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2,099,307

YARN CHANGE FEEDING MECHANISM FOR CIRCULAR KNITTING MACHINES

Filed Feb. 10, 1936

3 Sheets-Sheet 1

Fig. 1

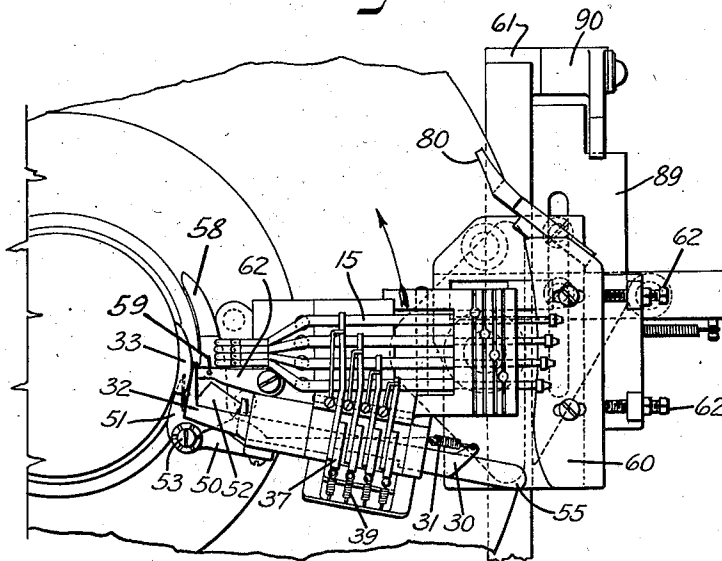
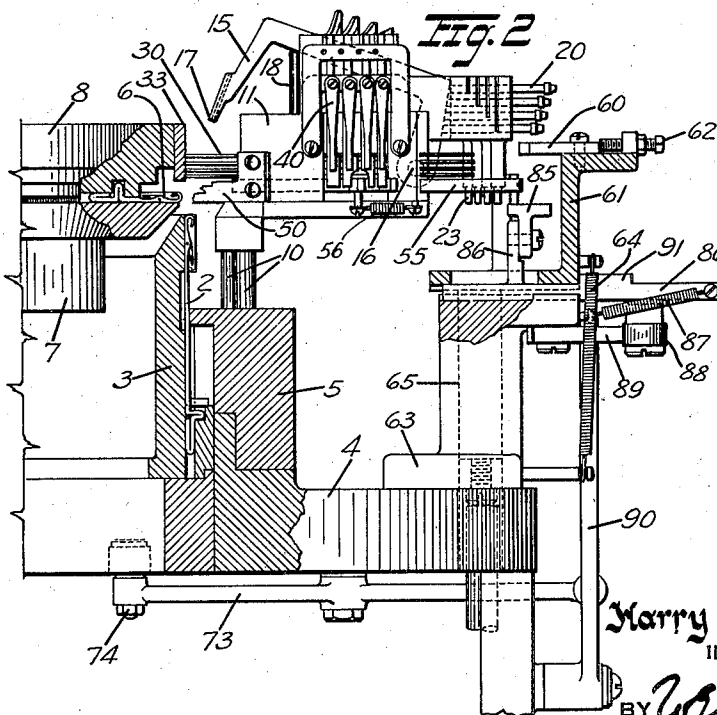


