Sept. 6, 1927. 1,641,590

F. E. JONES

FEEDING MEANS FOR KNITTING MACHINES

Filed Aug. 1, 1922 5 Sheets-Sheet 1

Fig. 2.

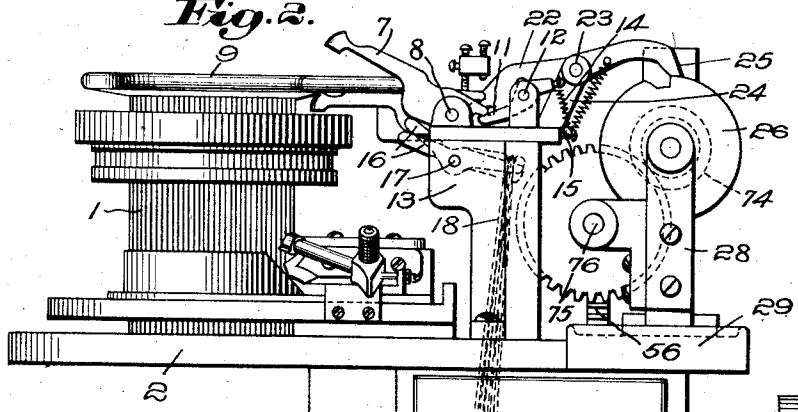
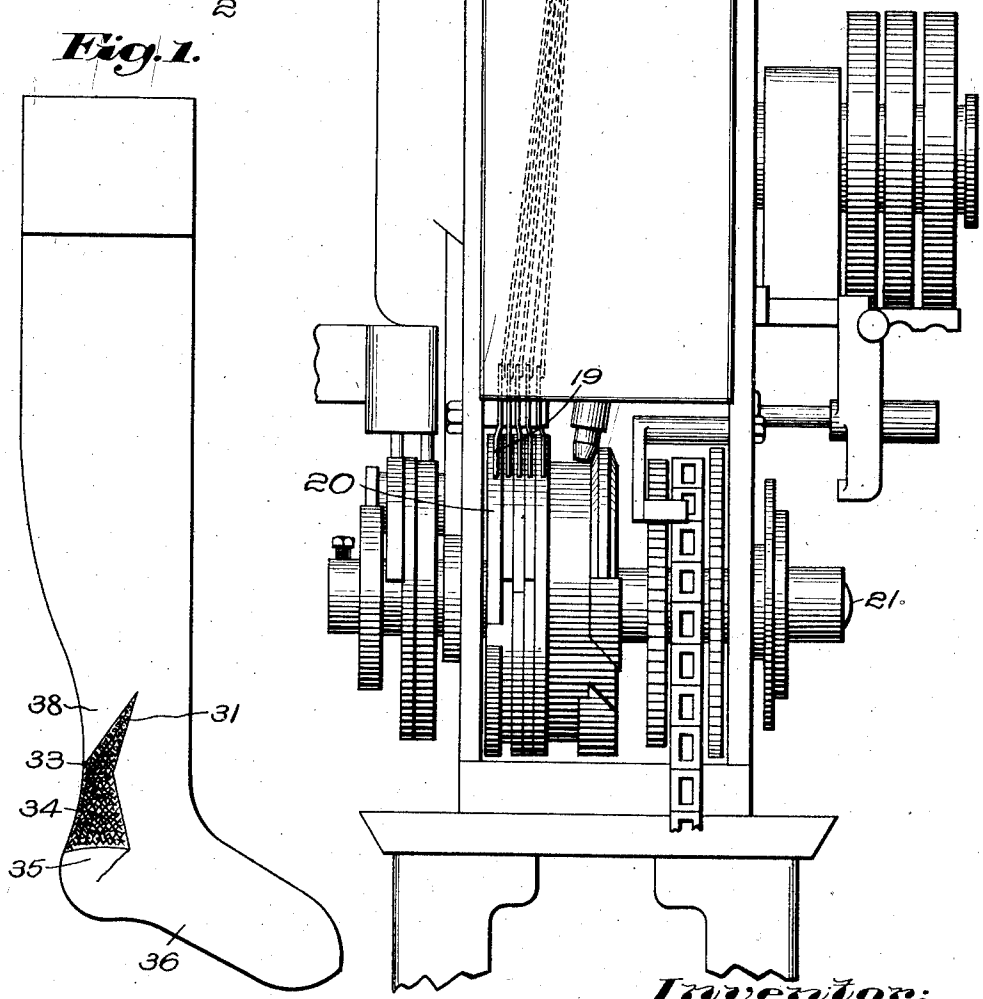


Fig. 1.



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Fig. 3.

