July 1, 1924. 1,500,083

W. LARKIN

YARN CHANGER

Filed June 27, 1919 4 Sheets-Sheet 1

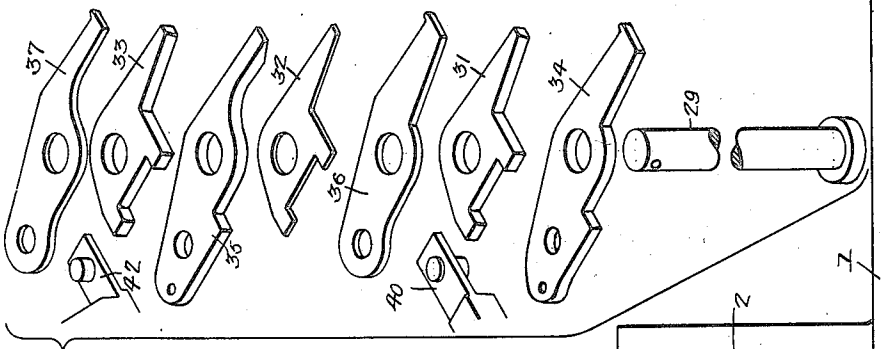


Fig. 8.

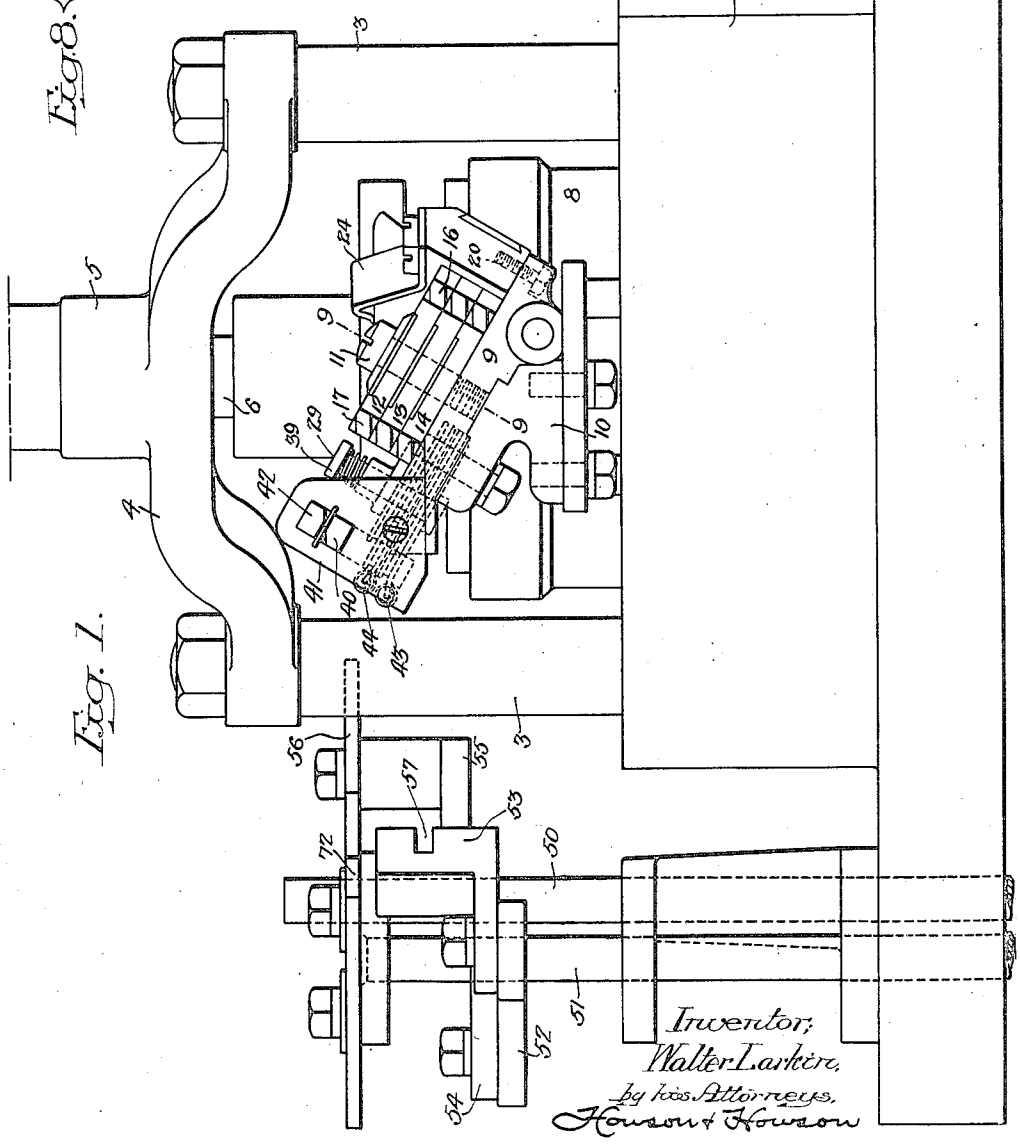


Fig. 1.

