Nov. 30, 1937. R. H. LAWSON ET AL 2,101,006

YARN CHANGE MECHANISM FOR KNITTING MACHINES

Filed June 3, 1931 3 Sheets-Sheet 1

FIG. 1.

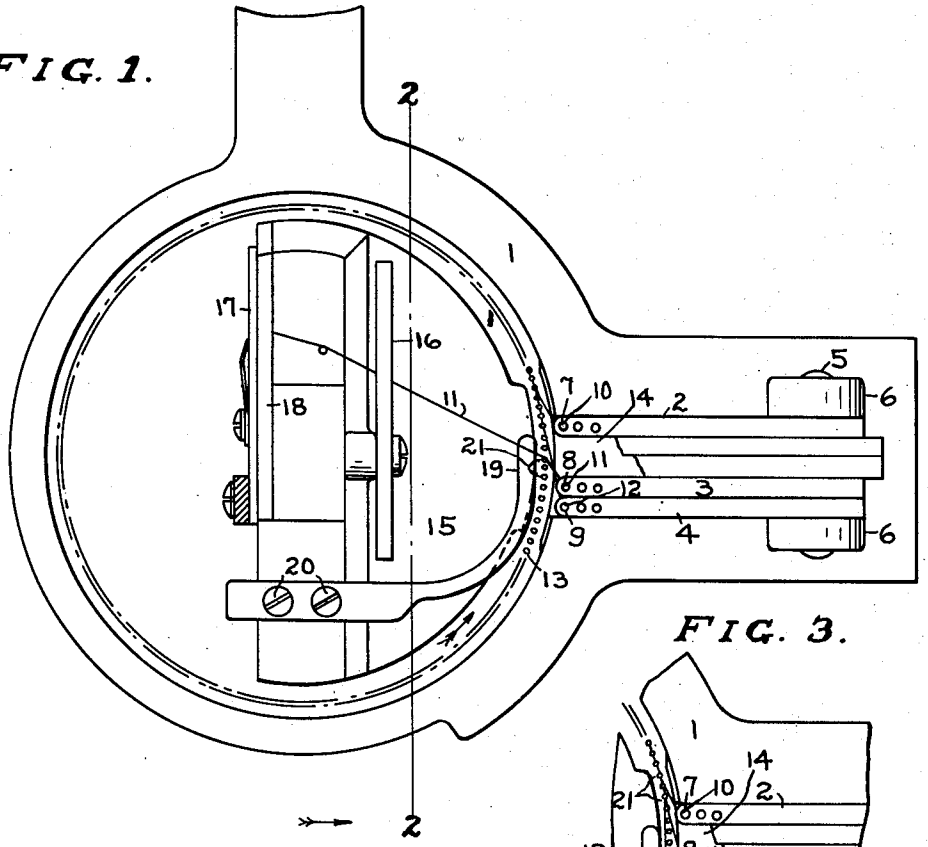


FIG. 3.

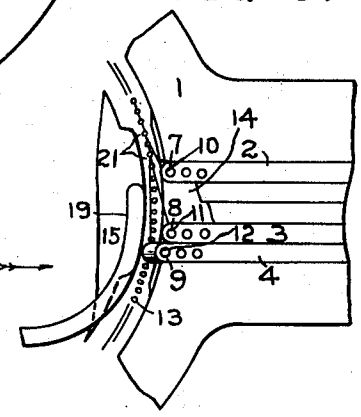


FIG. 2.