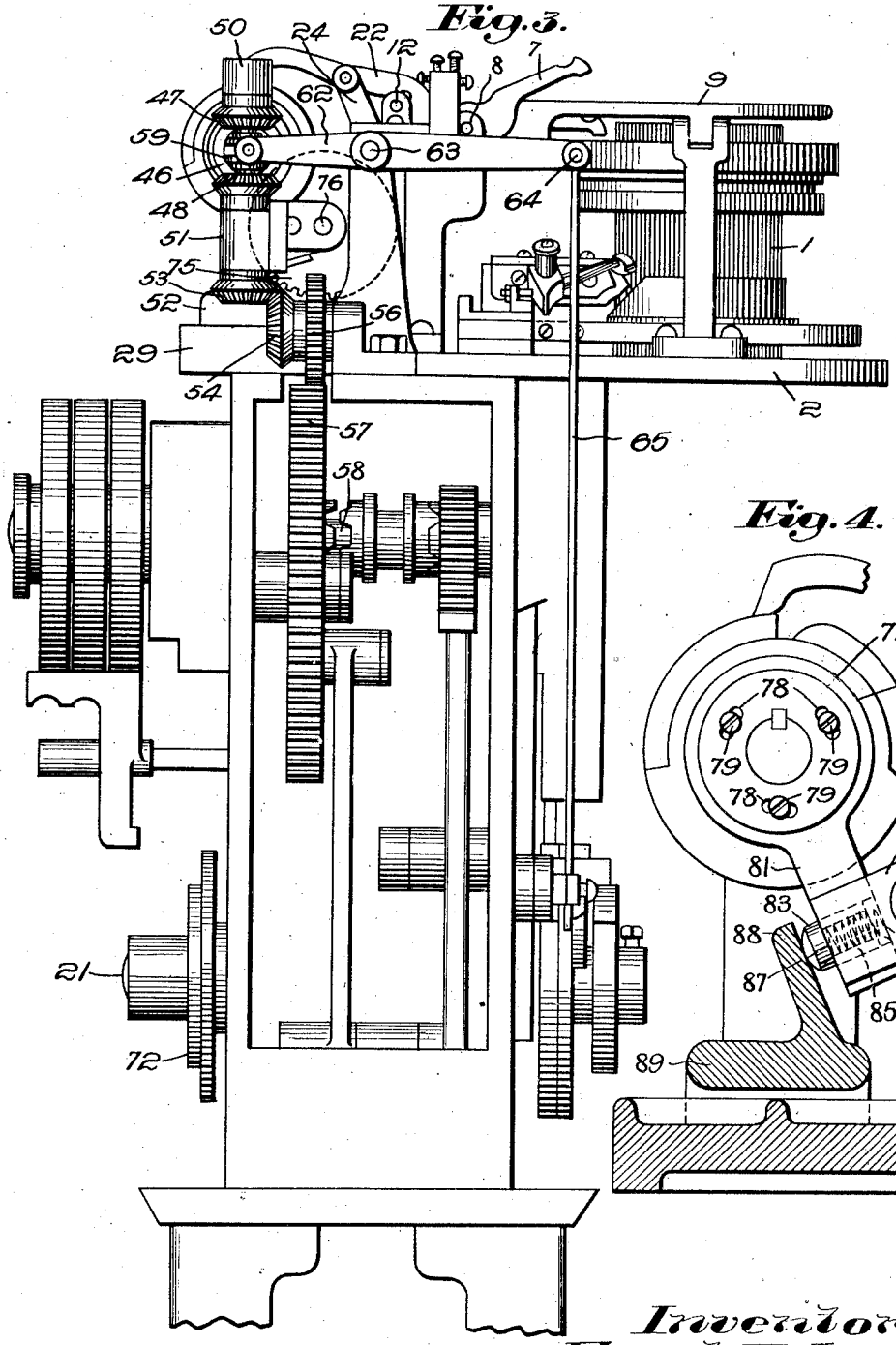


Fig. 4.

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FEEDING MEANS FOR KNITTING MACHINES

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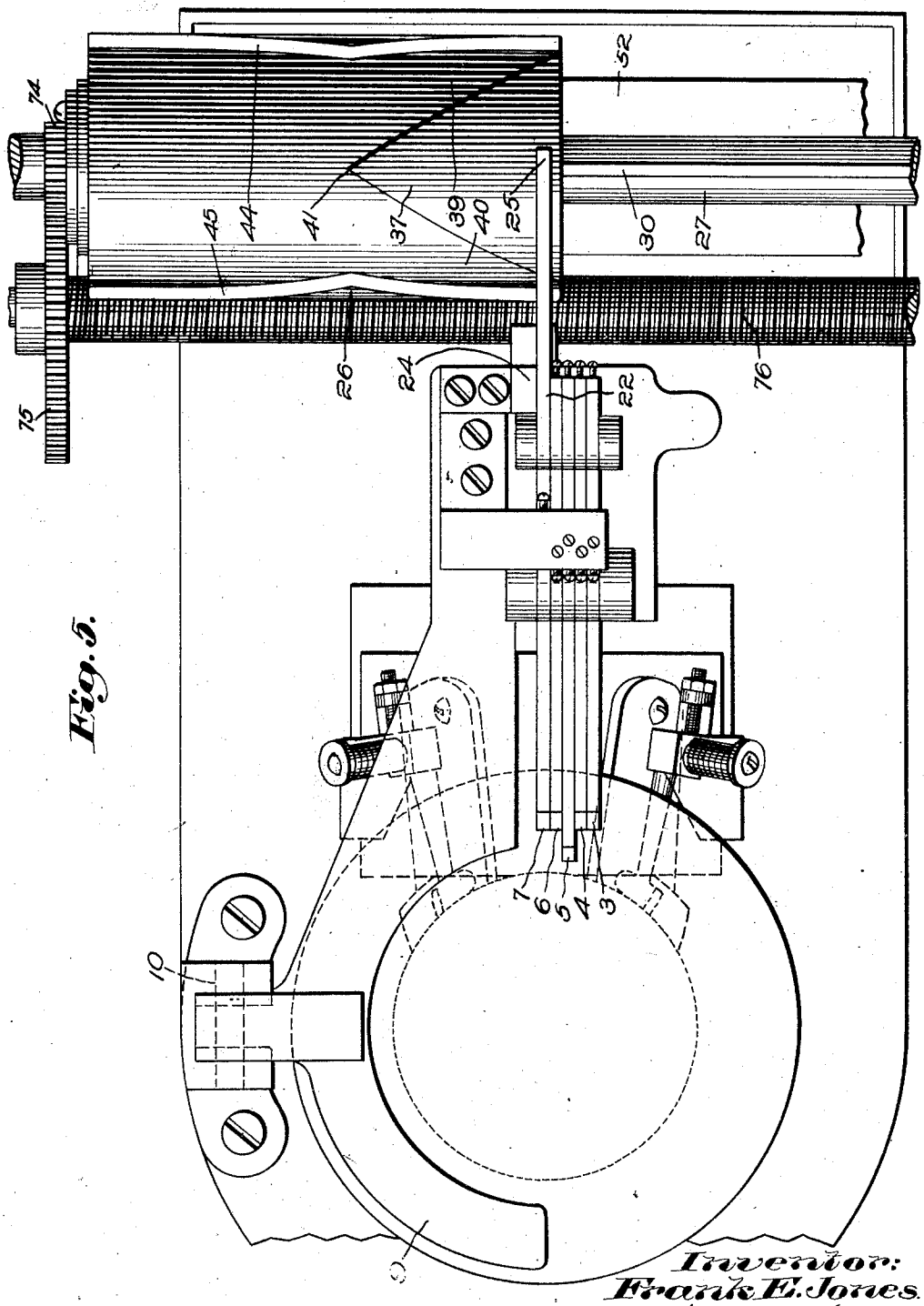


Fig. 5.

