Feb. 19, 1924. 1,483,904

M. C. MILLER

KNITTING MACHINE

Filed Aug. 17, 1918 3 Sheets-Sheet 1

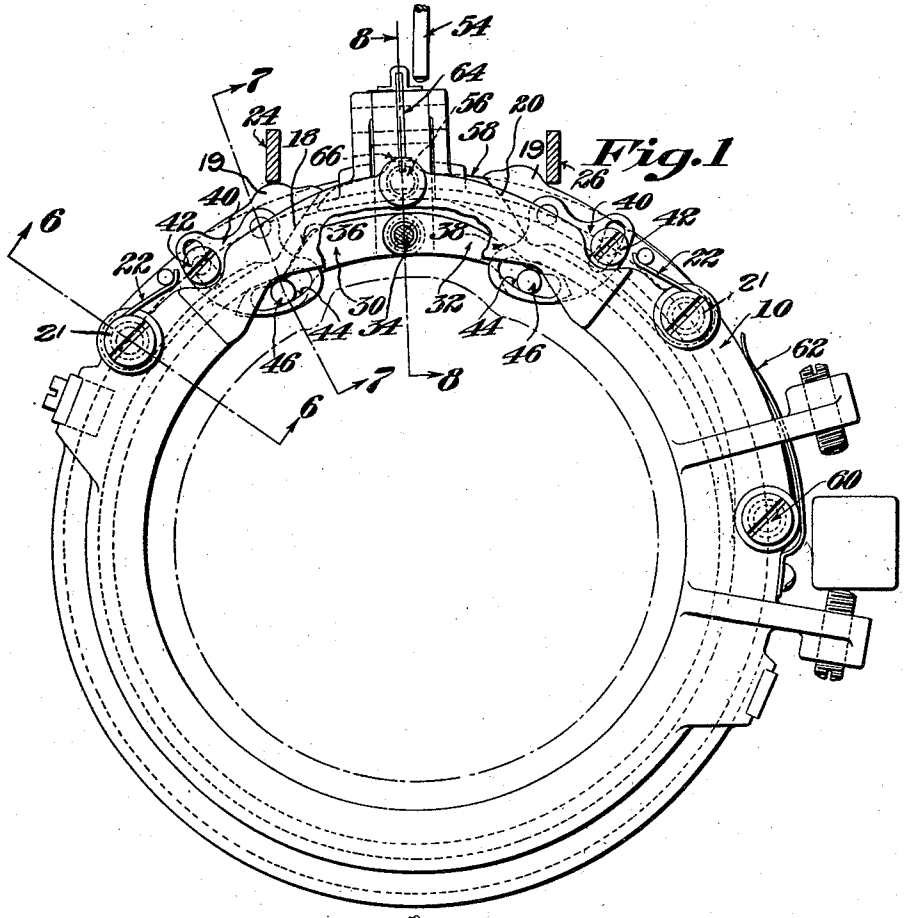


Fig. 1

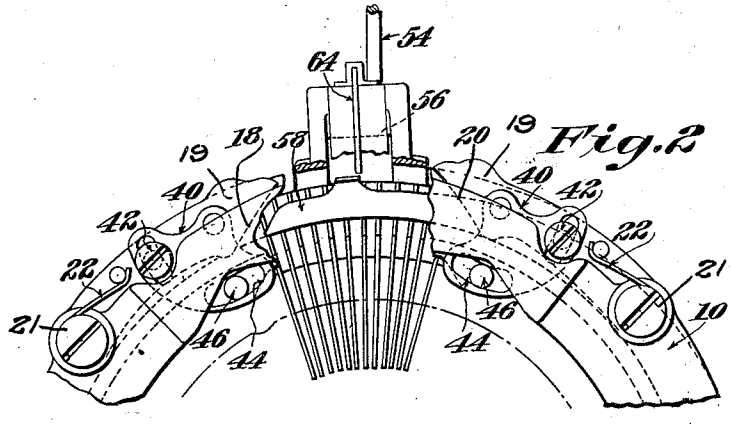


Fig. 2

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Fig. 3

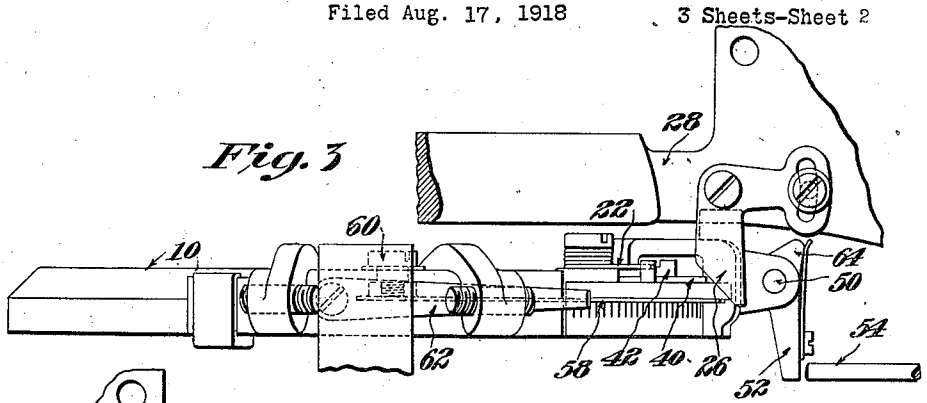


Fig. 4

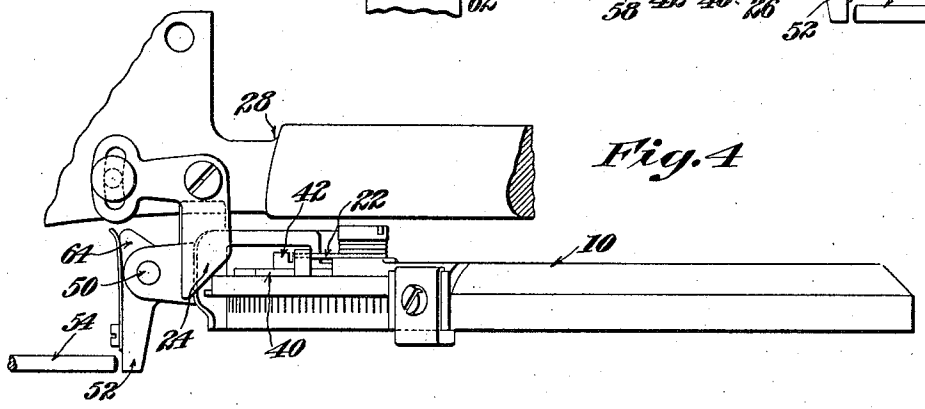
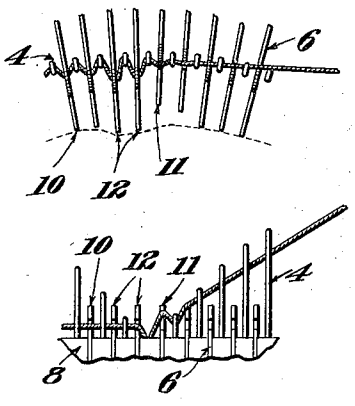


