March 26, 1929. K. HOWIE 1,706,884

WELT MECHANISM FOR FULL FASHIONED KNITTING MACHINES

Original Filed June 9, 1927 4 Sheets-Sheet 1

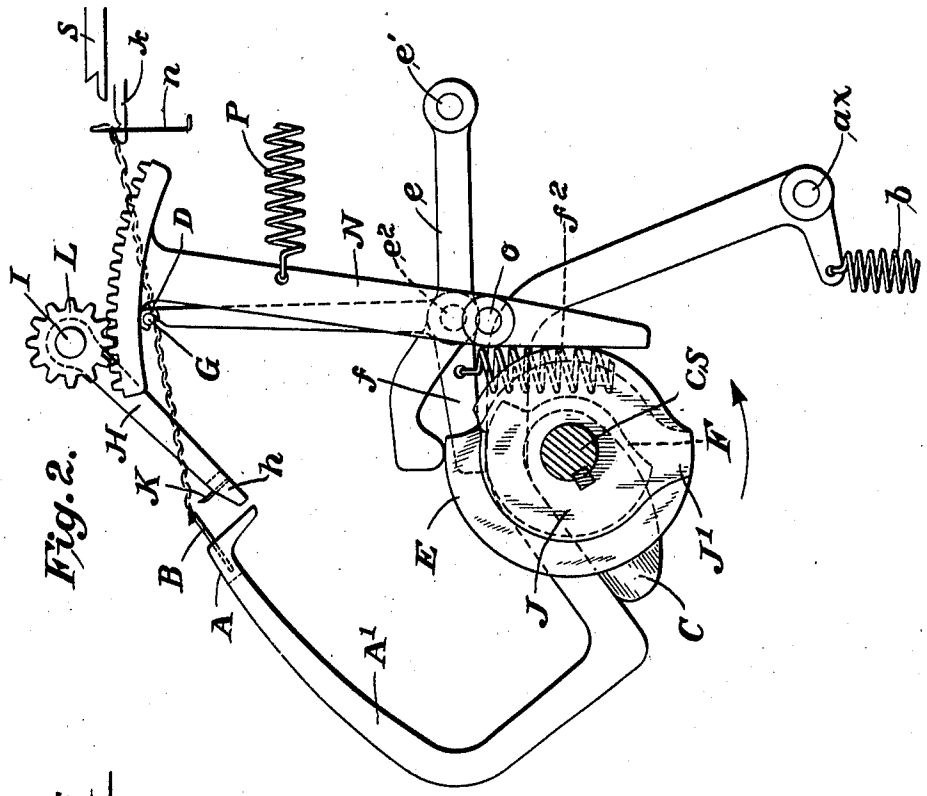


Fig. 2.

