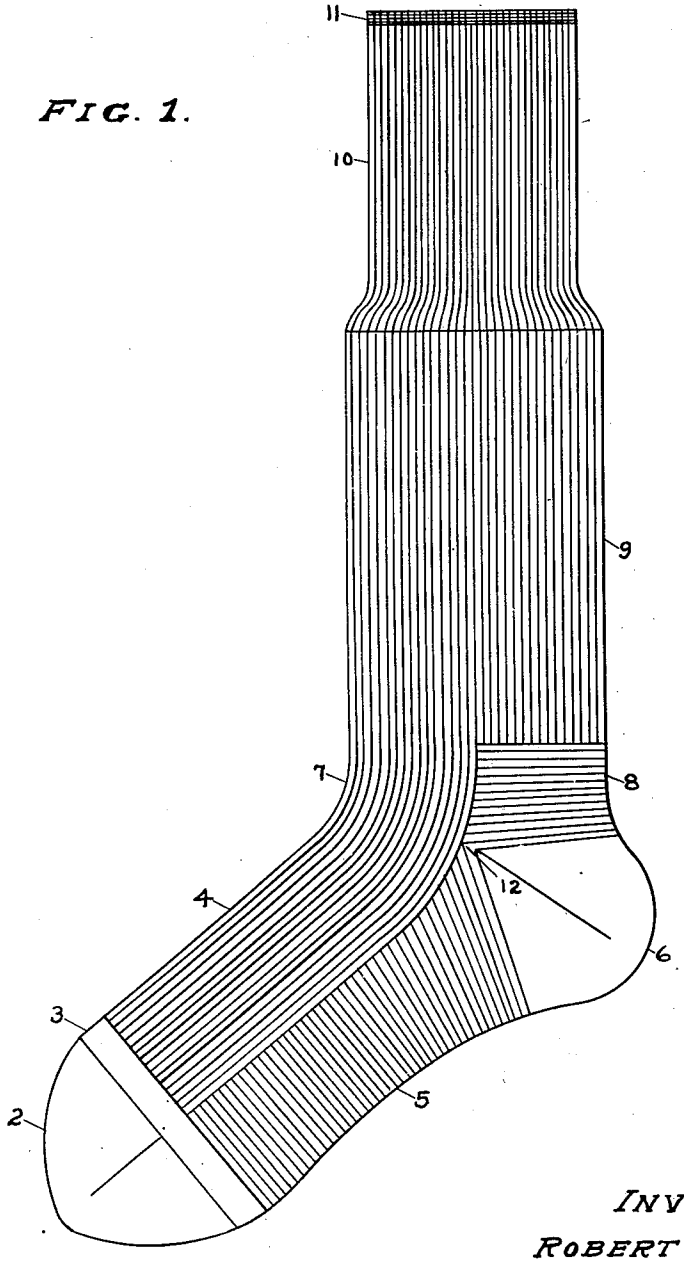
June 21, 1932. R. H. LAWSON ET AL 1,863,720

KNITTING MACHINE AND METHOD OF KNITTING

Filed Nov. 4, 1930 8 Sheets-Sheet 1

FIG. 1.



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June 21, 1932. R. H. LAWSON ET AL 1,863,720

KNITTING MACHINE AND METHOD OF KNITTING

Filed Nov. 4, 1930 8 Sheets-Sheet 2

FIG. 2.

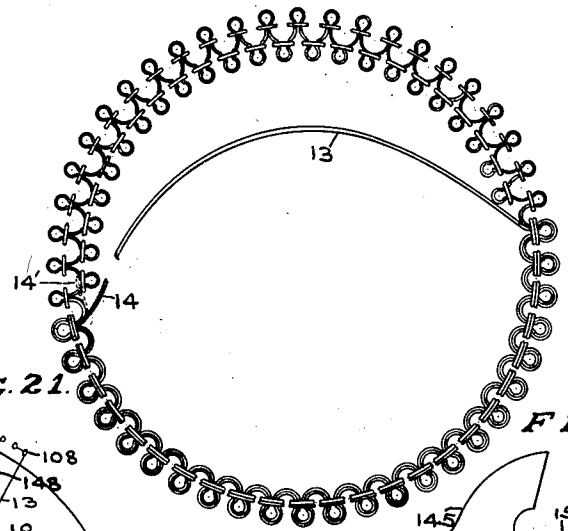


FIG. 5.

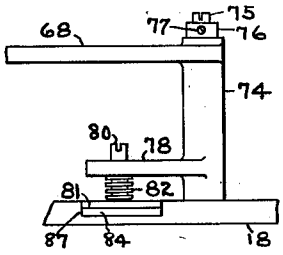


FIG. 4.

FIG. 21.

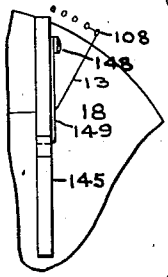
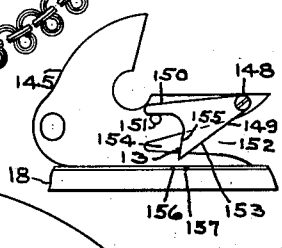


FIG. 22.



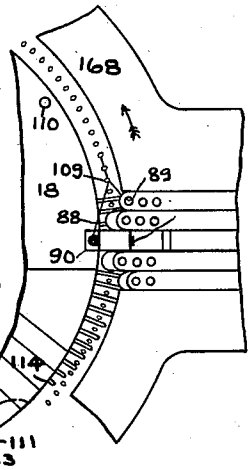
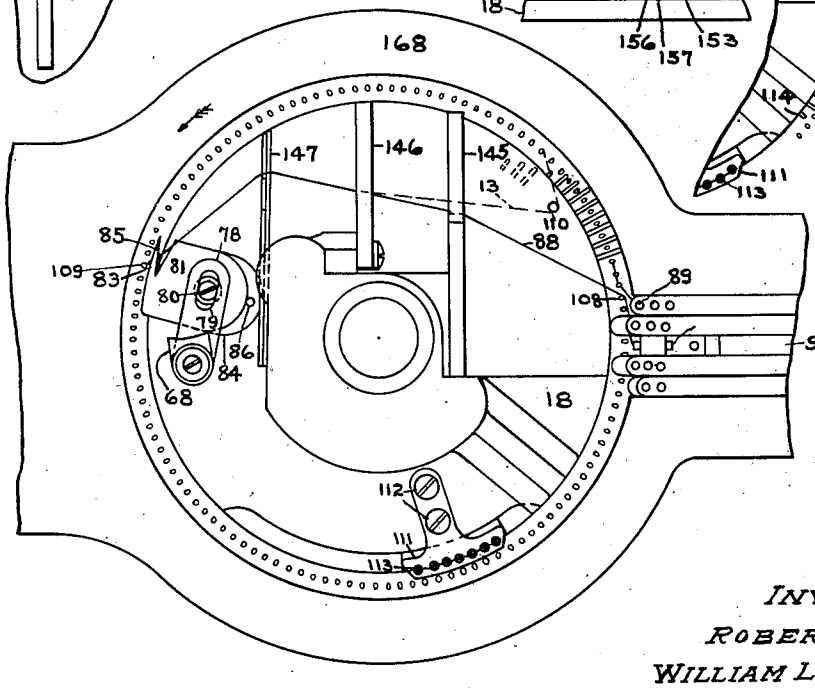


FIG. 3.



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June 21, 1932. R. H. LAWSON ET AL 1,863,720

KNITTING MACHINE AND METHOD OF KNITTING

Filed Nov. 4, 1930 8 Sheets-Sheet 3

FIG. 6.

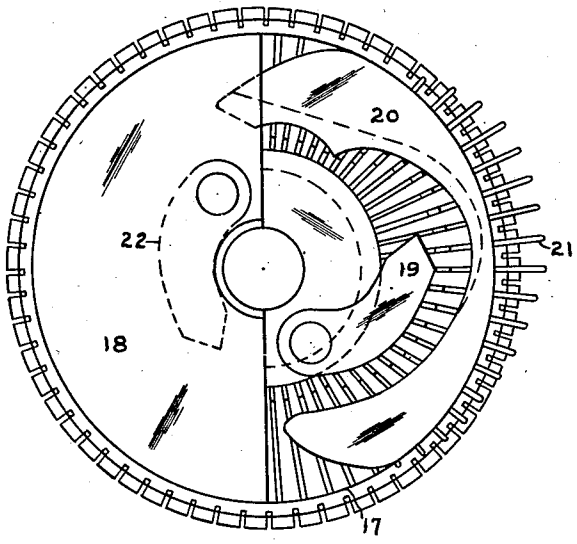


FIG. 7.

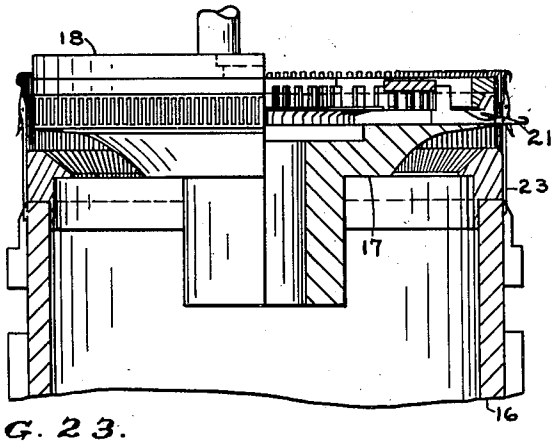
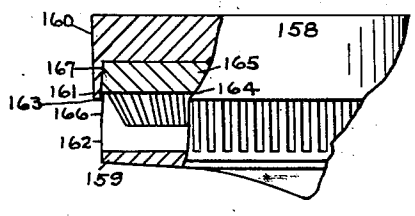


FIG. 23.



