July 12, 1938. R. H. LAWSON ET AL 2,123,701

KNITTING MACHINE AND METHOD OF KNITTING

Filed Dec. 23, 1932 4 Sheets-Sheet 1

FIG. 1.

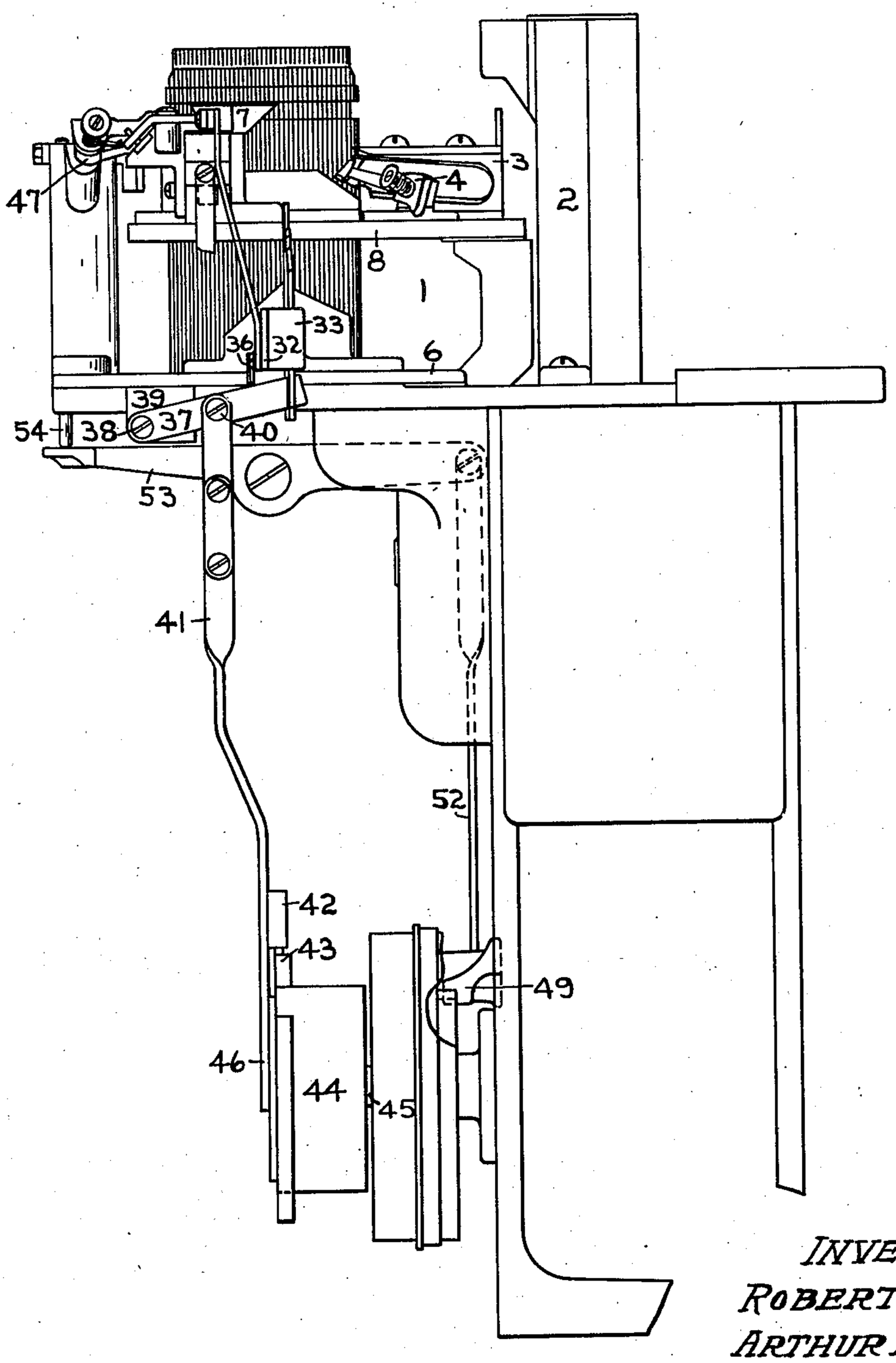

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FIG. 2.

