J. H. GLENN.

KNITTING MACHINE.

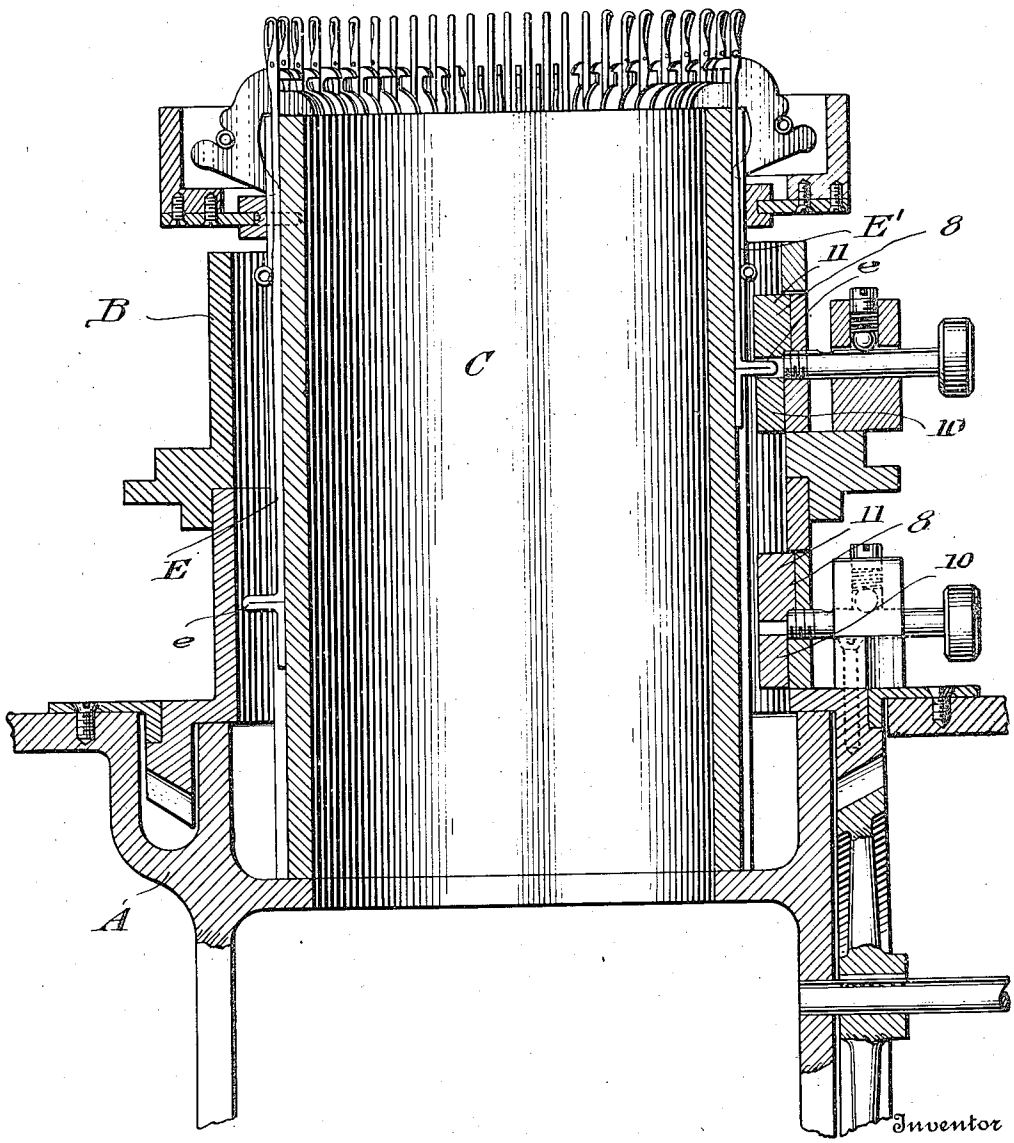
APPLICATION FILED NOV. 6, 1914.

1,278,634.

Patented Sept. 10, 1918.

3 SHEETS—SHEET 1.

Fig. 1.



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Witnesses

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3 SHEETS—SHEET 2.

