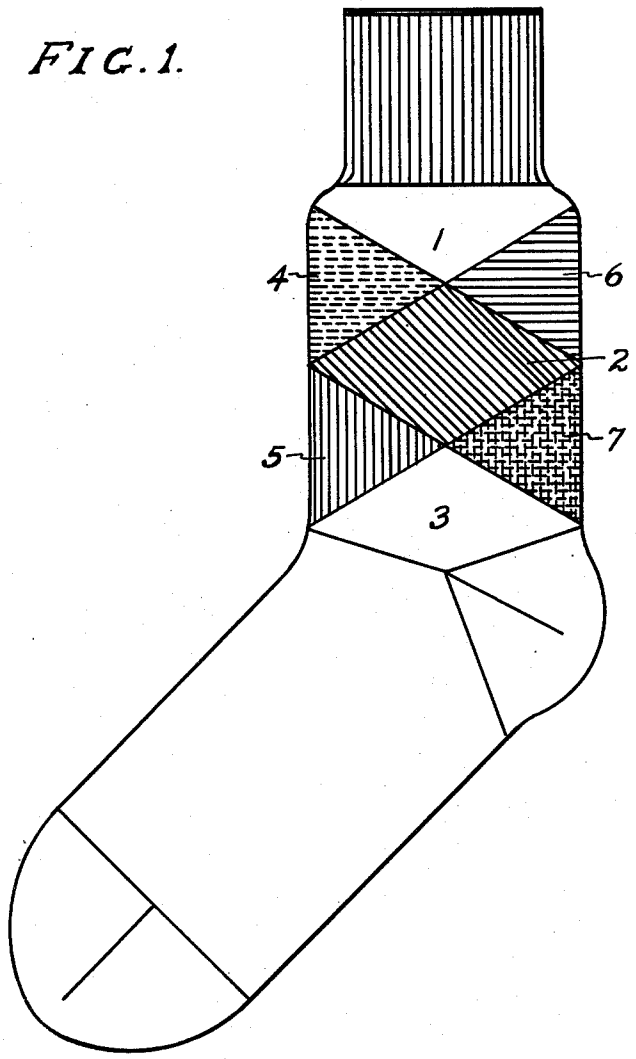
May 25, 1954 E. ST. PIERRE 2,679,149

YARN CHANGING MECHANISM

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FIG. 1.



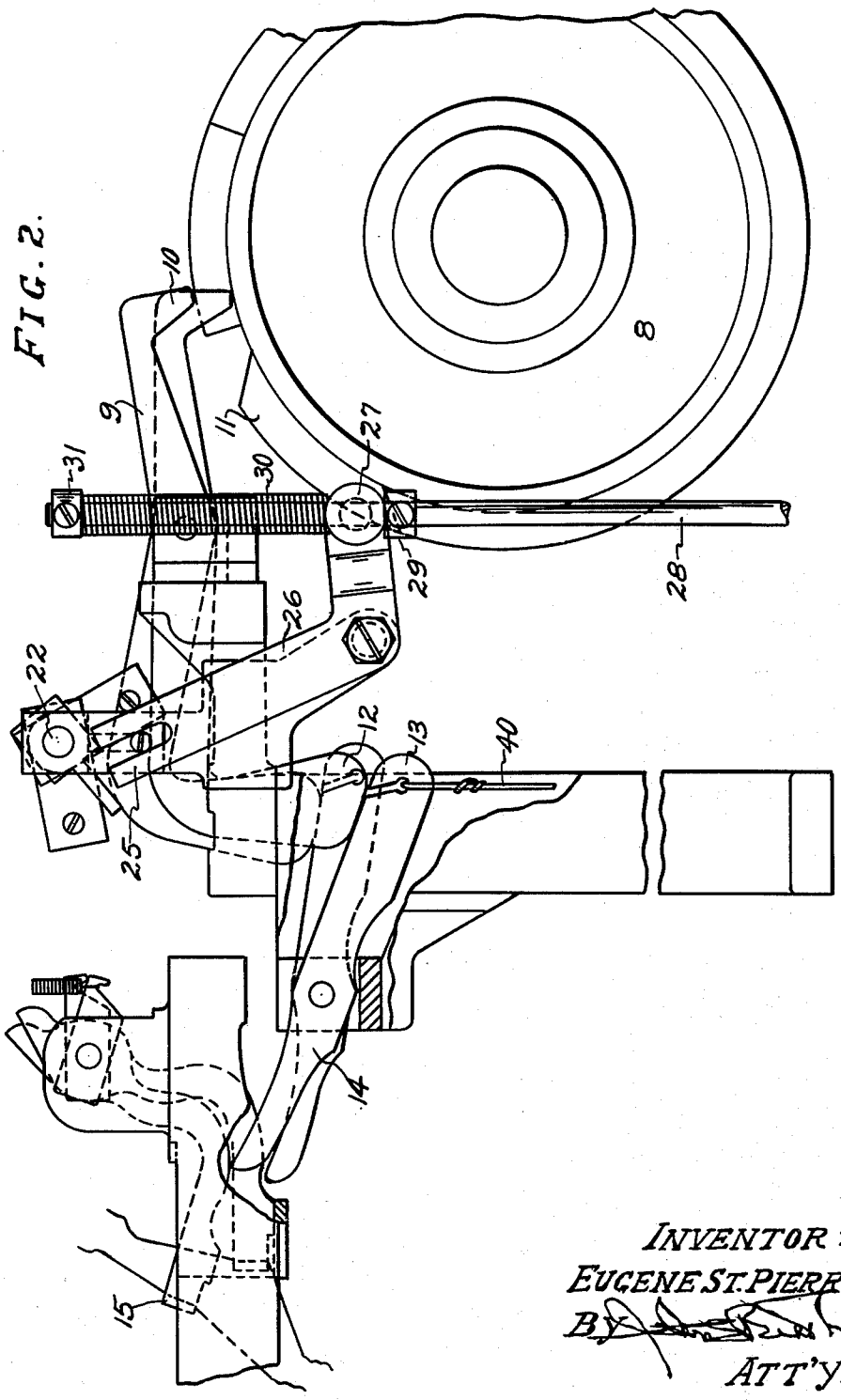
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FIG. 2.