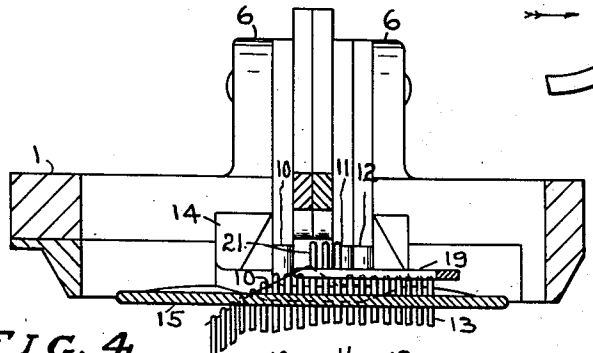
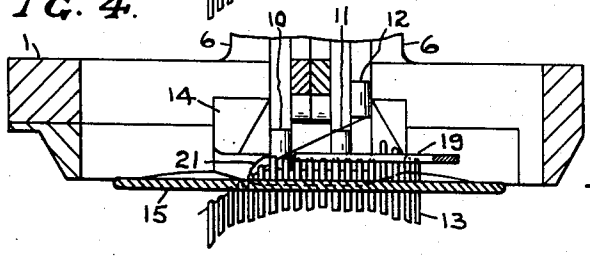


FIG. 4.



INVENTORS:
ROBERT H. LAWSON,
AUGUSTIN GAGNE',
BY Roy F. Lovell,
ATT'Y.

Nov. 30, 1937. R. H. LAWSON ET AL 2,101,006

YARN CHANGE MECHANISM FOR KNITTING MACHINES

Filed June 3, 1931 3 Sheets-Sheet 2

FIG. 5.

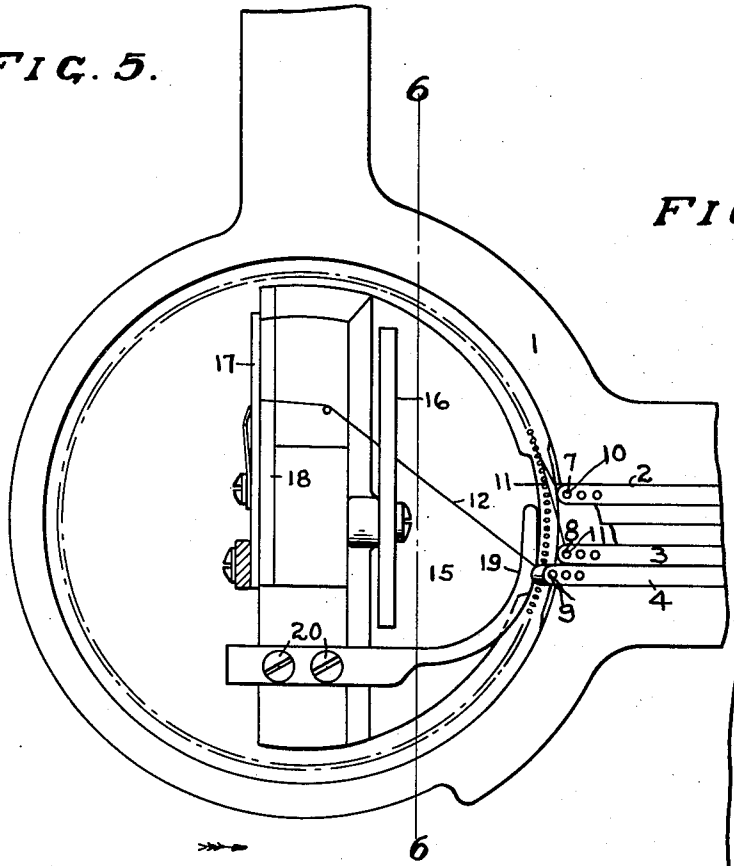


FIG. 8.

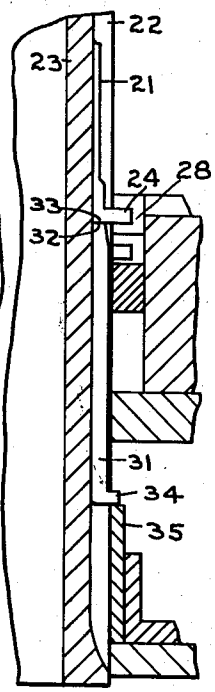
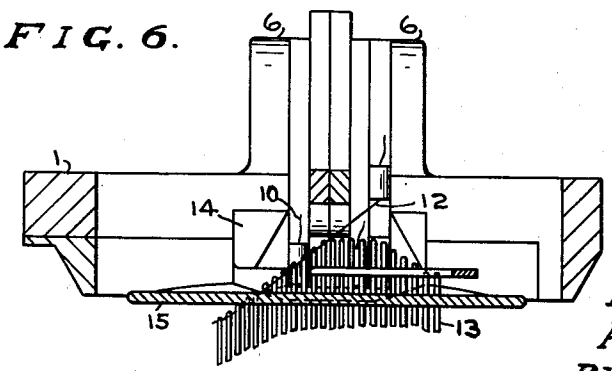


FIG. 6.



