Oct. 29, 1929. F. E. JONES 1,733,665

YARN FEEDING MEANS FOR KNITTING MACHINES

Filed Dec. 4, 1922 4 Sheets-Sheet 1

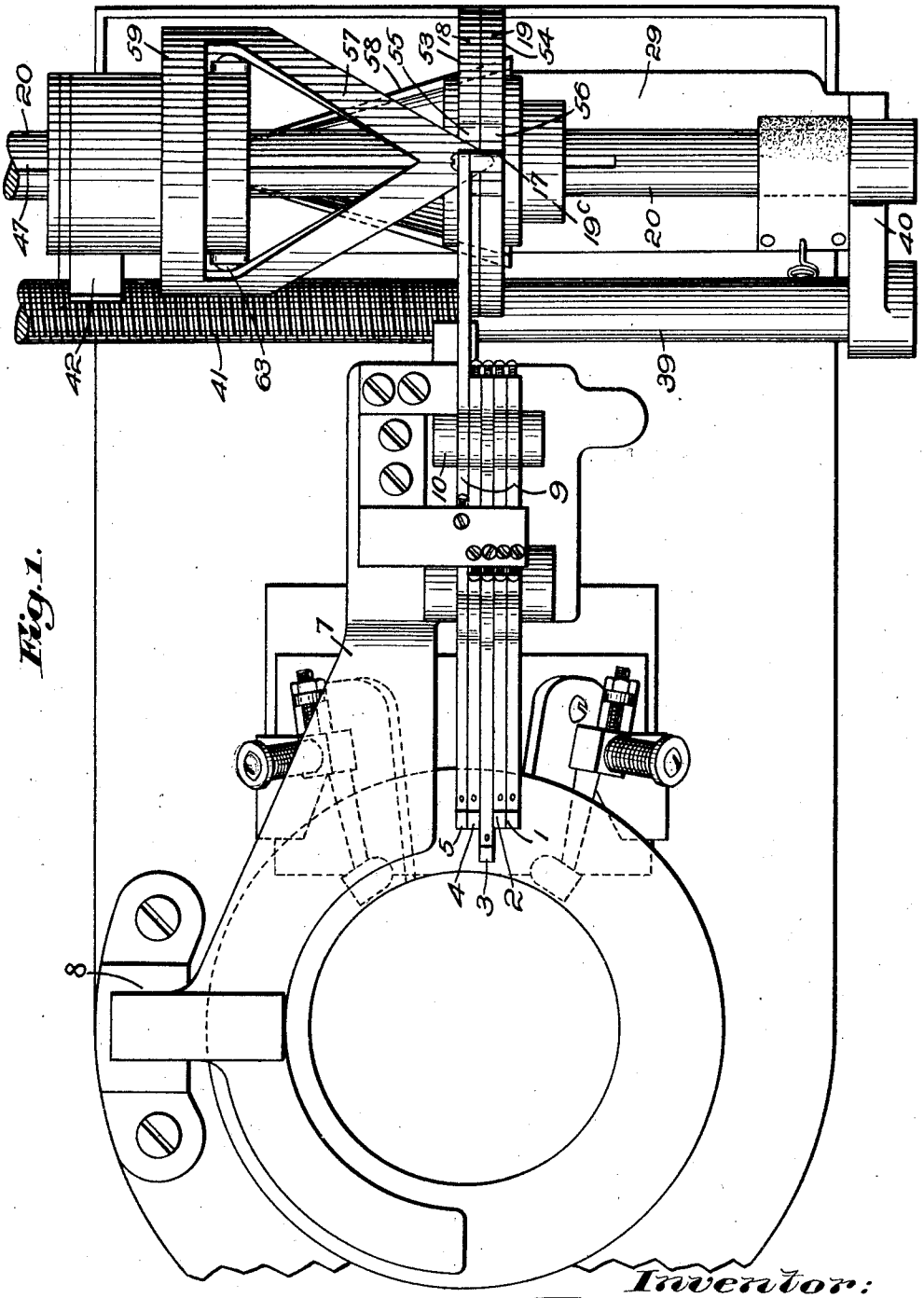


Fig. 1.