Fig. 5



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Fig. 6

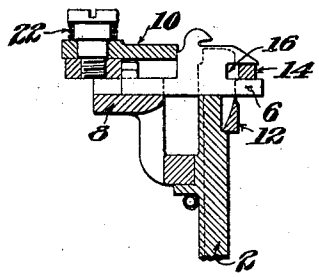


Fig. 7

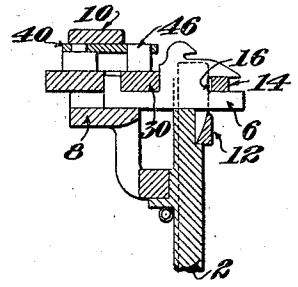


Fig. 8

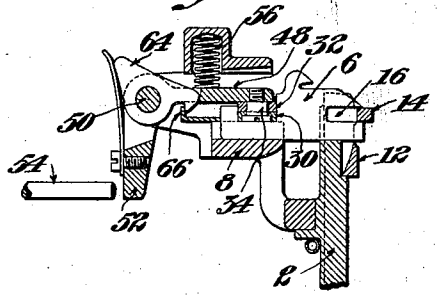


Fig. 9

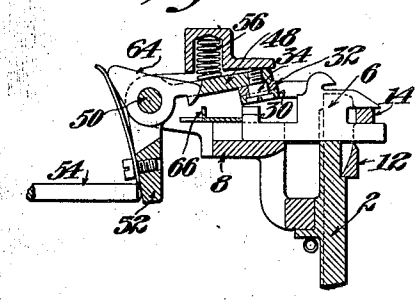


Fig. 10

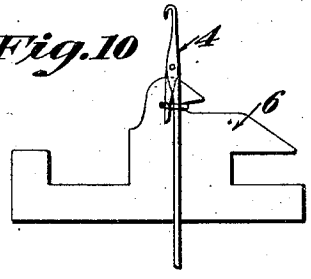


Fig. 11

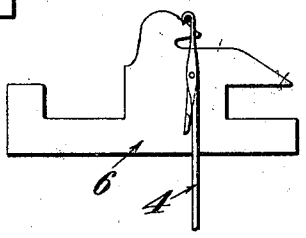


Fig. 13.