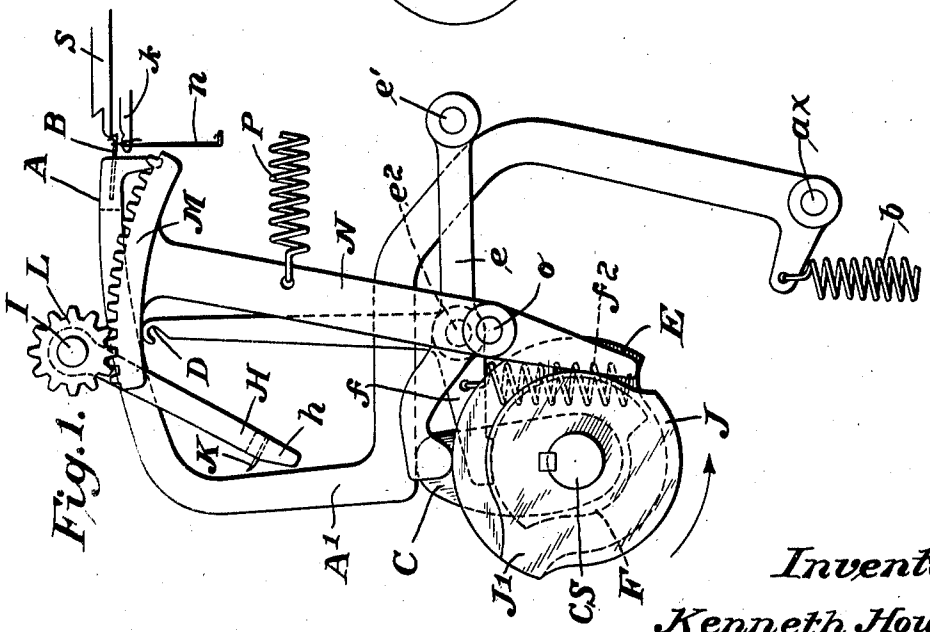


Fig. 1.

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WELT MECHANISM FOR FULL FASHIONED KNITTING MACHINES

Original Filed June 9, 1927 4 Sheets-Sheet 2

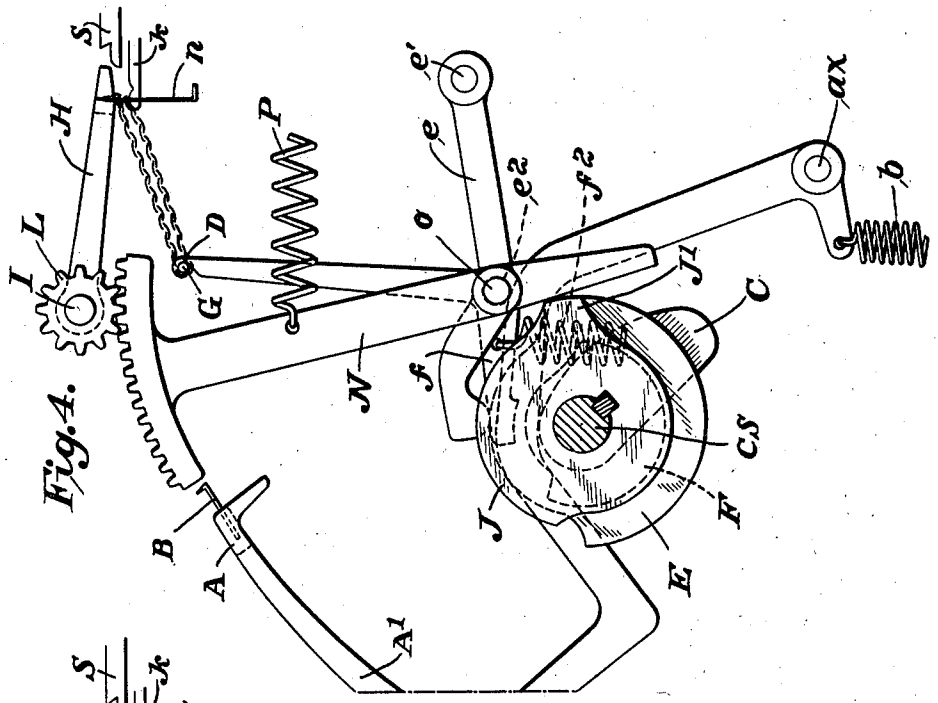


Fig. 4.