Inventor,
Walter Larkin,
by his Attorneys,
Howson & Howson

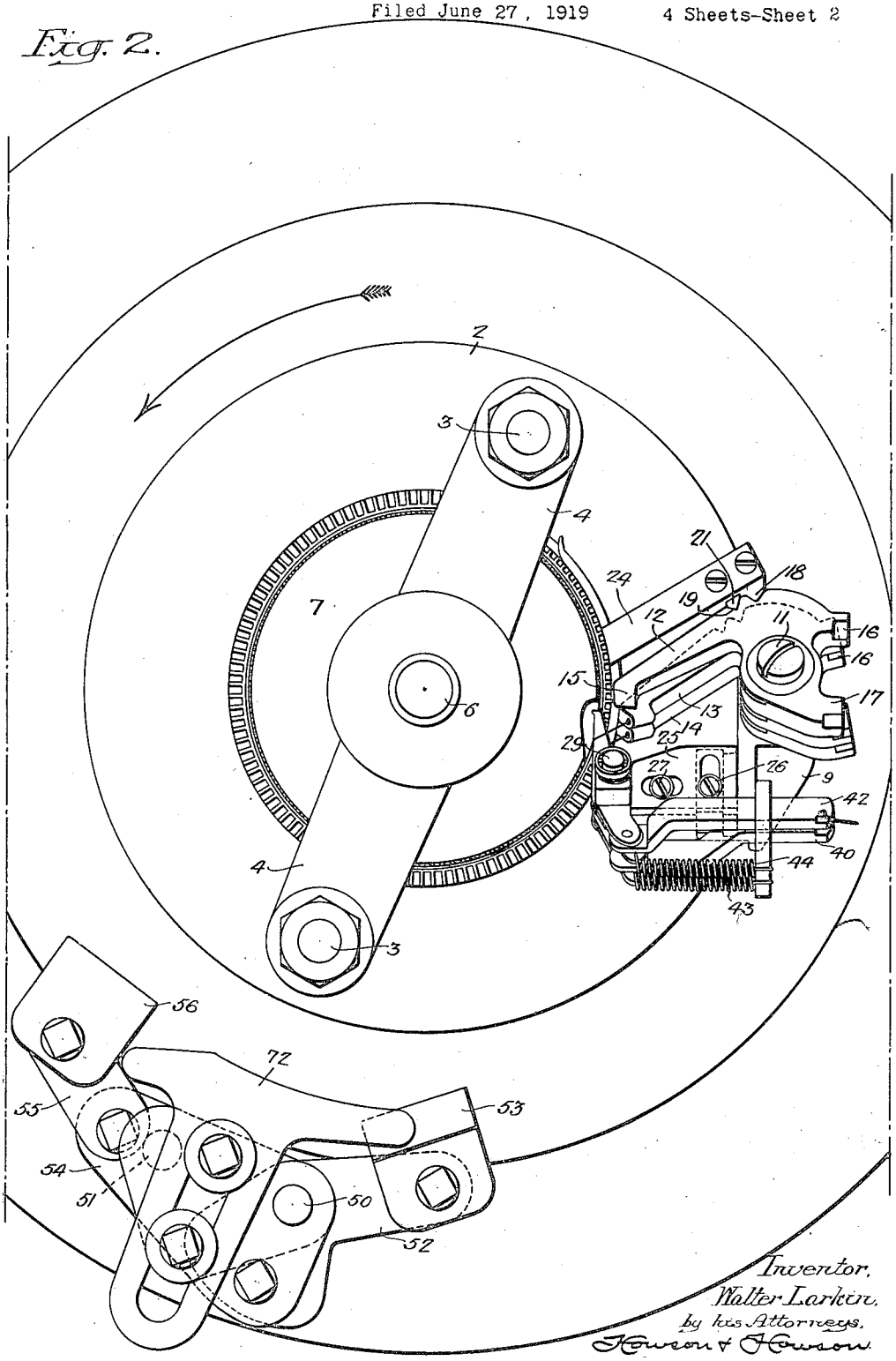
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Fig. 2.