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FEEDING MEANS FOR KNITTING MACHINES

Filed Aug. 1, 1922 5 Sheets-Sheet 4

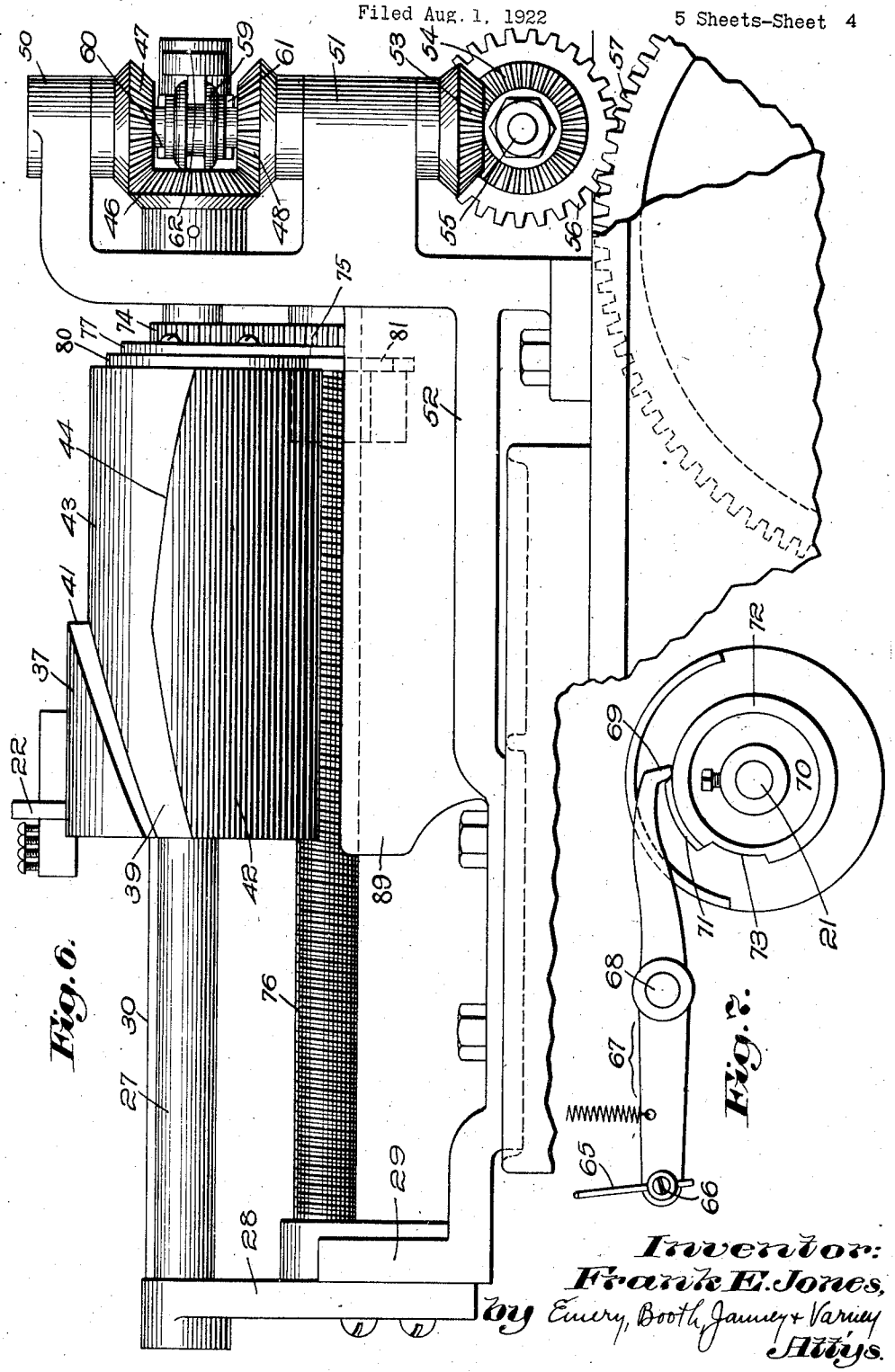


Fig. 6.

Fig. 2.

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Sept. 6, 1927. 1,641,590

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FEEDING MEANS FOR KNITTING MACHINES

Filed Aug. 1, 1922 5 Sheets-Sheet 5

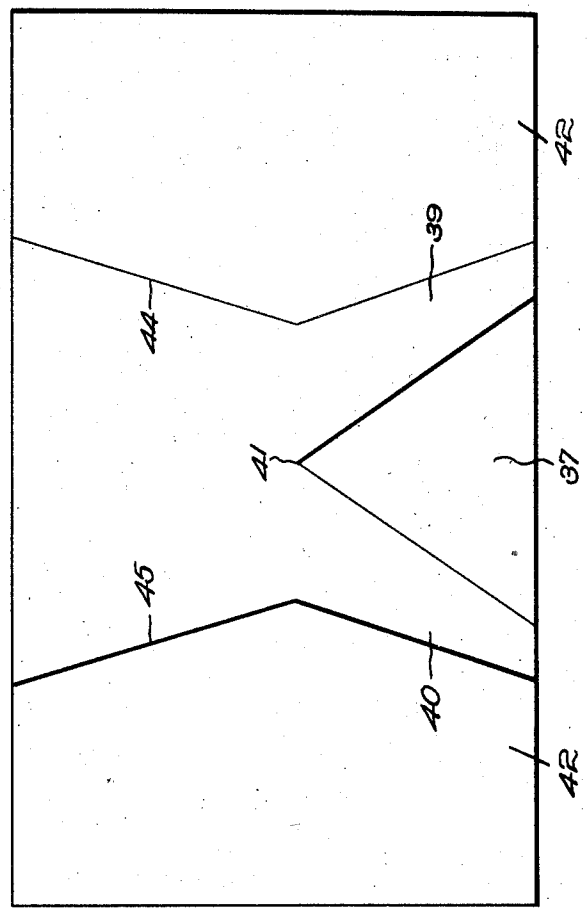


Fig. 9.

