1 and 3. This will cause the corresponding finger 15 to be depressed, forcing back the corresponding latch 28 until the tooth of the latch engages over the tooth 22. The finger is thus latched in its depressed position.

It is, of course, to be understood that there will always be one finger depressed and latched and that when the yarn is changed, a newly selected finger is depressed or put into action so that at this time two yarns are being knitted. This continues until the trip plate 36 strikes the entering edge 49 of the cam plate 45 whereupon the trip plate 36 is forced inward and shifts the release bar 32 outward, as heretofore described, releasing the latch of the previously depressed finger whereupon that finger is raised by its spring 23. Of course, the finger which has just been depressed by the cam plate 45 is held depressed by this plate so that the release of its corresponding latch has no effect on the selected finger and the latch after its release springs back into position again holding the finger down after the corresponding knuckle 26

has left the cam plate **45**. It will be understood, of course, that the depression of the selected finger carries its yarn downward from an idle position to a position below the level of the needle hooks, as shown in Fig. 3.

For the purpose of clamping the ends of the idle yarns, we have provided the clamp **50** shown in front elevation in Fig. 11 and in edge elevation in Fig. 6. This clamp consists, as illustrated, of strips of spring steel opposed to each other and held together to provide two opposed leaves, the lower ends of which are outwardly turned to form an entrance opening **51**. This clamp is attached by a screw **52** to the face of a small block **53** which is adjustably mounted on a post **54** carried by the dial plate C and held in place by a screw **55**. The clamp is held in a notch **56** in this block. The face of the cam box is recessed at *c* to accommodate this clamp so that the clamp is disposed inward of the line of needles, as shown in Fig. 1.

For the purpose of positively shifting a lowered yarn inward beyond the under line of needles, as shown in Fig. 3 and thus causing the selected yarn to extend upward and inward from the eye of the lowered needle, there is a bell crank lever **57** pivoted at **58** to the block **53** and having an outwardly extending arm and an upwardly extending arm. The outwardly extending arm carries a depending wire guide **59** having an inward bend or hook **60** at its lower end over which all the yarns pass except that one yarn which is being knitted. The upwardly projecting arm of the bell crank **57** is connected by a rod **61** to a trip plate **62**, as shown in Figs. 1 and 2, the rod extending at its end downward through one of a pair of arms **63** attached to the trip plate and which embrace the plate **36** and the arms **37**. The arms **37** and plate **36** are urged outward by a spring **64**, the arms being limited in their outward movement by the stop lug **65**.

The block **10** which forms the base of our attachment, has a lateral prolongation **66** which supports at its end a plate **67**, the inner end of which is upwardly extended and then inwardly extended at **68** (see Fig. 8) and which carries a downwardly extending fixed shear blade **69** and a pivoted blade **70**. The upper end of the blade **70** is connected by sectional rods **71** to the plate **62** and a spring **72** urges the pivoted blade to a closed position. This spring is shown as engaged with rod **71** and, of course, also urges this rod and the plate **62** outward to a projected position. Thus when the plate **62** is shifted inward by contact with the cam plate **45**, the shears or scissors **69** and **70** will be open and when the trip plate **62** has passed the cam **45**, the spring will project the trip plate, closing the scissors. The connecting rod **71** is preferably formed in sections connected by a turnbuckle **71***a* to provide for adjustment.

The trip plate **36**, in addition to operating the release bar **32**, also actuates a yarn lifter (see Figs. 6 and 7) designated **73**. This is in the form of an angular lever pivoted at **74** upon a split bracket **75** mounted on the prolongation **66** of the block **10**. This finger is disposed between the clamp **50** and the shears **69**—**70** but closely adjacent to the clamp **50**, as shown diagrammatically in Fig. 11. The upwardly extending arm of the lifter **73** is connected by a sectional rod **76** to a lug **36***a* on the trip plate **36**. Thus when the trip is forced inward by the cam plate **45**, the lifter will be lowered, as in Fig. 7, and it will remain lowered until the plate **36** runs off of the cam plate **45**. Upon the outward movement of the plate **35**, the lifter will be raised, lifting the yarn from the just raised finger into the mouth of the clamp **50**, as in Fig. 6. As the lifter rises, it carries the yarn upward into position above the hook or wire **59** which this time is open or moved upward and outward so that upon the inward movement of the hook into the position shown in Fig. 3, the idle yarn will be caught thereby and supported above the needles. Immediately after this action, the shears will operate to cut off the yarn thus raised. It is particularly pointed out that the shears are located a relatively considerable distance from the clamp **50** so that relatively long ends of idle yarn will be left within the clamp so that there will be no chance of these ends pulling out under strain until the proper time.