Inventor,
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YARN CHANGER

Filed June 27, 1919 4 Sheets-Sheet 3

Fig. 3.

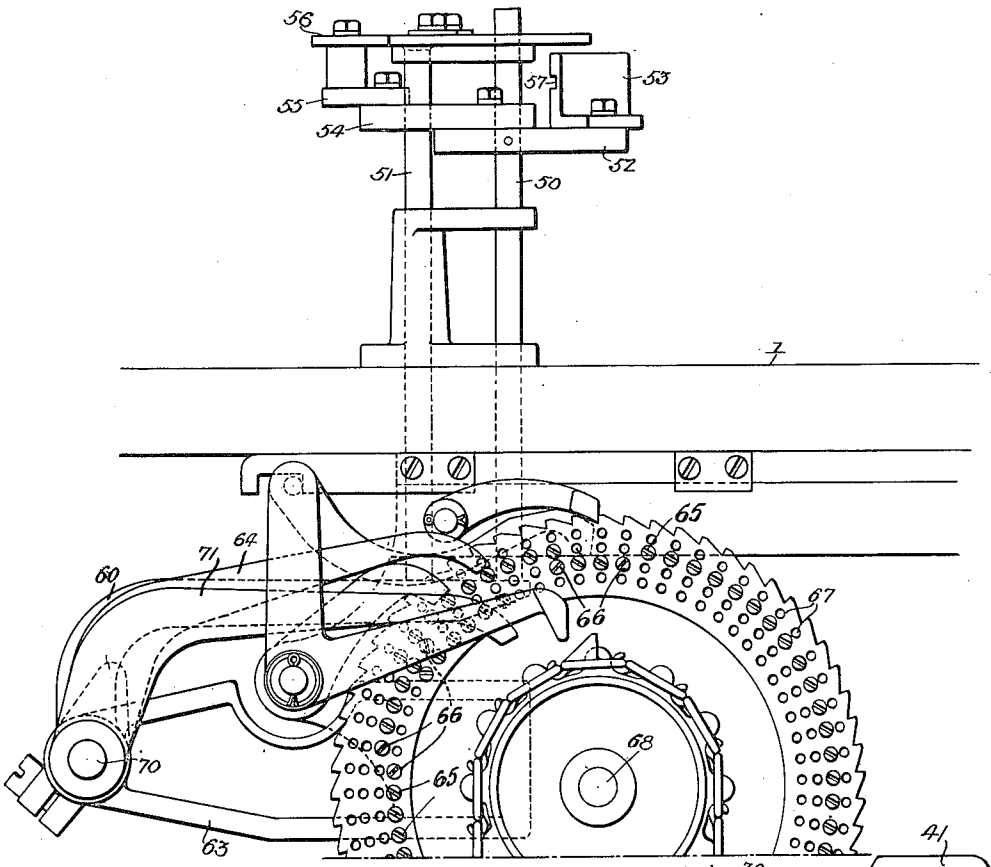


Fig. 5.

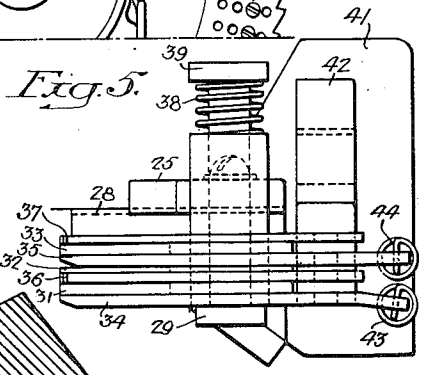


Fig. 9.

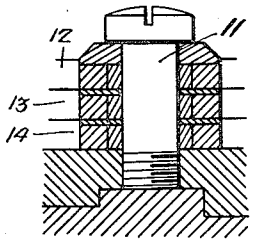
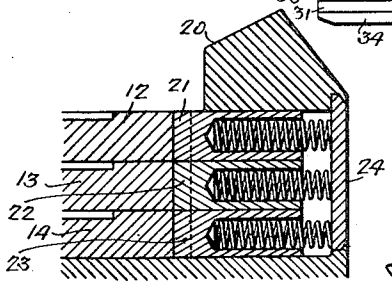


Fig. 10.



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YARN CHANGER

Filed June 27, 1919 4 Sheets-Sheet 4

Fig. 4.