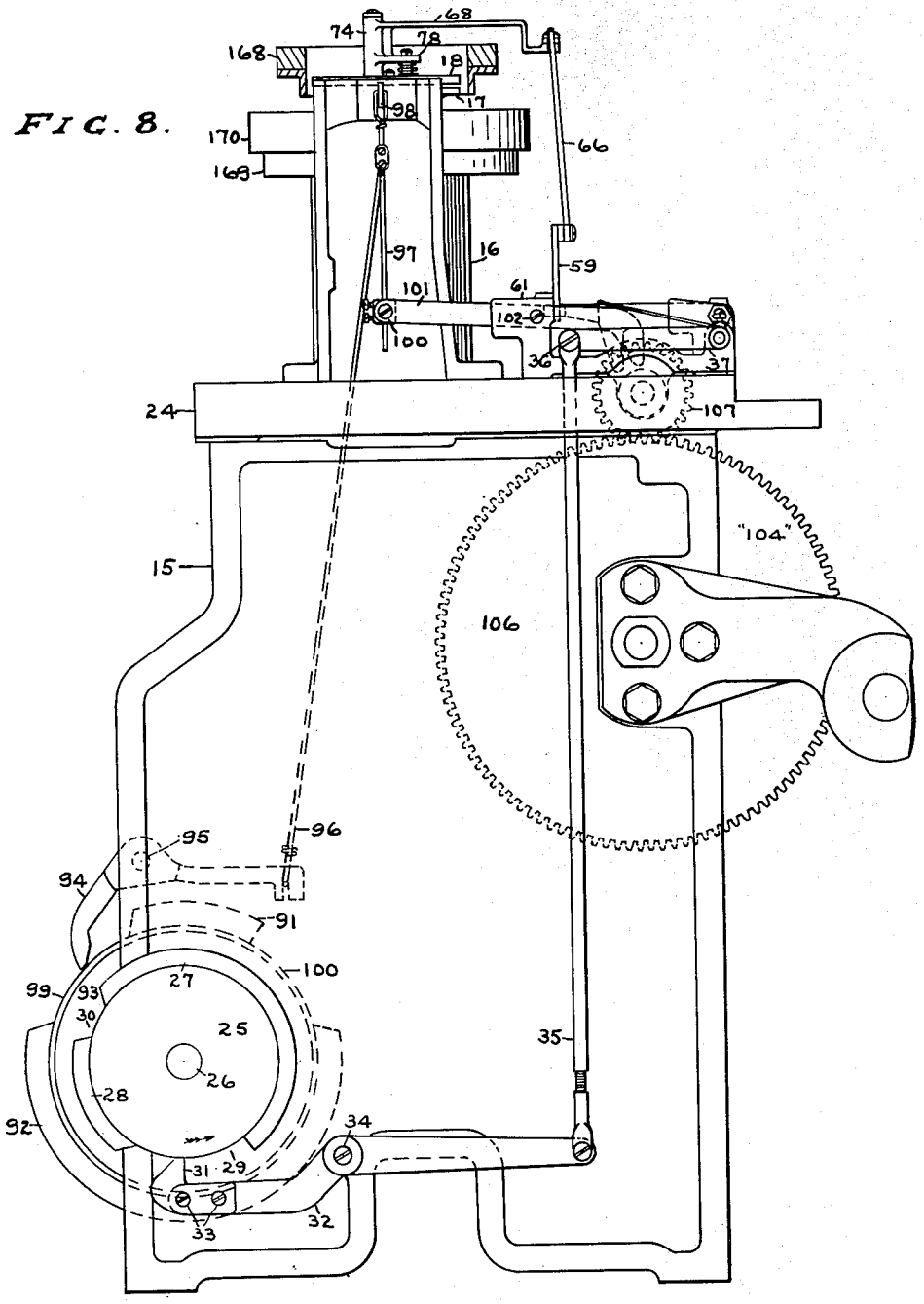
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June 21, 1932. R. H. LAWSON ET AL 1,863,720

KNITTING MACHINE AND METHOD OF KNITTING

Filed Nov. 4, 1930 8 Sheets-Sheet 4

FIG. 8.



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June 21, 1932. R. H. LAWSON ET AL 1,863,720

KNITTING MACHINE AND METHOD OF KNITTING

Filed Nov. 4, 1930 8 Sheets-Sheet 5

FIG. 9.

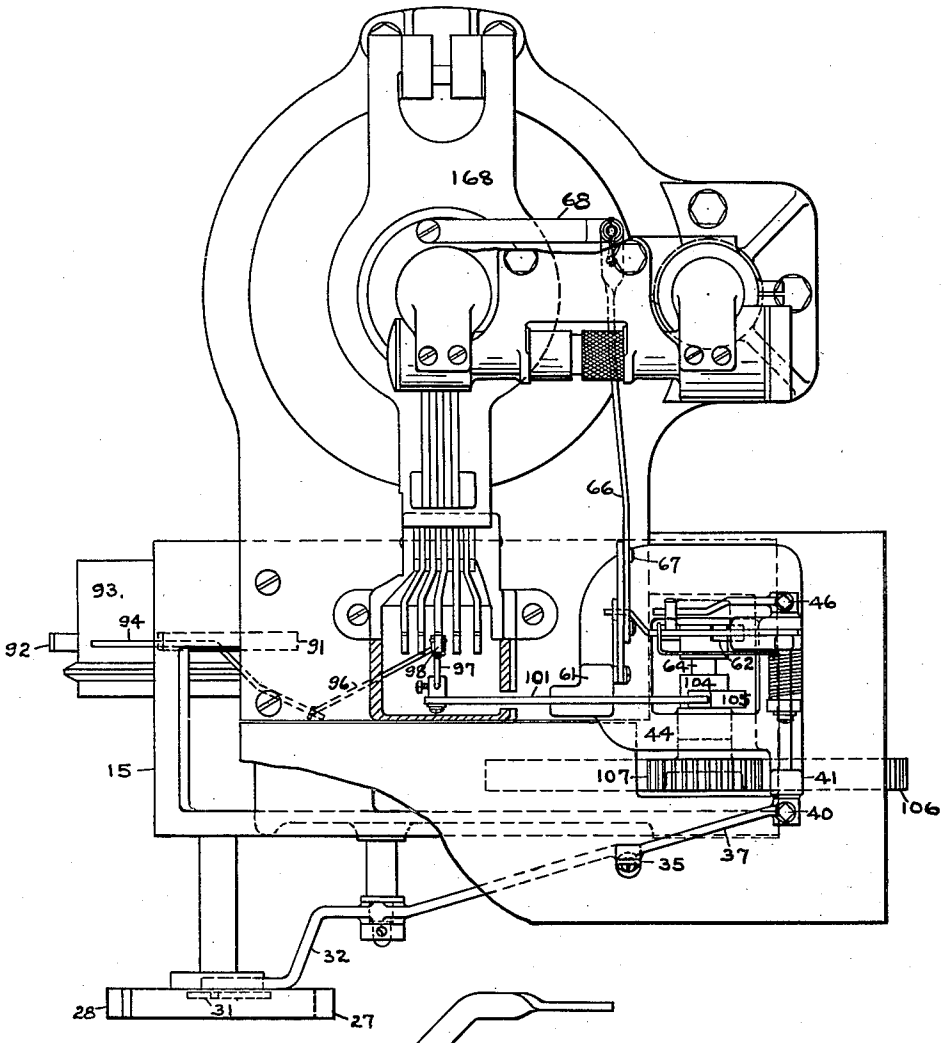
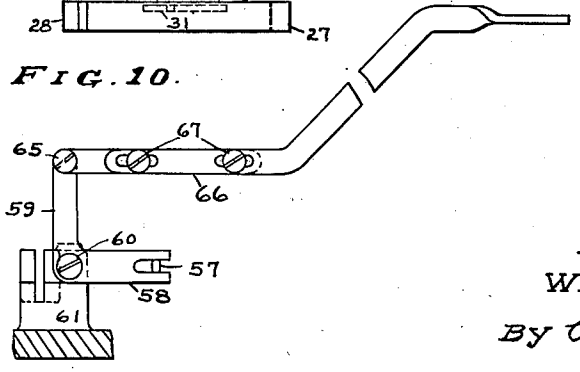


FIG. 10.



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June 21, 1932. R. H. LAWSON ET AL 1,863,720

KNITTING MACHINE AND METHOD OF KNITTING

Filed Nov. 4, 1930 8 Sheets-Sheet 6

FIG. 11.

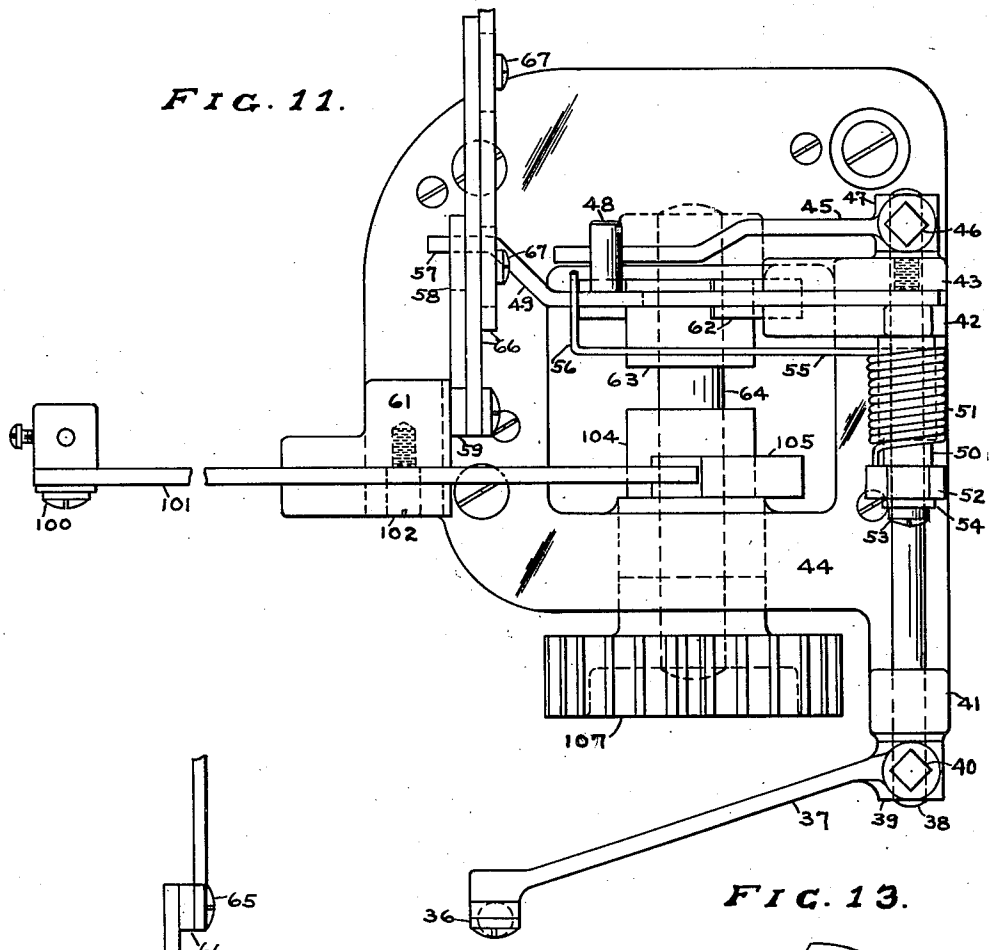


FIG. 13.