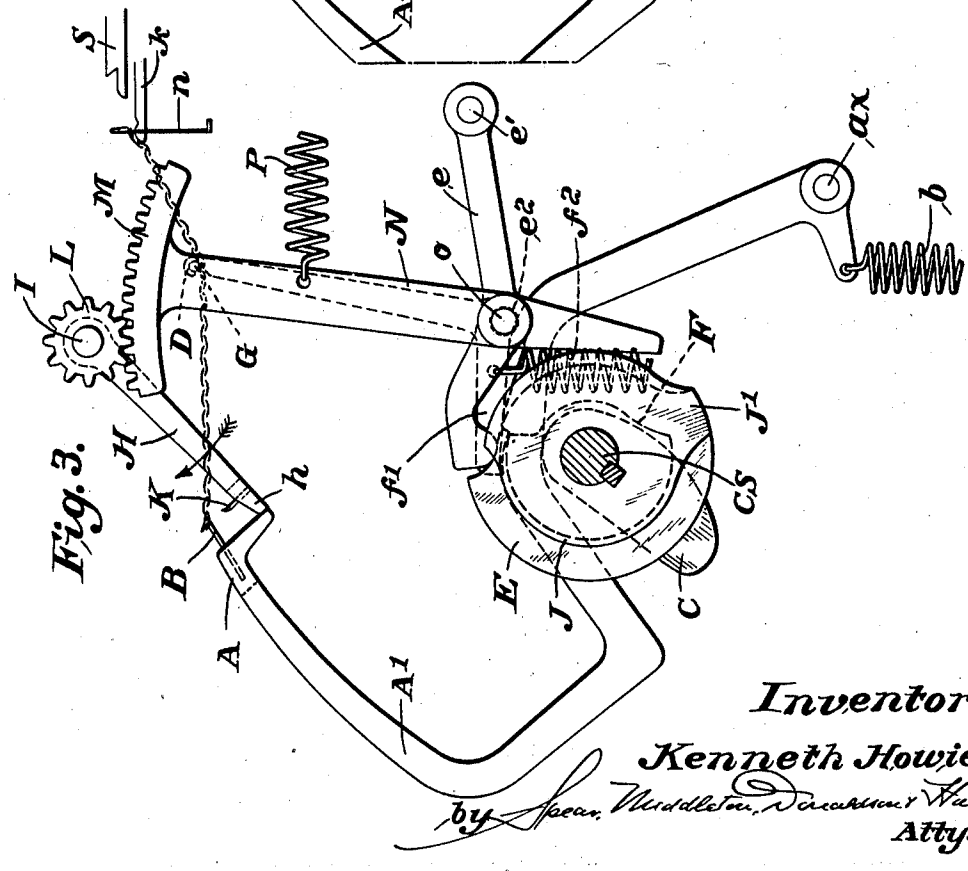


Fig. 3.

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WELT MECHANISM FOR FULL FASHIONED KNITTING MACHINES

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Fig. 5.

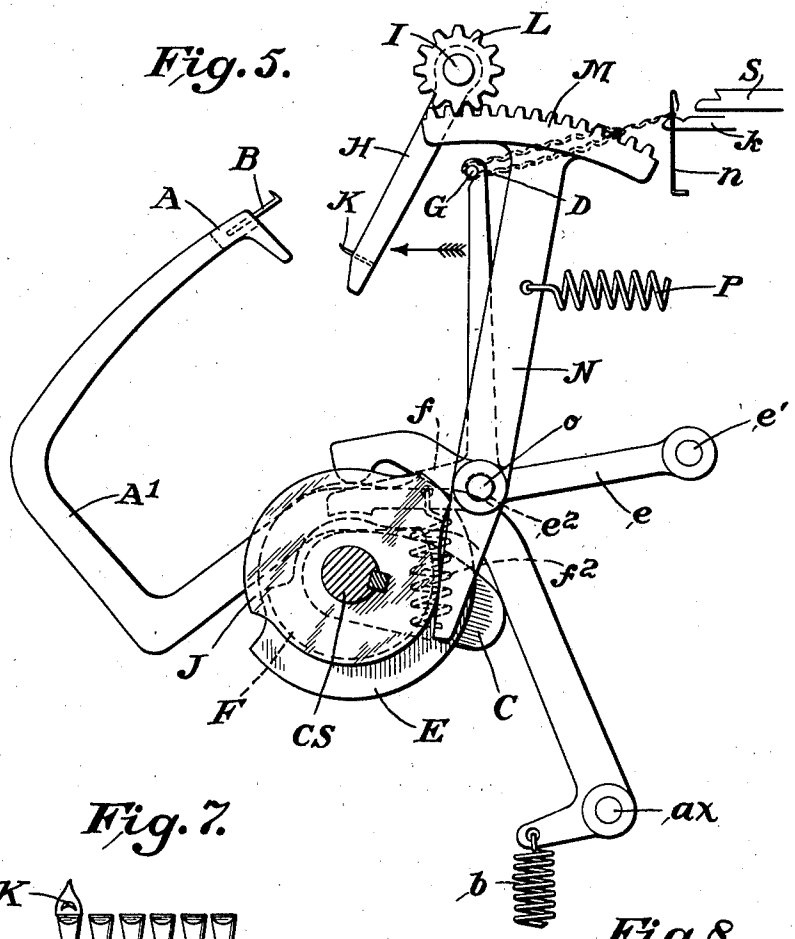


Fig. 7.