Fig. 2



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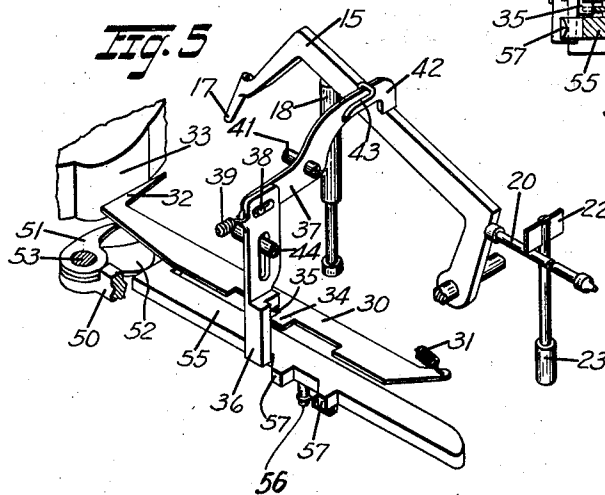
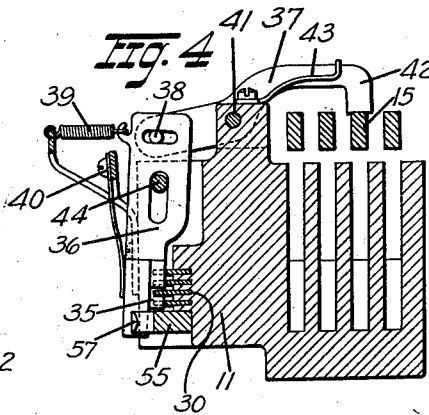
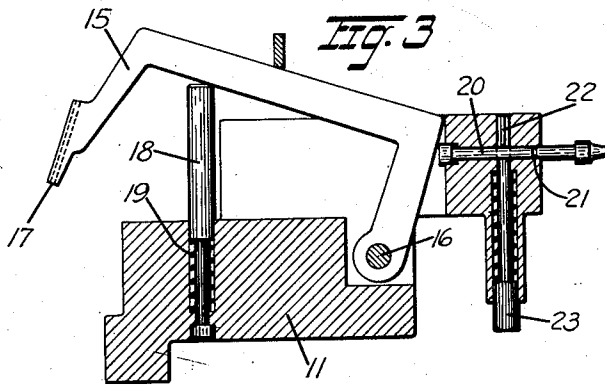
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3 Sheets-Sheet 2



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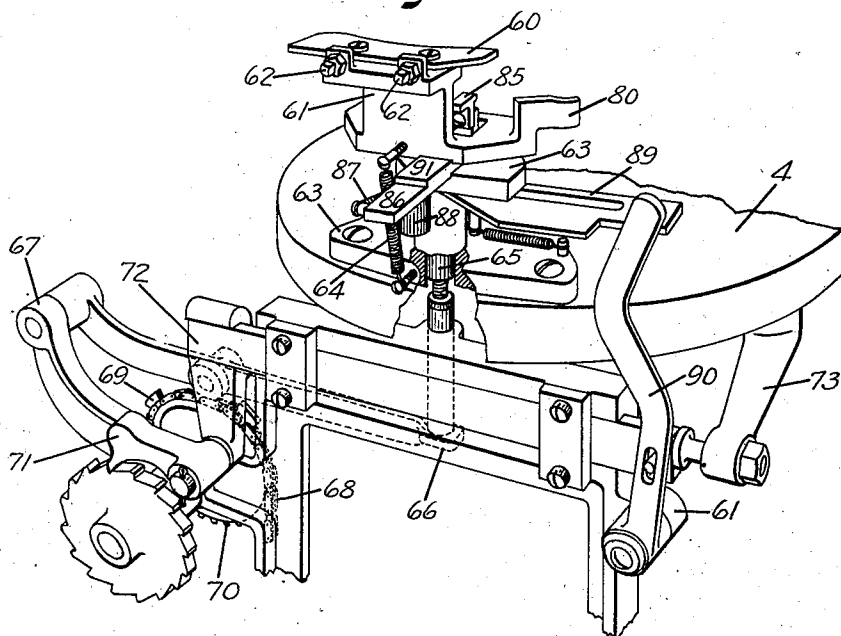
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YARN CHANGE FEEDING MECHANISM FOR CIRCULAR KNITTING MACHINES

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3 Sheets-Sheet 3

Fig. 6



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YARN-CHANGE FEEDING MECHANISM FOR
CIRCULAR KNITTING MACHINESHarry McAdams, Philadelphia, Pa., assignor to
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Application February 10, 1936, Serial No. 63,233

7 Claims. (Cl. 66—140)

My invention relates to the feeding of changes of yarns to the needles of a circular knitting machine, and more particularly to improved means for this purpose that may be effectively and satisfactorily applied to rib-knitting machines having both cylinder and dial knitting needles.