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YARN CHANGING MECHANISM

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FIG. 3.

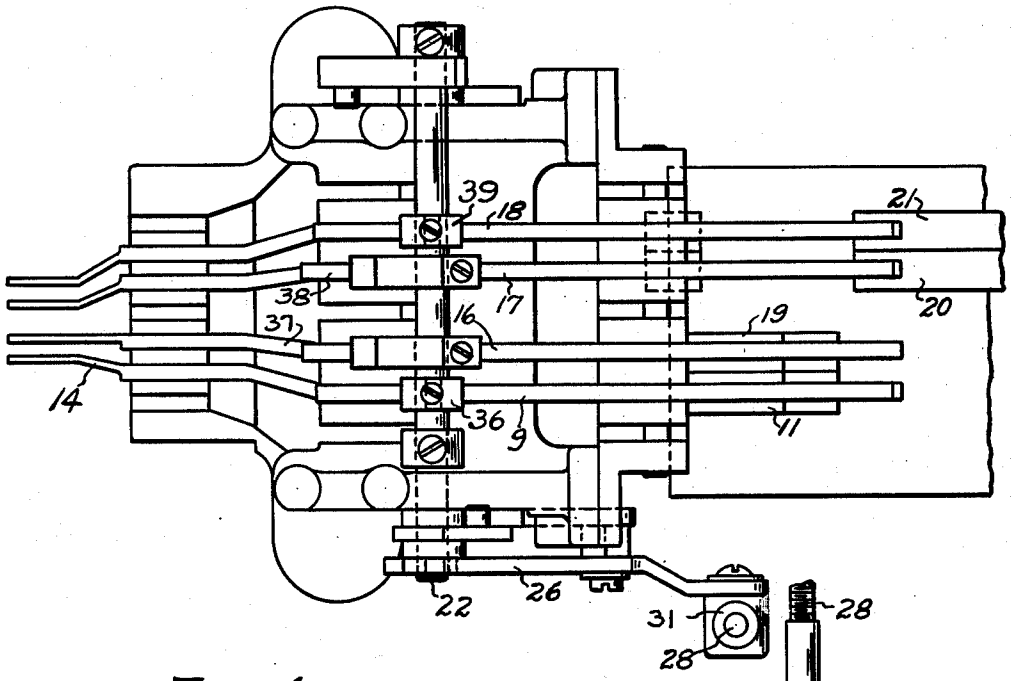
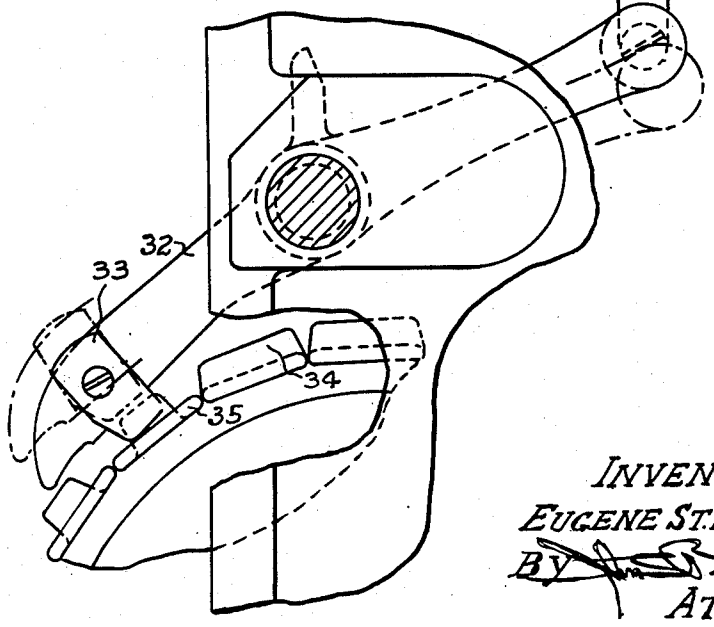