INVENTORS:
ROBERT H. LAWSON,
AUGUSTIN GAGNE,
BY Roy F. Lovell
ATT'Y.

Nov. 30, 1937. R. H. LAWSON ET AL 2,101,006

YARN CHANGE MECHANISM FOR KNITTING MACHINES

Filed June 3, 1931 3 Sheets-Sheet 3

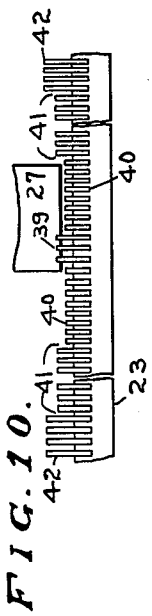


FIG. 10.

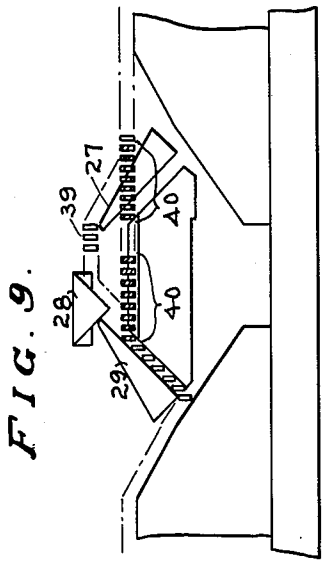


FIG. 9.