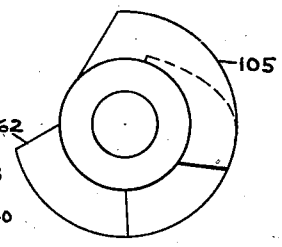
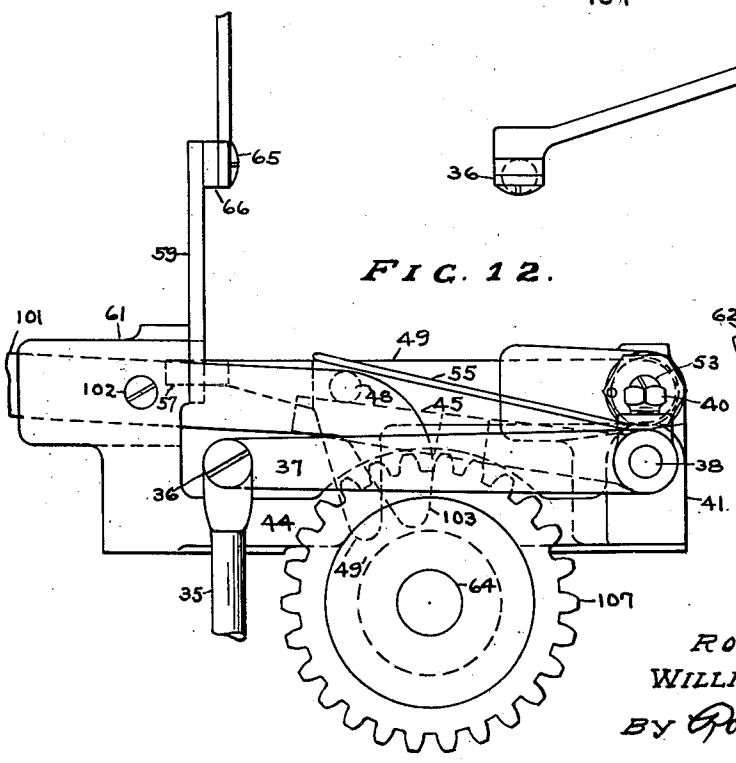


FIG. 12.



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KNITTING MACHINE AND METHOD OF KNITTING

Filed Nov. 4, 1930 8 Sheets-Sheet 7

FIG. 15.

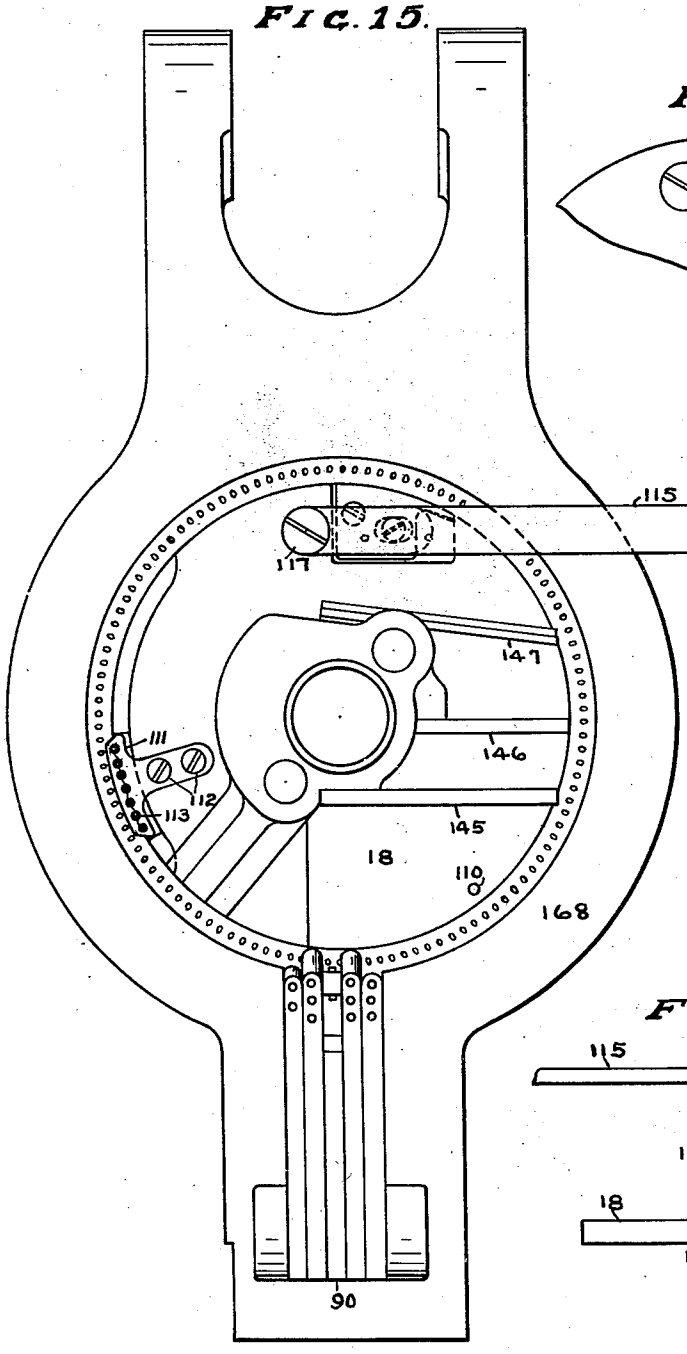


FIG. 17.

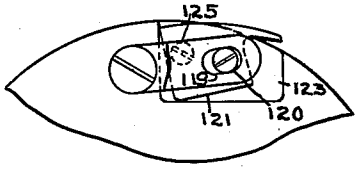


FIG. 14.

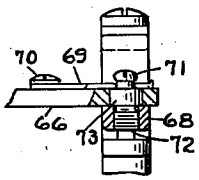
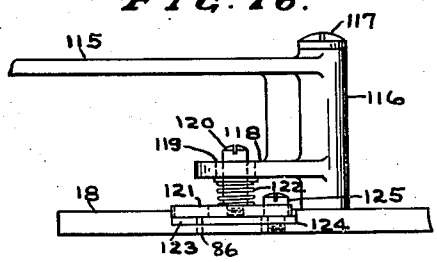


FIG. 16.



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KNITTING MACHINE AND METHOD OF KNITTING

Filed Nov. 4, 1930 8 Sheets-Sheet 8

FIG. 18.

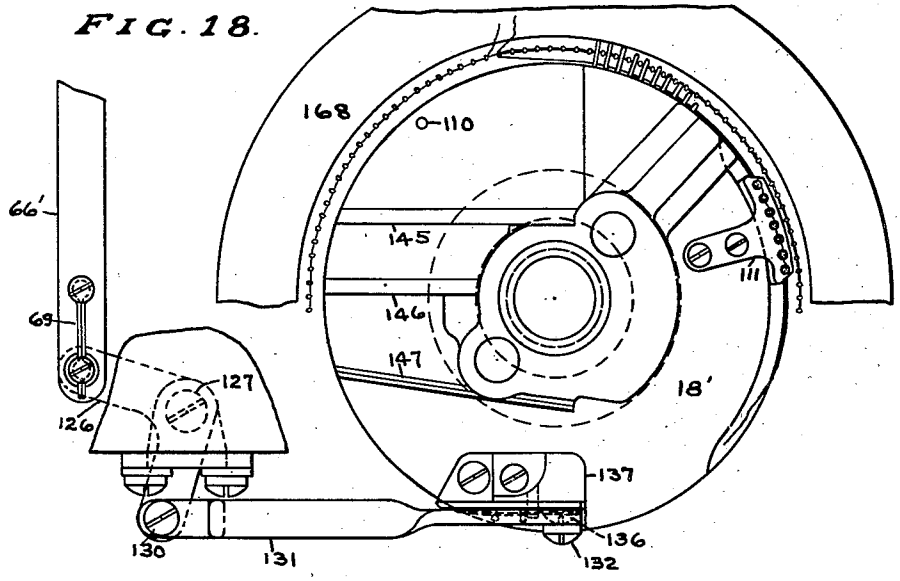


FIG. 19.

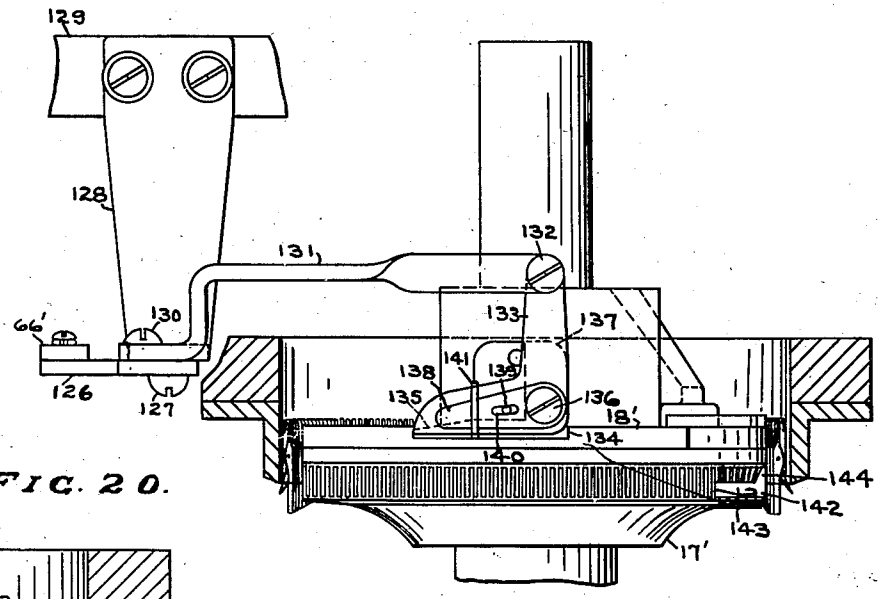
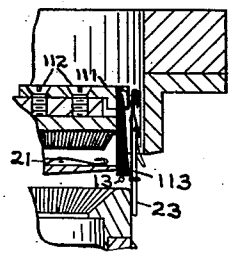


FIG. 20.