FIG. 4.



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YARN CHANGING MECHANISM

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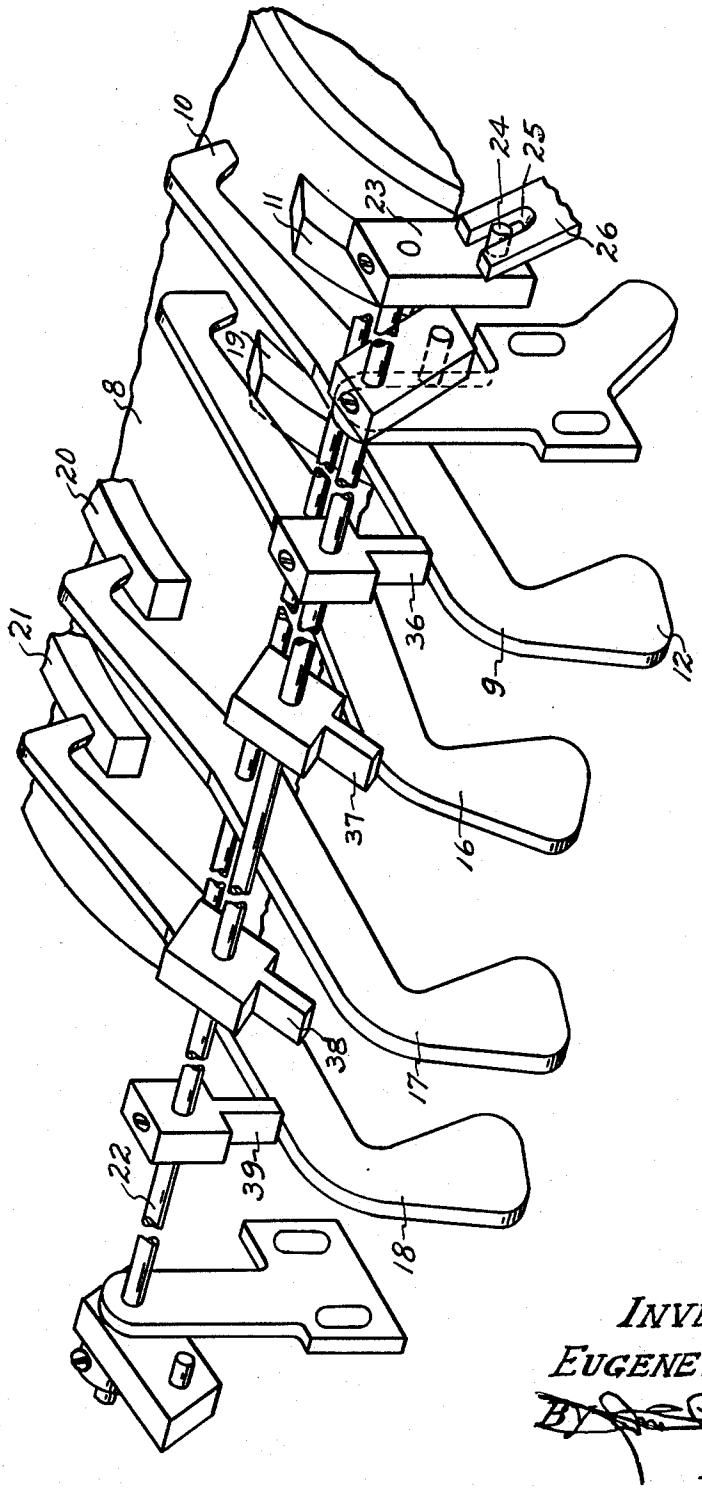