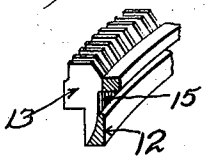
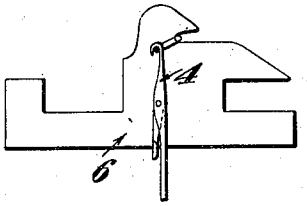


Fig. 12



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Patented Feb. 19, 1924. 1,483,904

UNITED STATES PATENT OFFICE.

MAX C. MILLER, OF CUMBERLAND HILL, RHODE ISLAND, ASSIGNOR TO JENCKES KNITTING MACHINE COMPANY, OF PAWTUCKET, RHODE ISLAND, A CORPORATION OF RHODE ISLAND.

KNITTING MACHINE.

Application filed August 17, 1918. Serial No. 250,361.

To all whom it may concern:

Be it known that I, MAX C. MILLER, a subject of the Emperor of Germany, residing at Cumberland Hill, in the county of Cumberland and State of Rhode Island, have invented certain new and useful Improvements in Knitting Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to web holder mechanisms for circular knitting machines such as are used for knitting seamless hosiery and to the method of starting the knitting by such mechanism.

One feature of the invention consists in so operating the web holders of a circular knitting machine that at the beginning of the knitting they will kink the initial course of yarn about all the needles and will hold it in bights against the fronts of the needles until the needles have again taken the yarn and are drawing the loops of the second course and will retain the first yarn and carry it back over the tops of the needles at the knitting point so that the needles rise through the loops of the second course in front of the initial yarn. All the loops of the second course are thus looped through bights of the initial yarn and thereafter each course of loops may be cast over the tops of the needles as the succeeding course is drawn by the needles in the usual manner. By continuing to hold the bights of the initial yarn against the needles substantially up to the knitting point the retention of the initial yarn under the nibs of the web holders and consequently the carrying of the initial yarn back over the tops of the needles is practically ensured. Web holders as heretofore operated have usually been withdrawn some distance before they reach the knitting point, thus releasing the kinked yarn of an initial course and permitting it to straighten and rise above the web holder nibs so that it is not carried back of the needles as they draw the loops of the second course with the resulting failure to so engage these loops with the yarn of the second course as to initiate the knitting on all the needles. Difficulty has been experienced, therefore, in starting knitting on all the needles, and particularly when using smooth and wiry yarn which does not cling to the needles or retain its kinked condition when released. By the above mode of operating the web holders, however, the knitting may be quickly initiated on all the needles without first forming a setting-up selvage and without the complication and special manipulation of the needles requisite to the forming of such selvage. It is advisable to continue to operate the web holders in the manner indicated during the knitting of several courses to ensure the proper interlooping of the yarn by all the needles, after which they may be operated in the usual manner until the stocking or other article is completed.

The invention contemplates any suitable means for operating the web holders in the manner specified. It is preferred, however, to remove the web holder withdrawing cam or cams from active position at the beginning of the knitting and to render active at this time suitable means for retaining the web holders in advanced position and permitting them to yield radially at the knitting point under the influence of the yarn drawn down against the curved or inclined upper sides of their nibs to enable the yarn to pass thereunder. After a few courses the withdrawing cam may be returned to normal active position where it remains until knitting is again to be started upon bare needles.

In addition to the features outlined above the invention includes certain other features of construction which will be hereinafter described and referred to in the claims. The various features of the invention will be understood from an inspection of the accompanying drawings and the following detailed description of the mechanism illustrated therein.

In the drawings, Figure 1 is a plan view of the web holder cam ring of a machine embodying the preferred form of the invention; Fig. 2 is a partial view of the same, indicating the positions of the parts when starting the knitting; Fig. 3 is an elevation looking toward the left in Fig. 1; Fig. 4 is an elevation looking toward the right in Fig. 1; Fig. 5 is a diagram showing in plan and elevation the action of the

yarn of the initial course on the web holders; Figs. 6, 7 and 8 are sectional views on lines 6—6, 7—7 and 8—8 respectively, Fig. 1; Fig. 9 is a view similar to Fig. 8, showing the parts in a different position; Figs. 10, 11 and 12 are enlarged views showing a web holder and the manner in which it co-operates with the needles during the initial course; and Fig. 13 is a detail of the web holder guide ring.