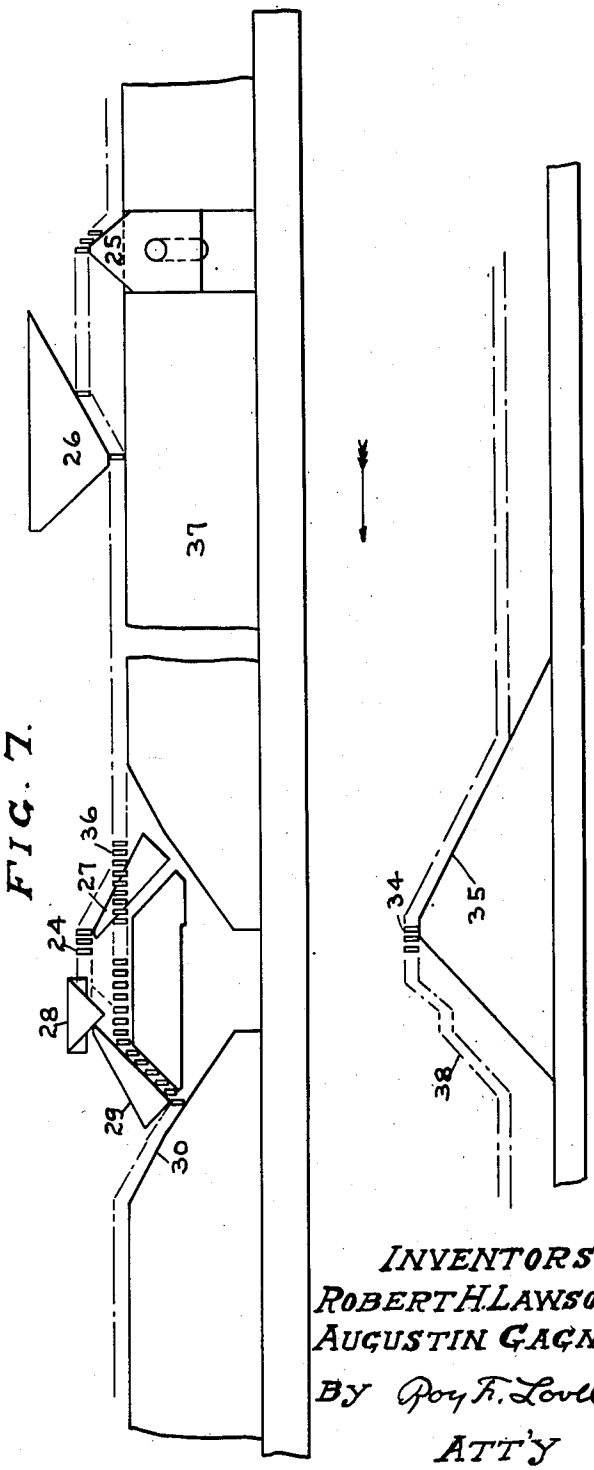


FIG. 7.

INVENTORS:
ROBERT H. LAWSON,
AUGUSTIN GAGNE,
BY Roy F. Lovell,
ATT'Y

Patented Nov. 30, 1937

2,101,006

UNITED STATES PATENT OFFICE

2,101,006

YARN CHANGE MECHANISM FOR KNITTING MACHINES

Robert H. Lawson, Pawtucket, and Augustin Gagne, Central Falls, R. I., assignors to Hemphill Company, Central Falls, R. I., a corporation of Massachusetts

Application June 3, 1931, Serial No. 541,856

4 Claims. (Cl. 66—140)

This invention relates to an improved means for and method of changing yarns in such a manner that the changing is made on the same needle or group of needles whenever the yarns are changed, the number of needles in such group being varied at will.

The changes in the yarns hereinbefore referred to are ordinarily for the purpose of knitting horizontal stripes although not limited thereto; and although the overlap of the newly inserted yarn and the withdrawn yarn may be a single wale width only, as hereinafter to be disclosed, the two yarns are lapped over three needles, i. e., three needles knit both the yarn to be withdrawn from feeding relation with respect to the needles and the yarn to be substituted therefor.

In the drawings:

Fig. 1 is a plan view of the latch ring showing two yarns being fed to the needles in plating relation and a third yarn just having been moved to feeding position;

Fig. 2 is a sectional view in elevation taken along line 2—2, Fig. 1, and looking in the direction of the arrow;

Fig. 3 is a fragmentary plan view similar to Fig. 1 but showing a plating yarn being moved to an inoperative position;

Fig. 4 is a view in elevation, partly in section, looking in the direction of the arrow, Fig. 3;

Fig. 5 is a plan view similar to Figs. 1 and 3 but showing a plating guide withdrawn to an inoperative position and its yarn held within the binder;

Fig. 6 is a view in vertical section taken along the line 6—6, Fig. 5 and looking in the direction of the arrow;

Fig. 7 is a fragmentary view showing the paths along which the needle butts and selecting jack butts travel, the arrow indicating the direction of travel of the needles and jacks;

Fig. 8 is a view in vertical section taken through the needle cylinder and showing how the jacks select the needles;

Fig. 9 is a view similar to Fig. 7 but showing a modification wherein the butts of the needles are of different lengths and jacks are not used; and

Fig. 10 is a plan view showing the different lengths of needle butts and how they are controlled.

Referring specifically to Figs. 1–6 inclusive, the latch ring 1 is shown as having mounted therein yarn levers 2, 3, and 4, which levers are pivotally mounted in the usual manner on a pin 5 carried by upstanding ears or lugs 6 carried by and forming part of the latch ring. Ordinarily in a knitting machine other yarn levers are from time to time used but a description of yarn levers 2, 3, and 4 and the method of operation will suffice to disclose the present invention. The respective yarn levers are provided with thread guiding eyelets 7, 8, and 9 through which threads 10, 11 and 12 respectively pass and by which the said threads are fed to the needles 13 of the knitting machine, which needles move past the mouthpiece 14 within which the thread guiding eyelets 7, 8, and 9 seat when they are in active, thread feeding position.