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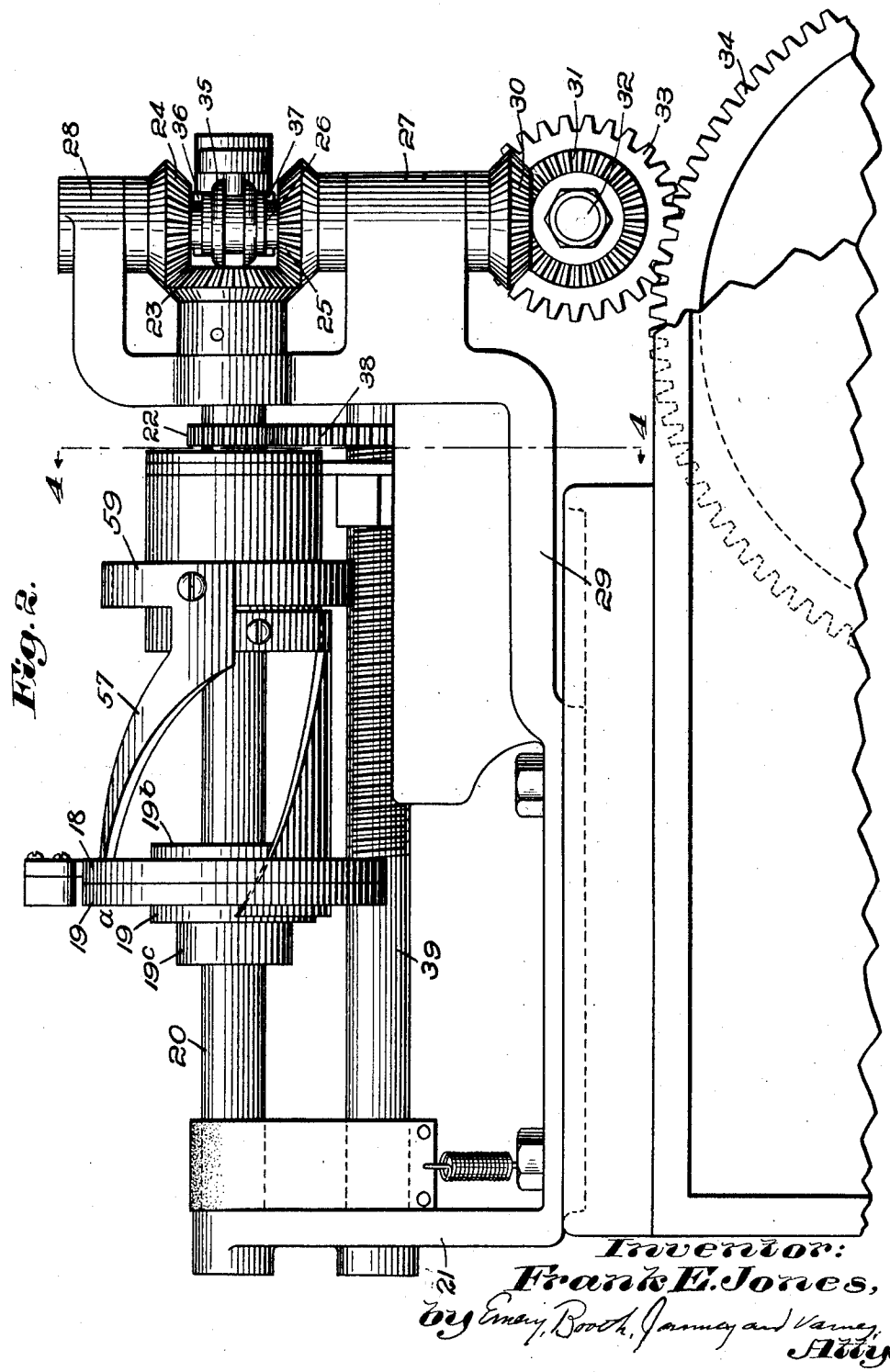


Fig. 2.