Within the circle of needles of the usual plain fabric knitting machine, room is ordinarily found for some form of cutting and clamping devices to hold the severed yarn ends in known advantageous position extending across the needles to their respective guides for reliably effective needle re-engagement when yarn changes are desired.

Such known yarn change means, however, cannot be applied to the ordinary rib-knitting machine, as the space within the circle of cylinder needles is commonly filled by the usual rib dial, dial needles, and operating mechanism. And it is further recognized that free floating yarn-ends cannot be relied upon to engage the needles with sufficient certainty to insure continuous knitting, making some means of holding such ends an essential of any change feeding if it is to be reliably effective.

Therefor among the objects of my invention, are to provide means, readily applicable and satisfactorily operative with rib knitting machines, for feeding a desirable plurality of yarns, providing adequate changes, with unrestricted selection in such yarn changes, and with individual clamped retention of the severed ends of the withdrawn yarns, held in an effective position to insure their positive re-engagement with the needles as determined by the feeding movement of their respective guides.

With the above main objects in view, my improved yarn change feeding means comprises separate guides for the several yarns, separate clamps for each yarn cooperative with its respective guide to hold each withdrawn yarn end, cutting means to sever each withdrawn yarn, and pattern control means for selectively effecting any desired yarn change, all of which will now be more fully described in connection with the accompanying drawings, and the novel features of which are set forth in the appended claims.

Fig. 1 is a partial plan view of a fragmentary portion of a rib knitting machine and shows also in plan view a preferred embodiment of my yarn changing mechanism applied to this machine.

Fig. 2 is a sectional elevation corresponding with Fig. 1, but showing my attachment in side elevation.

Fig. 3 is an enlarged detail view showing the

carrying frame of my attachment in sectional elevation with one yarn guide mounted therein.

Fig. 4 is a view similar to Fig. 3, but showing a cross sectional elevation and the guide operating connection to the yarn clamping members of my attachment.

Fig. 5 is a diagrammatic perspective view indicating the operative relation of my guide, clamp and cutter mechanism.

Fig. 6 is a perspective side view of the knitting machine indicating particularly the pattern control mechanism for automatically operating my attachment.

In the accompanying drawings I have shown a preferred embodiment of my improvements as applied to a rib-knitting machine of usual and known construction and operation, the machine showing being fragmentary and incomplete but sufficiently indicated, it is believed, for a full and complete understanding of the nature of my attachments and the manner of their automatic selective operation.

The circles of vertically movable knitting needles 2, in the machine indicated, are mounted in a needle cylinder 3 non-rotatably carried by the table 4, which also carries the cam cylinder 5, rotated in usual and known manner to operatively move the needles 2. The space within the circle of needles 2, is occupied by a circle of horizontally movable needles 6, shown mounted in a non-rotatable rib-dial 7, and operated by a rotated rib-cam dial 8, to cooperate with the needles 2 in the production of rib-knitting in well-known and commonly understood manner.

The present improvements have the object in view, as previously stated, of providing a multi-feed yarn change mechanism that will desirably hold the severed withdrawn yarn-ends in an advantageous position to insure their positive re-engagement with the needles when desired, and to adapt such mechanism to a rib-knitting type of machine in which the space within the circle of cylinder needles is occupied by other mechanism.