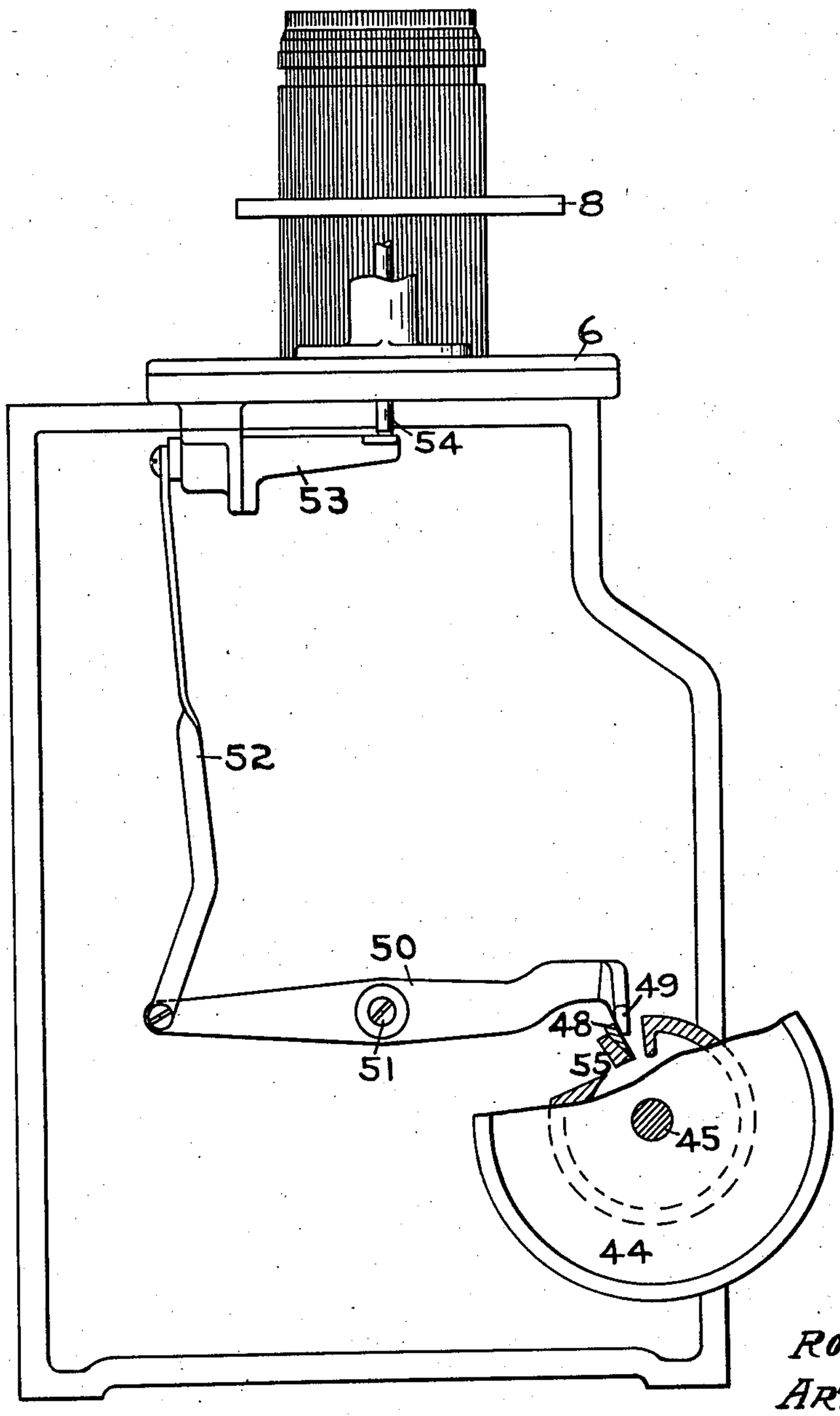

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FIG. 3.