FIG. 5.

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UNITED STATES PATENT OFFICE

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YARN CHANGING MECHANISM

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Application October 21, 1950, Serial No. 191,385

9 Claims. (Cl. 66—138)

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This invention relates to a yarn controlling mechanism for a circular, independent needle, knitting machine. The primary objective of this invention is to amplify the color changing possibilities in a machine of a type essentially similar to that disclosed in Patent #2,217,022. In this type of machine the leg is reciprocatorily knit at both the main and auxiliary cam blocks simultaneously. A complete course containing the corresponding fractions of four separate diamond patterns is knit during each half reciprocation and each diamond is knit of a separate yarn, the edges of adjacent diamonds being connected together by true sutures of both yarns. Heretofore, in commercial machines of this type, the diamonds at the sides of the stocking have been knit at the main cam block of yarns of a single color—there being one yarn for one side and one for the other. The front and back diamonds have been knit at the auxiliary cam block and these have been of two or more different colors.

This invention is in the nature of an attachment for this type of machine which, if applied to the yarn levers on the main side, make it possible to knit diamonds of different colors at the main cam block and also, if applied to the auxiliary side, enables the machine to produce numerous patterns which heretofore could be made only by hand or upon so-called hand-operated knitting machines. Because the invention relates primarily to a machine of the type referred to, it will be shown and described in association with such a machine. However, it is not intended to limit the invention to this use alone.

In the drawing:

Fig. 1 is a diagrammatic illustration of a stocking having a patterned leg made possible by the use of this invention;

Fig. 2 is a side elevation of the auxiliary yarn lever control at the main side of a machine of the type referred to to which this invention has been applied;

Fig. 3 is a similar plan view;

Fig. 4 is a view of a section of the pattern chain and mechanism by which the device of this invention is operated; and

Fig. 5 is a diagrammatic view of a part of the yarn lever operating mechanism including the device of this invention.

As shown in Fig. 1, the leg of the stocking is composed of diamond shape portions which are, of course, duplicated on the other side. The half and whole diamonds 1, 2 and 3 are knitted at the main cam block. They are duplicated by similar diamonds and half diamonds at the other side

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of the stocking. These also are knitted at the main cam block. The diamonds 4, 5, 6 and 7 at the front and back of the stocking are knitted at the auxiliary cam block. Each of these diamonds is knitted of a separate yarn and the edge of each is joined to the adjacent edge of another by a true suture so that there are no floats on the inside of the stocking.

Heretofore, diamonds 1, 2 and 3 and the corresponding diamonds on the other side of the stocking have been knitted of separate yarns but of the same color, whereas, diamonds 4, 5, 6 and 7 have been knitted of yarns of different colors. Although this limitation is not necessary theoretically, it has not been found practicable to provide for a greater number of yarn changes heretofore. By the use of this invention applied to the main side of the machine, it is possible to knit any one of the diamonds 1, 2 or 3 and its corresponding diamond on the other side of the same or a different color than the others and thus the possible color combinations are very decidedly expanded. Since a complete course is knit at each rotation of the cylinder in each direction, the yarn levers work in pairs—two at the main side and two at the auxiliary side to produce simultaneously the fractions of the four diamonds found in each course.

The auxiliary yarn lever mechanism which controls the operation of the main yarn levers during the knitting of the pattern part of the stocking is shown in Fig. 2. It consists of a drum 8 which is driven by the machine. A pivoted rocker or rocker lever 9 has a nose 10 which is adapted to ride on the surface of control drum 8 and upon drum cams, such as 11. The other end 12 of this rocker engages an end 13 of an intermediate lever 14, the other end of which is engageable with a yarn lever 15 to raise it into inoperative position. A similar mechanism is provided for each of the other yarn levers of which there are three. Each of these includes a rocker 16, 17 and 18, respectively, similar to lever 9. Associated with each of these levers is a cam 19, 20 and 21, respectively, on drum 8 whereby they are rocked with the result that the yarn levers are moved into and out of action at the desired time.

