United States Patent

[11] **3,630,050**

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[54] **PATERN MECHANISM FOR KNITTING MACHINES**
6 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** ..... **66/50 B**
[51] **Int. Cl.** **D04b 15/74**
[50] **Field of Search** ..... 66/50 B, 50 R, 25, 36

[56] **References Cited**

UNITED STATES PATENTS

2,694,908	11/1954	Lawson	66/50 R
2,110,823	3/1938	Speirs et al.	66/50 B
3,246,487	4/1966	Janda et al.	66/50 B
3,169,384	2/1965	Coile	66/50 B

FOREIGN PATENTS

1,906,567	11/1969	Germany	66/50 B

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ABSTRACT: Jack selector control means for knitting machines having a rotatable cylinder for jacks and needles the selector control means including a first trick drum for operating the selectors to select the jacks and needles of the machine for operation, a second trick drum for individually moving the selectors from inactive to active positions to be operated by the first trick drum, indexing means for the first and second trick drums, means for activating the indexing means to index the trick drums and common means for actuating the indexing means in a plurality of indexing movements during a single rotation of the cylinder to index the first trick drum in each of the plurality of indexing movements and to index the second trick drum in only one of the plurality of indexing movements.

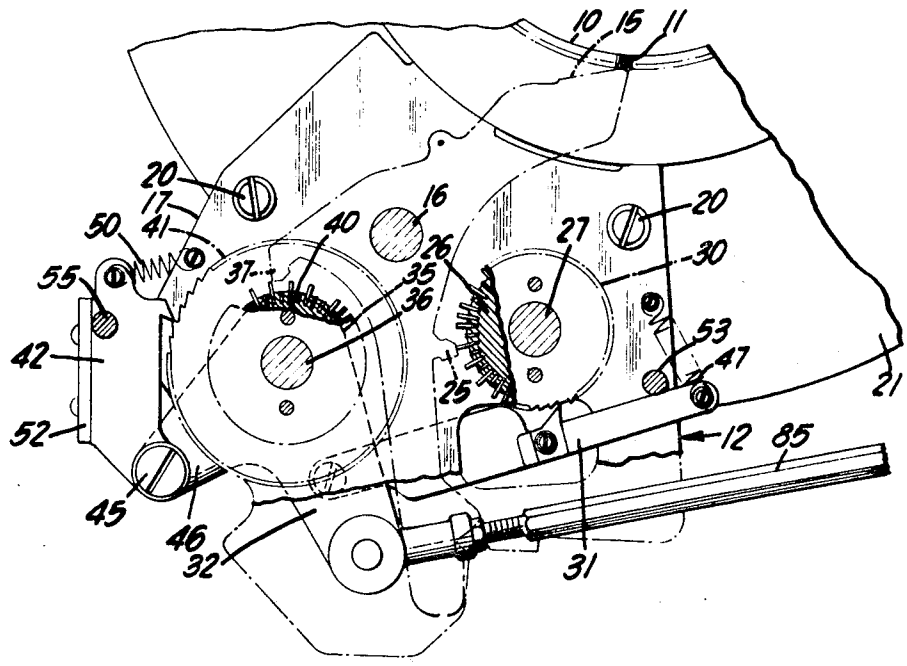


Fig. 1

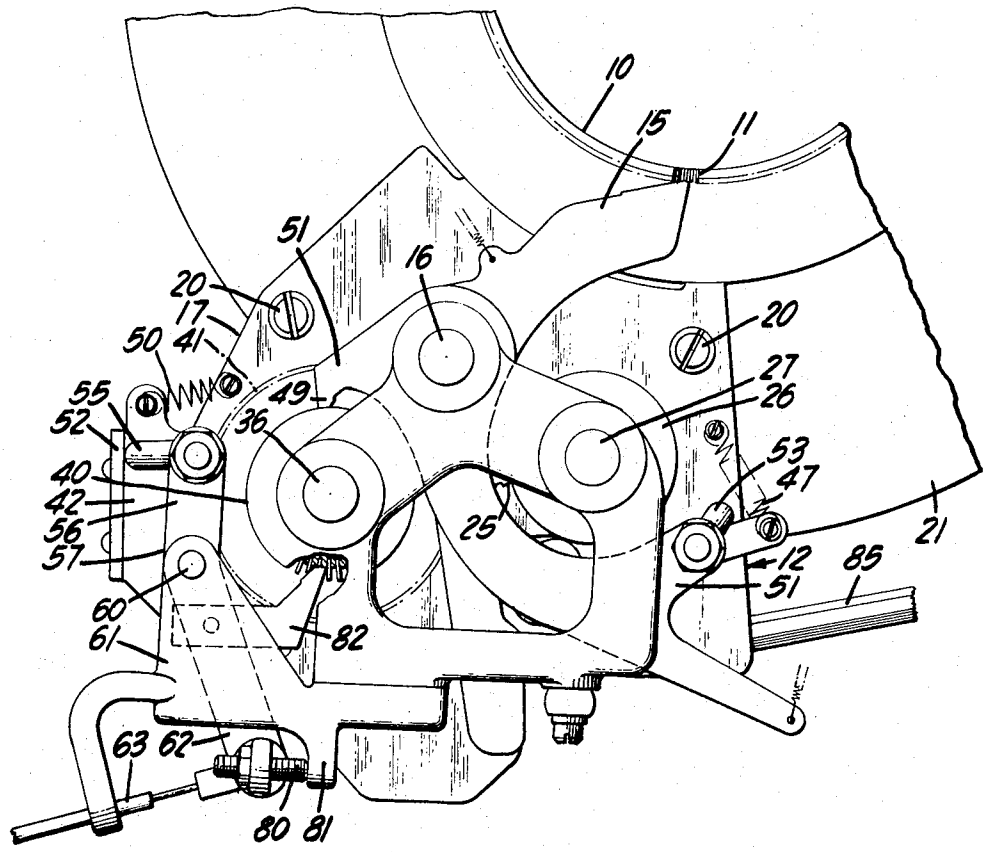

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Fig. 2

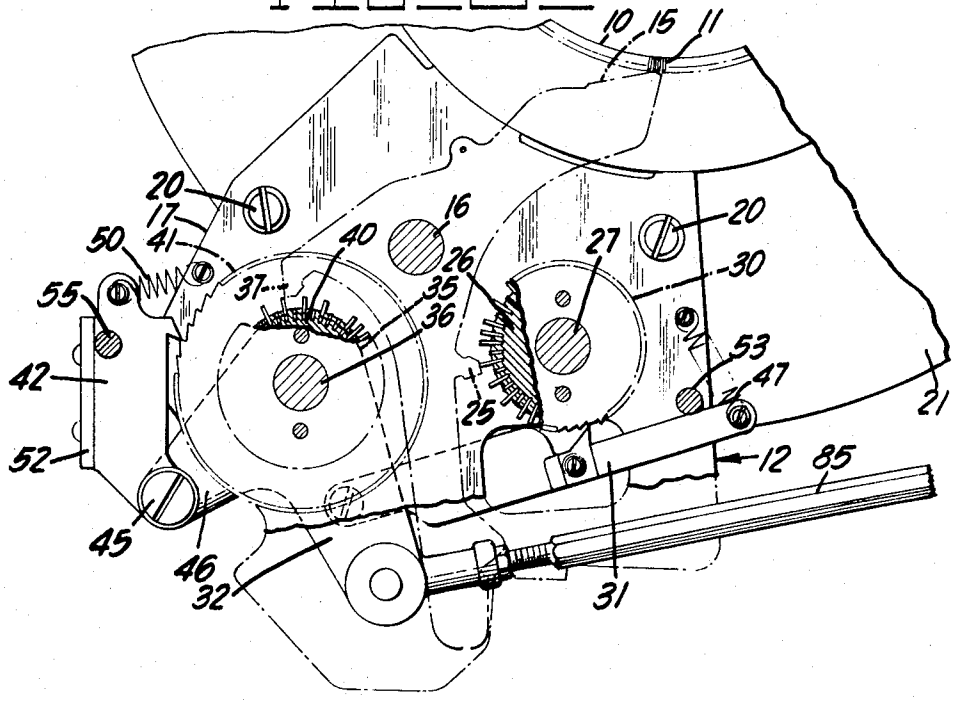

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FIG. 4

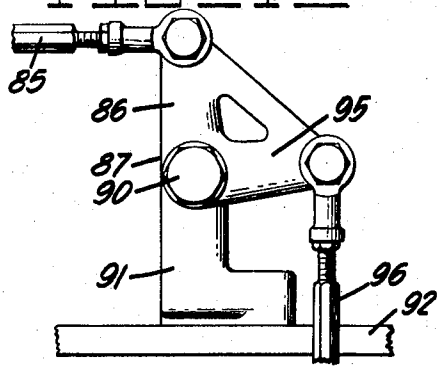
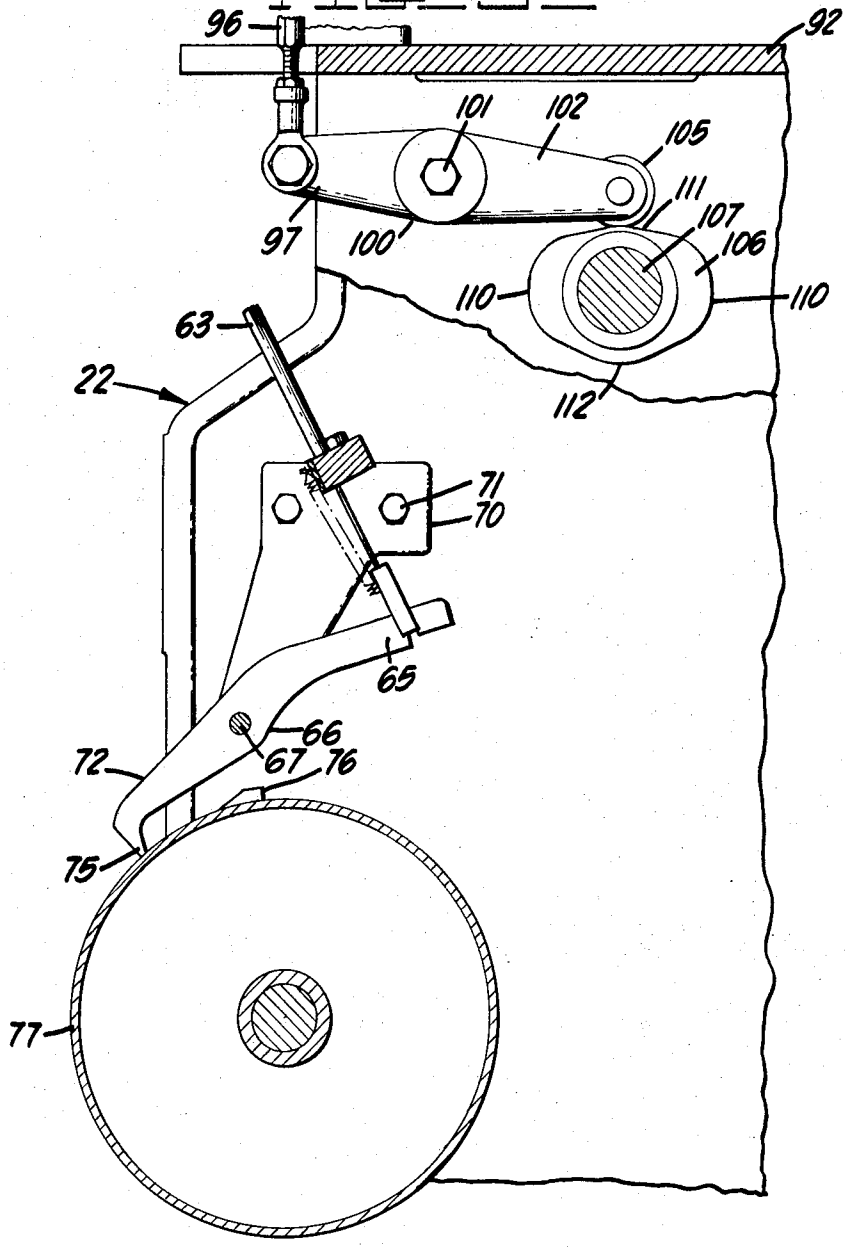

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FIG. 3


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PATERN MECHANISM FOR KNITTING MACHINES

BACKGROUND OF THE INVENTION

Conventionally, circular knitting machines are provided with a rotatable needle and jack cylinder, selectors for acting on the jacks with different groups of the selectors being controlled by trick drums to act on but patterns formed in corresponding groups of butt levels on the jacks to select the jacks in forming different stitch designs in stockings knitted on the machine in the manner disclosed in U.S. Pat. No. 3,205,683. The trick drums are indexed in two single tooth stepping movements by pawl and ratchet means during each rotation of the cylinder with one of the stepping movements controlling the selectors arranged to act on the jack butt patterns in one half of the cylinder and the other stepping movement controlling the selectors arranged to act on the jack butt patterns in the other half of the cylinder. The active and inactive positions of the different groups of selectors are controlled by separate levers which are operated by the main cam drum of the machine. With this arrangement since all of the selectors of each group are activated together the jack selecting functions thereof are limited to the entire group.