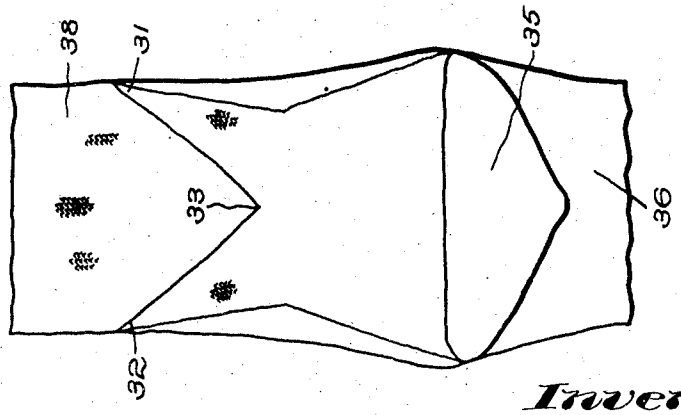


Fig. 8.

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Patented Sept. 6, 1927. 1,641,590

UNITED STATES PATENT OFFICE.

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FEEDING MEANS FOR KNITTING MACHINES.

Application filed August 1, 1922. Serial No. 578,873.

This invention relates to feeding means for knitting machines and particularly to means for feeding a reinforcing yarn or thread to circular knitting machines for varying lengths of portions of successive courses and particularly to spaced portions of the same course in a plurality of successive courses, as, for example, at the heel portion of a stocking for the formation of a peculiarly shaped high splice, the edges of which are not parallel to each other, but which are inclined and are in part so positioned as to create a bifurcation or lateral wings.

In order that the principle of the invention may be readily understood, I have disclosed one embodiment thereof in the accompanying drawings, wherein:

Fig. 1 is a side elevation of a so-called seamless stocking to the making of the high splice heel portion whereof my invention may be applied;

Fig. 2 is a front elevation of a knitting machine to which my invention may be applied;

Fig. 3 is a rear elevation of the mechanism shown in Fig. 1;

Fig. 4 is a detail in end elevation of the pattern cam and closely related parts;

Fig. 5 is a plan view of the mechanism shown in Fig. 2;

Fig. 6 is a side elevation of the pattern cam and its immediately controlling mechanism;

Fig. 7 is a side elevation of the cam and lever controlling the clutch for the pattern cam;

Fig. 8 is a diagram representing the entire high splice formation; and

Fig. 9 is a development of the pattern cam to show the high and low surfaces thereof.

My invention, relating as it does to circular knitting machines, may be applied to and embodied in various types of such machines, but I have chosen to represent the same as applied to a machine of the well known Banner type disclosed in the patent to Joshua D. Hemphill, No. 933,443, dated September 7, 1909. In this type of machine, the needle cylinder is cylindrical and rotates, while the cams remain stationary, and although the machine disclosed is for the purpose of producing hosiery, it is obviously not limited to such class of work. I will, however, describe my invention as applied to a machine of the said type without in all respects limiting it thereto.

Generally speaking, the machine includes a rotating needle cylinder 1 mounted upon a suitable table 2 constituting a part of the frame of the knitting machine, and as is customary in this type of machine, said cylinder is arranged to be rotated and reciprocated to form the fashioned and tubular portions of a stocking respectively. The means for effecting the rotary and reciprocating movements are substantially the same as those shown and described in said Hemphill patent, and being well known, need no further description.

A plurality of yarn or thread feeding elements are provided and which are herein shown as consisting of five pivoted yarn or thread guides, all pivoted at 8 upon a partial ring 9 shown most clearly in plan in Fig. 5 and itself suitably supported as indicated at 10 so that it may be swung up out of action to afford access to the needles or for any other purpose. The partial ring 9 is of the type usually employed in the Banner machine equipped with spring beard needles, but obviously my invention may be employed in connection with either spring beard or latch needles, and in the latter case a complete circle latch ring would be employed.

Each of said yarn or thread guides, excepting the guide 7, is normally pressed or urged into action by one of the series of levers 11 one of which is indicated in Fig. 2 as mounted at 12 upon a standard 13 rising from the framework of the machine, each lever having attached to its outer or right hand end viewing Fig. 2 a coiled spring 14 connected at its lower end to a screw or pin 15 on the standard 13, thus tending to move each of the specified levers into operative position. Such movement of such levers into operative position is, however, at times opposed and overcome by a series of levers, one for each of said yarn or thread guides 3 to 6 inclusive, one of such levers being indicated at 16 in Fig. 2 as pivoted at 17 upon the standard 13 and as having connected to its right hand end viewing said figure a wire or link 18 extending downward to and connected to a suitable lever 19 riding upon a suitable cam 20 mounted upon a disk or cam of the cam shaft 21 in a manner not necessary herein to describe, as it is similar

to the construction shown in the said Hemphill patent. There being four levers 16 for the four yarn or thread guides 3, 4, 5, 6, it is evident that according to the dictates of the cams upon the disk or drum, the guides 3, 4, 5 and 6 are permitted to act at suitable times, as, for example, to supply a thread for the leg of the stocking, another for the heel, another for the reinforcement of the heel and another for the foot.