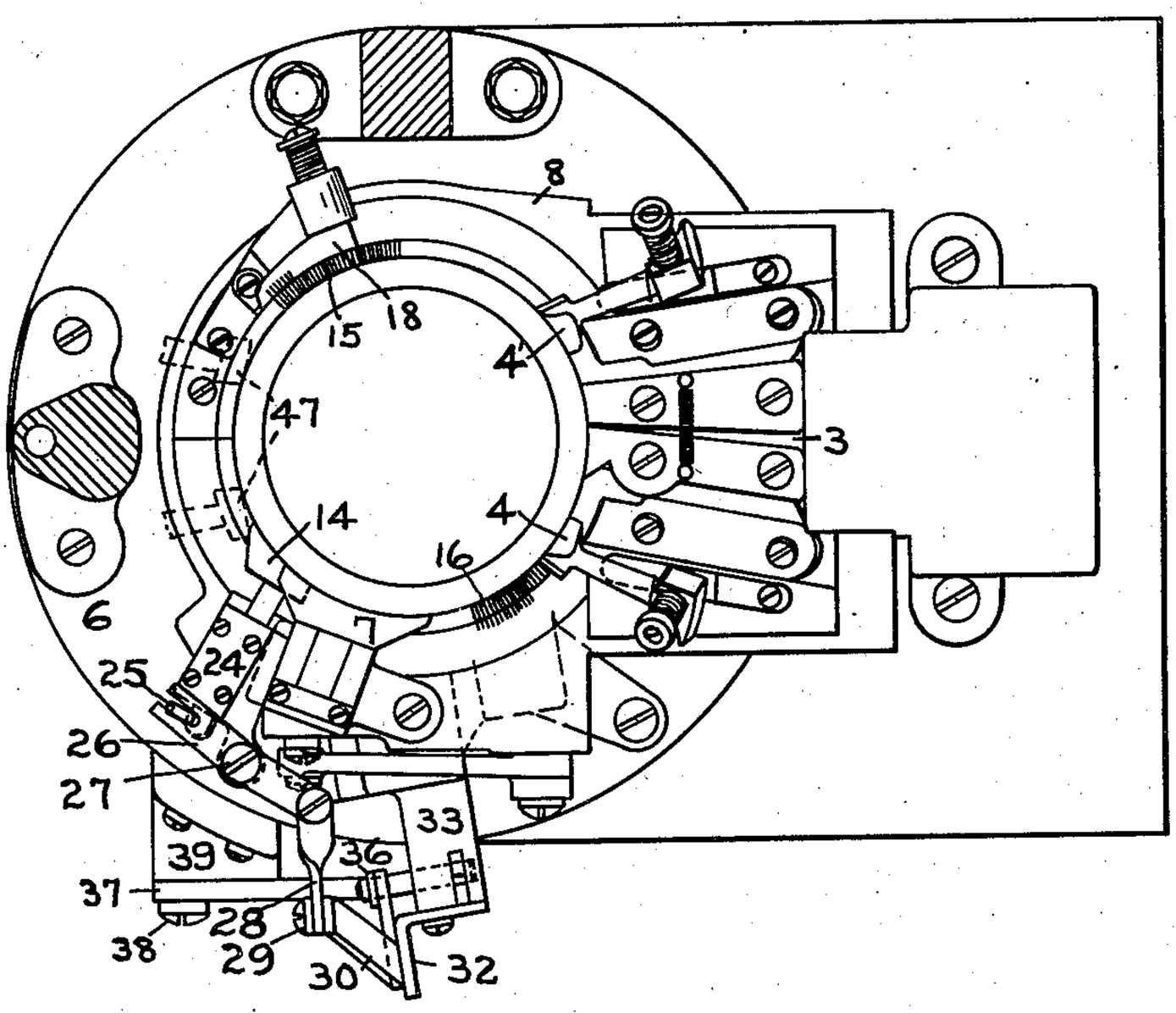
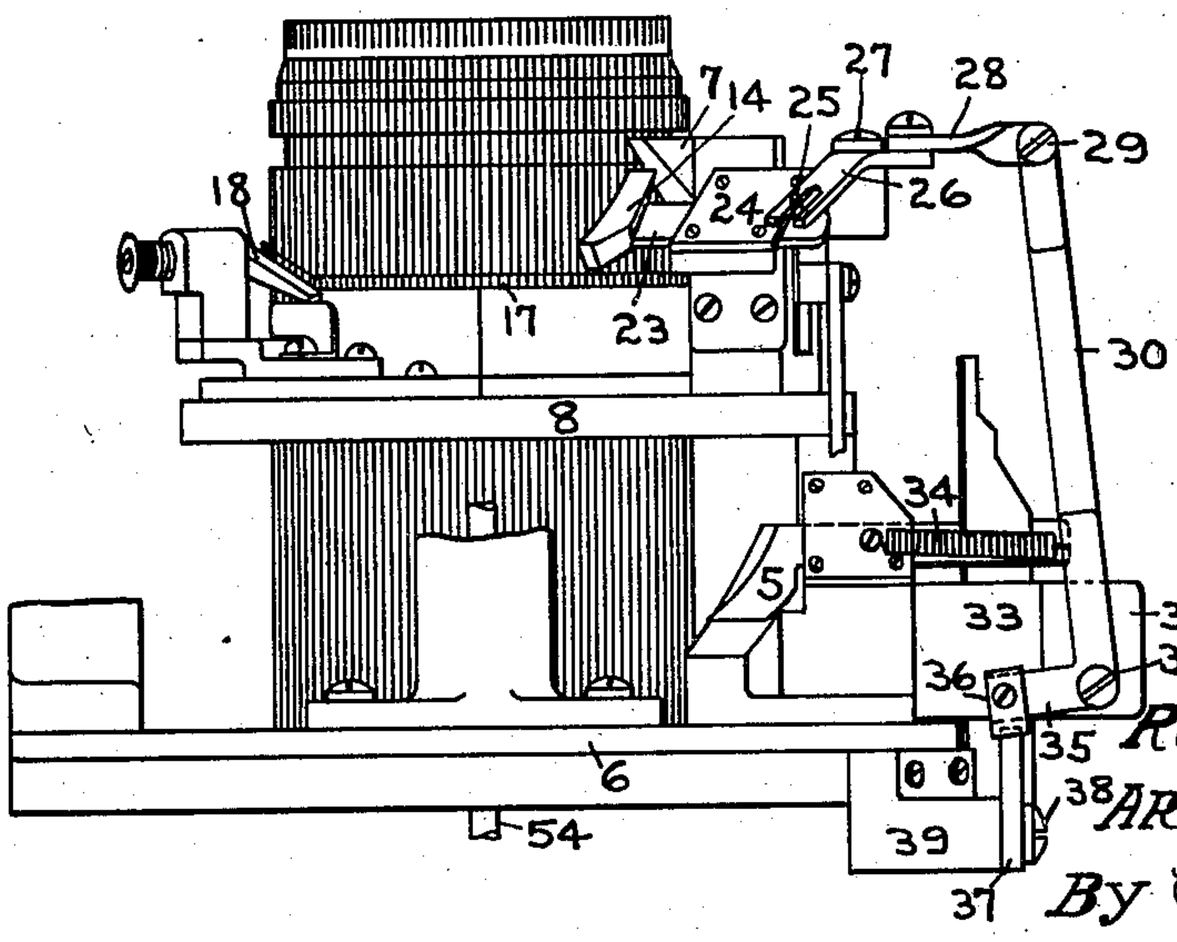