The drawings show two pillars or posts 10, 10, projecting upwardly from the cam cylinder 5, as forming a fixed support for a frame 11 thus rotated with said cylinder, and adapted to carry guides and clamps for multi-yarn changes, provision for four being shown as illustrative only and not to be considered as either a maximum or minimum limit. These guides and clamps are essentially alike in construction and operation, differing only in certain compensating proportions so that all will act alike, and in the following

detail description I will describe but one guide and one clamp and its mounting and feeding operation, and similar parts in each will carry the same reference numerals for the sake of clear-
 5 ness and avoiding a confusing number of reference figures.

15 15 designates a yarn guide pivotally mounted in frame 11 on pintle 16 so as to swing its yarn guide eye end 17 into and out of yarn feeding relation to the needles 2 and 6, a lift pin 18, backed by spring 19, tending to normally swing said guide 15 to raised non-feeding position, and a push rod 20 being actuated, as hereinafter described, to lower said guide 15 into yarn feeding
 15 position. Rod 20 is shown with a notch 21 engageable by a detent blade 22 adapted to lock said rod in holding contact with the lowered guide, and the latter is released to the action of lifting pin 18 by disengagement of blade 22
 20 through its depending spring-tensioned releasing extension 23, in a manner later herein described.

30 30 indicates a yarn clamp mounted horizontally in frame 11 to slide longitudinally, and tensioned by a spring 31 to normally press its yarn-clamping foot 32 against a contact pad or bulge on the rotated rib-cam-dial 8; the clamp 30 being shown with a lateral extension 34 forming a shoulder engageable by a wedge-cam 35 to retractingly
 30 move said clamp reversely against the tension of its spring 31. Cam 35 is shown as carried at the lower end of an arm 36 depending from one end of a lever 37, having a slotted pivotal connection 38 to said lever and tensioned by springs
 35 39 and 40 for a purpose hereinafter explained. Lever 37 is intermediately pivoted at 41 to frame 11, and its opposite end 42 is shown as downturned to bear against yarn guide 15, at an intermediate point in the length of the latter, lever
 40 37 extending transversely relative to guide 15 and normally held in contact with the latter by a spring 43, as shown.

A cutter device for the yarn is shown as mounted on an extension 50 of frame 11, with a fixed blade 51 and a movable blade 52 normally held
 45 in open position by a tensioning spring on pivot pin 53. The opened blades are positioned to engage the withdrawn yarn, and are closed to sever the latter by a push bar 55, shown as mounted in frame 11 beneath yarn clamp 30, and moved
 50 longitudinally therein against tension of retracting spring 56, the forward end of said bar 55 engaging against movable cutter blade 52, and the rear end projecting into the path of an operating cam as hereinafter explained. Bar 55 is
 55 shown with a laterally projecting cam 57 engageable with the lower end of arm 36 to swing the latter on its pivotal connection 38 against the tension of springs 39 and 40 sufficiently to move wedge cam 35 outwardly beyond the extension or shoulder 34 on yarn clamp 30, whereby
 60 the latter is released for clamping movement by its spring 31.

Frame 11 is shown as having a usual latch guard 58, provided in this case with a throat 59
 65 adapted to the four yarn guides 15, 15, 15, 15 shown in the drawings, and 62 indicates a usual yarn guide aperture for a possible main yarn not subject to change. In connection with the four
 70 guides shown in the drawings, each is provided with a cooperating yarn clamp for its respective yarn, and the operating mechanism above described is duplicated for each guide and clamp, it being noted that levers 37 have different lengths to compensate for their varying distances from
 75 the common pintle 16 for the guides 15. One cut-

ting device only is shown, as conveniently effective to sever each selectively withdrawn yarn. And push bar 55 is shown with a duplicate cam 57, each arranged, as indicated, to engage and swing two adjacent arms 36. To selectively operate any one of the four guides 15, it will be observed that their push rods 20 are arranged at four different levels, so each may be singly moved; and extensions 23 are shown at different radial distances from the axis of the cam cylinder 5 for selective individual operation if desired, though commonly not required.