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Patented June 21, 1932 1,863,720

UNITED STATES PATENT OFFICE

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KNITTING MACHINE AND METHOD OF KNITTING

Application filed November 4, 1930. Serial No. 493,360.

This invention relates to an improved mechanism for, and method of knitting stockings or half hose having ribbed legs and/or ribbed insteps, as well as reinforced high splices and/or double soles. The present application is a continuation as to all common subject matter of an application filed June 25, 1930, Ser. No. 463,763.

In the drawings:

Fig. 1 is a plan view of a stocking or half hose made in accordance with the methods and mechanisms hereinafter to be disclosed;

Fig. 2 is a view of a section of the stocking or half hose shown in Fig. 1;

Fig. 3 is a plan view of a latch ring and dial cap on which is mounted means for cutting one end of each of the splicing thread floats;

Fig. 4 is a fragmentary view similar to Fig. 3, but showing the parts at another phase of the knitting cycle;

Fig. 5 is a detail elevational view of one form of cutting mechanism;

Fig. 6 is a plan view of the needle cylinder, needle dial and cap therefor, a portion of the latter being omitted more clearly to show the dial cams and their action upon the needles;

Fig. 7 is a view in vertical section corresponding to Fig. 6;

Fig. 8 is a view in end elevation showing the improvements applied to a knitting machine provided with a needle cylinder and dial, parts of which machine are broken away or in section more clearly to show the improvements;

Fig. 9 is a plan view of the machine;

Fig. 10 is a detail view in side elevation showing certain of the connections shown in plan in Fig. 9;

Fig. 11 is an enlarged plan view of a portion of the mechanism shown in Fig. 9;

Fig. 12 is a view in end elevation of the parts shown in Fig. 11;

Fig. 13 is a detail view of cams for timing and controlling the operations of the high splice and double sole lever, and the auxiliary, high splice and double sole cutting mechanism;

Fig. 14 is a detail view of a readily detachable connection between the cutting mechanism and the controlling means for the same;

Fig. 15 is a view similar to Fig. 3, but showing a modified form of cutter which is in closed position;

Fig. 16 is a detail elevational view of the cutting mechanism;

Fig. 17 is a fragmentary plan view of the cutting mechanism with the parts thereof in such relative positions as to receive therebetween a float of thread;

Fig. 18 is a plan view of a latch ring and dial cap showing a modified form of cutting mechanism, the latch ring being shown broken away;

Fig. 19 is a view in elevation of the parts shown in Fig. 18;

Fig. 20 is a fragmentary view partly in section showing a float of thread pushed down between the dial and the cylinder needles so as not to be later knit in by the dial needles;

Fig. 21 is a view in plan of a means for trapping thread floats;

Fig. 22 is a view in side elevation of the means shown in Fig. 21; and

Fig. 23 is a fragmentary view of the dial cap and dial, the dial cap being somewhat modified as compared with the dial caps disclosed in the other figures of the drawings.

The stocking represented by the reference character 1, Fig. 1, which is produced by the methods and mechanisms hereinafter to be described, is, preferably but not necessarily, knitted from the toe to the top thereof. During the knitting the usual looper's rounds (not shown) are knitted by all of one set of needles, usually the cylinder needles, alone knitting. Thereafter one-half more or less of the cylinder needles knit a toe 2 in a usual manner after which a few courses constituting the so-called ring toe 3 are knitted by all of the cylinder needles following the knitting of which a ribbed instep 4, preferably though not necessarily of one and one rib, is knitted by one-half more or less of the cylinder needles in conjunction with interspersed dial needles, and at the same time the sole 5 or lower portion of the foot is also knitted and by the remaining cylinder needles knitting alone, i. e., not in conjunction with dial

needles. The sole half or portion of the foot is reinforced by means of an additional and/or heavier thread or threads being knitted in by the sole cylinder needles which, preferably, also knit in the thread knitted in by the instep dial and cylinder needles. At the completion of the knitting of the ribbed instep and plain sole the instep needles are withdrawn from action but are permitted to hold their loops during the knitting of a plain heel 6 which is knitted in any desired manner and preferably by one-half, more or less, of the cylinder needles. At the completion of the knitting of the heel 6 the instep needles are restored to action and during the knitting of a desired number of courses the instep dial and cylinder needles knit a continuation of the ribbed instep above the heel as indicated at 7 during the knitting of which continuation of the instep the needles, which theretofore knitted the double or reinforced sole, knit the same threads they were knitting during the formation of the double sole 5, whereby a high splice or heel reinforcement 8 is produced. After the desired number of partially reinforced courses have been knitted, the dial needles, companion to the high splice cylinder needles, are advanced to knitting position and they in conjunction with the high splice cylinder needles and instep dial and cylinder needles knit an all round ribbed leg 9 of one and one or other desired proportion of rib and plain wales. At 10 is indicated the top of the stocking which may be of finer rib in the event the leg is knitted of coarser rib such as four and one, and/or may be knitted with a finer or lighter thread and with shorter or tighter stitches to provide a garter top. Tuck welts 11 may be provided if desired.

Preferably the heel 6 as shown, Fig. 1, does not extend to the first rib wale of the instep but stops short thereof to provide intervening plain wales as at 12 between the heel suture and the first rib wale.

In Figure 2 is shown a section of the stocking, Fig. 1, one-half more or less of the wales of which are of one and one rib while the remaining wales are plain wales having knitted therein an additional and/or reinforcing thread. By the methods and mechanisms hereinafter to be described the reinforcing thread is knitted in by the plain sole needles only and floated between the last and first knitted in reinforced wales of successive courses which floats are severed adjacent to one reinforced wale, as hereinafter to be described, thereby providing long floats 13 and short floats 14 which floats especially the long floats 13 may be, and preferably are, subsequently removed, although the short floats 14 may be temporarily held, but not knitted in, between a few adjacent plain and rib wales as shown by the dotted line position 14′ of the floats 14, the confined short floats being readily pulled out from between the adjacent rib and plain wales by a suitable implement whereupon they assume a position within the needle circle such as shown in full lines, Fig. 2.

The knitting machine 15 (Fig. 8) herein disclosed, by way of example as of the rotary needle type, is provided with the usual needle cylinder 16 and needle dial 17 which are connected in any suitable manner so as to rotate and oscillate together during circular and reciprocating knitting although they may be so interconnected as to permit the cylinder to oscillate during the knitting of heels and toes while the dial remains stationary. Above the needle dial 17 is the usual dial cap 18 (Figs. 6 and 7) projecting from the underside of which are cams 19, 20 for controlling the dial needles 21 in their movements to and from knitting position and a cam 22 for advancing the dial needles 21 to cast off their stitches. Likewise cams (not shown) control the movements of the cylinder needles 23 to and from thread taking and knitting positions. The needle cylinder 16 is driven in any suitable manner as by means of a ring gear (not shown) which is mounted in and supported by the circular base 24 (Fig. 8) and is driven in any suitable manner as by means of the usual gearing (not shown).

For carrying out the purpose of the present invention mechanism is provided, one form of which is disclosed specifically in Figs. 2–14 inclusive wherein a cam drum or disc 25 is shown as fixed to a cam shaft 26 upon which are mounted cams (not shown) for controlling and timing the various operations of the knitting machine. Upon the periphery of the drum or disc 25 are fixed cams 27 and 28 between which are spaces 29 and 30 on the surface of the drum. The drum 25 is advanced in the direction of the arrow, Fig. 8, from time to time as dictated by lugs on the usual pattern chain (not shown). The stockings or half hose which are knitted upon the present machine are, preferably but not necessarily, knitted from toe to top, and during the knitting of the leg of each stocking as well as the looper's rounds, toe and ring toe, the toe 31 of a lever 32 rests upon the surface of the cam 27 and just prior to the first course of the double sole said toe 31 of lever 32 drops off the cam 27 and onto the surface of the drum at 29 as hereinafter to be more fully described. The toe 31 rests upon the surface of the drum throughout the knitting of the double sole, but, preferably, immediately prior to the knitting of the first course of the heel the cam 28 engages the toe 31 and rocks the lever 32 and the parts remain in the same relative positions until the knitting of the heel is completed when the toe 31 of the lever 32 drops off the cam 28 onto the

surface 30 of the drum 25 where it remains throughout the knitting of the high splice after which continued rotation of the drum 25 causes the cam 27 to engage the toe 31 and again rock the lever 32. Thus the drum 25, preferably, rotates one complete turn or 360 degrees during the knitting of a single, complete stocking or half hose.

The toe 31 is adjustably or otherwise fastened to one arm of the lever 32 by set screws 33 and the lever is pivoted intermediate its ends as at 34 to the machine frame. To the other arm of the lever 32 is pivotally connected an adjustable link 35 which extends vertically through a hole provided in the circular base 24 and to the projecting end of the said link 35 is pivotally connected at 36 a link 37. The other end of the last named link (Fig. 11) is rigidly fastened to a shaft 38 which passes axially through an enlargement or hub 39 carried by and forming part of the link 37 to which the said shaft is rigidly fastened by means of a screw or nut 40 whereby rocking movements periodically imparted to the lever 32 as hereinbefore described are communicated to the said shaft 38 through the instrumentality of the links 35 and 37. The shaft 38 is journaled for turning movements in upstanding ears 41, 42, 43 carried by or forming part of a bracket 44 rigidly attached to the bobbin support which is a continuation of the circular base 24. To the other end of the shaft 38 is affixed a lever arm 45 as by means of a set screw 46 which passes through and is in threaded engagement with a hub or enlargement 47, which constitutes one end of lever arm 45, and in contact with shaft 38, whereby to rigidly connect the arm 45 to the shaft 38. The lever arm 45 at its free end engages under a pin 48 which extends laterally from and is connected intermediate the ends of a lever 49 which lever is provided with a cam engaging toe 49′ and is pivoted adjacent one end thereof upon a shaft 50. The shaft 50 projects through and is rigidly supported by the upstanding ears 42, 43 between which the lever 49 is mounted. A portion of the shaft 50 projects laterally from the upstanding ear 42 and encircling the same is a coil spring 51 one end of which is rigidly connected to a nut 52 mounted upon the shaft 50 and prevented from turning thereon as by means of a locking screw 53 and a washer 54. The coil spring 51 at its other end extends substantially parallel with the lever 49 as at 55 and the end of such spring is turned at a right angle as at 56 thereby to engage with the upper face or edge of the lever 49. The end of the lever 49 opposite its pivot is offset as at 57 which offset end engages in the bifurcation provided in one arm 58 (Fig. 10) of a bell crank lever 59 which is pivotally supported upon a pin or screw 60 carried by an ear or lug 61 upstanding from and forming part of the bracket 44.