FIG. 4.



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KNITTING MACHINE AND METHOD OF KNITTING

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FIG. 5.

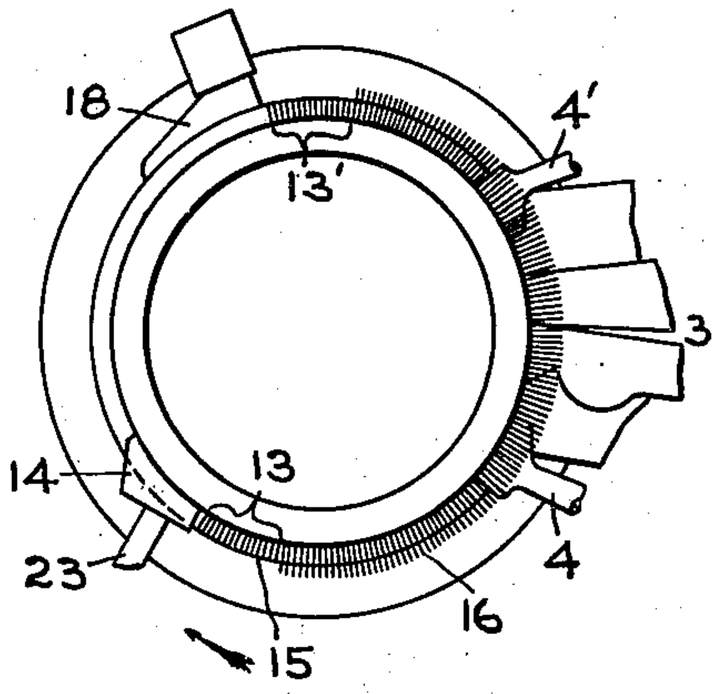


FIG. 6.

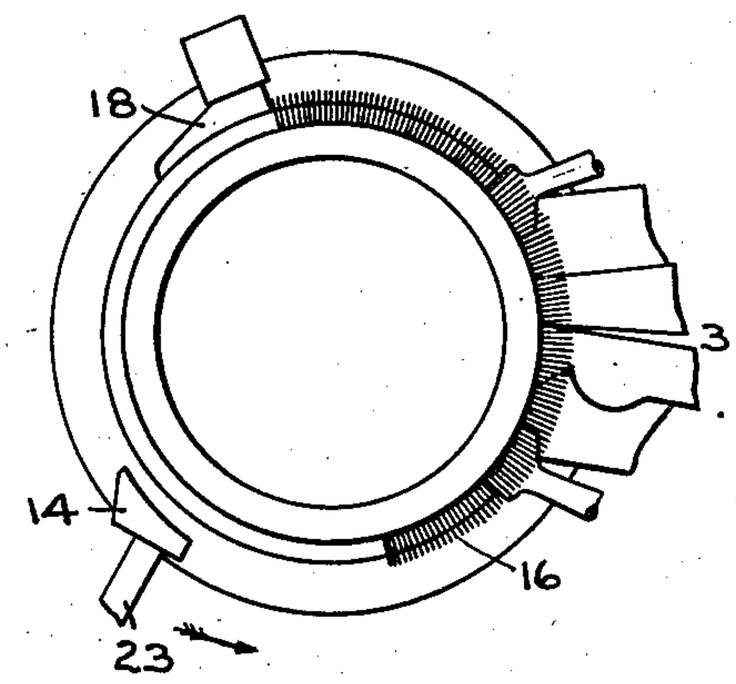


FIG. 7.