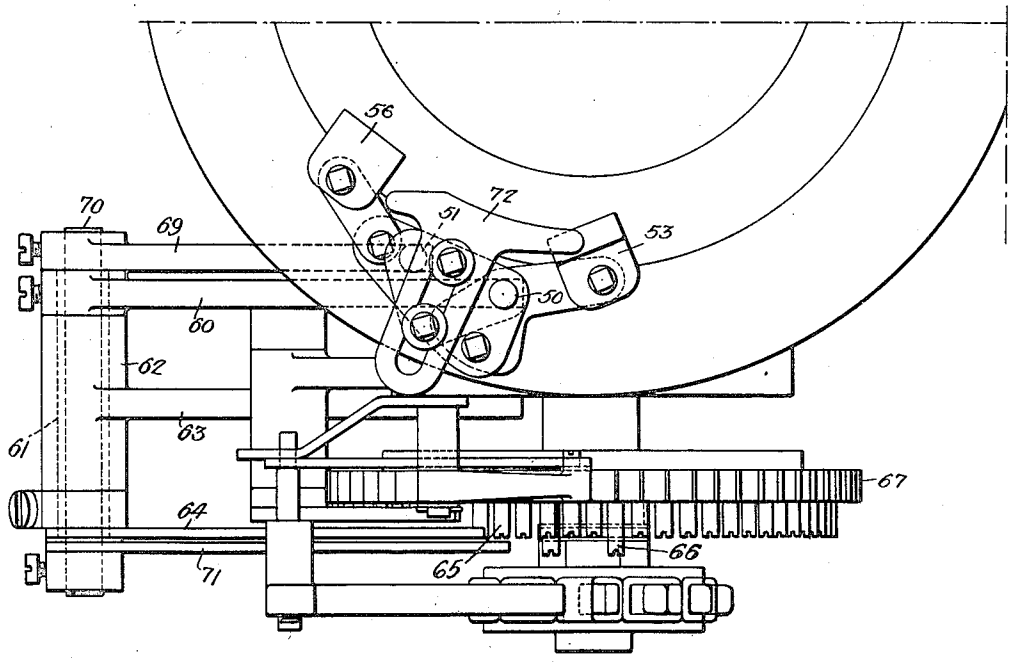


Fig. 12.

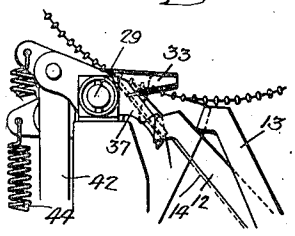


Fig. 13.

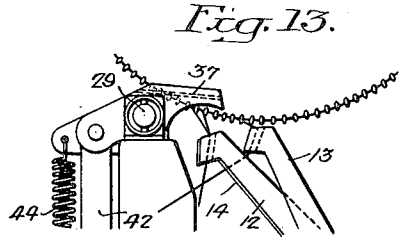


Fig. 11.

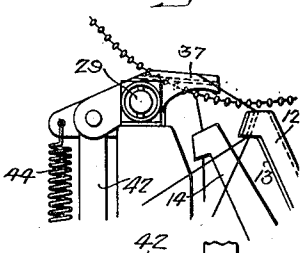


Fig. 7.

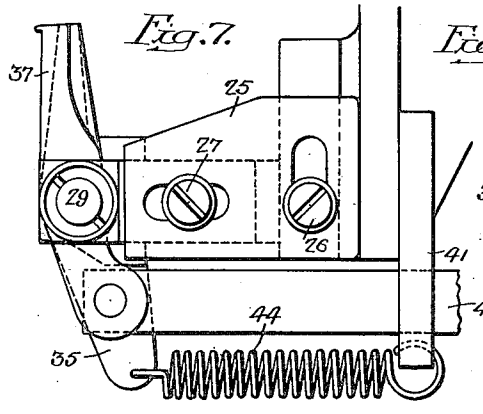
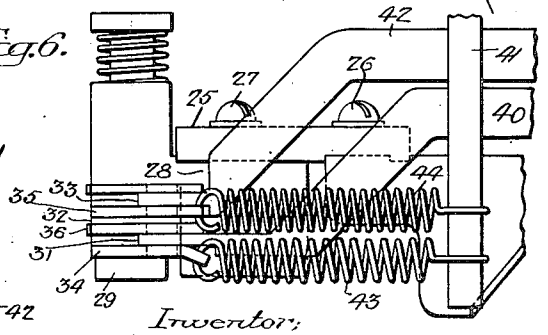


Fig. 6.