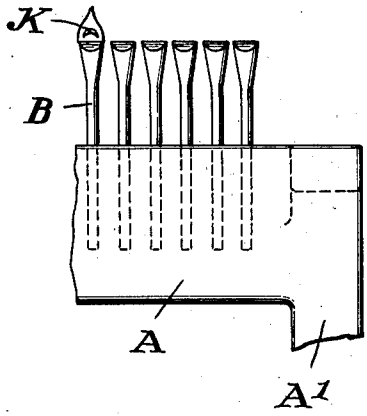
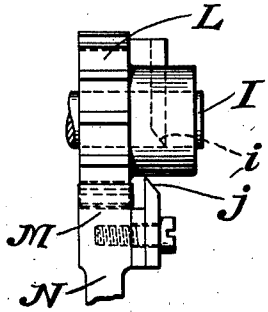


Fig. 8.



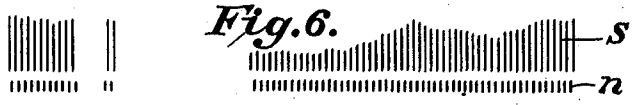
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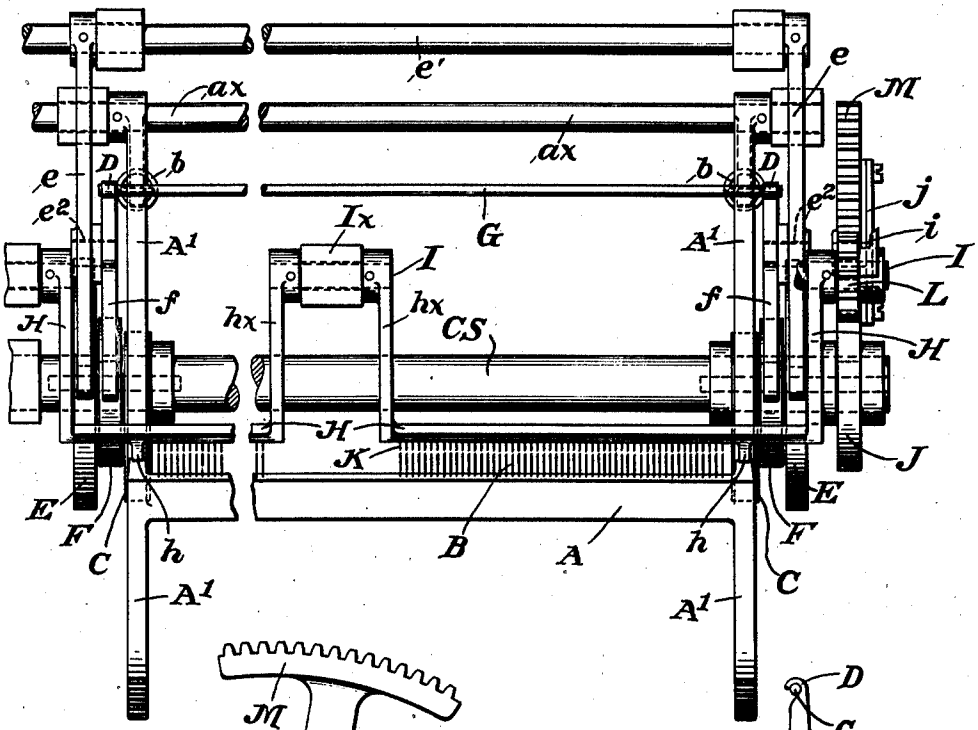
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WELT MECHANISM FOR FULL FASHIONED KNITTING MACHINES

Original Filed June 9, 1927 4 Sheets-Sheet 4

Fig.6.