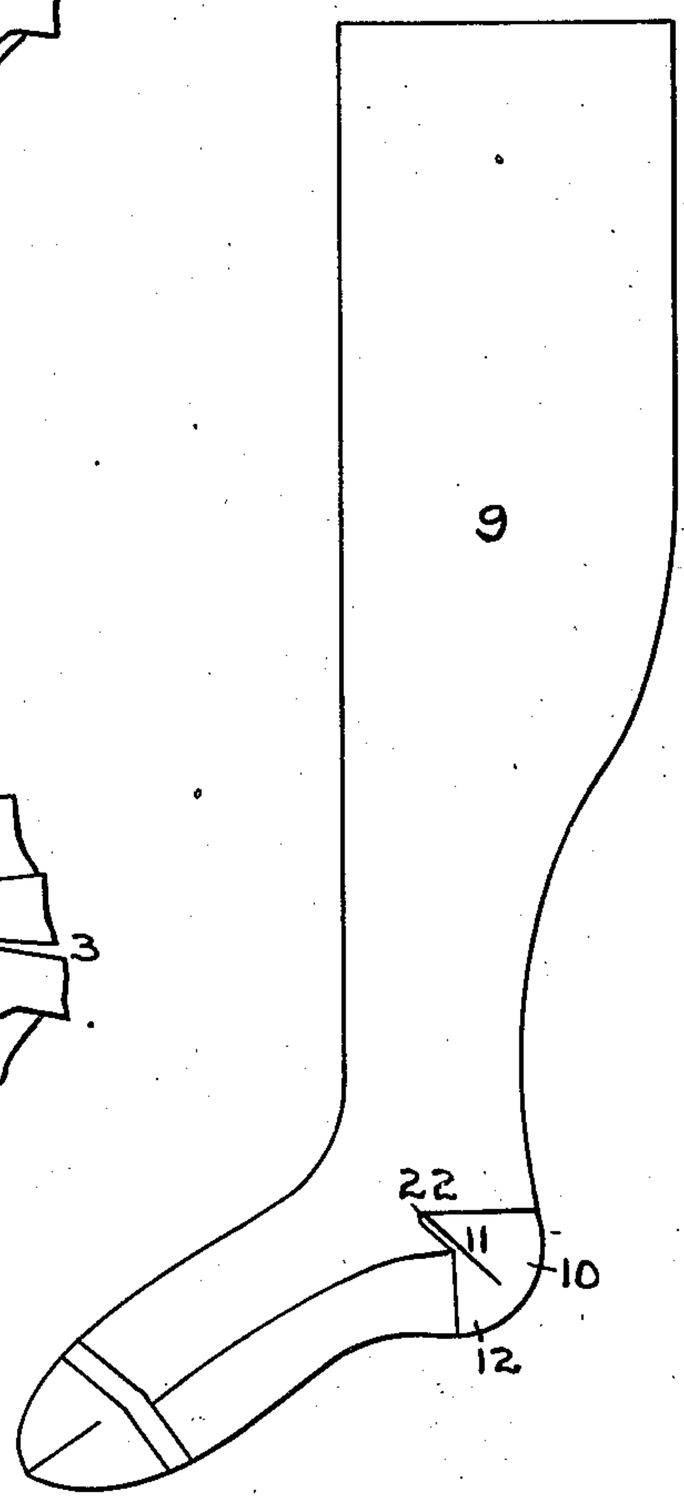


FIG. 8.

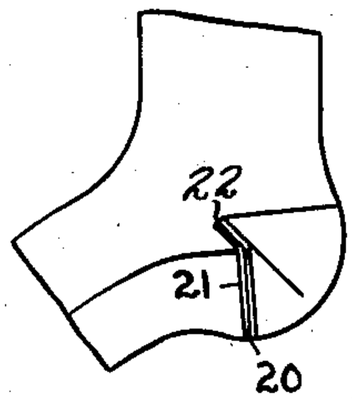
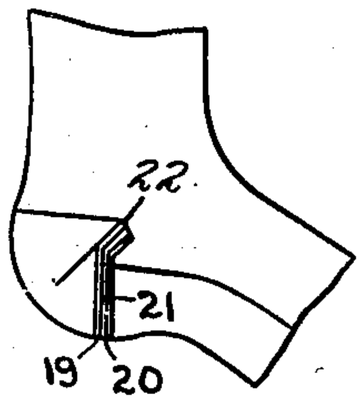


FIG. 9.



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Patented July 12, 1938 2,123,701

UNITED STATES PATENT OFFICE

2,123,701

KNITTING MACHINE AND METHOD OF KNITTING

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Application December 23, 1932, Serial No. 648,686

8 Claims. (Cl. 66—48)

This invention relates to a stocking or half hose having a small heel as well as to a method of and machine for knitting the same.