Recently, in order to permit both the activation of all of the selectors of the groups and also the activation of selected ones of the selectors of the groups to act on the jack butt pattern associated therewith to control the formation of stitch patterns in the stocking fabrics mechanism has been provided such as that shown in U.S. Pat. No. 3,246,487, to individually control the active and inactive positions of the selectors. The mechanism of said U.S. Pat. No. 3,246,487 includes a main trick drum for controlling the jack selecting operations of the selectors when they are moved to active positions and a second or auxiliary trick drum associated with the main trick drum for individually controlling the movement of the selectors between inactive and active positions. The main trick drum is indexed in two single tooth stepping movements during each rotation of the cylinder of the machine by pawl and ratchet means which is operated by a two-lobe cam rotating in synchronism with the cylinder and the auxiliary trick drum is indexed in a single tooth stepping movements by pawl and ratchet means which is operated by the main cam drum of the machine during indexing moves thereof. Since most of the machine during indexing moves thereof. Since most of the machine operating functions are also controlled from the main cam drum and the indexing moves of the cam drum are limited, usually to form 24 to 27 moves, it is sometimes inconvenient to time the indexing moves of the auxiliary trick drum by the cam drum in the required order unless such auxiliary trick drum moves can be instituted in idle cam drum moves in cam drum moves which the trick drum move coincides with another machine function to be instituted.

SUMMARY OF THE INVENTION

Briefly summarized the invention resides in the provision of jack selecting means in a circular knitting machine, the selecting means including selectors for acting on the jacks of the machine, a main trick drum for controlling the operations of the selectors when in active positions to act on the jacks of the machine, indexing means for the main trick drum, an auxiliary trick drum for determining the active positions of the selectors to be operated by the main trick drum, indexing means for the auxiliary trick drum and common means for operating the indexing means for the main and auxiliary trick drums in a plurality of indexing movements during a rotation of the needle cylinder of the machine to index the main trick drum in each of the plurality of indexing movements and to index the auxiliary trick drum in only one of the plurality of indexing movements. The selecting means also includes means for activating and deactivating the indexing means for the auxiliary trick drum which is in part controlled from the main pattern cam drum of the machine and in part controlled by the auxiliary trick drum itself.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of a portion of a circular knitting machine having jack selecting means of the type shown in U.S. Pat. No. 3,246,487 and with mechanism according to the instant invention incorporated therein;

FIG. 2 is a plan view with parts broken away for clearness of illustration, showing indexing means for the trick drums of the jack selecting means;

FIG. 3 is an elevational view, with parts in cross section, showing a portion of the operating and control means for the trick drum indexing means; and

FIG. 4 is a fragmentary view showing a further portion of the operating means for the indexing means.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1 and 2 of the drawings there is shown a portion of a circular knitting machine having a cylinder 10 with the usual slots for needles (not shown) and jacks 11 which preferably are of the rocking type with pattern butts at a plurality of levels, and pattern mechanism 12 for selectively controlling the operation of the jacks and needles in forming design stitch patterns in tubular fabrics, such as ladies stockings, knitted on the machine. The pattern mechanism 12, which is generally of the type shown in said U.S. Pat. No. 3,246,487, includes selector levers 15, one for each of the pattern butt levels on the jacks, which are pivotally mounted on a shaft 16 carried in a plate bracket 17 secured as by screws 20 to a deck plate 21 forming part of the frame of the machine, indicated at 22 in FIG. 3. Each of the selector levers has a projecting nose portion 25 for reading engagement with a trick butt pattern at a corresponding level on a first or main trick drum 26 mounted on a pin 27 carried in the plate bracket 17. The trick drum 26 is provided with a ratchet 30 having teeth adapted to be acted on by a pawl 31 pivotally connected to one arm 32 of a lever 35 mounted for pivotal movement on stud 36 secured in the bracket 17. The lever 35 is oscillated to move the pawl 31 to index the ratchet 30 and trick drum 26 by means and in a manner hereinafter set forth.