The body thread 10 is normally fed to the needles throughout the knitting of plated or other portions of the fabric; and other threads such as 11, 12 are interchangeably fed to the needles together with the thread 10 throughout such plated or other portions of the stocking or other fabric. Although as herein disclosed a body thread 10 is fed to the needles and other, plating threads 11 and 12 are interchangeably fed to the needles, the invention is not limited to the knitting of plated fabric in which event two or more threads would be interchangeably fed to the needles thereby producing horizontal stripes in the stocking or other fabric; however, preferably, either a body thread is fed to the needles throughout the knitting of a plurality of courses, while other, plating threads such as 11 and 12 are interchangeably fed to the needles; or two or more threads may be substituted for two or more threads, each set of threads being, preferably, fed to the needles in plating relation through the same guides.

Whenever a yarn is to be withdrawn from feeding relation with respect to the needles and another yarn substituted therefor it is essential that the incoming or substitute yarn be moved to feeding position prior to the withdrawal of the other yarn; in other words, the two yarns are fed to a few needles, thus providing a lap including several wales. Ordinarily when the threads are changed by, first, moving one guide to feeding position and thereafter moving another guide to an inoperative position, there is no certainty just which needle will first knit the substitute yarn and which needle will last knit the withdrawn yarn; therefore when producing horizontal stripes by interchangeably controlling the yarn guides, more or less irregular lines appear where such yarns are interchanged, due to the fact that the same needle is not always the first one to knit the substitute yarn and that the

same needle is not always the last one to knit the withdrawn yarn.

The present invention overcomes the defect hereinbefore mentioned, by so controlling the needles and threads or yarns that the overlap of the substitute and withdrawn yarns shall not extend over a great number of wales, preferably one to three wales constituting the overlap. Furthermore, the means hereinafter to be disclosed, so controls the yarns and needles that a certain needle shall always be the first needle to knit the substitute yarn and a certain needle—which may be the needle just mentioned—shall always be the last needle to knit the withdrawn thread or yarn.

For the purposes of the present invention the so-called binder plate 15 upon which are mounted the usual automatically controlled clamp 16, cutter 17 and auxiliary clamp 18, also carries a curved finger or projection 19 which, as shown in Figs. 1, 2, and 4, is connected to the binder plate 15 as by screws 20 and is elevated above the upper surface of the said binder plate. The function of the finger or projection 19 is to maintain the substitute yarn—herein shown as the yarn 11—above the hooks of some of the needles and at such a level as to be knitted by one or more specially controlled needles 21, three of such needles being herein shown. Continued rotation of the needle cylinder from the position shown in Fig. 1, and in the direction of the arrow, causes the needle or needles 21 to engage the thread or yarn such as 11 and finally to move the said thread or yarn 11 from the position shown in Fig. 1 to a position clear of the finger 19, whereupon the said thread 11 drops off the said finger 19 and onto the upper surface of the binder plate 15 which is at a lower level than the upper surface of the finger 19. The yarn 11 when at the last named position is at such a level as to be engaged and knitted by all of the needles.

When the thread or yarn such as 12 theretofore having been knitted by the needles, is withdrawn from such feeding position, its lever 4 is elevated from the feeding position shown in Figs. 1 and 2 to the non-feeding position shown in Figs. 5 and 6; and during such movement to non-feeding position, the guide 4 first assumes an intermediate position (the movement to non-feeding position, preferably, being a continuous one) such as that shown in Figs. 3 and 4 in which position the thread or yarn 12 is elevated above the tops of the needles which follow the needle or needles 21, with the result that the following needles do not knit such withdrawn thread 12. When the lever 4 has reached the position shown in Figs. 5 and 6 continued rotation of the needle cylinder in the direction of the arrow causes the thread 12 to be received beneath the clamp 16 after which the cutter 17 severs the end of the float of thread adjacent to the last needle knitting the said thread 12. Although as hereinbefore described, a thread such as 11 which is to be substituted for another thread such as 12, is engaged by a few needles prior to the withdrawal of the thread such as 12, nevertheless the timing and controlling of the movements of the levers such as 3 and 4 to and from operative positions depends somewhat upon their relative positions in the mouthpiece, i. e., with respect to the knitting point.