In the drawings:

Fig. 1 is a view in front elevation of a knitting machine equipped with mechanism for knitting the stocking or half hose;

Fig. 2 is a view in side elevation showing means for controlling the widening pick bracket;

Fig. 3 is a plan view of the mechanism shown in Fig. 1;

Fig. 4 is a view in side elevation showing the needle cylinder and cams for controlling the needles;

Fig. 5 is a plan view similar to Fig. 3 but showing the parts in another phase of the knitting cycle;

Fig. 6 is a plan view similar to Fig. 5 but showing the parts in still another phase of the knitting cycle;

Fig. 7 is a diagrammatic view of the stocking or half hose knitted by the mechanism disclosed in Figs. 1–6 inclusive; and

Figs. 8 and 9 are views showing the two sides of the heel of a stocking or half hose, diagrammatically representing the protective courses.

The knitting machine indicated generally by the numeral 1 is provided with the usual yarn lever box 2 which has the usual yarn levers (not shown) for interchangeably feeding yarns of threads to the needles of the knitting machine. The usual or any desired construction of cam block 3 is provided for controlling the needles in their knitting operations, the said cam block carrying the usual narrowing picks 4, 4'. Cams such as 5 for controlling jacks—when jacks are used—are mounted upon a circular base 6. Other cams, including the regular instep cam 7, are mounted upon the cam ring 8.

Referring to Fig. 7, the stocking or half hose 9 is knitted in the usual manner excepting during the knitting of the heel 10. The heel 10 is progressively narrowed as at 11 in the usual manner and is then progressively widened as at 12 in the usual manner until the last fifteen wales, more or less, on each side of the stocking are reached, at which time the remaining groups 13, 13' of inactive short butt needles are so controlled as to be simultaneously brought into action or into knitting position, i. e., during one stroke or movement of the needle cylinder.

As hereinbefore stated the last fifteen short butt needles on each side of the machine are simultaneously moved to active, knitting position, and to accomplish this purpose, a cam 14 is provided which cam when the widening has reached the last fifteen short butt needles, is advanced to a position adjacent to the needle cylinder as shown in Fig. 5, where the said cam 14 engages the short butts 15 of group 13 and incidentally as the needle cylinder continues its rotation also engages long butts 16 of the inactive, instep needles, with the result that the short butt needls 13 and some of the long butt needles are lowered to the knitting level indicated by the numeral 17, Fig. 4. After the long butt needles are lowered by cam 14, a cam 18 engages their long butts 16 and again raises the instep needles to an inactive, instep level; the short butts 15, however, moving past the said cam 18 without being elevated. During this stroke of the needle cylinder the said group of short butt needles 13 is actuated by the cams of cam block 3 thus knitting wales of a course 19, finally arriving at the end of the stroke indicated in Fig. 6, the other group 13' of fifteen short butt needles having meanwhile been restored to the knitting level by cam 14. Upon the needle cylinder reversing its movement and moving in the direction of the arrow, Fig. 6, the first mentioned group of fifteen short butt needles 13, knits wales of a course 20 being actuated by the cams comprising the cam block 3, and as the needle cylinder continues to rotate in the direction of the arrow, Fig. 6, the other group 13' of short butt needles is likewise actuated by the cams comprising the cam block 3, knitting other wales of course 20. As the first mentioned group 13 of fifteen short butt needles approaches the cam block 3, the narrowing pick 4 thereat elevates the leading short butt needle which needle consequently retains its previously drawn loop but fails to knit during that stroke of the needle cylinder.

Upon the needle cylinder again reversing its direction and moving in the direction of the arrow, Fig. 5, and from the position shown in said figure, the group 13' of fifteen short butt needles knits wales of a course 21 being actuated by the cams of cam block 3 after which, and upon continued rotation of the needle cylinder, the first group 13 of fifteen short butt needles, knits other wales of course 21, the needle cylinder completing its stroke when the needles arrive at the position shown in Fig. 6. During the last mentioned stroke of the needle cylinder, the leading short butt needle of group 13' is picked up by the narrowing pick 4'.

Following the last mentioned stroke of the needle cylinder, the needle cylinder reverses its movement and again moves in the direction of

the arrow, Fig. 6, for the first course of circular knitting. As the needle group 13 moves in the direction of the arrow, Fig. 6, its leading needle is picked up to the inactive level by the pick 4 after which the short butt needles knit the heel yarn, being actuated by the cams comprising the cam blocks 3. About half of the short butt needles knit the heel yarn, the lighter, silk yarn for the foot being substituted for the heel yarn as the last half, more or less, of the short butt needles 16 commence knitting. The foot is thereafter knitted by continuous circular knitting and the leading short butt needles of the groups 13 and 13' which were picked to an idle level by the picks 4 and 4', are restored to the active, knitting level by the instep cam 7.

The courses 19, 20 and 21, knitted in the manner hereinbefore described, are knitted with the heel yarn and consequently provide protective courses between the point 22 of the heel suture and the relatively light, and preferably, silk thread which is knitted into the foot of the stocking. In other words, the silk yarn is spaced from the point 22 of the heel suture, the relatively heavy, heel yarn knitted into the protective courses 19, 20 and 21 strengthening the point of the heel suture and thus preventing the formation of holes thereat.