In the drawings, the invention is shown as embodied in a revolving needle cylinder machine in which the length of the stitches in different parts of the stocking knit thereon is varied by vertical movements of the cylinder as is the common practice in this type of machine. The needle cylinder indicated at 2 carries the usual long and short butt latch needles 4 which are operated during rotary and reciprocatory knitting by knitting cams, pickers and elevating and depressing cams of any usual or suitable construction. The web holders 6 which co-operate with the needles are mounted to slide radially in the dial 8, and are provided with butts arranged to be engaged by cams on the web holder cam ring 10. The web holders are divided into groups having respectively long and short butts for a purpose hereinafter referred to. The cam ring is mounted on the dial in the usual manner and has the usual limited movement with the dial during reciprocatory knitting. The inner ends of the web holders are guided and held against vertical movement by a guide ring 12 secured at the upper end of the needle cylinder in any suitable manner. This ring is provided on its inner face with an inwardly projecting rib 14 adapted to fit within open-ended slots 16 formed in the inner ends of the web holders. Outside of this rib the ring 12 is provided with radial guiding slots 13 for the web holders which extend through the ring at 15 below the rib 14 for the passage of that part of the web holder lying below the slot 16. That part of the ring lying outside of the rib 14 is of such thickness that the walls of the slots 13 in the ring will close that part of the slots 16 in the web holders which is outside the rib 14 when the web holders are in their full retracted position as indicated in Fig. 8. The hold-down slots 16 in the web holders are therefore closed at all times by the rib 14 and the walls of the guiding slots outside the rib so that no lint or dirt can collect in the slots 16 between their outer ends and the rib 14 to interfere with the proper operation of the web holders. Another advantage of this form of web holder guide ring at the upper end of the needle cylinder is that the provision of the inwardly projecting rib 14 for engagement with the open-ended slots in the inner ends of the web holders enables each slot in the ring to be conveniently and economically formed by a single milling cut.

The web holder cam ring is provided with two web holder cams 18 and 20 for advancing the web holders at the knitting points during rotary and reciprocatory knitting. These cams are formed on the free ends of two cam levers 19 pivoted at 21 on the under side of the cam ring and pressed radially outward by springs 22. The cams are thus radially movable and their active positions are determined by two stationary controller cams 24 and 26 adjustably secured on the latch ring 28. The controller cams are so arranged that when the cam ring is in position for rotary knitting the web holder cam 18 will be in engagement with the controller cam 24 and will be held in active position thereby, while the web holder cam 20 will be out of engagement with its controller cam 26 and will be pressed back out of active position by its spring 22. When the cam ring is shifted on a reverse stroke of the needle cylinder in reciprocatory knitting, the web holder cam 20 will be carried into engagement with its controller cam 26 and will be forced into active position, while the cam 18 will be disengaged from its controller cam and will be moved outward into inactive position. The controller cams are so shaped that when the needle cylinder is raised or lowered to lengthen or shorten the stitch they will vary the radial position of the web holder cams so that the advance movement of the web holders will be varied in accordance with the variations in the length of the stitch. This construction is a modification of the construction shown and described in application No. 250,362, August 17, 1918, and in which this feature is broadly claimed. The centre cam for wthdrawing the web holders before they reach the knitting point and for preventing over-driving of the web holders as they are advanced by the web holder cams, is formed in two parts, each of which is connected with the opposed web holder cam so that it may be readily adjusted toward and from such cam to bring it into proper relation thereto, and each of which is also so connected with the opposed web holder cam that it is moved radially therewith, and therefore maintained in proper relation thereto, when the web holder cam is moved radially to vary the advance movement of the web holders.

As shown, the centre cam comprises two levers 30 and 32 mounted upon a common pivot 34 and provided with cam surfaces 36 and 38. During rotary knitting the cam surface 38 withdraws the web holders before they reach the knitting point, while that part of the cam surface 36 which

is opposite to the point of the web holder cam 18 prevents overdriving of the web holders as they pass the point of the cam. On the reverse stroke of the needle cylinder in reciprocatory knitting the cam surface 36 withdraws the web holders while that part of the cam surface 38 which is opposite the point of the web holder cam 20 prevents overdriving of the web holders by this cam. The means for connecting the withdrawing cams to the opposed web holder cams comprises a plate 40 pivoted to the web holder cam and adjustably secured thereto by a clamping screw 42 passing through a concentric slot in the plate. The plate is provided with an eccentric slot 44 engaged by a pin 46 projecting upward from the withdrawing cam. When the plate is adjusted about its pivot the eccentric slot acting on the pin moves the withdrawing cam toward or from the web holder cam to bring it into proper relation thereto, and after the plate is secured in position the withdrawing cam is maintained in proper relation to the web holder cam, whatever its radial position.