Inventor:
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Patented July 1, 1924. 1,500,083

UNITED STATES PATENT OFFICE.

WALTER LARKIN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO H. BRINTON COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

YARN CHANGER.

Application filed June 27, 1919. Serial No. 307,076.

To all whom it may concern:

Be it known that I, WALTER LARKIN, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented Yarn Changers, of which the following is a specification.

One object of this invention is to provide a yarn changing mechanism for circular knitting machines whereby it shall be possible to automatically govern the movement of at least three thread guides or fingers into and out of their active positions, with a view to providing the object knitted with a pattern of three or more colors or kinds or weights of yarn.

The invention also contemplates novel means for cutting and thereafter holding the ends of those threads not being knitted at any given time, together with a novel form of governing cam mechanism whereby any desired succession of the thread guides may be moved into operative positions and others of said guides be successively moved into inactive positions.

It is also desired to provide a simple, substantial and reliable means whereby the threads leading from the several thread guides of a machine of the character described are severed, held and released at predetermined times relatively to the times of operation of the thread guides.

I further desire to provide novel means for selectively actuating at least three thread guides and at least two associated thread holding and cutting devices, whereby after any one of at least three threads has been thrown into action, its end is released, and similarly when any of said threads is thrown out of action, it is cut and its end held;—the various parts of the apparatus being so formed and positioned relatively to the needles that there shall be no long thread ends adjacent the points of junction of the different threads and consequently no necessity for the subsequent removal of such ends.

It is also desired that the construction shall be such as to eliminate the long loose knitted in thread ends which ordinarily occur at the points of change from one thread to another.

These objects and other advantageous ends I attain as hereinafter set forth, reference being had to the accompanying drawings, in which,

Fig. 1 is a side elevation of part of a circular knitting machine, illustrating my invention as applied thereto;

Fig. 2 is a plan of the machine shown in Fig. 1;

Fig. 3 is a side elevation on a somewhat reduced scale illustrating one form of the mechanism for controlling the thread guides and shears forming part of my invention;

Fig. 4 is a plan of the mechanism shown in Fig. 3;

Figs. 5 and 6 are elevations at right angles to each other, illustrating the detail construction of the shearing and holding devices forming part of my invention;

Fig. 7 is a plan of the mechanism shown in Figs. 5 and 6;

Fig. 8 is a detached perspective of the shearing and holding mechanism;

Fig. 9 is a section on the line 9—9, Fig. 1;

Fig. 10 is a transverse section illustrating the detail construction of the pawls for holding the thread guides in their active or inactive positions; and

Figs. 11, 12 and 13 are diagrammatic views illustrating the operation of certain parts of my invention.

In my Patent 1,359,258, Nov. 16, 1920, I have described and illustrated a two color thread or yarn changer with the necessary thread shearing and holding mechanism but in attempting to employ three or more colors of thread I found it necessary to provide a novel arrangement of the cutting and holding mechanism particularly as regards the relation to the thread guides, as well as a novel construction and arrangement of cam mechanism for selectively controlling the operation of the thread guides, and the cutting and holding elements.

In the above drawings 1 represents a portion of the fixed structure of a circular knitting machine which, in the case illustrated, has a rotary cam ring 2 carrying vertically extending posts or standards 3 connected at their upper ends by and serving to support a spider or frame 4. This at its center has a hub 5 which through a dial post 6 and certain other parts forming no portion of the present invention, carries a dial 7 adjacent the upper end of a relatively stationary needle cylinder 8.

On one side of the upper edge of the cam ring is fixed a block 10 formed with a

flat face lying in a plane preferably at an angle of about 30° to the horizontal and having projecting perpendicular to said face a bolt or screw 11 constituting a pivot for at least three thread guides 12, 13 and 14. Each of these includes a long arm having a thread guiding eye 15 at that end adjacent the needle cylinder, in addition to which it has a pair of outwardly projecting arms 16 and 17 and these, owing to the angular mounting of the pivot member 11, are arranged in two sets with the elements of each set one over the other.

Moreover the arrangement is such that the lowest arm 17 of the uppermost yarn guide lies in a horizontal plane above the second horizontal plane including the lowest arm of the uppermost yarn guide 12. Each of the yarn guides is intended to occupy either of two positions in one of which the thread is so directed as to be engaged by the needles of the cylinder 8, and in the other of which said thread is held away from the cylinder so that it cannot be engaged by the needles. For holding the guides in either of these positions each of them is formed with two edge notches 18 and 19 and the block 10 has mounted on it an extension 20 having recesses for three spring pressed dogs 21, 22 and 23, each designed to enter either of the notches of its particular yarn guide. A guard plate 24 (Figs. 1 and 2) is removably mounted on said extension of the block 10 so as to prevent closing of the needle latches.