In addition to the yarn or thread guides 3, 4, 5 and 6, there is provided, as stated, a yarn or thread guide 7, the purpose of which in the disclosed embodiment of the invention is to provide a high splice of peculiar shape and desirably bifurcated in part, which is done by introducing a reinforcing yarn or thread above the heel and desirably for successively increasing lengths or portions of a series of successive courses at two places in each of said courses, so as to form two parts of the said bifurcation which after union merge into the lower part of the high splice. For this purpose the said yarn or thread guide 7 is pivoted at 8 and its outer end is adapted to be acted upon in any suitable manner by a lever 22 pivoted at 23 upon a bracket 24 extending upward from the standard 13, as by means of interengaging formations upon said levers 7 and 22 to ensure a positive action of the lever 7 in both directions. The opposite end of the lever 22 has an end 25 adapted to ride upon a pattern drum 26 mounted for rotative and axial movement upon a shaft 27, itself mounted in standards 28, one of which is clearly shown in Fig. 2, as rising from a bracket 29 secured upon the bed plate of the machine. The shaft 27 has a spline 30 which enters a groove in the pattern drum 26, so that the rotation of said shaft 27 compels rotation of said drum but permits the traverse of the drum lengthwise said shaft by the mechanism hereinafter described.

The drum 26 is of peculiar contour in the disclosed embodiment of the invention so as to effect the formation of a reinforcement at a plurality of spaced points or areas in the same course and in succeeding courses. Referring only to the disclosed embodiment of the invention and to the high splice reinforcement which is shown in Figs. 1 and 8, the said reinforcement is represented as having a bifurcation composed of members 31, 32 which commence at points at the opposite sides of the ankle and progressing downward over gradually increasing portions of successive courses, finally meet at a point 33 at the back of the heel after which the high splice is continued downward at 34 in an area of preferably gradually increasing extent measured along the courses until the heel 35 is reached, at which point the high splice yarn or thread may be replaced by the usual heel yarn or thread or may be continued if desired. Desirably, however, the high splice yarn or thread is replaced by the heel yarn or thread and said high splice yarn or thread may be again introduced to form the reinforced sole 36.

Thus the high splice of the form herein disclosed has divergent prolongations viewing the completed stocking, or converging and meeting spaced prolongations viewing the ankle of the stocking as it is being knitted. The reinforce as a whole has an initially formed bifurcation and in its disclosed form the high splice is a tapering reinforce with a diverging or converging bifurcation.

I provide pattern means for causing a plurality of reinforced areas or zones in the same course, and for continuing said reinforcing areas in succeeding courses and gradually elongating in the succeeding course the lengths of the reinforcements until said areas or zones meet and I provide means for continuing the reinforcement after the meeting of said areas or zones, as a single reinforcement of gradually increasing circumferential extent.

To this end the pattern drum 26 as indicated most clearly in Figs. 5 and 6 and in the development of said pattern drum in Fig. 9, is provided upon its periphery with a portion 37 of greatest radial height or extent and of generally triangular contour, said portion 37 being at the left hand end viewing Fig. 6 of the pattern drum, so as to be the portion first to act upon the lever 22 and to cause the thread guide 7 to be elevated into inactive position as shown in Fig. 2, thereby to prevent the feeding of the reinforcing yarn to the area 38 between the reinforcing areas 31, 32 of the stocking shown in Fig. 1. At either side of the high surface 37 of the pattern drum 26 are the two low areas 39, 40 which are both tapered as indicated in the several figures and extend to the left hand end of the pattern drum 26, viewing Fig. 6. The rest of the circumference or periphery of the pattern drum 26 between the left hand end of said drum and a circumferential line cutting the point or end 41 of the high surface 37 is a high surface and is indicated at 42, the purpose of such high surface being to keep the thread guide 7 elevated into non-functioning position during the knitting of the front portion of the ankle. When the lever 22 rests in the depressed portions 39, 40, the thread guide 7 is lowered into functioning position and thereby introduces the reinforcing thread in such manner as to effect the formation of the bifurcations 31, 32 of Fig. 1.

The remaining portion of the pattern drum 46 is composed of a low surface 43, which is a continuation of the low surfaces 39, 40 but is characterized by edges or limit-

ing walls 44, 45 separating the same from the high surface which is merely a continuation of the high surface 42 and exists throughout the remainder of the peripheral extent of the pattern drum 26. The low surface 43 is so shaped that when the lever 22 rests thereon it causes the introduction of the reinforcing yarn or thread through constantly increasing portions of successive courses so as to form the portion 34 of the high splice shown in Fig. 1.

It will be observed that the pattern drum 26 has upon its periphery throughout approximately one half the length thereof two portions of greatest radial height separated by two opposite portions of less radial height along lines inclined to lines normal to the ends of the pattern drum, and that throughout the remaining portion of the length of the pattern drum, it has upon its surface two portions of greatest and less radial height separated by walls inclined to lines along the surface normal to the ends of the drum. The said inclined lines may be slightly or somewhat curved instead of being entirely straight.

At the commencement of the reinforcing action of the yarn guide 7 the drum 26 may be assumed to be in the position shown in Fig. 6 and at that time the said yarn guide 7 is permitted to feed its reinforcing yarn or thread for the minimum length of time dependent upon the short peripheral extent of the portions 39, 40. As the drum 26 is traversed axially at a uniform speed, the yarn guide 7 will periodically be moved positively downward into action for successively increasing lengths or portions of partial courses at a plurality of zones or places in each course until the point 33 in Fig. 1 is reached. As the axial movement of the drum 26 continues the lever 22 controlling the yarn guide 7 will then ride upon the surface 43 and the surface constituting the longitudinal continuation of the surface 42, so that the reinforcement 34 is formed, after which the regular reinforcement of the heel pocket is desirably but not necessarily provided by another yarn guide for that purpose. It will be understood that so long as the yarn guide 7 is controlled by the pattern drum 26, said yarn guide will be moved into and out of action at the times indicated and for the purpose stated. At all other times than during the formation of the high splice, the said yarn guide 7 is held positively out of action by one of the series of levers 16, it being understood that the number of said levers 16 is equal to the entire number of yarn guides 3 to 7. Furthermore, the lever 16 for the yarn guide 7 will be so controlled that it will move the end 25 of the lever 22 slightly above and out of contact with the pattern drum 26, whenever said drum is not functioning, and this non-functioning position of the yarn guide 7 and its lever 16 will also occur during the reverse movement or traverse of the pattern drum 26, that is, during the movement thereof toward the right viewing Fig. 6.