The centre cams are so mounted that they may be raised out of active position when knitting is to be started upon bare needles, thus preventing the drawing out of the web holders to form the wave at the knitting point, which is indicated in dotted lines in Fig. 1. As shown in Figs. 8 and 9, the centre cam is mounted upon the inner end of a supporting lever 48 which is pivoted at 50 to the web holder cam ring, and is provided with a depending arm 52 adapted to be engaged by a controller bar 54 which may be operated manually or automatically by any suitable pattern mechanism. The lever 48 is pressed downward to hold the centre cam normally in active position by a spring 56. When the centre cams are raised out of active position, a spring-pressed blade or arm 58 which is arranged just outside of the path of the web holder butts, is rendered active and forces the web holders which have been withdrawn by the centre cams forward into their advanced positions and holds them under spring pressure at the knitting point as indicated in Fig. 2. The blade 58 is pivoted at 60 on the web holder cam and is forced inward by the spring 62. After the centre cams have been rendered inactive and the pressing blade 58 has been rendered active, the yarn for the initial course is fed to all the needles and the needles are operated to knit in the usual way. The needles draw the yarn for the initial course down against the upper sides of the nibs of the web holders, as indicated in Fig. 11, and at 11 in Fig. 5. Since the web holders are held yieldingly in advanced position the action of the yarn upon the curved or inclined upper side of the web holder nib forces the web holder back until the yarn passes off the point of the nib, after which the web holder is immediately advanced by the web holder cam 18 and passes over the yarn, kinking the yarn about the needle and holding it against the front side of the needle, as indicated in Fig. 12, and at 12 in Fig. 5. As the web holders pass the point of the web holder cam they move outward very slightly to relieve the pressure on the yarn (this movement being shown exaggerated in Figs. 1 and 5), and continue to hold the yarn kinked against the front sides of the needles, as indicated in Fig. 10, and at 10 in Fig. 5. The web holders continue to hold the yarn kinked about and pressed against the front sides of the needles until after the needles have been raised to take the yarn for the second course and have drawn the yarn down against the nibs of the web holders substantially at the knitting point. The web holders then yield just sufficiently to enable the yarn to pass under the nibs so that there is practically no opportunity for the initial yarn to escape from below the nibs of the web holders. The needles will therefore draw the loops of the second course down back of the kinks of the initial yarn, after which the web holders will carry the initial yarn back over the tops of the needles so that the needles will rise through the loops of the second course in front of the initial yarn. The loops of the second course are therefore looped through the kinks of the initial yarn by all the needles, so that the succeeding courses of loops may be drawn therethrough by the needles and the loops of the second course cast over the tops of the needles by the web holders in the usual manner.

To ensure the starting of the fabric on all the needles it is preferred to retain the centre cams out of action and the pressing blade in action during the knitting of several courses, after which the centre cam is returned to active position either manually or automatically, as the case may be. The provision of long and short butt web holders enables the centre cams to be conveniently and readily returned to active position. When the lever carrying the centre cams is released and forced downward by its spring, the centre cams ride on the tops of the short butts and act upon the long butts to draw the long butt web holders outwardly. After the short butts have passed from beneath the cams, their downward movement into active position is completed so that they are in position to act upon both the long and short butt web holders. When the first long butt web holders are drawn outward by the cam 38 they act on the spring-pressed blade 58 and force it outward to its outer position. When the centre cams finally drop into normal position a spring-pressed latch 64 which is mounted on the pivot 50 may move down into position to retain the blade in its outer

position by engagement with an upwardly projecting lip 66 on the blade 58. The end of the latch rests against the end of a slot in the lever 48 so that the latch is moved out of engagement with the lip by the upward movement of the lever 48 when the centre cams are raised into inactive position.

While it is preferred to employ the specific construction and arrangement of parts shown and described, it will be understood that this construction and arrangement is not essential and may be varied or modified as found desirable or best suited to the conditions under which the invention is to be employed.