A cam 62 (Figs. 9, 11, 13) is mounted upon and forms part of a sleeve or cam drum 63 which is in turn made fast to a shaft 64, the cam 62, during the knitting of the double sole and high splice, engaging toe 49′ and rocking lever 49 each course as the shaft 64 is rotated once each course, and in a manner hereinafter to be described, throughout all of the courses of the double sole and high splice. The other arm of lever 59 (Fig. 10) is pivotally connected as at 65 to a longitudinally extending link 66 which is composed of two rods adjustably connected by means of pin and slot connections 67. To the other end of the link 66 is connected (Figs. 9, 14 and 15) another lever 68. The pivotal connections between the link 66 and the lever 68 consist of a spring 69 fastened to the link 66 as by means of a screw 70 the curved outer arms of which spring 69 engage over the head of a pin or screw 71 the shank of which screw while it is in threaded engagement with the lever 68 as at 72 is provided with a smooth shank or collar portion 73 intermediate the ends thereof. The end of the link 66 is provided with a hole or recess which snugly fits the smooth shank portion 73 of the pin or screw 71. The described connection between the link 66 and lever 68 provides means for readily detaching the said link from the said lever.

Referring to Figs. 3 and 5, the other end of the lever 68 is shown as connected, integrally or otherwise, to a depending sleeve 74 mounted for turning movements upon an upstanding threaded shaft or screw 75 adjacent to the upper end of which is a collar 76 retained against endwise movements on the said shaft as by means of a set screw 77. The purpose of the collar is to maintain the lever 68 and sleeve 74 in position against the upper face of the dial cap 18. Intermediate the ends of the sleeve 74 is integrally or otherwise connected a second arm 78 of the lever 68. Through an elongated slot 79 of lever arm 78 passes a screw 80 the end of which screw is in threaded engagement with a plate 81 which constitutes one of the yarn severing members of the auxiliary high splice and double sole cutter. A coil spring 82 at one end engages the under face or arm 78 and at its other end engages the upper face of plate 81.

By means of the connections hereinbefore described movements imparted to the lever 68 rock the sleeve 74 and thereby move the plate 81 to and from the open or yarn receiving position shown in Fig. 3 to a position inward thereof where the yarn is severed between the under face of a finger 83 of the plate 81 and the upper face of a plate 84 the peripheral edge of which constitutes a cutting edge or surface companion to or

cooperating with the adjacent edge 85 provided by the finger 83. A pin 86 retains the plate 84 in position within a recess or cut-out 87 provided in the upper face or surface of the dial cap in which recess the plate 81 slides more or less radially of the dial cap. As shown the finger 83 is separated somewhat from the body of the plate 81 to provide a V-shaped notch within which notch the high splice and double sole floats are drawn by the continued rotation of the needle cylinder in the direction of the arrow, Fig. 3.

In order to feed the reinforcing thread 88 to the needles so that the latter will knit the said reinforcing thread in addition to the main or body thread 89 the high splice and double sole yarn lever 90 is automatically controlled so as to be permitted to move to feeding position at the beginning of the knitting of the double sole and thereafter of the high splice. The means for so controlling the movements of the lever 90 includes cams 91, 92 (Fig. 8) which are carried by the usual cam drum 93 rigidly mounted upon the cam shaft 26. Intermittent rotation of the shaft 26 and cams mounted thereon causes the cam 91 to rock a lever 94 which is pivoted intermediate its ends as at 95 to the frame of the machine. One arm of the lever 94 is connected to the wire link 96, which latter is in turn connected to a link 97 and thereby to a lever 98 one arm of which engages under the high splice and double sole lever 90 for the purpose of raising the same out of feeding relation with respect to the needles. At the conclusion of the knitting of the double sole the lever 94 is, due to the rotation of the drum in the direction of the arrow, Fig. 8, engaged by cam 91 and elevated above the surface 99 of the drum. The lever 94 remains on cam 91 until the knitting of the heel is completed and the knitting of the high splice is begun, whereupon the shaft 26 and cams carried thereby are rotated which causes the lever 94 to drop onto the surface of the drum at 100 to permit the high splice and double sole lever 90 to drop to feeding position where it remains throughout the knitting of the high splice. At the completion of the knitting of the high splice, cam 92 again rocks lever 94 whereupon lever 90 is raised out of feeding relation with respect to the needles where it remains until the knitting of a double sole for the next stocking or half hose is begun when the drum 25 is advanced and lever 94 permitted to drop onto the surface of the drum at 99 where it remains throughout the knitting of the double sole.

In order to have the high splice and double sole needles alone take and knit in the reinforcing thread 88 in addition to the main or body thread 89, during the knitting of the stocking or half hose shown in Fig. 1, the high splice and double sole yarn lever 90 is so controlled as to be dropped to feeding position and raised from such position once each course of the knitting of the double sole and high splice. In order to control the high splice and double sole lever 90 in its movements the wire or link 97 (Fig. 8) is connected to and, when movements are imparted to it through connections hereinafter to be described, rocks the lever 98 one arm of which thereupon engages under and raises the double sole and lever 90 which is returned to a lowered, feeding position in the usual manner by means of a spring (not shown). In order automatically to control the movements of the double sole and high splice lever 90 the link 97 is adjustably connected at its lower end as at 100 to a lever 101 which is pivoted intermediate its ends (Figs. 8, 9, 11, 12) at 102 to the lug 61. The other arm of said lever 101 is provided at its end with a depending toe 103 normally maintained in engagement with or adjacent to the peripheral surfaces of a cam drum or sleeve 104 or of a cam 105 carried thereby by means of the aforesaid spring which normally maintains the lever 90 in thread feeding position.

As aforesaid during the knitting of each course of the double sole and high splice, the levers 45 and 90 are automatically actuated and in time the one with the other so that, first, the lever 90 is moved to feeding position whereupon the double sole and high splice needles take and knit the said thread in conjunction with the body thread and, second, as the last cylinder needle, which knitted the reinforcing thread during the knitting of the preceding half course, reaches the position shown in Fig. 3, the auxiliary cutting mechanism is automatically operated.

In order automatically to control the movements of the lever 90 and the auxiliary cutting mechanism, the hereinbefore mentioned cams 105 and 62 are rotated by the cam shaft 64 and by such rotations actuate their respective levers 101, 49 and, through the connections hereinbefore described, said levers in turn actuate the thread lever 90 and the auxiliary cutting mechanism. In order to rotate the shaft 64 and cams mounted thereon a gear 106, Fig. 8, known as the "104" gear, meshes with and drives a gear or pinion 107. The "104" gear is driven to make one complete revolution every four courses of knitting and as its name implies has one hundred and four teeth whereas the gear or pinion 107 has twenty-six teeth only and as a consequence thereof makes one complete revolution during each revolution of the needle cylinder or each course of knitting. The gear 107 is fast to the stub shaft 64 to which is also rigidly secured the sleeve or drum 104. Therefore the cam 105 mounted on the drum 104 engages the toe 103 of the lever 101 and thereby rocks the said lever and consequently raises the lever 90 once each course during

the knitting of the double sole and high splice.

At the beginning of the knitting of the double sole and high splice the toe 31 of the lever 32 drops, due to the spring 51 acting upon the lever 49, into engagement with the surface of the drum 25 at 29 and 30, whereupon the auxiliary cutting mechanism may be operated during the knitting of each course by the means hereinbefore described and including cam 62; and likewise when the lever 94 drops, due to the usual spring means (not shown) acting upon the yarn lever 90, into engagement with the surface of the drum 92 at 99, at the beginning of the knitting of the double sole and later at 100 at the beginning of the knitting of the high splice, the yarn lever 90 is then released from control of the drum lever 94 and as a consequence thereof may be actuated once each course by means hereinbefore described and including cam 105. However, when the cams 27 and 28 rock the lever 32, the lever arm 45 is rocked which arm by engaging pin 48 rocks the bell crank lever 59 and consequently holds the movable yarn cutting element 81 in a closed position and so that periodic rotary movements of the cam 62 have no effect upon the auxiliary cutting mechanism, the cam 62 moving idly past the depending toe 49′ of lever 49; and likewise when the lever 94 is rocked by cams 91 or 92 the reinforcing lever 90 is maintained in an inoperative, elevated position above the needles and while in such position the rotary movements of the cam 105 merely cause idle rocking movements to be imparted to the lever 101.

In Figs. 3 and 4 are shown two positions of the knitting instrumentalities, in one of which positions, Fig. 3, the splicing lever 90 is shown in feeding position and the leading double sole and high splice cylinder needle 108 about to knit in the splicing thread 88 together with the body thread 89, while the last double sole or high splice needle 109 is shown substantially diametrically opposite the needle 108 and carrying the float 13 of the splicing thread 88 within a V-shaped notch defined by the inner, lower edge 85 of the finger 83 and the upper, outer edge of the companion cutting plate 84. In the other of said positions, Fig. 4, is shown the splicing lever 90 immediately after it has been raised to an inoperative position within the circle of needles in which position the advancing cylinder and dial needles do not engage and knit in the double sole and high splice thread 88 but knit in the body thread 89 only. In Fig. 4 the end needle 109 of the high splice and double sole series of cylinder needles is shown and, compared to its position in Fig. 3, is spaced therefrom, in the direction of the arrow, somewhat more than 180 degrees.