One means for selectively controlling the needle or needles 21, is shown in Figs. 7 and 8, while a modification thereof is disclosed in Figs. 9 and 10.

First, referring to the form of the needle selecting means disclosed in Figs. 7 and 8, one of the needles 21 is shown mounted within a groove 22 of the needle cylinder 23, the said needle having a butt 24 for actuation by cams 25, 26, 27, 28, 29, and 30 during straight-away or circular knitting. Mounted within the slot 22 of the needle cylinder is shown a jack 31 which jack at its upper end as at 32 is shown in engagement with the heel 33 of its needle 21, whereby when the jack 31 is elevated by its butt 34 riding up a cam 35, its needle is likewise elevated. The relative positions after elevation of the butt 34 of the jack and the butt 24 of the leading needle 21, are shown in Fig. 7. As shown in Fig. 7, the butts 24 of three needles 21 have been elevated to a level above the level of the remaining needles 19 which are indicated by butts 36, Fig. 7. The consequent elevation of the three needles 21 positions the hooks thereof at the level shown in Fig. 2 where they become the first needles to engage and thereafter knit the substitute thread 11, all in a manner hereinbefore described.

At the completion of the knitting of the toe of a stocking (when knitting from top to toe) the cam 27 is radially withdrawn from a position where it engages butts 24 and 36 of the needles, to a position radially outwards thereof (with respect to the needle cylinder) in which latter position the cam 27 does not—as indicated in Fig. 7—engage the short butts of the needles. The cam 25 may be maintained in the position shown in Fig. 7 throughout the knitting of the stocking or other fabric as desired; or the said cam 25 may be lowered to inoperative position during the knitting of heels and toes, etc. and elevated just prior to the withdrawal of the cam 27. It is essential that the cam 25, if moved to and from the position shown in Fig. 7, be moved to the position shown in Fig. 7 prior to the withdrawal of the cam 27, for otherwise the stitches on the needles between the cams 25 and 27 at the time of the withdrawal of the cam 27, would not clear their latches, and such needles would consequently knit tuck stitches in the next course, which would be objectionable. While the cam 25 is operative, the said cam causes the needles to be raised to latch clearing position after which the cam 26 returns the needles to their normal level adjacent to the upper face or edge of the cam ring 37. Thereafter continued rotation of the needle cylinder carries the needles, except the needle or needles 21, directly into engagement with the cam 29 which causes the needles to draw their stitches in the usual or any desired manner; the needles 21 in the meantime being first directed into the path of the cam 29 by the cam 28, the cam 28 causing the needles 21 to carry the substitute thread such as 11 off the upper surface of the finger 19 and onto the upper surface of the binder plate 15. After the needles have knitted their stitches, the cam 30 which constitutes one face of the cam ring 37, moves or elevates the needles to a position where they are engaged by the cam 25 during the next course of knitting.

Whereas the jacks 31 are elevated by means of the cam 35 engaging the jack butts 34, the said jacks are moved downwardly along the zigzag path indicated by dot and dash lines 38 by the heels 33 of the needles engaging the upper edges or surfaces of the jacks 31, the zigzag path 38 of the jacks being a counterpart of the path followed by the needles 21 as they are successively engaged by the cams 28 and 29.

Whereas in Figs. 7 and 8, jacks have been shown for the purpose of selectively controlling the needles 21; in Figs. 9 and 10 a modification is shown wherein the jacks are dispensed with and wherein a cam 27—during the knitting of portions of the stocking or fabric other than heels and toes—is in a radial position adjacent to but somewhat spaced from the shortest butts of the needles, being in a position to engage the usual short butts 39 on needles which correspond to the needles 21, but not being in such a position as to engage extra short butts 40 which span the butts 39, eight such extra short butts 40 being shown on each side of the three regular short butts 39. The cam 27 is automatically controlled in its movements to be advanced to engage and elevate the needles pertaining to the butts 39 and to be retracted radially, the said radial movements of the cam 27 being timed to occur so as not to elevate the needles pertaining to the butts 41 which precede or follow the needles pertaining to the butts 39. Adjacent to the butts 40 are groups 41 of any desired number of regular short butts 39 and adjacent to the latter are shown long, instep needle butts 42.