What is claimed is:

1. The method of starting a knit web on a circular series of needles, which consists in feeding an initial course of yarn to the needles and holding it in bights simultaneously across the fronts of all the needles, feeding a second course of yarn and while all the bights of the initial course of yarn are still simultaneously held against the fronts of the needles and under the nibs of the web holders until the needles have drawn the loops therethrough, and then carrying the initial yarn to the backs of the needles so that they will rise through the second loops and in front of the initial yarn, and thereafter continue to knit on all the needles.

2. A knitting machine, having, in combination, a series of needles, a series of web holders co-operating therewith, and mechanism for operating the web holders to kink an initial course of yarn about the needles, hold it in bights simultaneously wrapped across the front sides of all the needles and under the nibs of the web holders during the drawing of the second course of loops, and then carry it back of the needles as they rise through said loops, and means for thereafter withdrawing the web holders in advance of and advancing them at the knitting point.

3. A knitting machine having, in combination, a needle cylinder, radially movable web holders, means acting automatically to retain all the web holders in advance position and permit them to yield radially at the knitting point during the knitting of the initial course or courses and to thereafter retract them in advance of and advance them at the knitting point during the knitting of the remainder of a web.

4. A knitting machine, having, in combination, a needle cylinder, a web holder dial, radially movable web holders in the dial, two web holder cams, centre cams for withdrawing the web holders, means for removing the centre cams from engagement with the web holders, and means for retaining all the web holders in advance position and permitting them to yield at the knitting point when the centre cams are removed.

5. A knitting machine, having, in combination, a needle cylinder, web holders, web holder cams, centre cams, means for removing the centre cams from engagement with the web holders, and a spring-pressed blade for pressing forward the web holders when the centre cams are removed.

6. A knitting machine, having, in combination, a needle cylinder, web holders, web holder cams, centre cams, a vertically movable support on which the centre cams are mounted, and a spring-pressed blade for pressing forward the web holders normally engaged by the centre cams when the centre cams are raised out of engagement with the web holders.

7. A knitting machine, having, in combination, a needle cylinder, a web holder dial, long and short butt web holders radially movable in the dial, web holder cams, centre cams vertically movable out of and into the path of the web holder butts, and means for pressing all the web holders inward and permitting them to yield at the knitting point when the centre cams are raised.

8. A knitting machine having, in combination, a needle cylinder, web holders, two web holder advancing cams movable to vary the advance of the web holders thereby and arranged to act alternately during reciprocatory knitting, a cam opposed to each advancing cam for withdrawing the web holders as they approach the other and active advancing cam, and a connection between each advancing and opposed withdrawing cam adjustable to determine the space between them.

9. A knitting machine having, in combination, a needle cylinder, web holders, two web holder advancing cams movable to vary the advance of the web holders thereby and arranged to act alternately during reciprocatory knitting, a cam opposed to each advancing cam for withdrawing the web holders as they approach the other and active advancing cam, means for adjusting the position of each web holder advancing cam to vary the advance of the web holders thereby, and a connection between each web holder cam and the opposed cam for maintaining them in proper relation.

10. A knitting machine, having, in combination, a needle cylinder, web holders, two radially movable web holder cams, and controller cams directly engaging the web holder cams to vary their positions in accordance with height of the needle cylinder.

11. A knitting machine, having, in combination, a needle cylinder, web holders, two web holder cams, two pivoted centre cams between the active faces of the web holder cams each adjustably connected to the opposite web holder cam, and adjustable means for determining the active position of each web holder cam.

12. A knitting machine, having, in com-

bination, a needle cylinder, a web holder dial, radially sliding web holders having open-ended slots in their inner ends, a guide ring at the upper end of the cylinder having an inwardly projecting rib for engaging the slots in the web holders, and guiding slots wholly outside the rib passing through the ring below the rib.

13. A knitting machine, having, in combination, a needle cylinder, a web holder dial, raidally sliding web holders having open-ended slots in their inner ends, a guide ring at the upper end of the needle cylinder having an inwardly projecting rib for engaging the slots in the web holders, and guiding slots outside the rib, the walls of which close that part of the slots in the web holders which is outside the rib in all positions of the web holders.

14. A knitting machine having, in combination, a needle cylinder, web holders having butts, two web holder advancing cams movable to vary the advance of the web holders thereby and arranged to act alternately during reciprocatory knitting, a web holder withdrawing cam connected to move with each advancing cam and spaced therefrom to prevent over-driving of the web holder butts thereby, the withdrawing cams being arranged between the opposed active faces of the advancing cams.

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