Any suitable means may be provided to rotate and to traverse the pattern drum 26. Herein for the purpose I have provided the following mechanism: Fast upon the shaft 27 is a beveled gear 46 meshing with two beveled gears 47, 48, each loosely mounted upon an upright shaft 49 supported in extensions 50, 51 of the supporting bracket 52 and having fast upon its lower end a beveled gear 53 meshing with and driven by a beveled gear 54 upon a suitably supported shaft 55 also having fast thereon a gear 56 which meshes with and is driven by a large gear wheel 57 on the main drive shaft 58 of the machine.

The beveled gears 47, 48 are adapted periodically to be alternately clutched to the shaft 49 and therefore periodically alternately to rotate the shaft 27 in opposite directions, the gear 47 being employed to rotate the pattern drum 26 while the same is being traversed toward the left viewing Fig. 6, and the beveled gear 48 being employed to rotate said pattern drum when the same is being traversed toward the right viewing Fig. 6.

The clutch for alternately connecting the beveled gears 47, 48 to the shaft 49 is indicated at 59 in Fig. 6, said clutch having members 60, 61 adapted to be interengaged with corresponding formations upon the beveled gears 47, 48 to effect the functioning and non-functioning of the traverses of the pattern drum 26, after which said gears 47, 48 stand or remain unclutched until the time occurs to form the described high splice for the next stocking or to form a reinforcement comprehended by this invention, upon the chosen fabric.

In order to shift the said clutch 59 at proper times it is mounted upon the end of a lever 62 shown most clearly in Fig. 3 as pivoted at 63 upon the standard and having connected at its opposite end at 64, a wire or link 65, the lower end whereof is shown in Fig. 7 as pivotally connected at 66 to a lever 67 itself pivoted at 68 upon the framing of the machine. The opposite end of the lever 67 is provided with a nose 69 bearing upon a cam 70 upon the cam shaft 21. The said cam 70 is provided with an elevation 71 of greatest radial height with another portion 72 of lesser height and another portion 73 of least radial height. So long as the nose 69 of the lever 67 is in engagement with the cam formation 71, the gear 47 is clutched to the shaft 49 with the result that the pattern drum 26 is rotated and traversed toward the left viewing Fig. 6, so as to cause

the yarn or thread guide 7 to present its yarn or thread for the described length of time to the needles and thus to form a high splice in the manner described, it being understood that the yarn or thread of the guide 8 for those parts of the high splice courses where the thread is not fed to the needles, may be and desirably is floated until reintroduced and is cut out after completion of the knitting.

When the nose 69 of the lever 67 rides in the depression 73, the beveled gear 48 is splined to the shaft 59, and the drum 26 is rotated and traversed toward the right viewing Fig. 2, so as to return the pattern drum to its initial position. This is the non-functioning traverse of the pattern drum and during such return movement of such pattern drum the yarn or thread guide 7 is not permitted to be thrown into and out of action by the pattern drum 26 but the said yarn or thread guide is held out of action by the lever 16 therefor in the manner already described.

The cam portion 72 serves to hold the guide 7 out of functioning relation with respect to the pattern drum 26 so that said guide does not function. The length of the cam portion 72 corresponds to the length of time that the pattern drum remains stationary without either traversing or rotary movement, inasmuch as neither gear 47 nor 48 is clutched to the shaft 49. In other words the yarn or thread guide 7 is permitted to function by throwing its yarn or thread into engagement with the needles and withdrawing it therefrom for the indicated length of time or portions of courses only while the nose 69 of the lever 67 is in engagement with the cam 71.

Any suitable means may be provided to traverse the pattern drum 26. Herein for the purpose I have provided a gear 74 shown in Fig. 5 as upon the shaft 27 and as meshing with a larger gear 75 upon a worm or screw 76 mounted in the brackets 28 wherein the shaft 27 is supported and in parallelism therewith. The speed of rotation of the worm is such as to cause the pattern cam 26 to be traversed at the proper speed to form the high splice described.

In order to cause the rotative movement of the worm 76 to be conveyed to the drum 26 and to result in a traversing movement of the latter, I have provided upon one end of the drum 26 a ring like member 80 which encircles the shaft 27 with capacity for slight circumferential movement with respect to said shaft 27, for which purpose said member 80 is provided with curved slots underneath and coincident with the slots 78 receiving screws 79 in a washer 80 by which said washer and said ring-like member are secured to the end of the pattern drum 26. The said ring like member 80 is provided with a radial arm 81 carrying a half nut 82, the threads whereof engage those of the worm or screw 76. The said half nut 82 is held in yielding driving relation with the worm 76 by means of a plunger 83 received in a recess 84 of the half nut 82, the said plunger 83 itself being hollow and receiving therein a coiled spring 85 which at one end presses at 86 against the half nut 82 and at the other end 87 presses against the plunger 83. The said plunger 83 bears against the inclined face 88 of a bracket 89, the said face being of sufficient length to receive the plunger 83 during the entire traversing movement of the pattern drum 26 and hence during that entire time to hold the half nut 82 in driving relation with the worm or screw 76.

It will be evident from the foregoing description that at the commencement of the high splice at the tips of the bifurcations 31, 32 the pattern drum 26 is in substantially the position shown in Fig. 6, and at that time the beveled gear 47 is clutched to the shaft 49, so that said pattern drum 26 is rotated and at the same time is slowly traversed toward the left viewing Fig. 6, and therefore the yarn or thread guide 7 is moved into and out of action so as to supply the yarn or thread to the needles for successively increasing partial lengths of successive courses at two spaced areas, and to float the yarn or thread during the remaining portions of said courses, until the point is reached where the bifurcations 31, 32 meet and thereafter until the bottom of the high splice is reached at any suitable point as for instance at the top of the heel pocket. At that time, the toe 69 of the lever 67 rides off the cam 71 into the recess 73 and accordingly the bevel gear 48 is clutched to the shaft 49 and the pattern drum 26 is traversed non-functioningly in the opposite direction during which time the yarn or thread guide 7 is held up in inactive position by its lever 16. When the neutral cam portion 72 is reached, the effect upon the lever 67 is to hold the guide 7 in its non-functioning elevated position, so long as lever 67 rides upon the cam portion 72 the pattern drum 26 remains quiescent without either rotation or traverse, it being in position to act upon the guide 7 when the two spaced tips of the bifurcation of the high splice of the next stocking is reached.