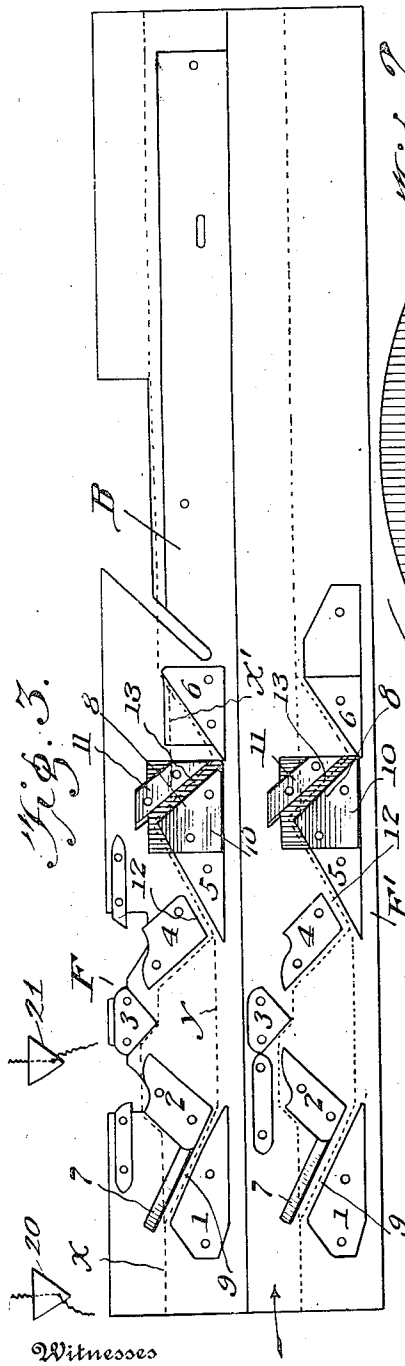


Fig. 3.

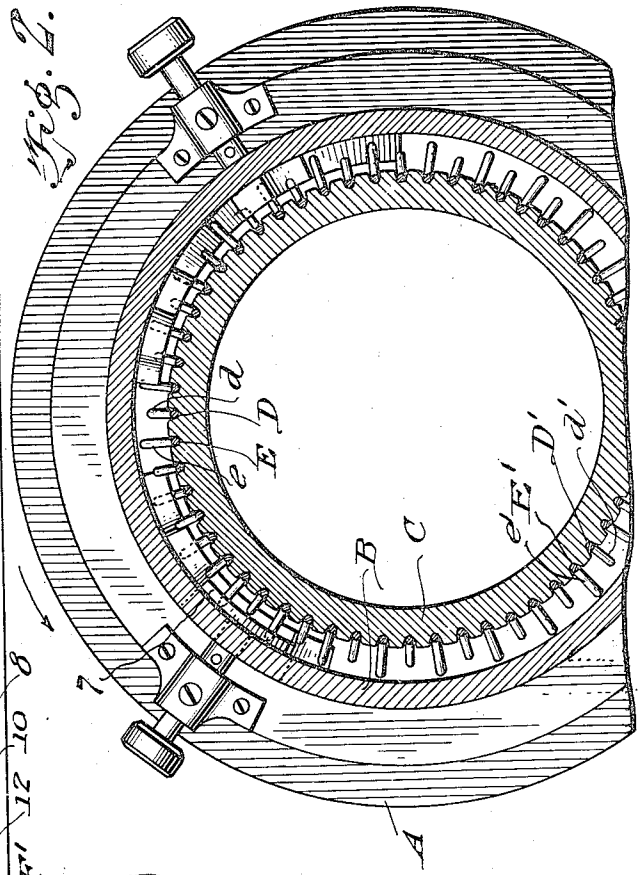


Fig. 2.

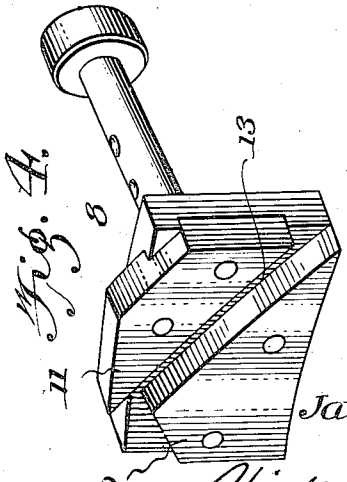


Fig. 4.

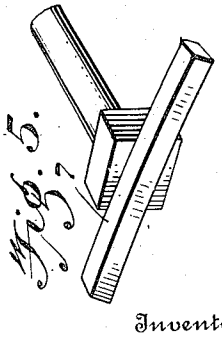


Fig. 5.

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3 SHEETS—SHEET 3.

Fig. 6.