The sequence of movements of the above described mechanism in effecting a selective change of feed of two yarns will now be described: Assuming the knitting machine to be in operation with my change mechanism, carried on posts 10, 10, rotating with the cam cylinder 5 around the circle of needles 2 and 6, with one guide 15 in lowered feeding position and its yarn entering the circle of needles in known manner at the advancing knitting wave caused by the knitting cams of cylinder 5 and cam dial 8; the other three guides in this particular disclosure being held in raised non-feeding position and their yarn ends separately clamped within the circle of needles against pad or bulge 33 on cam dial 8 by pressure thereagainst of their respective clamp foot 32.

A change of feed is effected by raising the lowered guide to non-feeding position, and lowering a selected one of the raised guides to lowered feeding position. Raising of the lowered guide is determined by a cam 85 movable to engage the extension 23 to release detent blade 22 for that particular guide from its holding engagement in the notch 21 of its lowering rod 22, permitting lift pin 18 for that guide to act to raise it to non-feeding position. Lowering to feeding position of a selected one of the three raised guides is determined by a cam plate 60 vertically movable to position its cam edge in a path to engage the lowering rod 20 of the determined guide, the cam plate acting to push said rod inward to lower its guide and the detent blade 22 for that rod engaging the notch 21 thereof to hold said rod in guide lowering position. The guide eye 17 of this lowered guide 15 is adjacent but outside the circle of needles, and its yarn end is clampingly held inside said circle, so that the yarn is laid across the needle circle in the most advantageous manner to insure engagement thereof by the needles, such engagement pulling said end from its particular clamp. The guide lifted to non-feeding position acts to swing its lever 37 on its pivot bearing 41 lowering its arm 36 and causing cam 35 thereof to engage shoulder of extension 34 to retract the yarn clamp 30 for that particular guide and move it against the tension of its spring 31 and draw its clamp foot 32 away from dial pad 33, permitting the yarn from such raised guide to enter between said foot and pad and at the same time to enter between the fixed and movable blades 51 and 52 of the cutter device. At this time push bar 55 is moved to cause blade 52 to close and sever the yarn therebetween and the cams 57, 57, on said bar 55 act to outwardly swing the lower ends of all arms 36 thus freeing the retracted clamp above referred to, and the latter is then moved by its spring 31 to press its foot 32 against pad 33 to clamp the severed yarn end therebetween. Single selection of action for releasing extensions 23 is not required in all cases, and in the drawings cam 85 is shown as engaging any extension 23 in lowered position and raising it, the cam plate 60 being shown as

contacting its selected rod 20 a sufficient time to permit reengagement of its detent blade 22 after action of cam 85 so as to hold its guide in lowered feeding position until the next change is desired. And it will be noted that the change feed guide is lowered before moving the feeding guide to non-feeding position, causing a sufficient over-lapping feed of both yarns to tie in the change yarn. Also it will be noted that each withdrawn yarn is severed by the single cutting device but is clamped by its particular yarn clamp, and the latter is opened to receive its yarn at the time of its withdrawal, so as to engage only its own particular yarn. Any change of yarn may be effected by proper location of cam plate 60 to act on the rod 20 of the particular guide carrying the desired substitute yarn, and lowering of such selected guide is timed with the raising of the prior feeding guide to insure continuous knitting.

Cam plate 60 for selective operation on push rods 20, 20, 20, 20, is shown in the drawings as carried by a bracket 61 and adjusted thereon by screws 62, 62 for accurate radial position relative to said rods. Bracket 61 is mounted to vertically slide on a table carried support 63 and normally rests on the latter under tension of a spring 64, but is raised therefrom to a selected level through its lifting rod 65 extending downwardly through table 4 to rest intermediately on a lever 66. One end of lever 66 is shown with a pivot support 67 and its other end is adapted to be operated by a pattern chain 68 carrying lugs 69 of varying height arranged in accordance with the desired yarn changes. Gear wheel 70 for chain 68 is shown as operated by a pawl 71 carried by a slide bar 72, reciprocated by a lever 73 intermediately pivoted to table 4, with one of its ends flexibly connected to bar 72 and its other end contacted by a stud 74 secured to rotate with cam cylinder 5.