Having thus described one illustrative embodiment of my invention, I desire it to be understood that although specific terms are employed, they are used in a generic and descriptive sense and not for purposes of limitation, the scope of the invention being set forth in the following claims.

Claims:

1. A hosiery knitting machine comprising knitting cams and a series of needles,

a main thread guide, a single reinforcing thread guide having movement into and out of action only in a direction substantially axially of the needles, and means for moving said single reinforcing thread guide into operative position to introduce the reinforcing thread therefrom at a plurality of spaced areas in each of a plurality of consecutive courses having movement into and out of action only in a direction substantially axially of the needles.

2. A circular hosiery knitting machine comprising a circular series of needles, knitting cams, a main thread guide, a single reinforcing thread guide having movement into and out of action only in a direction substantially axially of the needles, and means to control and operate the said single reinforcing thread guide to cause it to introduce the reinforcing thread at a plurality of spaced areas in each of a series of successive courses having movement into and out of action only in a direction substantially axially of the needles.

3. A circular hosiery knitting machine comprising a circular series of needles, knitting cams, a main thread guide, a single reinforcing thread guide having movement into and out of action only in a direction substantially axially of the needles, and means to control and operate the said single reinforcing thread guide to cause it to introduce the reinforcing thread at a plurality of spaced areas in each of a series of successive courses and for increasing extents in the successive courses having movement into and out of action only in a direction substantially axially of the needles, so that a plurality of tapered solid reinforced areas are produced.

4. A circular knitting machine comprising in combination, a circular series of needles, knitting cams, a main thread guide, a single reinforcing thread guide having movement into and out of action only in a direction substantially axially of the needles, and means to control and operate the said single reinforcing thread guide to cause it to introduce the reinforcing thread at two spaced areas in each of a series of successive courses having movement into and out of action only in a direction substantially axially of the needles and for increasing extents in the successive courses until said two areas meet.

5. A circular knitting machine comprising, in combination, a circular series of needles, knitting cams, a main thread guide, a single reinforcing thread guide, and means to control and operate the said single reinforcing thread guide to cause it to introduce the reinforcing thread at two spaced points in each of a series of successive courses and for increasing extents in the successive courses until said two areas meet, and for thereafter continuing the feeding of said reinforcing thread for the continuation of the reinforce.

6. A circular knitting machine comprising, in combination, a circular series of needles, knitting cams, a main thread guide, a single reinforcing thread guide, and means to control and operate the said single reinforcing thread guide to cause it to introduce the reinforcing thread at two spaced points in each of a series of successive courses and for increasing extents in the successive courses until said two areas meet, and for thereafter continuing the reinforce for successively increasing lengths of successive courses.

7. A circular hosiery knitting machine comprising, in combination, a circular series of needles, knitting cams, a main thread guide, a single reinforcing thread guide, and means to control and operate the said single reinforcing thread guide to cause it to introduce the reinforcing thread to produce a high splice having a bifurcated upper portion and an uninterrupted lower portion.

8. A circular hosiery knitting machine comprising, in combination, a circular series of needles, knitting cams, a main thread guide, a single reinforcing thread guide, and means to control and operate the said single reinforcing thread guide to produce a high splice having a bifurcation consisting of converging portions which meet and are thereafter continued without interruption as a high splice.

9. A circular hosiery knitting machine comprising, in combination, a circular series of needles, knitting cams, a main thread guide, a supplemental thread guide movable into and out of functioning position, and a pattern drum controlling the movements of said supplemental thread guide, said pattern drum having a high surface of tapering contour extending a portion only of the length of the pattern drum, low surfaces at each side of said high surface, and a high surface extending circumferentially from one of said low surfaces to the other, and means to cause relative traversing movement of the supplemental thread guide and said cam.

10. A circular hosiery knitting machine comprising, in combination, a circular series of needles, knitting cams, a main thread guide, a supplemental thread guide movable into and out of functioning position, and a pattern drum controlling the movement of said supplemental thread guide, said pattern drum having a high surface of tapering contour extending a portion only of the length of the pattern drum, low surfaces at each side of said high surface, and a high surface extending circumferentially from

one of said low surfaces to the other, and means to rotate said pattern drum and to move the same axially.

11. A circular hosiery knitting machine comprising, in combination, a circular series of needles, knitting cams, a main thread guide, a supplemental thread guide movable into and out of functioning position, and a pattern drum controlling the movement of said supplemental thread guide, said pattern drum having a high surface of tapering contour, low surfaces at each side of said high surface and a high surface extending circumferentially from one of said low surfaces to the other, and means to cause relative traversing movement of the supplemental thread guide and said cam.

12. A circular hosiery knitting machine comprising, in combination, a circular series of needles, knitting cams, a main thread guide, a reinforcing thread guide having up and down movement, a pattern drum for said reinforcing thread guide, and means to rotate and to traverse said pattern drum, said drum having a tapered high surface extending throughout substantially one half its length, tapered low surfaces at each side of said high surface and continued to the opposite end of the drum, the remainder of the surface of said drum being a high surface, whereby a reinforce is produced for a bifurcation with tapering portions and an uninterrupted continuation.

13. A knitting machine comprising, in combination, a series of needles, knitting cams, a main thread guide, a supplemental thread guide movable into and out of functioning position, and a pattern member controlling the movements of said supplemental thread guide, said pattern member having a high surface of tapering contour extending for a portion only of the surface of the pattern member, low surfaces at each side of said high surface, and a high surface extending from one of said low surfaces, and means to cause relative traversing movement of the supplemental thread guide and said cam.