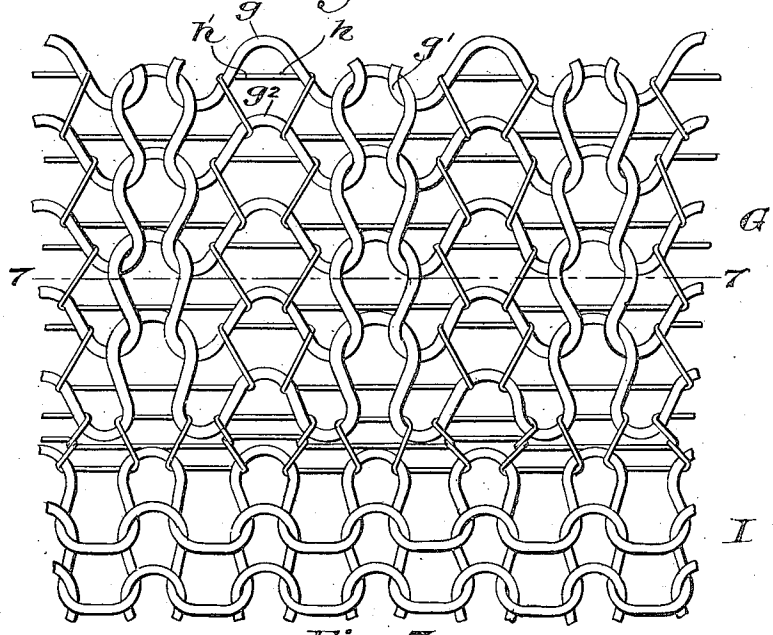
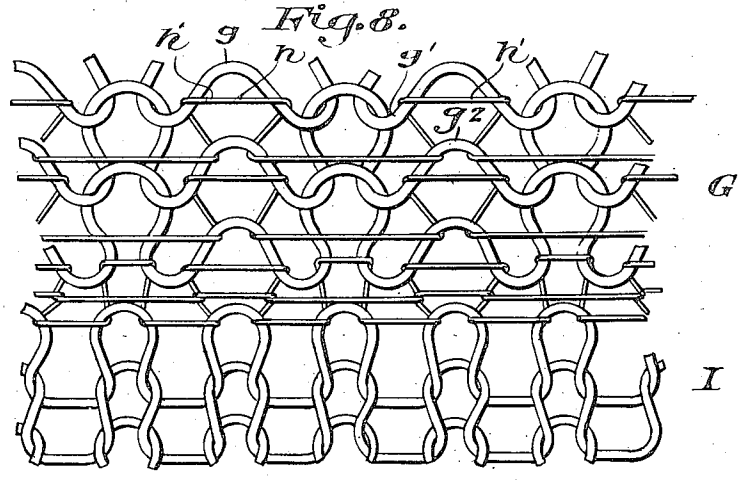


Fig. 7.



Fig. 8.



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UNITED STATES PATENT OFFICE.

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KNITTING-MACHINE.

1,278,634. Specification of Letters Patent. Patented Sept. 10, 1918.

Application filed November 6, 1914. Serial No. 870,703.

To all whom it may concern:

Be it known that I, JAMES H. GLENN, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented new and useful Improvements in Knitting-Machines, of which the following is a specification.

My invention relates to certain new and useful improvements in knitting machines and particularly to knitting machines of that character employed in the production of stockings and similar articles.

One object of the invention is to provide a knitting machine especially adapted for producing elastic stocking tops.

Another object is to provide a knitting machine embodying a novel construction and organization of needles and controlling cams for the aforesaid purpose.

Still another object is to provide a construction whereby complete stockings, including my improved elastic tops, may be made upon one and the same machine and by a continuous operation.

The invention consists of the features of construction, combination and arrangement of parts herein fully described and claimed, reference being had to the accompanying drawings in which:—

Figure 1 is a vertical section through a circular knitting machine constructed in accordance with my invention.

Fig. 2 is a horizontal transverse section of the same.

Fig. 3 is a diagrammatic view of one of the cam rings and cams thereon, illustrating in dotted lines the action of the needles.

Figs. 4 and 5 are perspective views of certain cams.

Fig. 6 is an outer side or front face view of a portion of the fabric.

Fig. 7 is a transverse section on the line 7—7 of Fig. 6.

Fig. 8 is a rear or inner face view of a portion of the fabric.