Bracket 61 is shown with a cam arm 80 secured thereto and moved vertically with bracket 61 into a path to contact the end of push bar 55 which operates the movable blade 52 of the cutter device described, cam arm 80 being indicated as of a width to contact said bar 55 at any level to which pattern lugs 69 raise said bracket 61, and is shown in proper relative position to operate said cutter blade in timed relation to the withdrawal of a yarn.

As described releasing extensions 23 are operated jointly by a cam 85 carried on a plate 86 mounted to radially slide on support 63 and tensioned by spring 87 to move said cam 85 into the path of travel of extensions 23. For proper timed relation of cam 85 it is shown as located within the length of cam plate 60, and projecting through an elongated aperture in the base of bracket 61, and it is moved to idle position outside the path of travel of extensions 23, through plate-carried stud 88 engaging a reciprocated cam plate 89. Plate 89 is shown as constantly reciprocated through an oscillated lever 90 actuated by reciprocated pawl bar 72, and its action is to retract plate 89 and move the latter sufficiently to position a detaining lift 91 on plate 86 for engagement by the spring lowered bracket 61, to hold said slide retracted, the reciprocations of cam plate 89 then being idle movements.

The lugs 69 on chain 68 determine the automatic yarn changes, and lug lifting lever 66 acts on rod 65 to raise bracket 61 and thus positions cam plate 60 for action on a selected one of rods 20 to lower its guide 15 into feeding position. Lifting of bracket 61 releases its engagement with lift 91 on plate 86 and the spring 87 of the latter

moves said plate inward to position cam 85 in the path of travel of extensions 23 to raise the latter and free detent blade 22 from its engagement with the rod 20 holding a yarn guide in feeding position, said rod being at a different level from the raised cam plate 60 and free to move, the raising of such guide acting as above described to open the clamp for that particular yarn. Cam 80, raised with bracket 61 is thus positioned to operate cutter operating push bar 55, and the latter acts as before described to sever the withdrawn yarn and also to free the opened clamp to move forward and hold such severed yarn against contact pad or bulge 33 on cam dial 8.

The operative movements of the knitting machine have not been described as heretofore known and well understood, and from the foregoing description, and the showing in the drawings, it is thought that the nature of my attachments, the manner of their operation, and their timed relations will be readily understood.

My improvements have been described as particularly adapted to a rib knitting machine, but are not to be understood as limited to this type of machine, and the specific mechanism above shown and described may of course be changed and modified without departing from the spirit of my invention as defined in the following claims.

What I claim is:—

1. In a knitting machine having a circle of knitting needles and operative mechanism therefor, a yarn changing mechanism comprising, a plurality of yarn guides arranged to selectively feed yarn adjacent the outside of said circle of needles, an equal plurality of yarn clamping members movable across the needle circle and each having an operative connection to its respective guide for retracting said member by movement of its guide to non-feeding position, a clamping contact member adjacent the inner side of said needle circle, and a common yarn cutting device operative to release any retracted clamping member to advance and engage its severed thread against said contact member within the needle circle.

2. In a knitting machine having a circle of knitting needles and operative mechanism therefor, a yarn changing mechanism comprising, a plurality of selectively movable yarn guides, an equal plurality of separately movable yarn clamping members having a common cooperative contact member arranged adjacent the inner side of said needle circle, each guide having a guide eye end movable to and from feeding position adjacent the outside of said circle of needles and an operative connection to its respective movable clamping member for retracting the latter from said common contact member by guide movement to non-feeding position, and a cutting device operative to release each retracted clamping member for movement into clamping engagement with said common contact member.