14. A circular knitting machine comprising, in combination, a circular series of needles, knitting cams, a main thread guide, a single reinforcing thread guide, means to elevate said single reinforcing thread guide out of action and to depress it into action and means for governing the periods during which the said single reinforcing thread guide is in action during the formation of each of a relatively large number of successive courses, said governing means in co-relation with said elevating and depressing means effecting the introduction by said single reinforcing thread guide of the said reinforcing thread at two relatively widely spaced points in each of a series of successive courses and for increasing extents in the said successive courses until said two areas meet, and for thereafter continuing the feeding of said reinforcing thread from said single reinforcing thread guide to effect a continuation of the reinforce with oppositely tapered sides.

15. A circular knitting machine comprising, in combination, a circular series of needles, knitting cams, a main thread guide movable into and out of action, a single reinforcing thread guide, means to elevate said single reinforcing thread guide out of action and to depress it into action and means for governing the periods during which the said single reinforcing thread guide is in action during the formation of each of a relatively large number of successive courses, said governing means in co-relation with said elevating and depressing means effecting the introduction by said single reinforcing thread guide of the said reinforcing thread at two relatively widely spaced points in each of a series of successive courses and for increasing extents in the said successive courses until said two areas meet, and for thereafter continuing the feeding of said reinforcing thread from said single reinforcing thread guide to effect a continuation of the reinforce with oppositely tapered sides.

16. A circular knitting machine comprising, in combination, a circular series of needles, knitting cams, a main thread guide, a single reinforcing thread guide having a side by side relation with respect to the main thread guide, means to elevate said single reinforcing thread guide out of action and to depress it into action and means for governing the periods during which the said single reinforcing thread guide is in action during the formation of each of a relatively large number of successive courses, said governing means in co-relation with said elevating and depressing means effecting the introduction by said single reinforcing thread guide of the said reinforcing thread at two relatively widely spaced points in each of a series of successive courses and for increasing extents in the said successive courses until said two areas meet, and for thereafter continuing the feeding of said reinforcing thread from said single reinforcing thread guide to effect a continuation of the reinforce with oppositely tapered sides.

17. A circular knitting machine comprising, in combination, a circular series of needles, knitting cams, a main thread guide, a single reinforcing thread guide, means to elevate said single reinforcing thread guide out of action and to depress it into action and means for governing the periods during which the said single reinforcing thread guide is in action during the formation of each of a relatively large number of successive courses, said governing means and

said single reinforcing thread guide having relative traversing movement and said governing means being so constructed as to effect, with said elevating and depressing means, the introduction by said single reinforcing thread guide of the said reinforcing thread at two relatively widely spaced points in each of a series of successive courses and for increasing extents in the said successive courses.

18. A circular knitting machine comprising, in combination, a circular series of needles, knitting cams, a main thread guide, a single reinforcing thread guide, means to elevate said single reinforcing thread guide out of action and to depress it into action and means for governing the periods during which the said single reinforcing thread guide is in action during the formation of each of a relatively large number of successive courses, said governing means and said single reinforcing thread guide having relative traversing movement and said governing means being so constructed as to effect, with said elevating and depressing means, the introduction by said single reinforcing thread guide of the said reinforcing thread at two relatively widely spaced points in each of a series of successive courses and for increasing extents in the said successive courses until said two areas meet, and for thereafter continuing the feeding of said reinforcing thread from said single reinforcing thread guide to effect a continuation of the reinforce with oppositely tapered sides.

19. A knitting machine comprising in combination, a circular series of needles, knitting cams, a main thread guide, a supplemental thread guide, means for bringing said supplemental yarn guide and the needles into and out of functioning position, and means controlling such movements and including a controlling member constructed and arranged to cause the supplemental thread to be taken at two relatively widely spaced points in each of a plurality of courses and by an increasing number of needles during said successive courses, whereby two tapering reinforcements are provided side by side commencing at said relatively widely spaced points, and means for continuing such action until said tapering reinforcements meet at two adjacent edges, and means for thereafter continuing the reinforcement as a single uninterrupted reinforcement having oppositely sloping sides.

20. A circular hosiery knitting machine comprising in combination, a circular series of needles, knitting cams, a main thread guide, a high splice thread guide, means for bringing said high splice thread guide and said needles into and out of functioning relation and including means for causing the needles to take the reinforcing thread above the heel at two relatively widely spaced points in the same course at opposite sides of the ankle and in successive courses to cause an increasing number of needles to take the reinforcing thread adjacent to said two spaced points until two tapered high splice extension reinforcements are formed in side by side relation joined at their adjacent sides and thereafter continued as a single high splice reinforcement with tapered sides.

21. A knitting machine comprising, in combination, a series of needles, knitting cams, a main thread guide, a supplemental thread guide movable into and out of functioning position, and a pattern member controlling the movements of said supplemental thread guide, said pattern member having a high surface of tapering contour extending for a portion only of the surface of the pattern member, low surfaces at each side of said high surface, and a high surface extending from one of said low surfaces, said pattern member being of cylindrical form and rotatable, and a screw with rotating means therefor, to traverse said member past and in operative relation to said supplemental thread guide during the rotation of said pattern member, thereby to move said reinforcing thread guide into and out of feeding position.

22. A knitting machine comprising, in combination, a series of needles, knitting cams, a main thread guide, a supplemental thread guide movable into and out of functioning position, and a pattern member controlling the movements of said supplemental thread guide, said pattern member having a high surface of tapering contour extending for a portion only of the surface of the pattern member, low surfaces at each side of said high surface, and a high surface extending from one of said low surfaces, said pattern member being of cylindrical form and rotatable, and a screw with rotary means therefor, to traverse said member past and in operative relation to said supplemental thread guide during the rotation of said pattern member, thereby to move said reinforcing thread guide into and out of feeding position, a main pattern drum upon the machine and operative connections therefrom controlling the traversing and rotating movements of said pattern member.

In testimony whereof, I have signed my name to this specification.

FRANK E. JONES.