The machine is in general of ordinary construction and includes a bed plate A, upon which is rotatably mounted the cam cylinder B within which is arranged the needle cylinder C. The cylinder C is provided with the usual vertical grooves into which are fitted sets of needles D and E and D′ and E′ which are of usual construction, except as hereinafter specified. The cam cylinder B carries the usual cams for vertically reciprocating the needles for the production of the stitches. In the present instance, two sets of needles are carried by the needle cylinder, and two sets of knitting cams are carried by the cam cylinder for action upon the respective sets of needles, the butts of the respective sets of needles and the respective sets of cams designed to act thereon being arranged in different horizontal planes. This arrangement is necessary in knitting heels, but is not essential otherwise, and is therefore merely referred to in order that the illustration may be fully and clearly understood.

The needles of each set, such as the needles D and E, are arranged in alternation with each other, and these needles are respectively provided with short butts *d* and long butts *e*, while each set of cams F and F′ upon the cam ring B are disposed to act upon the butts of the respective needles, whereby the needles are reciprocated in the knitting action.

As shown, each set of cams comprises cam members 1, 2, 3, 4, 5 and 6, which may be of ordinary construction and conform to the usual arrangement of knitting cams. For use in conjunction with these cams I provide additional cams 7 and 8, the cam 7 being arranged for coöperation with the cam 1 and the cam 8 for coöperation with the cams 5 and 6. The cam 7 is of less extent of projection from the cylinder than the remaining cams, and forms with the adjacent surfaces of the cam members 1 and 2 a guideway 9, while the cam 8 consists of two spaced members 10 and 11, the member 10 forming with the members 4 and 5 an upwardly inclined guideway 12, while said members 10 and 11 form a downwardly inclined guideway 13. The cams 7 and 8 are constructed in practice so as to be thrown into and out of operation as desired, in order that the machine may operate in the usual way to knit the body of the stocking after the improved elastic top has been knitted. The direction of revolution of the cam cylinder is indicated by the arrows in Figs. 2 and 3, while in Fig. 3 there is also diagrammatically indicated in dotted lines the actions of the short and long butt needles in the control of the same by the cams.

Yarn feeding devices are shown conventionally at 20 and 21 in Fig. 3.

In the operation of the machine the butts of the needles are brought within the paths of the cams, and at all times from beginning to end in the production of any piece of knit goods each needle carries at least one loop or thread of the fabric. The complete cycle of movement for each needle is to rise high enough to cast its loop over the tail end of the latch, permitting the loop to fall on the shank or loop part of the needle, after which the needle descends, causing the loop to close the latch over the stitch which has just been taken into the hook, and releasing the previous loop from the end of the needle hook which is now protected by the closed latch. In this way successive chains of stitches are formed. The primary characteristic of the machine of the present improved knitting mechanism resides in the fact that every alternate needle moves through two cycles while the remaining needles are performing one. In order to effect this, the cam members 7 and 8 are provided, and which act upon part of the needles only, the short butt needles having a different knitting action from the long butt needles, as hereinafter fully explained.

The improved knitting mechanism is designed principally for producing the ribbed tops of stockings, in such a manner as to secure a top of maximum strength, durability, and, as a matter of prime importance, elasticity, and also to enable this work to be done on an ordinary knitting machine, upon which both the bodies and tops of stockings may be produced. In the production of the ribbed elastic stocking top, two kinds of yarn are used, a coarse yarn g and a finer or tension yarn h. The coarse yarn is alternately acted upon by the needles E and D to produce loose, long loops and closer or tighter alternate short loops, and to interlock the shorter loops of adjacent courses of the coarse yarn by loops of the fine yarn, which hold the short loops of the coarse yarn under tension. In Figs. 6 and 8 G designates a portion of a stocking top, and I the portion of the stocking body with which it is connected. During the action of the machine in knitting the ribbed elastic top G all of the cam devices, including the cams 7 and 8, are in use, while in knitting the remainder of the stocking the cams 7and 8 are thrown out of action, whereupon the cam mechanism operates in the usual way to knit the body from the coarser yarn, the loops of the courses being, as ordinarily, of substantially the same dimensions and directly interlocked together.