Disposed immediately above the fingers when they are in their raised position is a yarn guide, as illustrated in Figs. 9 and 10, the guide being designated generally **77**, and this guide is formed with a plurality of eyes **78**. This yarn guide **77**, as shown in Fig. 4, is attached to the body **79** of the dogless attachment commonly found on machines of this character. The several yarns are fed or drawn from spools mounted upon the machine in the usual manner and these several yarns are guided down through the several eyes **78** of the yarn guide. These eyes are disposed just above the upper ends of the vertical portions **18** of the fingers so that when a finger is fully raised, the yarn will be pulled upward and around the eye of the guide so that frictional resistance is placed on the yarn. As the finger moves downward, however, the yarn will be slackened, as shown in Fig. 4, or will accumulate slack and then as the finger descends to its fully lowered position, this slack in the yarn will simply be straightened out and the yarn will have a straight free run through the eyes of the finger. This is particularly important where fine or delicate yarns or low-grade yarns are being knitted. This particular position and arrangement of the guide **77**, when low-grade yarns are being knitted, acts to keep a sufficient tension upon the yarns when the fingers are raised, which will thus place sufficient tension on the yarn to permit the lifter to lift the yarn into the clamp when the finger has been raised. The slack in the yarn which is secured as the finger is lowered is taken up when the finger has fully lowered and this also acts to eliminate any chance of the yarn being pulled out of the clamp when the finger is lowered. It is to be particularly noted that when the finger is lowered, the run of the arm is almost straight downward from the eyes **78** through the eyes **19** and **18**.

In the drawings, we have designated the usual latch guard as **80**, but it is to be understood that this needle guard is one that is commonly found on a large number of different machines of this type and forms no part of our invention.

The operation of this mechanism is as follows:

It is assumed that one of the fingers **15** is already down in a yarn feeding position and that it be now desired to change the yarn. The pattern mechanism raises the cam plate **45** to its selected position, that is, to a position opposite any selected knuckle and, as shown in Fig. 3, into position to engage the lowermost knuckle **26**, which knuckle, for purposes of identification in Fig. 3, is lettered *a*. The lug **27** of the previously lowered finger in Fig. 3 is identified by the letter

a, this lug only being identified because the finger itself is hidden behind the finger which has just been lowered by the cam plate **45**.

When the cam plate strikes the knuckle **26**—*a*, it forces the corresponding finger vertically downward parallel to the vertical needles, to the position shown in Fig. 3. The yarn *y* from this finger (see Fig. 11) now extends from a point below the upper ends of the raised vertical needles upward and inward over the hook **60** to the clamp **50** and diagonally across the row of needles (see Fig. 1). In this position, the yarn *y* is about to be drawn into the knitting position by the needles and knitted and the yarn *y'* which is about to be removed from the needles is also being knitted. As the needles engage the yarn *y*, they draw it downward across the hook **60** and this pulls the selected yarn out of the clamp **50** by a straight pull. Eventually the wire hook opens and if the yarn has not been entirely pulled out of the clamp, the opening of the hook will allow the yarn to be pulled directly out of the clamp. After this, a brush (not shown) brushes the loose end of the yarn into position where it is knitted in a manner well known and not necessary to describe.

In the position of the parts, as shown in Figs. 3 and 11, both fingers are held lowered by their latches **28**. This double weaving continues until the trip plate **36** strikes the cam plate **45** and then the trip **36** is forced inward, which through the releasing bar **32**, releases all of the latches. This, of course, releases the previously depressed finger whose lug **27** is designated *a* in Fig. 3, and this finger springs upward, but the finger which was newly depressed by the knuckle **26**—*a* is still held depressed by contact of the knuckle with the cam plate. When the knuckle leaves the cam plate, the depressed finger is held down by its latch.