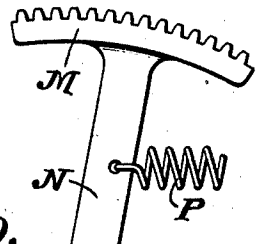


Fig.9.

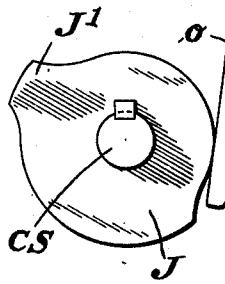


Fig.10.

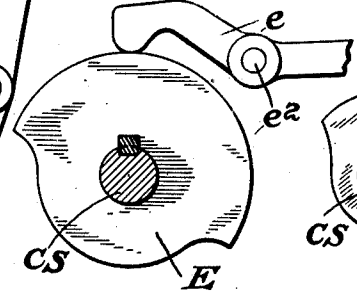
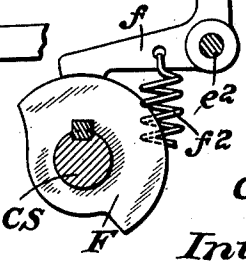


Fig.11.



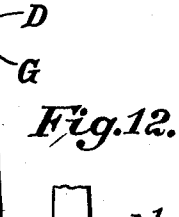
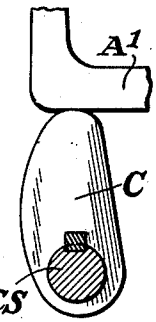


Fig.12.



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UNITED STATES PATENT OFFICE.

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WELT MECHANISM FOR FULL-FASHIONED-KNITTING MACHINES.

Application filed June 9, 1927, Serial No. 197,608. Renewed August 30, 1928.

The invention relates to the turning of the welt in full fashioned knitting machines. One object is to provide a mechanism which will perform automatically the operation of turning the welt including placing the initial course of loops back on the needles, ready to be cast off simultaneously with the fabric loops, said automatic operation taking place at all the sections or heads of the machine at the same time, thus reducing materially the time and labor now expended in making the welt on machines now in use.

Other objects of the invention will be clear from the following description and the appended claims.

In the accompanying drawings forming a part of this specification.

Figure 1 is a view of the mechanisms in position to receive the initial course of loops, in making a stocking leg.

Fig. 2 is a view similar to Fig. 1 with the parts in full lines in the relative positions assumed by them when sufficient fabric has been knit to turn the welt.

Figs. 3, 4 and 5 are views similar to Fig. 2 showing different relative positions of the parts at different periods in the operation.

Fig. 6 is a plan view of part of the mechanism.

Fig. 7 is a plan view of the hooks of the welt bar or frame.

Fig. 8 is a detail view of cam means for shifting the loop transfer frame laterally or in the direction of its axis to make its transfer points or quills align with the needles.

Figs. 9, 10, 11 and 12 are detail views of certain of the elements with the cams for operating them.

In carrying out the invention I employ a series of welt frames or bars such as shown at A, one for each set of needles or sections of the mechanism, said frames being mounted to move in unison for which purpose they are all mounted by arms A^1 upon a shaft ax which extends from one end of the machine to the other and serves all of the sections thereof. The frames or bars carry the welt hooks B to engage loops of the initial course. The frames or welt bars are under tension of a spring or springs b tending to draw said frames away from the needles, leftward in the drawings, and hence as courses are produced the frames A, A^1 under stress of the spring b will apply take-up tension to the fabric as it comes off from the needles.

The improvement also includes vertically movable hooks D which, as hereinafter described cooperate with a welt rod G to aid in the operation of turning the welt forming portion of the fabric over upon itself to have loops of the initial course of the fabric placed upon the needles. Further as one of the main elements of the apparatus there is a set of quills K for each set of needles, equal in number thereto; a pivoted frame or frames H carrying said quills and means for operating said frames to transfer the loops from the welt frames or bars to the needles.

The row of vertical needles is represented at n, the sinkers at S and the knock-over bits at k, these elements being arranged as is usual in a machine of the Cotton type.