By reference to Fig. 3, it will be understood that the butts d of all the short butt needles D will pass the cam surface and lower portion of the member 11 of the cam 8 without touching the same or being influenced thereby, whereas the needles E having the longer butts e will be depressed by said cam. At the beginning of each new stocking top, the short butt needles and the long butt needles are both in engagement with the heavy weight yarn, and it will be seen by reference to Fig. 3 that the cam members 1, 2 and 7 will be the first to act on the needles. The needles D having the short butts d will pass directly across the face of the cam 7 and first engage the cam 2, while the needles E having the longer butts e will strike the cam 7, and be forced downward for travel along the inclined groove 12 formed between and by the aforesaid cam members. In the rotation of the cam cylinder each needle D will first be elevated by the cam 2, then pass into engagement with the cam 3 and be depressed thereby, then move over into engagement with and be depressed by the cam 4, then be elevated by the cams 5 and 10, and finally depressed by the cam 11 and travel in the groove 13, when it will pass out of engagement with said cam and move into engagement with the upper portion of the cam 6, at which time its succeeding cycle will begin. Each needle D will thus be reciprocated twice on each working cycle, for producing a loop in the coarse yarn and also a loop in the fine yarn. In the cycle of each long butt needle, the butt of the needle will engage the cam 7, and said needle will pass downward below the knitting plane through the groove 9, thence cross from the cam 1 to the cam 5 and travel upward through the groove 12 and finally downward through the groove 13, and then upward along the cam 6 to the starting position, whereby each long butt needle will be reciprocated once on each cycle of motion to form a loop in the coarse yarn. The dotted line x indicates the cycle of action of the short butt needles and the action of the cams thereon, and the dotted line y indicates the cycle of action of the long butt needles. Each coarse yarn g will thus be formed with long loops g' and short loops g^2 alternating therewith, the loops g' being formed by the long butt needles and the loops g^2 by the short butt needles, while each fine yarn h will be formed with loops h' between the long loops g' of the yarn g, which loops engage and interlock the loops g^2 of adjacent courses together.

In this aforesaid cycle of action, each needle D moves upward over cam 2 and the loop on the needle is passed downward at the point and cast over the latch on the shank. As the needle descends along the cam 3, it takes up the fine yarn and on its further descent along the cam 4 pulls the fine yarn downward and slips the coarse yarn over the closed latch at the hook end of the needle.

On the ensuing upward movement of the needle along the cam 5, the fine yarn slips down over the open latch on to the shank,

and with the final descent of the needle along the cam 11, the coarse yarn is again taken on and the fine is cast off over the closed latch and the hook end of the needle. This leaves the coarse yarn in the hook to begin the next cycle. At the beginning of the cycle of each long butt needle it holds the coarse yarn first during its descent through the passage 9. It then rises along cam 5 and casts its stitch at the top of passage 13 as the short butt needles do, and on next descending through said passage 13 the long butt needles take up the coarse yarn and carry it up cam 6 to the beginning of the next cycle. It will thus be evident that the long butt needles carry only the coarse yarn and make but a single stitch in each cycle, while the short butt needles make two stitches in each cycle and alternately carry the coarse and fine yarns. The fine yarn is held at a greater tension than the coarse yarn.

Fig. 6 of the drawing shows a section of the fabric from the outer or face side, disclosing particularly the mode in which the elastic ribbed top is interwoven between the body of the stocking to which it is attached and the final course of the toe of the preceding stocking. It will be seen from this that the coarse yarn is woven loosely on the long butt needles, which form the long loops, and that the alternate stitches or loops are woven much more tightly. It will also be seen that the fine or high tension yarn passes back of the heavier and looser stitches formed by the long butt needles, thus forcing the rows of long loops, to the front while the intermediate stitches formed by the short loops of the coarse yarn and loops of the fine yarn being under greater tension, are pulled toward the back or inside of the stocking, thus forming the alternate ribs of the fabric. This structure is secured by weaving the short loops g^2 of the coarse threads and binder loops h' of the fine threads through the action of the short butt needles, in making two stitches during the action of a long butt needle in making a single and looser stitch, by which the rows of long stitches are drawn together and projected forward while the rows of short stitches are pulled backward, the resultant fabric being ribbed on its outer surface and substantially smooth on its inner surface. This construction or method of knitting may not only be carried out in the manner described on an ordinary knitting machine by modifying the needles and cam mechanism in accordance with my invention, but the ribbed top of the resultant product combines a high degree of elasticity with great strength, due to the fact that distention is permitted by the coarse loops on the finer loops, the degree of elasticity being confined within proper limits by the high tension small loops of the coarse threads and the fine threads.

I claim:—

In a device for knitting accordion fabric, a series of long butt needles, a series of short butt needles, a cam ring for controlling the needles, said ring including in succession a needle depressing cam adapted to engage the long butt needles to the exclusion of the needles of the other series, a stitch cam acting on the short butt needles, a sectional needle elevating cam, a depressing cam and another elevating cam, each acting on all the needles, the upper portion of the sectional cam and the second depressing cam being mounted on a common support for adjustment radially of the cam ring.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES H. GLENN.

Witnesses:
HELEN G. DALEY,
NORMAN J. SMITH.