The operation of the modification disclosed in Figs. 9 and 10 is substantially the same as that hereinbefore described with respect to Figs. 1–8 inclusive, excepting that in place of a jack cam 35 for controlling the needles 21, the cam 27 engages butts 39 of needles similar to needles 21 and raises them to the level shown in Fig. 9 which level corresponds to the level of the butts 24 shown in Fig. 7, the provision of the extra short butts 40 permitting the companion needles to remain in the relatively lowered position indicated in Fig. 9 at which time the hook ends of the said companion needles are in the position shown by the needles other than needles 21 in Fig. 2.

As shown in Fig. 10, the cam 27 is in position to engage and elevate the butts 39, 41 as well as the long butts 42 which are carried by the instep needles.

In Fig. 6 the instep needles are shown as passing the mouthpiece 14 and consequently such needles are shown as being elevated to the position of the needles 21, Fig. 2.

By the construction and operation hereinbefore disclosed, it is possible to change yarns in the same wale without exact setting of the cams which control yarn movements of the yarn levers, and this is especially true at the "going-out" side, i. e., where the yarns are withdrawn; furthermore, it is difficult, in fact practically impossible, to change yarns in the same wale or wales, when relying entirely upon the movements of the yarn fingers to and from feeding position to effect the yarn changes.

Whenever yarns are changed, as hereinbefore described, a yarn is moved to a feeding position with respect to the needles and remains in such position during the knitting of one or more complete courses, although such courses may be heel or toe courses; the yarn interchange hereinbefore disclosed thus being distinguished from such interchanging of yarns as occurs during the knitting of some varieties of split foot fabric.

Although as hereinbefore disclosed, the invention is applied to an independent needle knitting machine of the Banner type; nevertheless, the invention is not limited to the particular type of machine, e. g., the invention could be applied to a machine where the needles do not rotate.

We claim:

1. A circular knitting machine having a rotary needle cylinder and yarn guides for interchangeably feeding yarns to the needles, each such yarn being maintained in feeding position during the knitting of at least one complete course, means for temporarily retaining the ends of inactive yarns in such a manner that when the yarn guides are moved to feeding position with respect to the needles their yarns will be moved to a position where, due to the rotation of the needle cylinder, a needle will engage and thereafter knit the yarns, a member for temporarily maintaining a substitute yarn in an elevated position with relation to the needles, so that needles that move along the needle circle at one elevation will not engage the said yarn, and means for temporarily positioning at least one needle at such a height that the said needle will take the said yarn in its hook, and whereby continued rotation of the needle cylinder will cause the yarn to be moved off the mentioned member and thereafter to be positioned at a lower level, whereupon others of the needles will take the said yarn in their hooks.

2. A circular knitting machine of the independent needle type having a rotary needle cylinder and means for feeding yarns to the needles at a certain position, means within the needle circle and positioned above the aforesaid feeding position of the yarns, the means being so positioned as to engage a yarn moved to feeding position and temporarily retain the same in elevated position to be engaged by a certain, leading needle which thereafter causes the yarn to be lowered to a position to be engaged by following needles.

3. A knitting machine having means at one side of the needles for feeding yarns thereto, means at the other side of the needles for engaging a yarn when first moved to a feeding position with respect to the needles to retain the said yarn in a position always to be first engaged by the same needle, the said yarn thereafter being moved to a position to be engaged by following needles.

4. A knitting machine having means at one side of the needles for feeding yarns thereto, means at the other side of the needles and directly opposite the yarn feeding means for engaging a yarn when first moved to a feeding position with respect to the needles to retain the said yarn in a position always to be first engaged by the same needle, the said yarn thereafter being moved to a position to be engaged by following needles.

ROBERT H. LAWSON.
AUGUSTIN GAGNE.