In the operation of the machine the cam shaft C S is turned by any suitable means such as a hand crank or by auxiliary power means to cause the cam or cams C to move the welt bars or frames A up to the needles with their hooks B in position to receive loops of the first course, as shown in Fig. 1, this being a loose course. After this has taken place the cam C turning in the arrow direction passes from under the frame A^1 leaving this under the influence only of the spring b. Knitting now proceeds with the frame A, A^1 under tension of spring b acting as a take-up for the fabric as it is produced by the regular knitting operation.

In other words, this frame A virtually hangs on the fabric, it being stressed leftward by the spring b and acting to draw the fabric leftward course by course as said courses are knit. When the desired length of fabric necessary to provide a little more than one half the welt has been knit, the hooks D having been elevated to the position of Figs. 1 and 2, then welt bars G are inserted in the hooks D and on the fabric. The hooks D are elevated by the combined action of the cams E and F from the low position shown in Figs. 3 and 4 to the high position shown in Figs. 1 and 2.

This action is due to the combined action of cams E and F and the combined levers e and f. The lever e is pivoted at e' to a suitable frame part and at its free end it rests upon the cam E. The lever f is pivot-

ally mounted to the lever *e* at the intermediate point e^2.

The lever *f* is in the form of a ball crank the vertical arm of which constitutes the hook D and the horizontal arm of which rests upon cam F, being pulled down by a spring f^2. The elevated position of the hooks D is at a point above the plane of the fabric. The welt rod G is inserted above the fabric and into the hooks D.

This can be done while the knitting goes on to complete enough length of fabric to form the welt and the take-up frame is receding from the needle row.

When the fabric has attained sufficient length to form the welt, then the hooks D move vertically downward and pull the fabric down at the center of its length, see Fig. 3. This will cause the take-up or welt frame A to move back or rightward towards the needles until it is stopped by coming against stop fingers *h* on the loop transfer frame H which is mounted on pivots I about the axis of which the transfer frame is turnable. This stopping of the take-up frame in a definite position by making it retreat towards the needles after having advanced during the production of enough fabric for the welt is for the purpose of presenting the loops of the initial loose course now on the hooks B of the take-up frame, at a point where the transfer points or quills K can engage the said loops with certainty and carry them back to the needles to be delivered thereupon. The transfer points are in the form of quills K such for instance as are commonly used in a transfer ring. In the present case there is a row of these transfer quills, one for each needle, carried by the frames H and as this frame swings in the arrow direction Fig. 3 the transfer points will enter the loops extending from the take-up or welt hooks B. For this action the transfer frame has its transfer points or quills directed upwardly. They normally lie below the plane of the fabric and as they move up along their arc shaped path they pass through the loops hanging on the welt hooks B and take these loops from said hooks and carry them to the needles to be transferred onto the same, see Fig. 4. Fig. 5 shows the operation completed and regular fabric begun.

The take-up hooks B are formed with broad bases as shown in the plan view Fig. 7, so that the loops carried thereby will be spread out in order that they may readily receive the transfer quills to be carried thereby to the needles.

In the initial operation i. e. getting the loops from the needles onto the hooks it will be understood that the hooks are positioned below the plane of the sinkers and above that of the knock-over bits and the needles rise between the shanks of these hooks, take new yarn, and the sinkers advance and measure off new loop lengths. The sinkers now retract and the stitches are deposited onto the stems of the hooks to be taken by said hooks. When the loops are to be transferred to the needles by the quills, said quills are lowered by the final movement of the transfer frame H over the needles which take on the said loops. The quill carrying frame now restores to normal position and the apparatus is ready for a new operation. The usual elastic straps are attached to the welt rod G for the take up of the fabric as it is produced after the welt is formed.

The transfer frame is operated in swinging towards the needles and away therefrom by pinions, one of which is shown at L. There is one of these pinions at each end. They are operated by segmental racks, one of which is shown at M:

These racks are carried by levers, one of which is shown at N pivoted to a frame part at O with its lower end bearing upon a cam J having a high part J^1 which will give the desired swing to the segments.

The segments are returned by a spring P.