As this trip plate moves inward, it also lowers the lifter **73** to full line position in Fig. 11 and the position shown in Fig. 7, so that the lifter is below the yarn *y'*, thus as the lifter rises to the position shown in Fig. 6, it will lift the yarn *y'* into the clamp **50**. This raising of the lifter does not occur until the plate **36** has run off the cam plate **45**. At the point of operation shown in Fig. 11, the yarn *y* is being knitted in and the yarn *y'* takes the position shown in dotted lines in Fig. 11 and is taut between the raised finger and the needles and is drawn across below and into the flared mouth of the clamp **50**. When the trip plate **62** reaches the cam **45**, which occurs almost instantly after the trip **36** is forced inward, it also is forced inward. This opens the shears immediately above the yarn *y'* (see Fig. 11) and also shifts the yarn guide or wire **59** upward and outward to "open" position where it will allow the yarn *y'* to be lifted up by the lifter **73** to the dot-and-dash position in Fig. 11 and into position to be engaged by the hook on the guide wire **57** upon the inward and downward or closing movement of the wire **57**. At the same time, the lifter **73** is raised which carries the yarn *y'* upward into full engagement with the clamp **50** and into position above the hook of wire **57** and into the shears.

When the trip plate **62** passes off the cam plate **45**, the hook to wire **57** is moved downward and inward to a closed position and simultaneously the shears **69**—**70** will be closed by springs **72** and the yarn is cut off at some distance from the clamp **50**.

Attention is called to the advantage incident to the use of the knuckles **26** and to the particular manner of pivoting the fingers **15**. The knuckles have outwardly and rearwardly curved edges and are mounted for inward swinging movement in a horizontal plane so that as a selected knuckle is engaged by the cam plate **45**, it is "wedged" inward gradually and gently and always remains in the same plane as the cam plate **45**. If the cam plate **45** engaged directly with the lugs **27** or with the rear ends of the fingers, then the fingers would be traveling in a direction at right angles to the edge face of the cam plate and there would be a great deal of friction set up which would be liable to cause the fingers to bind upon each other. This is entirely avoided by our mechanism. The lugs **27** are successively shorter from the uppermost lug downward and are disposed in stepped relation, the first lug of the series being nearest the pivot **24** and being the shortest, as illustrated in Fig. 3. By pivoting the fingers at **21** at a point immediately below the lugs, as shown in Fig. 3, the lugs will have only an extremely slight vertical movement relative to the knuckles and will never get out of line therewith or overlap any other knuckle or prevent its full actuation.

It is to be understood that while we have described and illustrated a knitting machine wherein the needles are stationary and the yarn changing attachment revolves around the needles, yet our mechanism is equally applicable to a knitting machine in which the needles revolve and the attachment is stationary.

What is claimed is:—

1. A yarn changing mechanism for knitting machines, having a plurality of yarn carrying fingers movable to or from a yarn feeding position but urged out of said position; means for latching any selected finger in feeding position; a clamp for the idle yarn; a vertically movable yarn lifter disposed on the other side of the clamp from the fingers; a yarn guide disposed between the fingers and the clamp and swingingly mounted for movement in a vertical plane from a depressed and closed position to a raised and open position; a pair of shears disposed beyond the clamp; pattern controlled means for shifting a selected finger into feeding position while a previously actuated finger is also in feeding position; means successively operating to release the said previously actuated finger to permit its return to inactive position; said means acting to shift the lifter to open position to receive the cast-off yarn carried by the last named finger; means then acting to open the shears and simultaneously shift the yarn guide to open position; means successively acting to shift the lifter to lift the yarn from the inactive finger into the clamp and into the shears; and means then acting to shift the yarn guide to a closed position beneath the lifted yarn and simultaneously close the shears.