In the arrangement shown, the drum cams 11 and 19 are identical and identically positioned upon drum 8 as are cams 20 and 21. However, the relative positions of these pairs of cams are such that they operate upon the rockers at the different times. Without more, this would cause rockers 17 and 18 and the corresponding yarn levers to move into and out of action together and

the same would be true of rockers 9 and 16 and the corresponding yarn levers. This invention provides a device whereby one of each of these pairs of rockers can be made to operate independently of the other and vice versa.

As will be seen from the drawings and best from Figs. 2 and 5, the device consists of a shaft 22 extending transversely above the levers 9, 16, 17 and 18 and provided at one end with a crank 23. The free end of this crank has a pin 24 which engages the forked end 25 of a bell crank lever 26, the other end of which is provided with a pivot 27 through which a rod 28 slides. A collar 29 fixed to rod 28 provides means for swinging bell crank 26 when rod 28 is raised and spring 30 upon rod 28 between pivot 27 and retaining collar 31 on rod 28 provides a resilient means for moving rod 28 downwardly. The other end of rod 28 is pivotally connected to one end of a rocker 32, the other end of which is provided with a shoe 33 adapted to ride upon the side of the pattern chain links opposite to that which carries the normal machine controlling lugs. Certain of these links are provided with lugs such as 34. Whenever shoe 33 is riding upon a plain link, such as 35, rod 28 will be raised and bell crank 26 will be rocked to the position shown in Figs. 2 and 5. On shaft 22 are mounted fingers 36, 37, 38 and 39 so that they overlie the corresponding levers 9, 16, 17 and 18.

Each of fingers 36, 37, 38 and 39 may be so positioned around shaft 22 that it will prevent the corresponding rocker which has been riding upon a cam from dropping to the surface of the drum 8 when the cam has moved from beneath it. For example, in Fig. 5, rocker 9 is riding upon cam 11. By rocking the shaft 22, as above described, finger 36 has been positioned so that this rocker cannot drop to the surface of drum 8 when the cam 11 moves from beneath the rocker. In the same Fig. 5, finger 39 has been similarly positioned with respect to rocker 18 at a time when the rocker was riding upon cam 21. This cam has now moved from beneath rocker 18 but the rocker is still held away from the drum by finger 39.

On the other hand, fingers 37 and 38 are so positioned upon shaft 22 that they do not interfere with the normal functioning of rockers 16 and 17 which are consequently operable by cams 19 and 20.

By rocking shaft 22 in the opposite direction, which occurs when shoe 33 on rocker 32 rides up onto a pattern chain lug such as 34, fingers 37 and 38 will assume positions with respect to rockers 16 and 17 similar to those occupied by fingers 36 and 39 in Fig. 5 with the result that rockers 16 and 17 and the yarn levers which they control will be inoperative. At the same time, fingers 36 and 39 will be swung into their inoperative position so that rockers 9 and 18 are released for operation by cams 11 and 21.

Normally the machine described may be capable of making a solid color pattern stocking in which the whole and partial diamonds 1, 2 and 3 in Fig. 1 are of the same yarn and, consequently, of the same color. By means of this invention, the yarn lever action may be so varied that the yarn and, consequently, the color of diamond 2, for example, may be different from that of diamonds 1 and 3. This is merely one example of many and, of course, the machine is not limited to knitting of diamond shaped patterns.

In the machine, such as that described in Patent No. 2,217,022, the invention may be applied

both to the main and auxiliary yarn levers so that the patterning functions of both sides of the machine are similarly augmented. All that is required is a duplication of the equipment heretofore described and a rod or other means for connecting the two sides together so that they will work in harmony through a single control originating at the pattern chain already described. On the other hand, they may be operated independently from independent controls if desired.