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YARN FEEDING MEANS FOR KNITTING MACHINES

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Fig. 4.

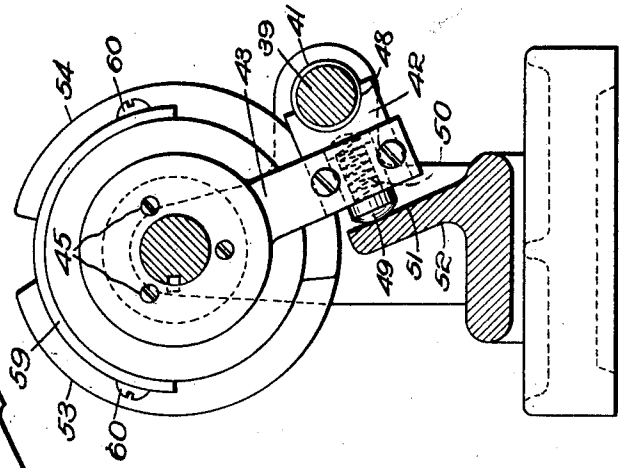
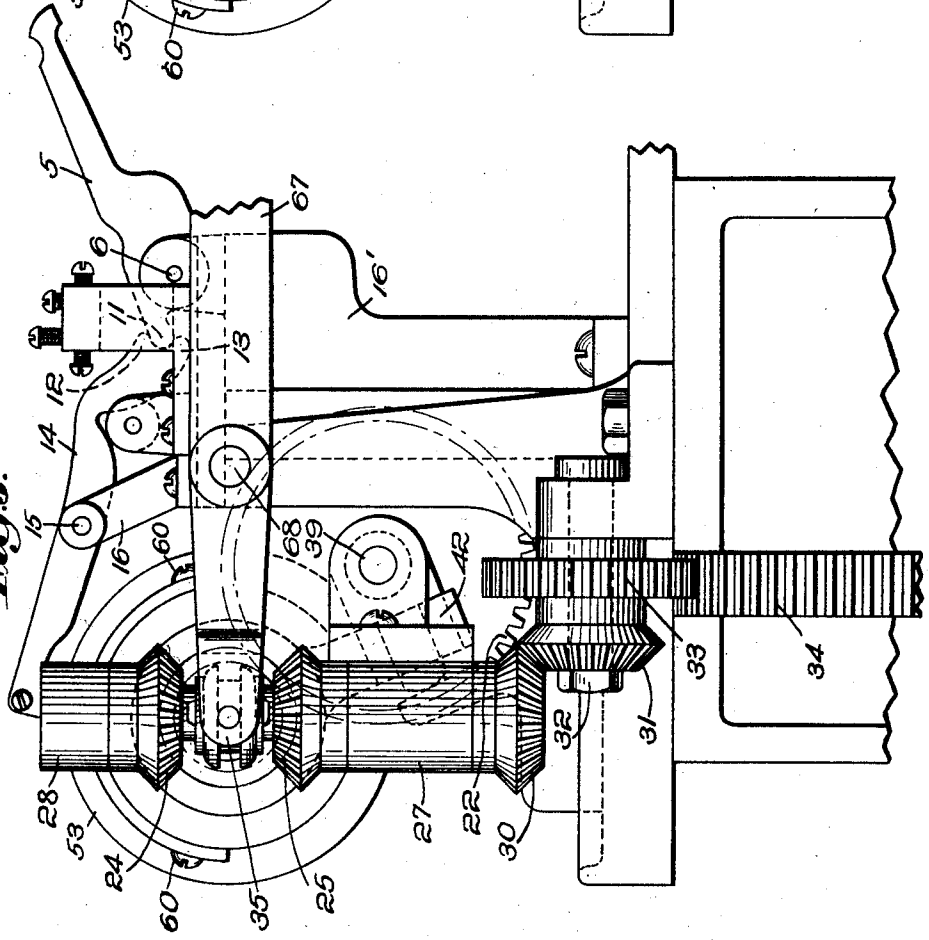


Fig. 3.