2. A yarn changing mechanism for knitting machines, including a plurality of yarn carrying fingers movable to a yarn feeding position but urged out of such position; means for latching the fingers in feeding position; a clamp for the idle yarns; a vertically movable yarn lifter disposed on the other side of the clamp from the fingers and movable upward from a depressed vertical position to a raised and horizontal position above the lower end of the clamp; a yarn guide disposed between the fingers and the clamp and swingingly mounted for movement in a vertical plane from a depressed closed position to a raised or open position, said guide when in a depressed or closed position being disposed inward of but

above the vertical needles of the machine; a pair of shears disposed on the other side of the clamp from the fingers and the lifter; pattern controlled means for shifting a selected finger into feeding position while a previously actuated finger is also in feeding position; means successively operating to release the previously actuated finger to permit its movement to an inactive position; means simultaneously acting to depress the lifter to open position to receive the cast-off yarn carried by the last named finger; means then acting to open the shearing mechanism and simultaneously raise the yarn guide to open position to receive the cast-off yarn, means then acting to raise the lifter to lift the yarn from the inactive finger into the clamp and into said shears; and means then acting to lower the yarn guide to a closed position beneath the so-lifted yarn and simultaneously close the shears.

3. In a yarn changer for knitting machines; a plurality of yarn feeding fingers; pattern operated means acting to shift one finger to a feeding position and after an interval shift a previously active finger to an inactive position; a yarn clamp; a yarn engaging guide over which the idle yarns pass to the clamp and shiftable from a position above and inward of the vertical needles of the machine to a lifted position in front of the vertical needles to permit the yarn from a feeding finger to slip off the guide upon engagement by a vertical needle; and means acting when the yarn from the feeding finger has been drawn off of the guide and out of the clamp to raise the yarn carried by the finger which has just been made inactive into the clamp; and means then acting to cut the yarn beyond the clamp.

4. In a yarn changer for knitting machines, a plurality of yarn feeding fingers; pattern operated means acting to shift one finger to a feeding position and after an interval shift a previously active finger to an inactive position, a yarn clamp; a yarn engaging guide over which the idle yarns pass to the clamp and shiftable from a position above and inward of the vertical needles of the machine to a lifted position in front of the vertical needles to permit the yarn from a feeding finger to slip off the guide upon engagement by a vertical needle; and means acting when the yarn from the feeding finger has been drawn off of the guide and out of the clamp to raise the yarn carried by the finger which has just been made inactive into the clamp; and means then acting to cut the yarn beyond the clamp, said cutting means being located a relatively considerable distance from the clamp whereby to leave long yarn ends extending through the clamp.

5. In a knitting machine having vertical needles and having a dial cam casing; a plurality of yarn feeding fingers urged out of a yarn feeding position; pattern actuated means acting to shift one finger to a feeding position and latch it in this feeding position and after an interval release a previously active finger from its feeding position; a yarn clamp operatively supported upon the dial cam casing of the machine and opening downward; a yarn engaging guide pivotally mounted upon the dial cam casing and having an inwardly extending extremity normally bearing against the dial cam casing, the guide being pivoted for movement in a vertical plane toward and away from said casing, the idle yarns passing to the clamp over said inwardly extending extremity of the guide; means acting when the yarn from the newly actuated feeding finger has been drawn off of the guide and out of the clamp to lift the guide into an open position away from the dial cam casing, raise the yarn from the released finger into the clamp, and means then acting to cut the yarn beyond the clamp.

6. In a knitting machine having vertical needles and a dial cam casing; a plurality of yarn carrying fingers movable to or from a yarn feeding position but urged out of such position; means for latching any finger in a feeding position; a downwardly opening clamp for the idle yarn mounted on the dial cam casing; a vertically movable yarn lifter disposed on the other side of the clamp from the fingers but adjacent the clamp and pivoted for movement from a depressed vertical position to a raised horizontal position above the lower end of the clamp; a yarn guide pivotally mounted upon the dial cam casing for oscillation in a vertical plane, the lower end of the guide having an inwardly extending extremity normally bearing against said casing, the yarn guide being disposed between the clamp and the fingers; a shearing means disposed beyond the lifter on the side away from the fingers; pattern controlled means for shifting a selected finger into feeding position while a previously actuated finger is also in feeding position; means operating after a predetermined time to release the previously actuated finger to permit its movement to inactive position; means simultaneously acting to depress the yarn lifter to an open vertical position to receive the cast-off yarn carried by the just released finger; means then acting to place the shearing mechanism in shearing position and simultaneously raise the yarn guide to a position outward and away from the dial casing; means then acting to raise the lifter to lift the yarn from the released finger into the clamp and into operative relation to the shearing mechanism; and means then acting to shift the yarn guide downward and toward the dial cam casing and beneath the lifted yarn and simultaneously actuate the shearing mechanism to shear off the idle yarn.