3. In a knitting machine having a circle of knitting needles and operative mechanism therefor, a yarn changing mechanism comprising, a plurality of yarn guides having means for selectively moving them to feeding position adjacent the outside of said needle circle and means for reversely moving each guide to non-feeding position, an equal plurality of yarn clamping members movable transversely across the needle circle for engagement with a clamping contact member adjacent the inner side of said needle circle and each having an operative connection

to its respective guide for reversely moving said clamping member by movement of its guide to non-feeding position, and a yarn cutting device having means for operating the same and means for releasing each retracted clamping member for engagement with said contact member to clampingly hold a severed yarn end against the latter.

4. In a knitting machine having a circle of knitting needles and operative mechanism therefor, a yarn changing mechanism comprising, a plurality of yarn guides each having a push rod for selective movement of the guides to yarn feeding position adjacent the outer side of said circle of needles and means for releasing each rod for reverse movement of each guide to non-feeding position, a clamping contact member adjacent the inner side of said needle circle, a plurality of movable yarn clamping members movable across said circle into cooperative engagement with said contact member and each movable member having a shoulder extension and a retractive cam operated by its respective guide moving to non-feeding position to withdraw said movable clamping members from engagement with said contact member, a cutting device having an operating bar and releasing cams thereon adapted to release each withdrawn clamping member, and pattern control means for synchronously operating a push rod of one selected guide and the releasing means of a guide in feeding position, and the operating bar for said cutting device whereby one guide is withdrawn from feeding position and its severed yarn end clampingly engaged inside the circle of needles and another yarn guide moved to feeding position and its yarn end withdrawn from clamped engagement.

5. A yarn changing mechanism for rib-knitting machines comprising a yarn clamping contact member carried by the rib cam dial adjacent the inner side of the needle circle, a plurality of cooperating yarn clamping members movable transversely across said needle circle into cooperative engagement with said contact member, a plurality of yarn guides selectively movable into and out of feeding position adjacent the outer side of said needle circle and each guide having means for retracting its respective movable clamping member for engagement with said dial carried contact member, and a yarn cutting device operative to release each retracted clamp-

ing member for movement into re-engagement with said dial contact member.

6. A yarn changing mechanism for rib-knitting machines comprising a yarn clamping contact member carried by the rib cam dial adjacent the inner side of the needle circle, a plurality of cooperating yarn clamping members tensioned to normally move transversely across said needle circle into cooperative engagement with said contact member and each movable member having a shouldered extension and a cam engageable therewith to retractingly move it away from said dial contact member, a yarn cutting device having an operating bar provided with cams to release each movable clamping member from the action of its retractive cam, a plurality of yarn guides tensioned to normally rest in non-feeding position and each having a push rod to move its guide to feeding position adjacent the outer side of said needle circle, a detent to hold each push rod against its feeding position guide and having a releasing extension to free said rod for reverse movement of said guide, an operative connection from each guide to the retractive cam of its respective movable clamp member adapted to retract the latter by movement of its guide to non-feeding position, and pattern controlled means for synchronously operating the push rod of a selected guide and the releasing extension of a guide in feeding position and the cutter operating bar, whereby one guide is moved to feeding position and another withdrawn from feeding position and its severed yarn end clamped against the dial contact member.

7. In the yarn changing mechanism set forth in claim 6, pattern control mechanism comprising a pattern chain, a reciprocated pawl carrying bar for moving said chain in a step-by-step movement, lugs of varying height carried by said chain, a lever variously operated by said lugs, a slide frame variously moved by said lever and having cams positioned by said varied movement to operate a selected guide push rod and said cutter operating bar, a cam released by movement of said slide to operate the rod detent releasing extensions, and a slide cam operated by said reciprocated pawl-carrying arm to position each of the aforesaid cams in non-operative position between the actions of the pattern chain lugs.

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