In addition to the yarn guides, the block 10 carries a plate 25 slotted for the reception of a screw 26 whereby it is clamped in place so that upon loosening said screw it may be moved in a direction generally toward or from said guides. Said plate is also slotted for the reception of the second screw 27 (Fig. 2) whereby there is clamped to it a plate 28 (Figs. 5–7) providing a bearing for a bolt 29 inclined in a line substantially parallel to that of the screw or pivot 11, it being noted that the slot for the screw 27 extends in a line substantially at right angles to that of the screw 26 in order that the plate 28 may be adjusted toward or from the center line of the machine.

On the bolt 29 are fixed three holding plates 31, 32 and 33 of substantially similar form, each having one elongated arm and two shorter arms respectively fitting on opposite sides of the plate 28. Between the holding plate 31 and the head of the bolt 29 is a plate 34 constituting a shear blade and a second similarly formed shear blade 35 is loosely mounted on said bolt between two holding plates 32 and 33. A loose holding plate 36 is mounted on the bolt between the two fixed holding plates 31 and 32, and a second loose holding plate 37 is similarly mounted on the bolt between the topmost fixed holding plate 33 and the bearing which supports said bolt;—all of said plates being yieldingly pressed together by a coil spring 38 confined between the upper end of said bearing and a removable head 39 on the upper end of the bolt.

The lower shear blade 34 and the lower movable holding plate 36 are both pivotally connected to an operating bar 40 extending outwardly away from the needle cylinder and slidably guided through an opening in a plate 41 fixed to the block 9; a second operating bar 42 being similarly guided by said plate above the bar 40. The inner end of this second bar is pivotally connected to the upper movable shear blade 35 and the upper movable holding plate 37, and two coil springs 43 and 44 extend between the guide plate 41 and the two movable shear blades 34 and 35 respectively so as to tend to retain these with their associated holding plates 36 and 37 immediately under the fixed plates 31, 32 and 33.

With this arrangement of parts the inward movement of either of the operating bars 40 or 42 swings one of the movable shear blades with its associated movable holding plate against the action of the corresponding spring 43 or 44 from a closed, thread retaining position in which said blade and plate lie respectively below and above a fixed plate, into a position in which these members project at an angle to the latter. In the former position the end of a thread extending from between the fixed and movable shear blades 34 and the holding plate 31, for example, and leading to one of the arm guides, would be frictionally held between said holding plate 31 and the movable holding plate 36, while in the latter or open position such thread end would be released and a second thread end could be inserted in the angular space between the two shear blades.

The form and mounting of the two operating arms 40 and 42 is such that their outer ends project beyond the plate 41 in two adjacent horizontal planes both of which lie above the horizontal plane including the arm 17 of the uppermost or top yarn guide 12. With the yarn guides formed and mounted as illustrated and described, an inward pressure on any of the arms 17 of said guides when its thread directing end is in its outer position, will turn such guide on the pivot screw 11 and swing its thread directing end into its inner position immediately adjacent the needle cylinder. Similarly, an inward pressure exerted on the arm 16 of a guide whose thread delivering end is in its inner position, will swing said guide on the pivot screw 11 so as to move said thread delivering end 15 into a position in which the thread cannot be engaged by the needles.

For actuating the thread guides through

the arms 16 and 17 and the shear and holding plates through the bars 40 and 42, I provide certain selection mechanism shown in detail in Figs. 1 to 4 inclusive. This includes two rods 50 and 51 vertically guided in suitable bearings formed in or supported by the plate or base structure 1, and of these two rods, the first has fixed to it a plate 52 carrying a throw-out cam 53. A second plate 54 also carried by the plate 52 carries a third plate 55 carrying a throw-in cam 56,—the intermediate plate 54 being perforated for the passage of the rod 51 on which it is vertically slidable.

The throw-in cam 56 consists of a flat plate of such thickness that it may engage any one of the arms 17 of the three yarn guides without affecting the others of said arms, while the throw-out cam 53 consists of a structure having a flat vertical surface in which is formed a horizontal slot 57 (Figs. 1 and 3) of such width that it will permit the passage through it of any one of the three arms 16 of the yarn guides without operating engagement while the adjacent flat face of said structure 53 either above or below this slot will act upon either or both of the other two arms 16 to swing the corresponding yarn guides from active to inactive positions.