The downward vertical movement of the hooks D is due to the fact that the bell crank lever *f* and the lever *e* compensate for each other. The cams E and F are so related and timed that as the lever *e* falls the lever *f* swings on its pivot relative to the lever *e* and hence hook D may be maintained in substantially upright position during this falling action.

Means are provided whereby the transfer frame is shifted laterally after it leaves the take-up frame, so that the loops on the quills may be brought into accurate alignment with the needles. It will be understood that in receiving the loops of the loose course the take-up hooks B lie in the spaces between the needles, and hence take the sinker loops, whereas when they deliver these loops to the needles the said loops must be presented in alignment with the said needles. This condition is taken care of by having a cam which when the transfer frame is swinging from its forward or idle position to its position at the needles, will cause said frame to move laterally as a whole to bring its quills into exact alignment with the needles. This cam is shown at *i* on the pinion of the swinging frame cooperating with a cam *j* on the rack segment.

When the welt fabric is doubled over it should be kept taut during the whole procedure of transferring the loops to the needles. For this purpose the hooks D move down to take up any slack in the fabric, and then the said hooks are left free to be under tension of the spring f^2 which stresses the hooks leftward to keep the fabric taut while the doubling over and loop transferring action is performed. This leftward tendency

of the hooks D takes place when the low part of the cams E and F controlling the motion of this hook comes below the lever system. At such time the hook D is under the influence of its spring alone and hence this hook with the welt-rod G can hang in the fabric under spring tension.

The downward movement of the hooks is substantially vertical owing to the lever system described.

The whole apparatus can be operated from the main cam shaft by an auxiliary motor or the cam shaft may be turned over by a hand crank.

To state the operation briefly:

The welt hooks (B) go in between the sinkers (S) and knocking over bits (*k*) when the needles are at the bottom of their stroke.

The needles then come up between the welt hooks (B) and receive the stitches from the sinkers. On the down stroke of the needles these sinker stitches or loops are laid on the welt hooks. When the needles are at the end of their down stroke the frame (A^1) which carries the welt hooks (B) is released by the cam, allowing the spring (*b*) to pull the hooks (B) to the left so that when the needles rise the end of the hooks will be back of the needles.

The machine then knits in the regular way until the required length of fabric is knitted.

In the turning of the welt when the needles take the stitches from the quills (K) their movement is the same as it is when the machine is doing the regular transfer work for narrowing the leg of the stocking but the regular transfer points are held up out of action, until after the welt is turned.

As shown in Fig. 6, the frames H are substantially U-shape with their arms *hx* pivotally mounted in suitable bearing I*x* at their intermediate points.

I claim:

1. Automatic welt forming apparatus for full fashioned knitting machines comprising take-up means having hooks to engage loops of the initial loose course, at the several sections of the machine, said means receding from the needles as the courses are formed, a loop transfer member having transfer points to take the loops from the said take-up means after sufficient length of fabric has been knit to form the welt and to carry said loops from said take-up means back to the needles, and means for operating the take-up means and the transfer member, substantially as described.

2. Automatic welt forming apparatus for full fashioned knitting machines, according to claim 1, in which the loop transfer member has swinging movement automatically from the hooks of the take-up means to the needles, substantially as described.

3. Automatic welt forming apparatus according to claim 1 in which means are provided for retracting the take-up means to a definite point, prior to the engagement of the transfer points with its loops to insure accurate engagement of said points with said loops, substantially as described.

4. In combination in a full fashioned knitting machine, welt hooks for engaging the initial course of loops, a carrier for said hooks pivotally mounted, means for stressing said carrier to take up the fabric as it is knit, means for transferring loops from said hooks to the needles after sufficient fabric has been knit to form the welt, and means for retracting the welt hook carrier to a definite point to make the loops carried thereby register with the pathway of the transfer points.

5. In combination in a full fashioned knitting machine, welt hooks, a carrier therefor, means for moving the carrier to position said hooks at the knitting elements to receive the first course of loops therefrom, means for moving the said carrier away from the needles as the knitting proceeds, transfer points to take the loops from the welt hooks and move them to the needles, and means for registering the welt hooks in relation to the path of the transfer points, substantially as described.