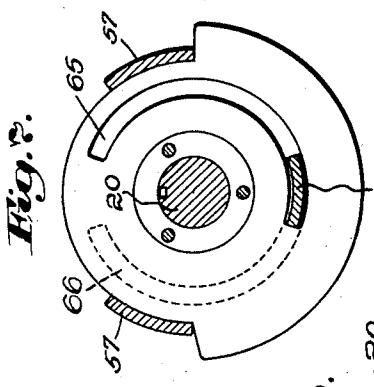


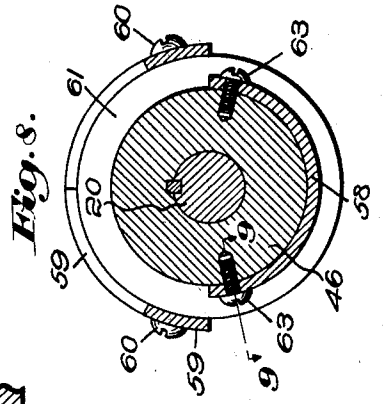
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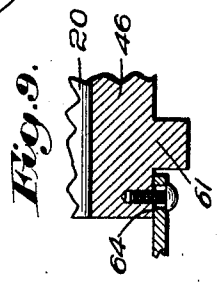
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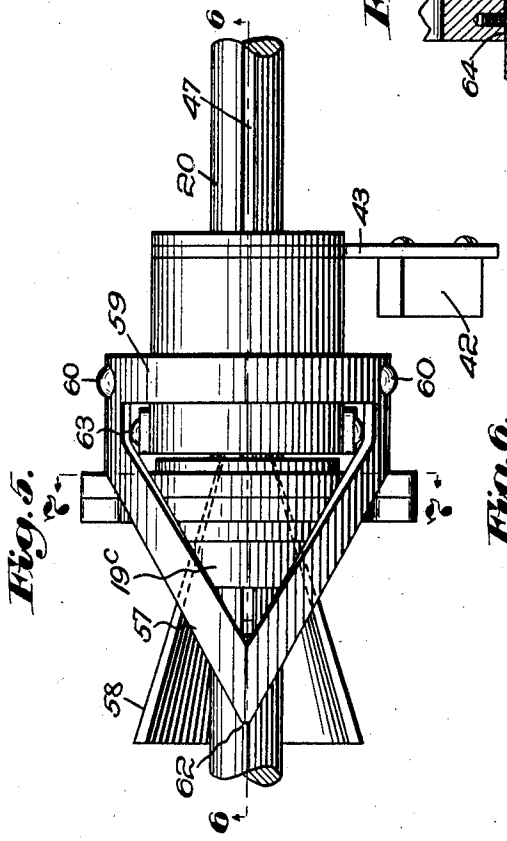
YARN FEEDING MEANS FOR KNITTING MACHINES

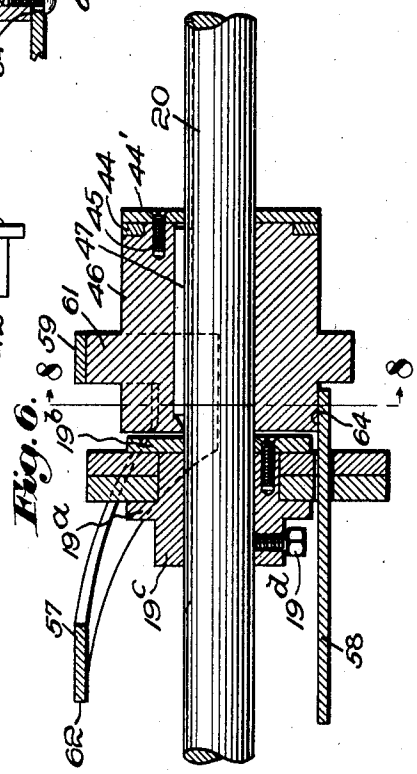
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Patented Oct. 29, 1929 1,733,665

UNITED STATES PATENT OFFICE

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YARN-FEEDING MEANS FOR KNITTING MACHINES

Application filed December 4, 1922. Serial No. 604,641.