For elevating the rod 50 at predetermined times to bring the two cams 56 and 53 into any one of their three operative positions, I provide an arm 60 fixed to a sleeve 61 rotatable in a suitable bearing structure 62 carried by a portion 63 of the frame of the machine and also having fixed to it a second arm 64 capable of being oscillated by any of two series of pins 65 and 66 projecting perpendicularly from one face of a cam wheel 67 at any of three distances from the center thereof. They consequently cause the arm 64 and with it the arm 60 to be swung through any one of three different angles depending upon their position on the cam wheel and thus raise the cams 53 and 56 from one active position to either of two other active positions in which they cooperate with the arms 16 and 17 of the yarn guides.

The rod 51 is actuated through an arm 69 fixed to a spindle 70 rotatably mounted within the sleeve 61 and also having fixed to it a second arm 71 capable of engaging any of the pins 66 which are arranged upon the cam wheel 67 at either of two distances from the supporting shaft 68 thereof. The pins 65 being shorter than the pins 66, are not engaged by the arm 71. The shear operating cam 72 which is carried by said rod 51, is thus periodically moved from an inactive position to either of two active positions in which it engages either of the shear operating bars 40 or 42 as the case may be as the cam ring 2 is rotated. Prior to putting the machine in operation the two sets of pins 65 and 66 are arranged in the proper radial positions and in suitable numbers on the cam wheel 67 and if it be assumed that yarn of three different colors is supplied to the three guides 12, 13 and 14, respectively, the machine when started would be operated with one of said guides, as 12, in the position shown in Fig. 2, i. e., with its yarn delivering eye 15 immediately adjacent the needle cylinder in position to permit its thread to be engaged and knitted by the needles.

The three cams 53, 56 and 72 would all normally occupy their lower positions so that as the cam ring 2 with its associated parts is turned in a counter-clockwise direction the machine knits a tubular ribbed fabric in the well known manner. During this time the second and third threads leading from the delivering eyes of the yarn guides 13 and 14 extend from the latter so that one of them is frictionally held between the shear blades 33 and the movable holding blade 37 while the other is similarly held between the fixed shear blade 31 and the movable holding blade 36.

If now the pattern requires that a thread of another color be substituted for that delivered from the guide 12, the pins on the cam wheel 67 are so arranged that as said wheel is intermittently turned by mechanism forming no part of the present invention, one of the pins 65 engages and raises the arm 64. If it is desired to knit into the fabric the yarn of the color carried by the guide 13, the pin 65 which moves the arm 64 is placed so as to raise said arm to its second or intermediate height and through the arm 60 thereby raise the rod 50 with the two cams 53 and 56 to the middle of their three operative positions. The latter of said arms upon the succeeding revolution of the cam cylinder, comes into engagement with the arm 17 of the intermediate yarn guide 13, thereby swinging its thread delivering eye 15 inwardly into such a position that the thread leading therefrom to the shears is engaged by the needles,—it being held in this position by its pawl or dog 22. After the needles have caught the thread sufficiently to hold it from pulling out, the cam 53 engages the projecting arm 16 of the yarn guide 12 without affecting the projecting arm 16 of the guide 13 since the latter passes through its slot 57. Said guide 12 is thereupon turned on its pivot so that its thread delivering eye is moved away from the needles from the position shown diagrammatically in Fig. 11 to that illustrated in Fig. 12. About the same time one of the longer pins 66 placed on the cam wheel at the intermediate distance from the shaft 68, comes into engagement with the arm 71, raising this but without affecting the position of the arm 64, which already occupies a similar posi-

tion. The arm 69 is consequently swung upwardly and caused to raise the rod 51 together with the cam 72 carried thereby, so that this engages the upper shear actuating rod 42, causing the movable shear blade 35 and the holding plate 37 to be turned to their open positions. The thread end leading from the delivery eye of the middle yarn guide 13 is thus released and shortly thereafter the yarn leading from the guide 12 is delivered into the angular space defined by the shear blade 33 on the one side and the blade 35 and the plate 37 on the other. Obviously the thread guides remain in the positions to which they are moved by their respective cams 53 and 56 owing to the holding action of the dogs 21 and 22, whereas as soon as the cam 72 passes out of engagement with the bar 42, the spring 44 acts to close the shear blade 35 and the holding plate 37, thus severing the yarn from the guide 12 and holding that end thereof which leads from said guide. Owing to the peculiar mounting and positioning of the thread guides and shear blades, the severed end of the thread previously delivered from the guide 12 is extremely short, as is also the end of the new color thread delivered from the guide 13. Moreover these ends, for the above noted reasons, are completely knitted into the fabric so that they do not project, forming a sightly connection requiring none of the subsequent work on the part of the operator which would have been necessary if a greater or less length of either or both of the ends had been allowed to project from the surface of the fabric.