Although in Fig. 5 there are shown only four rockers, such as 9, 16, 17 and 18, this number may, of course, be decreased or increased as desired. One finger may be provided for each of the yarn levers which function to produce the patterned part of the stocking or for any other yarn lever desired. Also, by providing the operating links on the pattern chain with lugs of two or more heights, the fingers may be given correspondingly varied positions about the shaft 22 and in this way a great number of patterns, both symmetrical and unsymmetrical may be made. Heretofore, this has been possible only by hand operated knitting machines and by hand knitting. Obviously, the device may be applied to the machine of the type selected for description by adding parts without altering in any other way whatsoever its construction or its normal mode of operation except as above described.

No mention has been made above of the yarn lever control relating to the various major parts of the stocking. This is of the usual type as identified here as a wire 40 connected to each of the intermediate levers 14 and extending through the usual mechanism to a drum (not shown) by which they are operated. When wires 40 are pulled downward, levers 14 are removed from control by rockers 9, 16—18, because when a nose 13 falls off a cam 11, 19—21 and rocks tail 12 upwards a lever 14 will not follow because it is held down by a wire 40 and consequently the corresponding yarn lever will remain inactive.

By way of summary, it may be said that the invention is concerned with a yarn control system having individual yarn feeding levers 15, individual intermediate levers 14 for operating the yarn feeding levers, and a primary, a secondary and a third means for controlling this operation.

In the embodiment described, the primary means comprises wires 40 connected between the ends 13 of intermediate levers 14 and other levers (not shown) operated by a drum (also not shown). The secondary means comprises rockers 9, 16—18 interposed between intermediate levers 14 and cams 11, 19—20 on pattern drum 8. The third means comprises rotatable shaft 22 and locking fingers 36—39.

I claim:

1. A circular, independent needle, knitting machine having a primary means for changing yarns and a secondary means for changing yarns to produce a patterned stocking leg, said secondary means being under the control of said primary means, a third yarn changing means operating directly upon said secondary yarn changing means to vary the operation of said secondary yarn changing means at predetermined times.

2. A circular, independent needle, knitting machine having a pattern chain, a primary means for changing yarns and a secondary means for changing yarns to produce a patterned stocking leg, said secondary means being under the control of said primary means, a third yarn changing

means operating directly upon said secondary yarn changing means to vary the operation of said secondary yarn changing means at predetermined times, said third yarn changing means being controlled by the pattern chain.

3. A circular, independent needle, knitting machine having a primary means for changing yarns and a secondary means for changing yarns to produce a patterned stocking leg, said secondary means being under the control of said primary means, a third yarn changing means acting directly upon said secondary means to prevent the yarn changing operation of said secondary means at predetermined times.

4. A yarn lever control system for a circular, independent needle, knitting machine comprising a plurality of yarn feeding levers, a plurality of intermediate levers each adapted to operate an individual yarn feeding lever, a plurality of rockers adapted to operate said intermediate levers, cams for moving said rockers, and a rotatable shaft having a plurality of individual locking fingers, said shaft being so adapted to be rotated and said fingers being so disposed that individual fingers bear against individual rockers as said shaft is rotated, thereby excluding said rockers from movement by said cams.

5. A yarn lever control system according to claim 4 wherein said locking fingers are individually positionable at different angles around said shaft.

6. A yarn lever control system for a circular, independent needle, knitting machine which includes a yarn feeding lever, a rocker adapted to operate said yarn feeding lever, a cam adapted to rock said rocker, and a rockable locking finger proximate said rocker movable into position to lock said rocker against rocking by said cam.

7. A circular, independent needle, knitting machine having a yarn lever control system which includes a yarn lever, an intermediate lever adapted to operate said yarn lever, a rocker having a cam following nose and adapted to operate said intermediate lever, a drum having a cam row adapted to move said cam following nose thereby rocking said rocker, and a locking element adapted to be interposed into the path of said rocker to prevent said rocking of said rocker.

8. In a circular, independent needle, knitting machine a yarn lever controlling mechanism having a primary means for releasing from an inoperative position yarn levers to be used in knitting a given portion of fabric, a secondary means for introducing into and removing from yarn feeding position yarn levers released by said first means, and a third means for preventing yarn levers released by said first means from being introduced into yarn feeding position by said second means.

9. In a circular, independent needle, knitting machine having as part of its operating mechanism a bank of separate cam operated rocker type levers and cams for operating said levers, a device for controlling the operation said levers, a device for controlling the operation of said levers by said cams which comprises a rotatable shaft having a plurality of projecting fingers adapted to press against individual ones of said levers as said shaft is rotated.

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