This invention relates to yarn feeding means for knitting machines, and particularly to means for feeding a reinforcing yarn to circular knitting machines for varying lengths in or portions of successive courses, as, for example, above the heel portion of the stocking for the formation of a so-called high splice, the edges of which are not parallel to each other, but which are inclined, as, for example, to meet, or substantially to meet, at a point at the back of the stocking.

The invention is, however, applicable in other relations.

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

Fig. 1 is a plan view of a circular knitting machine having my invention applied thereto;

Fig. 2 is an elevation from the end of the machine of the splicing yarn controlling mechanism shown in Fig. 1;

Fig. 3 is a rear elevation of the upper part of said mechanism;

Fig. 4 is a vertical section taken through the shaft 39 and other parts and showing certain parts in elevation;

Fig. 5 is a view in side elevation of a portion of the mechanism for controlling the position of the splicing yarn guide;

Fig. 6 is a longitudinal vertical sectional view of the mechanism shown in Fig. 5;

Fig. 7 is a transverse vertical section upon the line 7—7 of Fig. 5;

Fig. 8 is a transverse vertical section upon the line 8—8 of Fig. 6, and

Fig. 9 is a detail in longitudinal section upon the line 9—9 of Fig. 8.

My invention relating, as it does, to circular knitting machines, may be applied to or 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 December 7, 1909. In this type of machine, the needle support 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 this 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, and without limiting my invention to a rotating needle cylinder type of machine.

Generally speaking, the machine selected for illustration, includes a rotating needle cylinder, not herein shown, and which is mounted on a suitable table constituting a part of the frame of the knitting machine. As is customary in this type of machine, the said cylinder is arranged to be rotated and reciprocated to form the fashioned and tubular portions of the stocking respectively. The means for effecting the rotating and reciprocating movements are desirably substantially the same as those shown and described in said Hemphill patent, and being well known require no further description.

A plurality of yarn feeding elements is provided, and which are herein shown as consisting of five pivoted yarn guides 1, 2, 3, 4, 5, all pivoted at 6 upon a partial ring 7 shown in plan in Fig. 1 and itself suitably pivoted at 8 so that it may be swung up out of action to afford access to the needles or for any other purpose. The ring 7 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 guides including the yarn guide 5 is normally pressed or urged into action by one of a series of levers 9 shown in Fig. 1 as mounted upon a standard 10 rising from the framework of the machine. Each of said levers desirably has attached to its outer or right hand end viewing Fig. 1 a coil or other spring tending to move each of the specified yarn guides into operative or feeding position. Such movement of said yarn guides or levers into operative position is, however, at times opposed and overcome by a series of levers one for each of said yarn guides 1 to 5 inclusive in a manner characteristic of the well known Banner machine, as

disclosed, for example, in the said patent to Joshua B. Hemphill, No. 933,443. Said levers are desirably pivoted upon a suitable standard rising from the bed plate and each has a wire or link extending downward to and connected to a suitable lever riding upon a suitable cam mounted upon a disk or drum on the cam shaft of the machine in a manner characteristic of the Banner machine and not herein necessary to disclose. There being a controlling lever for each of the yarn guides, it is evident that according to the dictates of the cams upon the disk or drum upon the cam shaft, the yarn guides 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 guides 1, 2, 3, 4, there is provided, as stated, a yarn guide 5 to which this invention more particularly relates, and the purpose of which in the disclosed embodiment of the invention is to provide a high splice reinforcing yarn above the heel and desirably for successively increasing lengths in or portions of a series of successive courses constituting said high splice. For that purpose the said yarn guide 5 is pivoted at 6 as stated, and its outer rounded end 11, as shown in Fig. 3, is adapted to be engaged between the spaced projections 12, 13, of a lever 14 pivoted at 15 upon a bracket 16 extending upward from the standard 16′ and having an end or roll 17 extending laterally therefrom and adapted to ride upon the periphery of a double disk cam, the parts whereof are indicated at 18, 19. The said cam 18, 19 is mounted for rotative movement between flanges 19^a, 19^b, on a hub 19^c, secured by set screw 19^d upon a shaft 20, itself mounted in standards rising from the bed plate of the machine, one of said standards being indicated at 21 in Fig. 2. Said shaft 20 has fast thereon a pinion 22 so that the double disk cam 18, 19 is constantly rotated in one direction or the other according to the direction of rotation of the shaft 20.