Each of the selector levers 15 is also provided with a second nose portion 37 for reading a trick butt pattern at a corresponding level on a second or auxiliary trick drum 40 mounted for rotation on the stud 36. The trick drum 40, which corresponds to the control drum 97 of said U.S. Pat. No. 3,246,487, has a ratchet 41 provided with teeth adapted to be engaged by a pawl 42 pivotally mounted on a stud 45 carried in a second arm 46 of the lever 35. The pawl 42 is moved to index the trick drum 40 during oscillating movements of the lever 35 in the manner hereinafter described. A spring 47 connected between the free end of pawl 31 and the bracket 17 tends to bias this pawl into engagement with the teeth of the ratchet 30 and a similar spring 50 connected between the free end of pawl 42 and the bracket 17 tends to bias pawl 42 into engagement with the teeth of the ratchet 41.

The auxiliary trick drum 40 has a trick butt pattern arranged to individually move the selector levers 15 between inactive positions in which the nose portions 25 thereof are out of engagement with the butt pattern on the main trick drum 26, and active positions in which the nose portions 25 are in reading engagement with the butt pattern on the main trick drum to cause the selector levers to act on the jacks in the manner set forth in said U.s. Pat. No. 3,246,487. The trick drum 40 is also provided with a butt pattern at one of the butt levels thereof for acting on a nose portion 49 of a lever 51 having a downwardly extending rod 53 for engagement with the pawl 31. The lever 51 is operated by the butt pattern on the trick drum 40 to move the pawl 31 between an inactive position to idle the main trick drum 26 when no selection of the jacks by the selector levers is to be made and an active position to index the main trick drum when selections of the jacks are to be made by the selector levers as set forth in said U.S. Pat. No. 3,246,487.

The pawl 42 is also adapted to be moved at times between an inactive position when the auxiliary trick drum 40 is to be idled and an active position to index the auxiliary trick drum. For controlling its movement between inactive and active positions pawl 42 is provided with a projecting wall 52 adapted to be engaged by a nose portion 55 carried on the free end of one arm 56 of a lever 57 pivotally mounted on a pin 60 mounted in fixed position in a bracket 61 secured to the upper ends of shaft 16 and pins 27 and 36 (FIG. 1). The free end of a second arm 62 of the lever 57 is connected by a Bowden wire 63, or the like, to one arm 65 of a lever 66 pivoted on a pin or stud 67 carried in a bracket 70 secured by bolts 71 to the frame 22 (FIG. 3). The free end of a second arm 72 of the lever 66 has a nose portion 75 for reading engagement with cams, one of which is shown at 76, on a cam drum 77 of the machine. The cam drum 77, which forms a part of pattern mechanism for controlling substantially all operating functions of the machine, is indexed in steps or moves in the conventional manner. The levers 57 and 66 are normally maintained in their positions of FIGS. 1 and 3 by engagement of a stop screw 80, adjustably carried in the free end of the arm 62 of lever 57, with a portion 81 of the bracket 61 to inactivate the pawl 42 when there is no cam 76 beneath the nose portion 75 of the lever 66. On the other hand when a cam 76 is moved beneath the nose portion 75 during a move of the cam drum the levers 66 and 57 are moved clockwise from their positions of FIGS. 1 and 3 thereby permitting spring 50 to move the pawl 42 to active position for an indexing movement of the trick drum 40. It is to be here noted that the movements of the cam drum are of such extent and are so timed as to move a cam beneath the lever 66 to activate the pawl 42 for an indexing movement of the trick drum 40 and again move the cam from beneath the lever 66 to inactivate the pawl following the indexing movement of the trick drum.

The active and inactive positions of the pawl 42 are also controlled by a finger 82 secured to the arm 62 of the lever 57 for reading engagement with a butt pattern at one of the butt levels on the trick drum 40. When the lever 57 is under the control of the cams 76 on the cam drum 77 to activate the pawl 42 for indexing movements of the trick drum 40 a butt in the butt pattern on the trick drum 40 at the level of the finger 82 is omitted, as indicated in FIG. 1, so that there is no interference with the indexing movements instituted by the cam drum. When, however, a butt is moved beneath the finger 82 during an indexing movement of the trick drum instituted by the cam drum, the lever 57 is maintained in its clockwise position to hold the pawl 42 in active position to index the trick drum and the pawl 42 is again inactivated when the finger is aligned with a trick without a butt. Hence, the above-described dual control of the active and inactive positions of the pawl 42 will permit the indexing movements of the auxiliary trick drum to be instituted at times from the cam drum and will also permit the indexing movements of the auxiliary trick drum to be instituted at other times by the auxiliary trick drum itself following an indexing movement thereof instituted by the cam drum.