Upon continued rotation of the needle cylinder in the direction of the arrow, Fig. 3, the float 13 is carried by the end high splice and double sole needle 109 from the position shown in Fig. 4 around the needle circle above a pin 110 and finally to the position shown in Fig. 3, whereupon the movable cutting member 81 is actuated by the mechanism hereinbefore described, float 13 being severed and the severed end of the said float being temporarily retained, as will hereinafter be described, by a clamp which constitutes part of the main binder. Thereafter the leading high splice and double sole needle 108 carries the float, which extends from the said needle 108 to the auxiliary cutter, around the pin 110 as indicated in dotted lines, Fig. 3, whereupon, due to continued rotation of the needle cylinder in the direction of the arrow, the float is withdrawn in a more or less radial direction across the top of the dial cap 18. The floats 13 thus drawn across the dial cap 18 by the pin 110 are caused to drop off the edge of the dial cap and dial at a point immediately adjacent to the said pin 110, whereupon continued rotation of the needle cylinder causes the said floats to follow the leading high splice and double sole needle 108 in its movement of rotation around the needle circle and, due to gravity, the floats tend to drop behind the cylinder needles, that is, between the cylinder needles and the dial, the companion dial needles being withdrawn and inactive. Substantially 270 degrees, more or less in the direction of rotation of the needle cylinder from the pin 110 a brush 111 is attached to the dial cap 18 as by screws 112. The brush consists of tufts of depending hairs or bristles 113, Fig. 20. When, due to continued rotation of the needle cylinder, the leading high splice and double sole needle 108 reaches a position adjacent to the brush 111 the bristles thereof engage a float 13 and force the said float below the dial cap 18 and dial 17 so that the dial needles 21 as they subsequently advance as at 114, Fig. 4, may not engage and knit in such high splice and double sole float. Furthermore as the cylinder needles 23 are in the elevated position shown in Fig. 20 throughout the major portion of the needle circle the long floats 13 are prevented from passing in front of the needle hooks where they might be knitted in by the said cylinder needles.

In Figs. 15, 16 and 17 is disclosed an auxiliary cutting mechanism modified somewhat from the specific form of cutting mechanism hereinbefore disclosed for severing the high splice and double sole floats 13. The mechanisms disclosed in said Figs. 15, 16 and 17 are controlled in the same manner and through the same connections as are the corresponding mechanisms hereinbefore described and where the parts are unmodified the same reference characters are adopted as are used in connection with the disclosures in the figures of the drawings hereinbefore referred to.

Pivotally connected to the link 66 is a lever 115 substantially identical with the corresponding lever 68. A sleeve or tubular extension 116 which connects the two arms of the lever 115 extends to and rests upon the upper surface of the dial cap 18 and is mounted for turning movements upon and is retained in position by means of a pivot pin or screw 117 which latter, at its lower end, is in threaded engagement with the dial cap 18. An arm 118 of lever 115 is provided with an elongated slot 119 adjacent to the outer end thereof through which passes a pin 120 the other end of which is threaded and screwed into a threaded opening in the upper and movable member 121 of the cutter. A coil spring 122 is interposed between the under face of the lever arm 118 and the upper face of the movable plate or blade 121, whereby the said plate is maintained in position against a second plate 123 which constitutes the fixed element or blade of the cutter. The dial cap 18 is recessed as at 124 within which recess the plate 123 is fixedly retained by means of a pin or screw 125 which also serves as a pivot for the plate 121. During the knitting of each course as hereinbefore described the link 66 is shifted and such shifting of the link 66 is communicated to the lever 115 whereupon the pin and slot connection 119, 120 moves the plate 121 upon its pivot 125 thereby to swing the said plate to and from the open or yarn receiving position shown in Fig. 17 which position corresponds to the position of the plate 81, Fig. 3.

In Figs. 18 and 19 further modified means for cutting the high splice and double sole floats are disclosed and wherein a link 66′ corresponding to but not identical with the link 66 is pivoted to a bell crank lever 126 by means of the detachable connections specifically disclosed in Fig. 14. The bell crank lever 126 is pivoted at 127 to a bracket 128 in turn depending from and connected to the dial supporting bracket 129. To the other arm of the bell crank is pivotally connected at 130 a link 131 to which is pivoted, at its other end at 132, a movable element or blade 133 of an auxiliary cutting mechanism for severing the high splice and double sole floats 13. The dial cap 18′ is recessed as at 134 thereby to provide room for the movable element or blade of the cutting mechanism and at the same time to present an inclined, fixed cutting edge 135 adapted to cooperate with the lower cutting edge of the movable cutting member 133. The movable member 133 is pivotally connected intermediate its end by means of a pin or screw 136 to an upstanding block 137 which constitutes part of the dial cap 18′. The pin or screw 136 also serves to retain a spring 138 in position against the outer face of the movable element 133 and thereby retain the latter in position so that the cutting edge thereof may register properly with the cutting edge 135. A pin 139 carried by the movable element 133 engages in a slot 140 formed in the spring 138 thereby preventing the latter from turning on the pin 136. A pin 141 upstanding from the dial cap serves to guide the floats 13 of the splicing thread.

In Fig. 19 a portion of the dial 17′ is shown broken away as at 142. The dial is radially slotted as usual, one of which slots is shown at 143. The dial walls which separate and define therebetween the slots 143 are provided with upwardly extending spacing fins or projections 144 which constitute a flange on the dial whereby to close the gap between the under face of the dial cap and the upper face of the dial. If no such provision is made the floats 13, which are carried around by the rotation of the needle cylinder as hereinbefore described, may be drawn over the tops of the dial needles as they are advanced, Figs. 4 and 18, to take thread and knit. Consequently the fins or projections 144 serve the purpose of closing the space otherwise formed between the upper face of the dial and the lower face of the dial cap thereby preventing the floats 13 from being caught and knit in by the dial needles as they are projected and later retracted.

As hereinbefore stated the pin 110, in conjunction with the brush 111, functions to cause the floats to pass downwardly between the backs of the cylinder needles and the dial. Ordinarily the pin 110 in conjunction with the brush 111 serves the purpose but occasionally a float 13 may be laid over and engaged by dial needles as they are advanced and in order to avoid such possibility the space between the upper face of the dial and the lower face of the dial cap is filled in by means of the projections 144 which constitute continuations of the needle walls.

Although shown in connection with a modified form of cutter, Figs. 18 and 19, nevertheless the construction of the dial for the purpose just described is also applicable to dials and dial caps having mounted thereon the forms of auxiliary cutters shown specifically in Figs. 5 and 16.

In Figs. 21 and 22 is disclosed a means which, although it may be used in conjunction with the pin 110, is preferably used alone, that is, without the pin 110.

In addition to the auxiliary yarn severing mechanism hereinbefore described the usual binding mechanism is used which includes an automatically actuated clamp 145 and a loosely mounted clamp 146 adapted lightly to tension the yarns or threads and retain them when the clamp 145 is raised to permit the entry of a thread or yarn thrown out of action, and a cutter 147 mounted upon the upper face of the dial cap and automatically actuated in any desired manner. The clamp 146 additionally functions during high splice

and double sole knitting temporarily to retain the ends of the long floats 13 until the leading high splice and double sole needles again knit the reinforcing thread.

Fastened to one face of the clamp 145 as by means of a screw 148 is a fork-shaped member 149 an arm 150 of which normally seats upon a stop pin 151 carried by and laterally extending from clamp 145. Whenever, during the knitting of reinforced courses such as high splice and double sole, the lever 90 is raised to an inoperative position, Fig. 4, above the needles, the hereinbefore mentioned last double sole and high splice needle 109 moves in the direction of the arrow, Fig. 4, and finally carries the float to such a position that it passes into the space 152 provided in the clamp 145 and finally engages the outer face or edge 153 of the member 149 and upon continued rotation of the needle cylinder tilts the said member 149 on its pivot 148 whereupon the float 13 is trapped or held within the space 154 defined by an arm of the member 149 and the clamp 145. The member 149 after the float passes thereunder immediately drops until the arm 150 engages pin 151. Thereafter continued rotation of the needle cylinder causes the leading high splice and double sole needle 108 (Figs. 3, 21 and 22) to carry the float against the edge 155 of the member 149 and pull the severed float 13 in a direction more or less radially of the dial cap and finally completely free from the clamp 145 as the said float 13 follows the needle 108 due to the continued rotation of the needle cylinder.

One important advantage of the use of the float trapping member 149 resides in the fact that, when the needle 108 draws the float 13 across the edge 155 of the element 149, it does not disturb or tend to pull out from the binder other threads, two of which are indicated at 156 and 157 by way of example, because of the fact that the other threads are retained between the clamp 145 and the upper face of the dial cap, whereas the float 13 is out of contact therewith and consequently exerts no friction thereon which would tend to pull the said yarns or threads from beneath the clamp 145.

Although in the description of the modification disclosed in Figs. 21 and 22 reference has been made to Figs. 3 and 4, nevertheless the yarn trapping means 149 may be used in connection with the other forms of auxiliary yarn cutting mechanisms disclosed specifically in Figs. 15–19 inclusive.

In Fig. 23 is shown a modified construction of dial cap 158 which cap is provided with the usual cams shown in Fig. 6 and is of a diameter slightly greater than the diameter of the needle dial 159, and connected to or formed integrally with the overhanging portion 160 of the dial cap is an annular flange 161 which overlaps the dial needle walls 162 as at 163 thereby to prevent the splicing or other threads from passing into the space 164 which separates the upper edges of the dial walls from the lower face of the dial cap or cams 165. The needle walls 162 are beveled as at 166 and the inner face of the flange 161 is likewise beveled as at 167.

While the brush 111 and pin 110 or the yarn trapping means 149 serve to guide the floats of thread so that they will pass between the dial and cylinder, nevertheless unless the flange 161 or an equivalent means be provided the floats of threads may pass in between the dial cap and dial which is objectionable.

A latch ring 168 as well as a sinker head 169 and a sinker cap 170, which sinker cap is provided with cams for imparting radial movements to sinkers (not shown), are all mounted upon or carried by the frame of the machine in the usual manner and cooperate with the dial and cylinder needles to knit the stocking or half hose disclosed in Fig. 1.

The needles may be divided, and thereby some of them selected to knit the reinforcing thread, in any suitable manner and by any suitable means, either in conjunction with the half-course movements of the reinforcing guide, or independently thereof.