Any suitable means may be provided to rotate the shaft 20. Herein for the purpose I have provided the following mechanism. Fast upon the said shaft 20 is a beveled gear 23 meshing with two beveled gears 24, 25, each normally loose upon an upright shaft 26 supported in extensions 27, 28, of a bracket 29, which is secured to the bed plate of the machine. Fast upon the lower end of the shaft 26 is a beveled gear 30 meshing with and driven by a beveled gear 31 upon a suitably supported shaft 32 which also has fast thereon a gear 33 meshing with and driven by the large gear wheel 34 on the main drive shaft of the machine.

The beveled gears 24, 25 are adapted periodically to be alternately clutched to the shaft 26 and therefore periodically alternately to rotate the shaft 20 in opposite directions. The clutch for alternately connecting the beveled gears 24, 25 to the shaft 26 is indicated at 35 in Figs. 2 and 3, said clutch having members 36, 37 adapted to interengage with corresponding formations upon the beveled gears 24, 25 respectively for the purpose of imparting movement to means for so acting upon the two members 18, 19 of the double disk cam as to vary the contour of said cam during the knitting operation, and thereby to vary the contour of the reinforcement controlled thereby, and in the specific instance herein disclosed to effect the formation of a tapered high splice.

The pinion 22, as shown most clearly in Fig. 2 constantly meshes with and drives a gear 38 which is fast upon a shaft 39 mounted in parallelism with the shaft 20 and in brackets, one of which is shown at 40 in Fig. 1. The said shaft 39 has formed thereon a screw or worm 41, with which engages a partial nut 42 carried by a radial arm 43 extending from a ring like member 44 encircling the shaft 20 desirably with capacity for slight circumferential movement. Said ring like member 44 is held in position by a washer 44′ itself secured by screws 45 to the end of a hub 46 splined upon the shaft 20 as indicated at 47, so that said hub and the parts carried thereby may be moved gradually along said shaft 20 in one direction or the other according to the direction of rotation of said shaft 20, and consequently of the direction of rotation of the worm or screw 41 upon the shaft 39.

The half nut 42 is provided with threads 48 engaging those of the screw or worm 41, and said half nut 42 is desirably held in yielding driving relation with the worm or screw 41 by means of a plunger 49 received in a recess of the nut 42, said plunger itself being desirably hollow and receiving therein a coil spring 50, which at one end presses against the half nut 42 and at the other end against the plunger 49. The said plunger 49 bears against the inclined face 51 of a bracket 52, the said face being of sufficient length to receive the plunger during the entire traversing movement of the hub 46 and hence during that entire time to hold the said half nut 42 in driving relation with the screw or worm 41.

Desirably the disks 18, 19 which together constitute a compound cam, are in touching face to face relation as clearly indicated in Fig. 1. Desirably said two disks are complementary and each has a high portion 53, 54 respectively and a low portion 55, 56 respectively, so that the lateral projection or roller 17 of the lever 14 rides upon the combined high surface of the two disks 18, 19. Obviously by moving the two disks 18, 19 circumferentially relatively to each other, and desirably in opposite directions, the combined high portion and the combined low portion