The cam 14 is provided with an outwardly extending shank 23 which is slidably mounted in a bracket 24 supported by and upstanding from the cam ring or plate 8. The shank 23 extends through the bracket 24 and at such end is provided with an upstanding pin 25 which is straddled by two arms of a bifurcated lever 26, which latter is pivoted intermediate its ends at 27 upon a part of the bracket 24. The other arm of the aforesaid lever is pivotally connected to a link 28 in turn pivoted at 29 to a depending arm 30 of a bell crank lever, pivoted intermediate its ends upon a pin 31 passing through the elbow of the lever and into an angle bracket 32 which is fastened to and carried by cam bracket 33 which carries a jack cam 5 hereinbefore referred to. A coil spring 34 is attached at one end to lever arm 30 intermediate the ends thereof and at the other end to bracket 33, such spring tending to urge the upper end of the arm 30 to the left, Fig. 4, and consequently to hold the cam 14 in a retracted position away from the needle cylinder in which position it does not engage the needle butts. The action of the spring 34 also holds the free end of the arm 35 of the bell crank lever in a relatively lowered position, where a hardened shoe 36, which is adjustably fastened to the free end of the said arm 35 so as to be properly positioned with respect to the free end of a lever 37, is maintained in engagement with the free end of said lever 37, Fig. 1, which latter is pivoted at 38 to a bracket 39 depending from the circular base 6. Intermediate its ends the lever 37 is pivotally connected at 40 to an adjustable link 41 which latter depends therefrom and adjacent to its lower end is provided with a cam or lug 42 which is periodically engaged by means of a cam 43 mounted on the periphery of a drum 44 which latter is rigidly mounted on the main cam shaft 45 of the machine. In order to steady the link 41 and maintain the cam 42 in the path of the cam 43, said link 41 extends below the lug 42 as at 46 to engage the side of the drum 44.

The lug 42, preferably, is engaged by a cam 43 once only during the knitting of each stocking or half hose, namely, when the last fifteen short butt needles on each side of the machine are to be simultaneously restored to the knitting level.

As hereinbefore stated and as shown in Fig. 7, the heel pocket is progressively narrowed in the usual manner and is also progressively widened in the usual manner until the last fifteen, more or less, of the short butt needles on each side of the cylinder are reached. At the beginning of the widening of the heel, the usual butterfly cam is elevated thereby permitting the widening picks 47 to be raised by the usual springs to positions where reciprocations of the needle cylinder will cause the two leading short butt needles at each side of the cylinder to be engaged by widening picks and lowered to a knitting level, the narrowing picks 4' constantly remaining in action. The means for raising the butterfly cam includes a cam 48 on the drum 44 which, by engaging a toe 49 on a lever 50 pivoted to the machine frame as at 51, rocks the said lever and causes the link 52 to rock another lever 53 and thereby raise a rod 54 to the upper end of which the aforesaid butterfly cam is connected. The cam 48 acts to rock the lever 50 as aforesaid, when the widening or knitting of the second half of the heel is commenced; and the widening picks 47 remain in active position and work in conjunction with the narrowing picks 4, 4' in the usual manner until the last fifteen short butt needles, more or less, on each side of the needle cylinder are reached at which time, as hereinbefore stated, the cam 14 acts to restore the said last fifteen needles at each side of the cylinder to the knitting level being, preferably, immediately attracted as indicated in Fig. 6. At the time the cam 14 is advanced in the manner aforesaid, the advancing of the drum 44 which effects such cam movement also permits the toe 49 of a lever 50 to drop into the space indicated by the numeral 55, Fig. 2, thereby permitting the rod 54—preferably assisted by a spring not shown—to drop, which movement causes the aforesaid butterfly cam to retract the widening picks 47 or move them to an inoperative position where they no longer engage the needle butts.

Although in the foregoing description, reference has been made to the knitting of protective courses for spacing the silk, instep yarn from the point 22 of the heel suture, the invention in its broader aspect is directed to the widened portion 12 (which may be omitted altogether) of the heel being smaller than the narrowed portion 11 thereof, the smaller, widened portion 12 of the heel being more suitable for stockings knitted with a slipper heel effect, i. e., a low or narrow double sole portion. If it be not necessary to provide strengthening courses adjacent to the point 22 of the heel suture, the widening of the heel may continue to the last fifteen short butt needles at each side of the stocking at which time the regular instep cam may be advanced thereby restoring all of the needles (including the long butt needles) to the knitting level whereupon circular knitting is resumed, the instep yarn being first knitted by the last half of the short butt needles to pass the cam block 3.