As shown in FIGS. 2, 3 and 4, the free end of the arm 32, of the lever 35, which forms a part of a common means for operating the pawls 31 and 42 in their indexing movements according to the instant invention, is pivotally connected by an adjustable link 85 to one arm 86 of a lever 87 pivoted on a stud 90 carried in a bracket 91 secured to a deck plate 92 of the frame 22. A second arm 95 of the lever 87 is pivotally connected by an adjustable link 96 to one arm 97 of a cam lever 100 pivoted on a stud 101 secured in a portion of the frame 22. A second arm 102 of the lever 100 rotatably carries a roller-type follower 105 for engagement with a cam 106 on the drive shaft 107 of the machine. The drive shaft, which is driven by conventional drive means, is connected to the cylinder 10 by gearing (not shown) to rotate the cylinder one revolution for each rotation of the drive shaft.

The cam 106 is provided with an opposed pair of high surfaces or lobes 110 having substantially the same height, and opposed first and second low portions 111 and 112, respectively, between and connecting the lobes. As shown in FIG. 3 the height of the low portion 111 is slightly less than that of low surface 112. The lobes 110 act through the levers 100 and 87 to oscillate the lever 35 to move the pawls 31 and 42 to the same extent in a counterclockwise or indexing direction twice during each rotation of the shaft 107 and the low portions 111 and 112 act to oscillate the lever 35 to move the pawls to different extents in the clockwise or resetting direction, for purposes hereinafter set forth.

As indicated in FIGS. 1 and 2, the trick drums 26 and 40 are of the same diameter and are provided with the same number of tricks. The ratchet 30 associated with the trick drum 26 and the ratchet 41 associated with the trick drum 40 are provided with teeth equal in number to the tricks in the trick drums. The diameter of the ratchet 30 is such that the spacing between next adjacent teeth thereof is less than the movement of the pawl 31 in the resetting direction by either of the low portions 111 or 112 of the cam 106 so that during each rotation of the cam 106 the pawl 31 will be operated to index the ratchet and trick drum a single tooth by one of the lobes 110 following each resetting movement thereof. On the other hand, the diameter of the ratchet 41 is greater than that of the ratchet 30 so that the spacing between next adjacent teeth is slightly less than the movement of the pawl 42 in the resetting direction by the first low portion 112 and is slightly greater than the resetting movement of the pawl 42 by the second low portion 111. Hence, with this arrangement when the pawls 31 and 42 are activated in the manner above set forth, pawl 31 is operated to index the ratchet 30 and trick drum 26 a single tooth following resetting movements thereof by both low portions of the cam 106 and pawl 42 is operated to index the ratchet 41 and trick drum 40 a single tooth following a resetting movement thereof by only one of the low portions during a single rotation of the cam.

From the foregoing it will be seen that the mechanism of the invention provides a single or common means for operating the indexing means associated with the first and second trick drums controlling the jack selectors of a circular knitting machine in pairs of indexing movements with the common means being adapted to operate one of the trick drums in each indexing movement of the pairs and to operate the other trick drum in only one of the indexing movements of the pairs. The mechanism also provides a dual means for controlling the indexing means for one of the trick drums whereby this indexing means may be activated at times by pattern mechanism of the machine when single indexing movements of the trick drum are required and at other times by the trick drum itself when one or more successive indexing movements are required following actuation of the indexing means by the pattern mechanism.

It will be understood that the improvements specifically shown and described by which the above results are obtained can be changed and modified in various ways without departing from the invention disclosed.

We claim:

1. In a circular knitting machine having a rotatable cylinder with slots for slidably mounting a circular series of needles and a pattern jack for selectively operating each of said needles, and pattern means for acting on a butt pattern on said jacks, said pattern means including selector levers, a first trick drum having a trick butt pattern for selectively operating said selector levers, first means for indexing said first trick drum, a second trick drum having a trick butt pattern for individually moving said selector levers between active positions in which said selector levers are operated by said first trick drum and inactive positions, second means for indexing said second trick drum, and common means for operating said first and second indexing means in a plurality of indexing movements during a rotation of said cylinder, said common means including a multifaced cam having portions adapted to operate said first indexing means to index said first trick drum in each of said plurality of indexing movements and one of said portions

being adapted to operate said second indexing means to index said second trick drum in only one of said plurality of indexing movements.