After having performed their functions, the two cams 53 and 56 remain in their given positions, while the cam 72 drops to its inactive position and the machine continues to operate in the well known manner until the pattern again requires a change of color. Obviously by a suitable positioning of the pins 65 and 66 on the cam wheel 67, either one of the yarn guides 12 or 14 may then be thrown into action and the yarn guide 13 thereafter withdrawn, so that the knitting of the fabric is continued either with thread of the color first supplied or with thread of the third color delivered by the guide 14.

In the first case the cam 72 actuates the bar 42 to release the thread carried by the guide 12 and thereafter sever the thread from the guide 13, while in the second case said cam is so positioned as to operate the bar 40 to free the end of the thread from the guide 14 and subsequently sever that from the guide 13. It is thus possible to knit the fabric with threads of three colors in any desired order and for any desired lengths without in any case having unsightly connections at the points of change from one thread to the other or allowing projecting ends of thread which require to be removed by the operator upon the completion of the work.

Owing to the peculiar construction of the slotted cam 53 and to its position relatively to the cam 56, its slot 57 will always permit of the passage by it of the projecting arm 16 of that particular one of the yarn guides which has just been thrown into active position by the cam 56, at the same time presenting its adjacent vertical faces either above or below said slot for engagement with the arm 16 of that one of said thread guides which is to be moved from its active to its inactive position.

I claim:

1. The combination with the cylinder and needles of a circular knitting machine of at least three yarn guides each comprising a pair of rearward spaced arms, said guides being pivotally mounted to turn on a common axis inclined at an acute angle to the center line of the cylinder whereby the said arms are disposed in different horizontal planes; means adapted to engage said arms for turning said guides on their pivot in a predetermined succession into and out of the thread delivering positions; with means for severing and thereafter holding the threads from said guides as they are moved to their inactive positions.

2. The combination with the cylinder and needles of a circular knitting machine of at least three yarn guides each comprising a pair of rearward spaced arms, said guides being pivotally mounted to turn on a common axis inclined at an acute angle to the center line of the cylinder whereby the said arms are disposed in different horizontal planes; means adapted to engage said arms for turning said guides on their pivots in a predetermined succession into and out of the thread delivering positions; with a plurality of sets of shears including elements mounted to turn on an axis also inclined at an acute angle to the center line of the cylinder, for severing the threads from the guides after these latter have been moved to inactive positions.

3. The combination with the cylinder and needles of a circular knitting machine of at least three yarn guides pivotally mounted to turn on a common axis inclined at an acute angle to the center line of the cylinder, means for turning said guides on their pivots in a predetermined succession into and out of the thread delivering positions, with a plurality of sets of shears including elements mounted to turn on an axis parallel to the axis of the yarn guides for severing the threads from the guides after these latter have been removed to inactive positions.

4. The combination with the cylinder and needles of a circular knitting machine of a plurality of superposed thread guides each

having two actuating arms extending in different planes; with mechanism for actuating said guides including a cam having a substantially vertical face formed with a transverse slot; and means for moving said cam to any of a number of positions in which one actuating arm of a thread guide lies in a horizontal plane including the slot while the vertical face of said cam is positioned to act on others of said arms.

5. The combination with the cylinder and needles of a circular knitting machine of a plurality of thread guides each having two actuating arms projecting in two parallel planes; mechanism for actuating said thread guides including a cam vertically adjustable to engage one arm of any of said guides; with a second cam having a slot positioned to permit passage of the second arm of the guide engaged by said first cam without acting thereon while actuating the arm of at least one other guide.

6. The combination with the cylinder and needles of a circular knitting machine of a series of superposed thread guides mounted to turn on an axis inclined to the center line of the cylinder and each having two actuating arms projecting in parallel planes; with two cams automatically adjustable to positions in which one engages any one of one set of said guide actuating arms and the slot of the other cam permits of the free passage of the second arm of the guide actuated by the first cam while actuating the second arm of any of the other guides.

In witness whereof I affix my signature.

WALTER LARKIN.