In some of the claims reference is made to rib fabric and plain fabric as being knitted simultaneously or at the same time. By that is meant rib and plain fabric is knitted during the knitting of each reinforced course.

Although as hereinbefore disclosed, the invention is primarily intended for the production of stockings provided with ribbed insteps and reinforced portions nevertheless the invention in its broader aspect, may be utilized for the production of ribbed fabric other than hosiery having rib wales and adjacent thereto plain wales which latter are reinforced.

Although it is desirable that the severing of the reinforcing thread or yarn be closely adjacent to the wales constituting the high splice and/or double sole, nevertheless the severing may occur at a point somewhat removed from the said high splice and/or double sole wales, the limitation "adjacent" being intended to mean a severing of the reinforcing thread somewhere between the first and last wales where the said reinforcing thread is knitted into the fabric, and preferably nearer to one side of the reinforced area than to the other side thereof.

The machine hereinbefore specifically described and illustrated in the accompanying drawings discloses the preferred forms of mechanisms for effecting the knitting of the product disclosed in Fig. 1 hereof, although other types of knitting machines capable of knitting rib and plain fabric may be so constructed or modified as to knit the stocking or half hose disclosed in Fig. 1; in other words, the type of machine disclosed in the foregoing description and accompanying drawings, is

merely illustrative of the invention, it not being the intention to limit the claims otherwise than by the express limitations in the claims themselves.

The invention hereinbefore disclosed is applicable either to a half hose or to a stocking of full length and although in certain of the claims reference is made to a stocking nevertheless there is no intention of thereby limiting the invention to a full length stocking, the term "stocking" being used in a generic sense.

Claims:

1. A circular knitting machine including a needle dial and a needle cylinder the needles of which are adapted to cooperate in the knitting of a partly ribbed and partly plain fabric, means for reinforcing, by means of a thread other than the body thread, the adjacent plan wales which constitute the plain portion of the fabric, a dial cap provided with cams on one face thereof for controlling the knitting movements of the dial needles and means mounted on the other face thereof for severing the reinforcing thread adjacent to a wale defining one side of the reinforced portion, at least once during the knitting of each reinforced course.

2. A circular knitting machine including a needle dial and a needle cylinder the needles of which are adapted to cooperate in the knitting of partly ribbed and partly plain fabric, means for reinforcing, by means of an additional thread, the adjacent plain wales which constitute the plain portion of the fabric, a dial cap provided with cams on one face thereof for controlling the knitting movements of the dial needles, and means mounted on the other face of dial cap, automatically controlled at least once during the knitting of each partially reinforced course, for severing the reinforcing thread adjacent to a wale defining one side of the reinforced portion.

3. A circular knitting machine including a needle dial and a needle cylinder the needles of which are adapted to cooperate in the knitting of partly ribbed and partly plain fabric, means for reinforcing, by means of a thread other than the body thread, the adjacent plain wales which constitute the plain portion of the fabric, a dial cap provided with cams on one face thereof for controlling the knitting movements of the dial needles and means mounted on the other face thereof for severing the reinforcing thread adjacent to a wale defining one side of the reinforced portion, at least once during the knitting of each reinforced course, a guide for feeding said other thread to some of the needles, in combination with means for automatically controlling the active and inactive positions of the said guide, whereby the guide is moved to and from feeding position at least once during the knitting of each reinforced course.

4. A circular knitting machine including a needle dial and a needle cylinder the needles of which are adapted to cooperate in the knitting of partly ribbed and partly plain fabric, means for reinforcing, by means of an additional thread, the adjacent plain wales which constitute the plain portion of the fabric, a dial cap provided with cams on one face thereof for controlling the knitting movements of the dial needles, and means mounted on the other face of the dial cap automatically controlled at least once during the knitting of each partially reinforced course for severing the reinforcing thread adjacent to a wale defining one side of the reinforced portion, a guide for feeding the additional thread to some of the needles, in combination with means for automatically controlling the active and inactive positions of the said guide, whereby the guide is moved to and from feeding position at least once during the knitting of each reinforced course.

5. A circular knitting machine including a dial and cylinder and needles mounted therein for independent movements to and from thread taking position, in combination with a dial cap having cams on one face thereof for controlling the movements of the dial needles and means on the other face thereof for severing the thread floats of partially reinforced courses and temporarily retaining the ends of the severed floats, means adapted to cause the floats to be so positioned between the cylinder and dial that the dial needles, when they are advanced to take thread, will not take and thereafter knit in the mentioned floats or ends of thread.

6. A circular knitting machine including a dial and cylinder and needles mounted therein for independent movements to and from thread taking position, in combination with a dial cap having cams on one face thereof for controlling the movements of the dial needles and means on the other face thereof for severing the thread floats of partially reinforced courses and temporarily retaining the ends of the severed floats, means adapted to cause the floats or ends to be so positioned between the cylinder and dial that the dial needles, when they are advanced to take thread, will not take and thereafter knit in the mentioned floats or ends of thread, said means including a pin mounted on the dial cap and so disposed that continued rotation of the needle cylinder causes the severed floats of thread to be positioned between the cylinder and dial needles.

7. A circular knitting machine including a dial and cylinder and needles mounted therein for independent movements to and from thread taking position, in combination with a dial cap having cams on one face thereof for controlling the movements of the

dial needles and means on the other face thereof for severing the thread floats of partially reinforced courses and temporarily retaining the ends of the severed floats, means adapted to cause the floats to be so positioned between the cylinder and dial that the dial needles, when they are advanced to take thread, will not take and thereafter knit in the mentioned floats or ends of thread, said means including a pin and a brush mounted upon the dial cap and so disposed that continued rotation of the needle cylinder causes floats of thread to be positioned between the cylinder and dial needles and to be depressed below the dial needles.

8. A circular knitting machine including a dial and cylinder and needles mounted therein for independent movements to and from thread taking position, in combination with a dial cap having cams on one face thereof for controlling the movements of the dial needles and means on the other face thereof for severing and clamping the floats of thread withdrawn from feeding relation with respect to the needles for a number of courses, and other means for severing the thread floats of partially reinforced courses and temporarily retaining the ends of the severed floats, means adapted to cause the floats to be so positioned between the cylinder and dial that the dial needles, when they are advanced to take thread, will not take and thereafter knit in the mentioned ends or floats of thread, said means including a thread trapping means mounted upon the aforesaid clamping means for the threads withdrawn from feeding relation with respect to the needles for a number of courses, said trapping means adapted to guide the thread floats of partially reinforced courses when continued rotation of the needle cylinder carries the thread floats across the dial cap, said yarn trapping means thereafter adapted to guide the floats as they are subsequently withdrawn from the means for temporarily retaining the ends of the severed floats in such a manner as to position the severed floats between the cylinder and dial needles, whereby the said dial needles when they are advanced to take thread will not take and thereafter knit in the mentioned floats of thread.

9. A circular knitting machine including a dial and cylinder and needles mounted therein for independent movements to and from thread taking positions, in combination with a dial cap having cams on one face thereof for controlling the movements of the dial needles and means on the other face thereof for severing and clamping the floats of thread withdrawn from feeding relation with respect to the needles for a number of courses, and other means for severing the thread floats of partially reinforced courses and temporarily retaining the ends of the severed floats, means adapted to cause the floats to be so positioned between the cylinder and dial that the dial needles, when they are advanced to take thread, will not take and thereafter knit in the mentioned floats or ends of thread, said means including a thread trapping means mounted upon the aforesaid clamping means for the threads withdrawn from feeding relation with respect to the needles for a number of courses and adapted to guide the thread floats of partially reinforced courses when continued rotation of the needle cylinder carries the thread floats across the dial cap, said thread trapping means thereafter adapted to guide the floats as they are subsequently withdrawn from the means for temporarily retaining the ends of the severed floats in such a manner as to position the severed floats between the cylinder and dial needles, whereby the said dial needles when they are advanced to take thread will not take and thereafter knit in the mentioned floats or ends of thread, a brush mounted upon the dial cap and adapted to engage the severed floats and depress the same between the cylinder and dial needles thereby additionally serving to prevent the dial needles from knitting the floats of thread.

10. A needle dial having a flange, radial slots provided in the dial and extending into the flange for the reception of radially slidable needles, the recess in the dial being defined by the flange providing a space for the reception of cams which act upon the needle butts.

11. In a knitting machine, a needle dial and a needle cylinder the needles of which are adapted to cooperate to knit adjacent rib wales and other adjacent plain wales, means for reinforcing the mentioned plain wales which means includes a guide for feeding a reinforcing thread or yarn to a series of adjacent cylinder needles, whereby the reinforcing thread or yarn is temporarily floated from the feeding means to the last needle knitting the said reinforcing thread or yarn during the knitting of each partially reinforced course, and means for severing such floats adjacent to one end thereof, in combination with other means for guiding the severed floats so that they will not be knit-in by dial needles.

12. In a knitting machine, a needle dial and a needle cylinder the needles of which are adapted to cooperate to knit adjacent rib wales and other adjacent plain wales, means for reinforcing the mentioned plain wales which means include a guide for feeding a reinforcing thread or yarn to a series of adjacent cylinder needles, whereby the reinforcing thread or yarn is temporarily floated from the feeding means to the last needle knitting the said reinforcing thread or yarn during the knitting of each partially rein-

forced course, and means for severing such floats adjacent to one end thereof, in combination with other means for guiding the severed floats so that they will not be knit-in by dial needles, said other means for guiding the severed floats including a flange on the dial which substantially fills the space separating the adjacent faces of the dial cap and dial.

13. In a knitting machine, a needle dial and a needle cylinder the needles of which are adapted to cooperate to knit adjacent rib wales and other adjacent plain wales, means for reinforcing the mentioned plain wales which means include a guide for feeding a reinforcing thread or yarn to a series of adjacent cylinder needles, whereby the reinforcing thread or yarn is temporarily floated from the feeding means to the last needle knitting the said reinforcing thread or yarn during the knitting of each partially reinforced course, and means for severing such floats adjacent to one end thereof, in combination with other means for guiding the severed floats so that they will not be knit-in by dial needles, said other means for guiding the severed floats including a flange on the dial which substantially fills the space separating the adjacent faces of the dial cap and dial, and a brush for depressing the floats below the dial needles prior to the time the dial needles are advanced to take thread and knit.