2. A machine according to claim 1 in which said first indexing means includes a first ratchet on said first trick drum and a first pawl operated by said common means, and there is means for controlling the movement of said first pawl between an inactive position and an active position to act on said first ratchet to index said first trick drum.

3. A machine according to claim 2 in which said controlling means for said first pawl includes said second trick drum and a lever operated thereby.

4. In a circular knitting machine having a rotatable cylinder with slots for slidably mounting a circular series of needles and a pattern jack for selectively operating each of said needles, and pattern means for acting on a butt pattern on said jacks, said pattern means including selector levers, a first trick drum having a trick butt pattern for selectively operating said selector levers, first means for indexing said first trick drum, a second trick drum having a trick butt pattern for individually moving said selector levers between active positions in which said selector levers are operated by said first trick drum and inactive positions, second means for indexing said second trick drum, common means for operating said first and second indexing means in a plurality of indexing movements during a rotation of said cylinder, said common means including a cam adapted to operate said first indexing means to index said first trick drum in each of said plurality of indexing movements and to operate said second indexing means to index said second trick drum in only one of said plurality of indexing movements, said first indexing means includes a first ratchet on said first trick drum and a first pawl for acting on said first ratchet, said second indexing means includes a second ratchet on said second trick drum and a second pawl acting on said second ratchet, said common means includes a lever on which said first and second pawls are mounted, said lever being operated by said cam, said cam including an opposed pair of high portions for moving said lever and said first and second pawls in an indexing direction, and low portions between said high portions for moving said lever and said first and second pawls in a resetting direction, said low portions acting to reset said first pawl to cause said first pawl to index said first trick drum during movements thereof in said indexing direction by each of said high portions, and said low portions acting to reset said second pawl to cause said second pawl to index said second trick drum during movement thereof in said indexing direction by only one of said high portions.

5. In a circular knitting machine having a rotatable cylinder with slots for slidably mounting a circular series of needles and a pattern jack for selectively operating each of said needles, and pattern means for acting on a butt pattern on said jacks and for controlling operations of said machine, said pattern means including selector levers, a first trick drum having a trick butt pattern for selectively operating said selector levers, first means for indexing said first trick drum, a second trick drum having a trick butt pattern for individually moving said selector levers between active positions in which said selector levers are operated by said first trick drum and inactive positions, second means for indexing said second trick drum, and common means for operating said first and second indexing means in a plurality of indexing movements during a rotation of said cylinder, said common means being adapted to operate said first indexing means to index said first trick drum in each of said plurality of indexing movements and to operate said second indexing means to index said second trick drum in only one of said plurality of indexing movements, said second indexing means includes a second ratchet on said second trick drum and a second pawl operated by said common means, and there is means for controlling the movement of said second pawl between an inactive position and an active position to act on said second ratchet to index said second trick drum, and said controlling means for said second pawl includes a lever, a first means operated by said pattern means for operating said lever at times to control the movement of said second pawl between said inactive and active positions, and a second means operated by said second trick drum for operating said lever at other times to control the movement of said second pawl between said inactive and active positions.

6. In a circular knitting machine having a rotatable cylinder with slots for slidably mounting a circular series of needles and a pattern jack for selectively operating each of said needles, and pattern means for acting on a butt pattern on said jacks and for controlling operations of said machine, said pattern means including selector levers, a first trick drum having a trick butt pattern for selectively operating said selector levers, first means for indexing said first trick drum, a second trick drum having a trick butt pattern for individually moving said selector levers between active positions in which said selector levers are operated by said first trick drum and inactive positions, second means for indexing said second trick drum, common means for operating said first and second indexing means in a plurality of indexing movements during a rotation of said cylinder, said common means being adapted to operate said first indexing means to index said first trick drum in each of said plurality of indexing movements and to operate said second indexing means to index said second trick drum in only one of said plurality of indexing movements, first means for inactivating said first indexing means to idle said first trick drum and for activating said first indexing means to permit operation thereof by said common means to index said first trick drum, second means for inactivating said second indexing means to idle said second trick drum and for activating said second indexing means to permit operation thereof to index said second trick drum, said first means for inactivating and activating said first indexing means includes a first member operated by said second trick drum, and said second means for inactivating and activating said second indexing means includes a second member in part operated by said pattern means and in part operated by said second trick drum.

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