7. In a knitting machine; a series of vertical needles; a dial cam casing; a vertically shiftable pattern operated cam plate; a plurality of yarn carrying fingers movable to or from a yarn feeding position by said cam plate but urged out of such position; means for latching any finger in feeding position; a downwardly opening yarn clamp mounted upon the dial cam casing; a vertically movable yarn lifter disposed on the other side of the clamp from the fingers and movable upward from a depressed vertical position to a raised horizontal position above the lower end of the clamp; a yarn guide pivotally supported upon the cam casing for vertical movement, the yarn guide having an inwardly extending extremity normally approximating at its end the cam casing; the yarn guide being disposed between the fingers and the clamp; a shearing means disposed on the other side of the clamp and lifter from the fingers, the pattern controlled cam plate being constructed and arranged to shift a selected finger into feeding position while a previously actuated finger is also in feeding position; a trip actuated by the cam plate after the actuation of a feeding finger to release the originally actuated finger to permit its movement into inactive position, said trip upon its engagement with the cam plate simultaneously acting to depress the lifter to open position to receive a cast-off yarn from the released finger; a second trip successively engaging the cam plate after the

first named trip has been engaged thereby and acting when engaged by the cam plate to shift the shearing mechanism to shearing position and simultaneously raise the yarn guide to open position; the movement of the first named trip out of engagement with the cam plate acting to raise the lifter to lift the yarn from the inactive finger into the clamp and into operative position with relation to the shearing mechanism, the second-named trip when it leaves the cam plate acting to shift the yarn guide to a closed position beneath the lifted yarn and simultaneously actuate the shearing mechanism.

8. A yarn changing attachment for circular knitting machines having vertical needles and a pattern controlled vertically shiftable element; the attachment including a support constructed and arranged to be mounted on the machine outward of the vertically movable needles thereof; a plurality of fingers mounted on the support for movement into or out of active feeding position; means urging the fingers out of the feeding position; a latch for each finger adapted to hold an active finger in its feeding position; shiftable members mounted on the support, one for and engaging each finger, constructed and arranged to be engaged by the pattern controlled element to shift a selected finger into active feeding position; a latch releasing member common to all of the latches; a downwardly opening idle-yarn clamp constructed and arranged to be mounted on the dial cam casing of the machine; an angular yarn guide constructed and arranged to be mounted adjacent the cam casing and normally having its angular extremity extending toward the said casing; a yarn lifter mounted on the support and movable from a depending to a raised position and disposed adjacent the yarn clamp; yarn shears mounted on the support and disposed on the other side of the clamp from the fingers; an outwardly urged trip mounted on the support rearward of the fingers and disposed to be engaged and forced inward by the pattern controlled element; means engaged by the trip element engaging with and actuating the finger releasing member upon an inward movement of the trip; an operative connection between the trip and the yarn lifter to cause the lifter to shift to an open position upon the inward movement of the trip and to a closed position upon an outward movement of the trip; a second outwardly urged trip mounted on the support in position to be engaged and forced inward by the pattern controlled element; operative connections between the second named trip, the yarn guide and the shears and causing the shifting of the yarn guide to open position and the shears to an open position upon the inward movement of the second named trip, the outward movement of the second named trip upon disengagement from the pattern element causing the upward movement of the lifter and the closing of the shears.

9. A yarn changer for knitting machines, including a plurality of fingers for feeding a plurality of yarns; means for moving the fingers to active and inactive positions; a downwardly opening yarn clamp; a yarn lifter movable from a position below the lower end of the clamp to a position above said lower end and an angular yarn guide over which the idle yarns pass and disposed between the fingers and the clamp; and means for moving the yarn guide to a yarn supporting position or to a yarn releasing position.