In the foregoing description two protective half-courses have been described as being knitted on one side of the heel and three such protective half-courses on the other side thereof. The number of such half-courses may vary; in other words, the number of reciprocations of the needle cylinder subsequently to the moving to knitting position of the groups 13 and 13' of short butt needles, may vary.

Although in the foregoing description, the invention has been described in connection with the knitting of a small heel; nevertheless, there is no intention thereby to limit the claims to the knitting of a heel although the toe pocket is, preferably, knitted in the usual manner. Furthermore, unless specific terms are used, there is no intention of limiting the invention to the embodiment described in the foregoing description and/or shown in the drawings.

We claim:

1. A method of knitting a pocket consisting in progressively narrowing by oscillating a circular series of needles while progressively withdrawing needles from knitting, continuing the knitting by progressively adding withdrawn needles to the active series and then simultaneously restoring to knitting a group of the withdrawn needles and continuing to knit with the same thread, the said group comprising more needles than are progressively added each widening course, and immediately thereafter knitting circular courses with a relatively light thread.

2. A method of knitting a pocket in a stocking consisting in progressively narrowing by oscillating a circular series of needles while progressively withdrawing needles from knitting, continuing the knitting by progressively adding withdrawn needles to the active series and then simultaneously restoring to knitting all of the remaining withdrawn needles comprising more needles than are progressively added each widening course while continuing to oscillate the needles and to knit with the same thread, and then knitting circular courses with a relatively light thread.

3. A method of knitting a stocking including the knitting of the heel with a relatively heavy yarn upon less than all of the needles of a knitting machine and knitting the foot of the stocking with a relatively light yarn upon all of the needles, and interposing courses between the heel and foot, said courses being knitted with the same yarn used in the knitting of the heel, the method of knitting being such that the relatively light yarn is spaced from the heel suture in the completed stocking.

4. A circular knitting machine having independent needles and picks for acting upon the said needles and for moving the needles to effect the knitting of fabric, there being during knitting relative movements between the needles and the cams, means for causing continuous relative circular movements between the needles and cams during the knitting of the leg of the stocking and means for causing relative oscillatory movements during the knitting of the heel of the stocking, the picks acting progressively upon the needles to effect a narrowing and then a widening of the heel, means for simultaneously restoring a group of needles to knitting position at the completion of widening of the heel, means for thereafter effecting the knitting of oscillatory courses during the knitting of which courses the narrowing picks act upon leading needles, the heel courses and the last mentioned courses being knitted with the same yarn, means for thereafter knitting circular courses and with another yarn.

5. A method of knitting a stocking including the knitting of the heel with a relatively heavy yarn upon less than all of the needles of a knitting machine and knitting the foot of the stocking with a relatively light yarn upon all of the needles, and interposing reciprocatory courses between the heel and foot, said courses being knitted with the same yarn used in the knitting of the heel, the method of knitting being such that the relatively light yarn is spaced from the heel suture in the completed stocking.

6. A circular knitting machine having independent needles and picks for acting upon the said needles and for moving the needles to effect the knitting of fabric, there being during knitting relative movements between the needles and the cams, means for causing continuous circular movements of the needles during the knitting of the leg of the stocking and means for causing oscillatory movements of the needles during the knitting of the heel of the stocking, the picks acting progressively upon the needles to effect a narrowing and then a widening of the heel, means for simultaneously restoring a group of needles to knitting position at the completion of widening of the heel, means for thereafter effecting the knitting of oscillatory courses during the knitting of which courses the narrowing picks act upon leading needles, the heel courses and the last mentioned courses being knitted with the same yarn, means for thereafter knitting circular courses and with another yarn.

7. A circular knitting machine having independent needles and picks for acting upon the said needles and for moving the needles to effect the knitting of fabric, there being during knitting relative movements between the needles and the cams, means for causing continuous relative circular movements between the needles and cams during the knitting of the leg of the stocking and means for causing relative oscillatory movements during the knitting of the heel of the stocking, the picks acting progressively upon the needles to effect a narrowing and then a widening of the heel, means for simultaneously restoring a group of needles to knitting position at the completion of widening of the heel, means for thereafter effecting the knitting of oscillatory courses, the heel courses and the last mentioned courses being knitted with the same yarn, means for thereafter knitting circular courses and with another yarn.

8. A circular knitting machine having independent needles and picks for acting upon the said needles and for moving the needles to effect the knitting of fabric, there being during knitting relative movements between the needles and the cams, means for causing continuous circular movements of the needles during the knitting of the leg of the stocking and means for causing oscillatory movements of the needles during the knitting of the heel of the stocking, the picks acting progressively upon the needles to effect a narrowing and then a widening of the heel, means for simultaneously restoring a group of needles to knitting position at the completion of widening of the heel, means for thereafter effecting the knitting of oscillatory courses, the heel courses and the last mentioned courses being knitted with the same yarn, means for thereafter knitting circular courses and with another yarn.

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