6. In combination in a full fashioned knitting machine, welt hooks to engage loops of the initial course, a carrier for said hooks, means for moving said carrier to apply tension to the fabric, transfer points to take the loops from said welt hooks and transfer them to the needles, carrier means for said points, and means for stressing the fabric at a point between the needles and the welt hooks, and stop means for registering the welt hooks in relation to the path of the transfer points, substantially as described.

7. Welt forming mechanism for full fashioned knitting machines according to claim 6 in which the means for stressing the fabric exerts control thereupon while the transfer of loops is being effected, substantially as described.

8. In combination in a full fashioned knitting machine, welt hooks, a carrier therefor, means for moving said carrier away from the needles as the fabric is knit, bars resting on the fabric, means for stressing said bars downwardly, stops for determining the position of the welt hooks when retracted by the said bars stressing said fabric downwardly, transfer points for moving the loops from the welt hooks to the needles, and carrier means for said transfer points with means for operating the same, substantially as described.

9. Welt forming mechanism according to claim 8 in which the means for stressing the bars resting on the fabric consists of a bell crank lever having hooks engaging said bars, a carrier lever to which the bell crank is

pivoted, a spring for stressing the bell crank lever and a cam for operating the carrier lever, substantially as described.

10. In combination in a full fashioned knitting machine needles, welt hooks, a carrier therefor, transfer points, to take the initial loops from the welt hooks, a carrier therefore to move the transfer points to the needles to deliver the loops thereto, means for stressing the fabric for the welt at an intermediate point thereof, and a cam shaft having cams for operating the said carriers and fabric stressing means, substantially as described.

11. In combination in a full fashioned knitting machine, welt hooks, a carrier therefor, means for operating the carrier to position the welt hooks in the spaces between the needles to receive the initial course of fabric, means for retracting said carrier away from the needles as the fabric is produced, transfer points to take loops from the welt hooks and transfer them to the needles, a carrier for said transfer points and means for shifting said carrier laterally to register the loops taken from the welt hooks with the needles, substantially as described.

12. Welt turning mechanism according to claim 11 in which the means for shifting the carrier of the transfer points consists of a cam incline on a part of the said carrier engaging a complementary member, substantially as described.

13. Welt turning mechanism according to claim 11 in which the carrier for the transfer points has a pinion operated by an oscillatory rack and the shifting means for said carrier consists of complementary inclines on the pinion and rack, substantially as described.

14. Welt turning apparatus according to claim 1 in which the welt hooks have points with broad bases to spread the loops for their engagement by the transfer points, substantially as described.

15. In combination in a full fashioned knitting machine, open welt hooks facing upwardly, a carrier therefor to present the hooks to the spaces between the needles to have the loops deposited thereon, said carrier moving the hooks away from the needles as the fabric is produced, a carrier for transfer points, transfer points on said carrier extending upwardly to take the loops from the welt hooks by an upward movement in respect thereto and means for operating the carrier to take the loops and transport them back to the needles, substantially as described.

16. In combination in a full fashioned knitting machine, welt hooks, a carrier therefor, means for moving said carrier to and from the needles, transfer points and carrier means therefor for removing the loops from the welt hooks and transporting them back to the needles while the welt hooks remain in their position away from the needles, substantially as described.

17. In apparatus according to claim 6 the said stop means being on the carrier of the transfer points, substantially as described.

18. In a full fashioned knitting machine and in combination, welt hooks, a carrier therefor to draw the fabric away from the needles as it is being knit, welt bars, means for detachably receiving said welt bars when placed on the fabric and for moving said bars in a downward direction to stress the fabric, said means holding the bars while the fabric is being turned, transfer points for taking the loops from the welt hooks and transferring said loops to the needles, and a carrier for the transfer points.

19. Apparatus according to claim 15 in which the carrier for the transfer points swings upwardly to take the loops continuing thence towards the needles and downwardly to deposit the loops onto said needles, substantially as described.

In testimony whereof, I affix my signature.

KENNETH HOWIE.