10. A yarn changer for knitting machines, the changer including a plurality of fingers for feeding a plurality of yarns; means for moving the fingers to active or inactive position; a downwardly opening yarn clamp disposed rearward of the fingers; a pair of shears disposed rearward of the yarn clamp at a relatively considerable distance therefrom; a yarn guide having an angularly extending extremity, the guide being mounted for oscillation in a vertical plane and being disposed between the fingers and the clamp; means for moving the guide into active or inactive positions, the guide in an active position supporting the idle yarns and in an inactive position releasing the yarn of the active finger and in this position adapted to receive a yarn from a finger recently made inactive; a yarn lifter disposed between the shears and the clamp and movable from a position below the lower end of the clamp to a position above the lower end of the clamp and vice versa; and means for closing the shears when the idle yarn has been lifted by the lifter into the clamp.

11. In a knitting machine having a vertically shiftable pattern controlled cam plate; a yarn changing mechanism including a plurality of vertically movable yarn carrying fingers; each finger having a rearwardly projecting lug disposed at a different level from any other lug; means urging the fingers upward; and means for depressing the fingers including a plurality of horizontally disposed knuckles, all of the knuckles being pivoted at one end upon a vertically disposed pivot, each knuckle being movable inward to depress the corresponding finger upon engagement of the knuckle with the cam plate.

12. In a knitting machine having a vertically shiftable pattern controlled cam plate; a yarn changing mechanism including a plurality of vertically movable yarn carrying fingers; each finger having a rearwardly projecting lug disposed at a different level from any other lug; means urging the fingers upward; and means for depressing the fingers including a plurality of horizontally disposed knuckles, all of the knuckles being pivoted at one end upon a vertically disposed pivot, each knuckle being movable inward to depress the corresponding finger upon engagement of the knuckle with the cam plate, the fingers all being pivoted on a common axis located below the lowermost knuckle and rearward of the rear ends of said lugs.

13. For use in a circular knitting machine having a pattern controlled cam plate; a yarn changing attachment including a support; a plurality of vertically disposed fingers pivoted upon said support for vertical movement and having yarn guiding eyes at their forward ends; each of said fingers above its pivot having an outwardly projecting lug, the lug of each finger being disposed at a different level from the lug of any other finger; a plurality of knuckles pivotally mounted upon the support for movement in a horizontal plane, the outer edge faces of the knuckles being rounded, each knuckle being associated with a particular lug and the knuckles being adapted to be engaged by said cam plate to thus cause the depression of a selected finger; a series of latches one for each finger and adapted to engage with the finger upon its depression and hold said finger depressed; a release bar operatively engaging all of the latches to cause the movement of the latches to released position upon an actuation of the release bar in one direction; and a trip disposed rearward of the knuckles and fingers and mounted upon said support, the trip

being adapted to be engaged and forced inward by engagement with the pattern actuated cam plate, and means causing the momentary shifting of the release bar to a latch releasing position upon the inward movement of said trip.

14. In a yarn changing mechanism for knitting machines, a yarn carrying finger movable in a vertical plane from a raised non-feeding position to a lowered yarn feeding position, the finger having a portion extending downward from the body of the finger having yarn guiding apertures therein, the uppermost aperture opening upon the upper inner end of the finger; and means for guiding a yarn to said finger including an eye disposed inward of but below the uppermost position of the upper end of the finger whereby to angularly flex the yarn extending through said eye when the finger is raised but permit slack to be formed in the yarn as the finger starts to lower from its raised position.

15. A yarn changer for knitting machines, including a plurality of fingers for feeding a plurality of yarns; means for moving the fingers to active or inactive positions; yarn cutting means; a downwardly opening yarn clamp including opposed members yieldingly urged against each other, the clamp being disposed between the fingers and the cutting means and constructed and arranged to frictionally hold the free ends of idle yarns coming from one or more of the inactive fingers while and after the idle yarns are cut off; a yarn lifter movable from a position below the lower end of the clamp to a position above said lower end to thus insert into said clamp a yarn rendered inactive by a movement of a finger to an inactive position, without opening said clamp and thus relieving pressure on other previously inserted yarns; means acting to operate said yarn lifting means to thereby carry said yarn up into the clamp, and means then operating the cutting means to cut off the lifted and clamped yarn.

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