of said disks are varied, one being increased and the other decreased. The result is that the lateral projection or roll 17 rides upon the combined periphery of the two disks, the splicing yarn guide 5 being lifted or swung upwardly out of action when said lateral projection or roll 17 rides upon the combined high portion of said periphery, and said yarn guide being lowered or swung downwardly into action when said lateral projection or roll rides upon the combined low portion of said disks. By automatically moving said two disks relatively to each other and desirably by moving them in opposite directions automatically during the knitting operation, the contour of the reinforcement is varied. While I may within the scope of my invention relatively move said disks to any desired extent and at any desired rate, preferably I provide means whereby the reinforcement may be commenced upon a minimum number of needles, as for example, two or four, and whereby upon each succeeding course or upon each of a series of succeeding courses, as, for example, on every second, third or fourth course, one or more additional needles at each end of the series, receive the reinforcing yarn, thereby making a tapering reinforcement of the desired angularity. If the stocking be commenced at the toe, obviously the reinforcing operation is reversed and a successively smaller number of needles receives the reinforcing yarn.

While any suitable means may be employed relatively to move the disks 18, 19, I desirably, generically stated, move at least one of said disks, and, more specifically speaking, I desirably move both disks to an equal extent but in opposite directions, and by means which itself moves along a path which is in parallelism with the axis of the said disks 18, 19, that is, transversely to the peripheries of said disks. For this purpose I have herein represented a pair of wedges 57, 58, which as shown most clearly in Figs. 2, 5, and 6, are secured upon the axially movable hub 46. The wedge 57 which preferably is of skeleton formation is provided with a base portion 59 of semi-ring form as indicated clearly in Fig. 8, secured by screws 60, 60 upon an annular flange 61 upon the hub 46. The point or apex 62 of said wedge is directed away from the hub 46. The other wedge 58 is oppositely positioned with respect to the wedge 57. It is arranged at a distance of 180 degrees therefrom upon the hub 46 and the apex thereof is directed oppositely to that of the wedge 57. As shown most clearly in Fig. 8, said wedge 58 is secured by screws 63 to the part 64 of the hub 46 and the two disks 18, 19 are respectively provided with arcuate slots 65, 66 which overlap more or less to receive the apex of said wedge 58. It will be apparent that by movement of the hub 46 axially of the shaft 20 by the worm or screw 41, the wedges 57, 58, so act upon the two disks 18, 19, as gradually to move them in opposite directions, and thereby gradually to increase the peripheral extent of the combined low portion of the disks 18, 19 thus constantly or gradually increasing the length of the partial courses of the knitted reinforcing yarn.

When the wedges 57, 58 have been traversed in one direction sufficiently to effect the formation of the tapered high splice, the wedges are then traversed in the opposite direction through the reversal of the direction of rotation of the worm or screw 41 by means of the clutch 35. The said clutch is adapted to be controlled by a lever 67 shown most clearly in Fig. 3 as pivoted at 68 upon the standard. Said lever is adapted to be connected at its opposite end to a wire or link extending downward to and suitably connected to a lever having a nose bearing upon a disk cam on the cam shaft of the machine as fully disclosed in my copending application Serial No. 566,338, filed June 6, 1922, upon which this application constitutes an improvement. Such disk cam is provided with suitable elevations and depressions controlling the periods of traversing movement of the wedges 57, 58, so that the reinforcement is made at the proper time. Means are also preferably provided as disclosed in said application, whereby when the yarn guide 5 is not introducing its reinforcing or splicing yarn, it is held in its elevated non-functioning position.

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 circular knitting machine having needles and yarn guides including a splicing yarn guide, in combination with a compound cam controlling the splicing yarn guide, said cam comprising two disks in face to face relation, and means movable in substantial parallelism with the axis of said cam for moving said disks relatively to each other, thereby automatically to vary the contour of said cam.

2. A circular knitting machine having needles and yarn guides including a splicing yarn guide, in combination with a compound cam controlling the splicing yarn guide, said cam comprising two disks having a face to face relation, wedge means, and means to impart straight line movement to said wedge means for moving said disks relatively to each other to vary the contour of said cam.

3. A circular knitting machine having needles and yarn guides including a splicing yarn guide, in combination with a compound cam controlling the splicing yarn guide, said cam comprising two disks upon the combined periphery whereof splicing yarn guide con-

trolling means is adapted to ride, and means movable transversely to the combined periphery of said cam to vary the contour of the latter.