14. In a knitting machine a needle dial, a needle cylinder, and a dial cap for controlling the dial needles, the needles and dial cap being relatively rotatable in combination with a brush fixedly mounted with respect to the dial cap and extending between the cylinder and dial needles.

15. In a knitting machine a needle dial, a needle cylinder, and a dial cap for controlling the dial needles, the needles and dial cap being relatively rotatable in combination with a brush mounted on the dial cap and extending between the cylinder and dial needles.

16. A knitting machine including a needle dial and a needle cylinder, means for feeding a body thread to cylinder and dial needles and a reinforcing thread to cylinder needles so as to reinforce adjacent plain wales, the means for feeding the reinforcing thread to the cylinder needles being adapted to feed such thread to such cylinder needles for partial courses only, and said reinforcing thread being caused to float from the feeding means to the last needle knitting the said reinforcing thread during the knitting of each partially reinforced course, in combination with means for severing the said floats during the knitting of each course.

17. A knitting machine including a needle dial and a needle cylinder, means for feeding a body thread to cylinder and dial needles and a reinforcing thread to cylinder needles so as to reinforce adjacent plain wales, the means for feeding the reinforcing thread to the cylinder needles being adapted to feed such thread to such cylinder needles for partial courses only, and said reinforcing thread being caused to float from the feeding means to the last needle knitting the said reinforcing thread during the knitting of each partially reinforced course, in combination with means for severing the said floats during the knitting of each course, and means for causing the thread floats to be positioned and maintained below the dial needles as they are advanced to knit rib in conjunction with some of the cylinder needles.

18. A knitting machine including a needle dial and a needle cylinder, means for feeding a body thread to cylinder and dial needles and a reinforcing thread to cylinder needles so as to reinforce adjacent plain wales, the means for feeding the reinforcing thread to the cylinder needles being adapted to feed such thread to such cylinder needles for partial courses only, and said reinforcing thread being caused to float from the feeding means to the last needle knitting the said reinforcing thread during the knitting of each partially reinforced course, in combination with means for severing the said floats during the knitting of each course, the means for feeding the reinforcing thread to the needles being automatically controlled to move to and from thread feeding position at least once during the knitting of each reinforced course.

19. A knitting machine including a needle dial and a needle cylinder, means for feeding a body thread to cylinder and dial needles and a reinforcing thread to cylinder needles so as to reinforce adjacent plain wales, the means for feeding the reinforcing thread to the cylinder needles being adapted to feed such thread to such cylinder needles for partial courses only, and said reinforcing thread being caused to float from the feeding means to the last needle knitting the said reinforcing thread during the knitting of each partially reinforced course, in combination with means for severing the said floats during the knitting of each course, the means for feeding the reinforcing thread to the needles being automatically controlled to move to and from thread feeding position at least once during the knitting of each reinforced course, the means for automatically controlling the movements of the reinforcing thread feeding means including a cam drum and gearing for rotating the same one revolution for each revolution of the needle cylinder.

20. A dial cap having cams mounted on one face thereof for controlling dial needles and having a main thread clamping and cutting mechanism as well as an auxiliary thread severing member mounted on the other face thereof.

21. A dial cap having cams mounted on one face thereof for controlling dial needles and having a thread severing member mounted on the other face thereof, the thread severing member being pivoted to move in a plane parallel with the plane of the dial cap.

22. A dial cap having cams on one face thereof for controlling dial needles and main and auxiliary means mounted on the other face thereof for severing thread, said last named means including a thread severing member movable so that the thread severing edge thereof may move to and from thread severing position in a direction at an angle to the dial cap.

23. A dial cap having cams on one face thereof for controlling dial needles, in combination with main and auxiliary means for severing thread.

24. A method of knitting partly rib and partly plain fabric wherein a reinforcing thread is knitted in at the plain wales and floated, including the steps of severing the resultant thread floats adjacent to reinforced end wales thus leaving long floats which are caused to pass between the dial and cylinder.

25. A circular knitting machine including a needle dial and a needle cylinder, in combination with means for feeding a reinforcing thread to some of the cylinder needles during the knitting of some at least of the circular courses of the stocking or other fabric, and means acting in conjunction with the means first mentioned automatically to discontinue the feeding of such thread during the knitting of courses other than those first mentioned, other means adapted to be controlled automatically so as to sever the reinforcing thread adjacent to one, at least, of the wales defining the reinforced area during the knitting of each reinforced course, and adapted to control the action of the severing means whereby the latter is rendered inactive during the knitting of courses other than the reinforced courses.

26. A needle dial and a dial cap therefor having cams on one face thereof for controlling the movements of the dial needles, the dial cap overhanging the dial needle walls and such overhanging portion terminating in a flange which overlaps the periphery of the dial needle walls.

27. A needle dial and a cap therefor having cams on one face thereof for controlling the dial needles, the dial needle walls constituting the face of the needle dial adjacent to the cam face of the dial cap, the dial needle walls throughout the greater portions of their lengths being substantially spaced from the adjacent face of the dial cap whereby cams carried thereby may actuate the dial needles, the said dial needle walls adjacent to their outer ends extending adjacent to but spaced from the adjacent face of the dial cap, an annular flange carried by the dial cap extending a sufficient distance below the lower face of the said dial cap to overlap the outer portions of the dial needle walls.

28. A knitting machine including a needle dial and a needle cylinder each having needles independently mounted therein, means for feeding a main thread to needles and an additional thread to needles for partial courses only, the additional thread being adapted temporarily to float from the additional thread feeding means to the last needle that knits the said additional thread during the knitting of each partially reinforced course, means for severing the additional thread each course, in combination with means for preventing the severed ends of the floats of thread from passing to a position forward of the hooks of the cylinder needles.

29. A knitting machine including a needle dial and a needle cylinder each of which has needles independently mounted therein, means for feeding a main thread to needles and an additional thread to needles for partial courses only, the additional thread being adapted temporarily to float from the additional thread feeding means to the last needle that knits the said additional thread during the knitting of each partially reinforced course, means for severing the floats of the additional thread during the knitting of each course, in combination with means for preventing the severed ends of the floats of thread from passing to a position forward of the hooks of the cylinder needles, said means including cylinder needles maintained in elevated position.

30. A circular knitting machine provided with a needle cylinder and a needle dial each of which has needles independently mounted therein, means for feeding a main thread to needles and an additional thread to some of the needles for partial courses only, the thread last mentioned being adapted temporarily to float from the additional thread feeding means to the last needle that knits the said additional thread during the knitting of each partially reinforced course, in combination with means for severing the thread last mentioned at least once during the knitting of each course, and means for keeping the severed ends of the additional thread out of the dial and in such a manner as not to interfere with the normal operation of the dial needles.

31. A circular knitting machine of the independent needle type including a needle dial and needle cylinder each of which has needles independently mounted therein, means for feeding at least one thread to the needles and an additional thread to some of the needles in such a manner as temporarily to cause said additional thread to float from the feeding means to the last needle knitting the said additional thread during the knit-

ting of each partially reinforced course, in combination with means for severing the floats adjacent to the last knitted, reinforced wales of each course.

32. A circular knitting machine of the independent needle type including a needle dial and a needle cylinder each of which has needles mounted therein, means for feeding at least one thread to needles and an additional thread to some only of the needles in such a manner as temporarily to cause said additional thread to float from the feeding means to the last needle knitting said additional thread during the knitting of each partially reinforced course, in combination with means for cutting the floats adjacent to one end and so controlling the resultant ends of the floats that they will not interfere with the normal operation of the needles.

33. A circular knitting machine of the independent needle type including a needle dial and a needle cylinder each of which has needles mounted therein, means for feeding at least one thread to needles and an additional thread to some only of the needles in such a manner as temporarily to cause said additional thread to float from the feeding means to the last needle knitting said additional thread during the knitting of each partially reinforced course, in combination with means for cutting the floats adjacent to one end and so controlling the resultant ends of the floats that they will not interfere with the normal operation of the needles, and at the same time so controlling the floats that the latter will not be knitted in, the short ends of the floats being readily removable from between the rib and plain wales.

34. A knitting machine including two needle beds adapted to knit either rib or plain fabric, means for feeding the body thread to cooperating needles in each needle bed and a reinforcing thread to needles in one of the beds so as to reinforce adjacent plain wales, the means for feeding the reinforcing thread to the needles in one of the needle beds being adapted to feed such thread to such needles for partial courses only, the said reinforcing thread being caused to float from the feeding means to the last needle knitting the said reinforcing thread during the knitting of each partially reinforced course, in combination with means for severing the said floats during the knitting of each course.

35. A circular knitting machine of the independent needle type including two needle beds each of which has needles independently mounted therein, means for feeding at least one thread to cooperating needles mounted in the two needle beds and an additional thread to some of the needles in one of the needle beds in such a manner as temporarily to cause said additional thread to float from the feeding means to the last needle knitting the said additional thread during the knitting of each partially reinforced course, in combination with means for severing the floats adjacent to the last knitted, reinforced wales of each course.

36. In a knitting machine consisting of two needle beds the needles of which are adapted to cooperate to knit adjacent rib wales and other adjacent plain wales, means for reinforcing the plain wales which means includes a guide for feeding a reinforcing thread or yarn to a series of adjacent needles in one of the needle beds, whereby the reinforcing thread or yarn is temporarily floated from the feeding means to the last needle knitting the said reinforcing thread or yarn during the knitting of each partially reinforced course, and means for severing such floats adjacent to one end thereof, in combination with other means for guiding the severed floats so that they will not be knit-in by other needles.

37. A knitting machine having two needle beds the needles of which are adapted to cooperate to knit rib fabric while at the same time the needles of one needle bed are adapted to knit plain fabric, means for reinforcing the plain fabric, said means including an element for feeding reinforcing thread or yarn to the needles last mentioned, in combination with means for severing such thread or yarn at least once during the knitting of each reinforced course.

38. A knitting machine including a needle cylinder and needle dial each having needles independently mounted therein, the needles being adapted simultaneously to knit adjacent rib wales and other adjacent plain wales, means for reinforcing the plain wales, said means including a guide for feeding the reinforcing thread or yarn to a series of adjacent cylinder needles, in combination with means for severing such thread or yarn at least once during the knitting of each reinforced course.

In testimony whereof we affix our signatures.

ROBERT H. LAWSON.
WILLIAM L. SMITH, JR.