4. A circular knitting machine having needles and yarn guides, including a splicing yarn guide, in combination with a compound cam controlling the splicing yarn guide, said cam comprising two disks in touching face to face relation, and means movable transversely to the combined periphery of said cam to vary the contour of the latter.

5. A circular knitting machine having needles and yarn guides including a splicing yarn guide in combination with a compound cam controlling the splicing yarn guide, a shaft whereon said cam is supported against axial movement, but with respect to which it may move circumferentially, and means movable in the direction of the axis of said shaft for moving said compound cam circumferentially to vary the contour thereof.

6. A circular knitting machine having needles and yarn guides including a splicing yarn guide in combination with a compound cam controlling the splicing yarn guide, a shaft whereon said cam is supported against axial movement, but with respect to which it may move circumferentially, said cam being composed of a plurality of parts movable relatively to each other circumferentially of said shaft, and means movable along said shaft for imparting such circumferential movement to vary the contour of the cam.

7. A circular knitting machine having needles and yarn guides including a splicing yarn guide in combination with a compound cam controlling the splicing yarn guide, a shaft whereon said cam is supported against axial movement, but with respect to which it may move circumferentially, said cam being composed of a plurality of disks having capacity for relative circumferential movement, and means traversed along said shaft for imparting such relative circumferential movement during the knitting operation.

8. A circular knitting machine having needles and yarn guides including a splicing yarn guide in combination with a compound cam controlling the splicing yarn guide, a shaft whereon said cam is supported against axial movement, but with respect to which it may move circumferentially, said cam being composed of a plurality of parts having capacity for relative circumferential movement, and wedge means movable in substantially the direction of the axis of the said shaft, for imparting such movement during the knitting operation.

9. A circular knitting machine having needles and yarn guides including a splicing yarn guide in combination with a compound cam controlling the splicing yarn guide, a shaft whereon said cam is supported against axial movement, but with respect to which it may move circumferentially, said cam being composed of a plurality of parts having capacity for relative circumferential movement, and automatically acting wedge means acting by continuous wedge engagement with said cam, for imparting such movement during the knitting operation, thereby to vary the contour of said cam.

10. A circular knitting machine having needles and yarn guides including a splicing yarn guide in combination with a compound cam controlling said splicing yarn guide, a shaft whereon said cam is supported for circumferential movement, and wedge means movable automatically along the axis of said shaft for moving said compound cam circumferentially to vary its contour.

11. A circular knitting machine having needles and yarn guides including a splicing yarn guide in combination with a compound cam controlling said splicing yarn guide, a shaft whereon said cam is supported for circumferential movement, a pair of oppositely positioned wedges to engage the parts of said compound cam, and means to move said wedges during the knitting operation to vary the periphery of said cam.

12. A circular knitting machine having needles and yarn guides including a splicing yarn guide in combination with a compound cam controlling said splicing yarn guide, a shaft whereon said cam is supported for circumferential movement, a pair of oppositely positioned wedges to engage the parts of said compound cam, and means automatically to traverse said wedges during the knitting operation, so as automatically to vary the periphery of said cam.

13. A circular knitting machine having needles and yarn guides including a splicing yarn guide in combination with a compound cam controlling said splicing yarn guide, a shaft whereon said cam is supported for circumferential movement, said cam being composed of a pair of disks in touching face to face relation, and having complemental peripheral formations, and means movable along the axis of said shaft relatively to move said disks with respect to each other.

14. A circular knitting machine having needles and yarn guides including a splicing yarn guide in combination with a compound cam controlling said splicing yarn guide, a shaft whereon said cam is supported for circumferential movement, wedge means for moving parts of said cams circumferentially with respect to each other, and a screw for moving said wedge means.

15. A circular knitting machine having needles and yarn guides including a splicing yarn guide in combination with a compound cam controlling said splicing yarn guide, a shaft whereon said cam is supported for circumferential movement, wedge means for

moving parts of said cams circumferentially with respect to each other, a screw for moving said wedge means, and means for reversing the direction of movement of said screw.

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

FRANK E. JONES.