Feb. 2, 1926. 1,571,769

W. FELS

SELECTIVE THREAD CHANGE MECHANISM FOR KNITTING MACHINES

Original Filed July 8, 1920 6 Sheets-Sheet 1

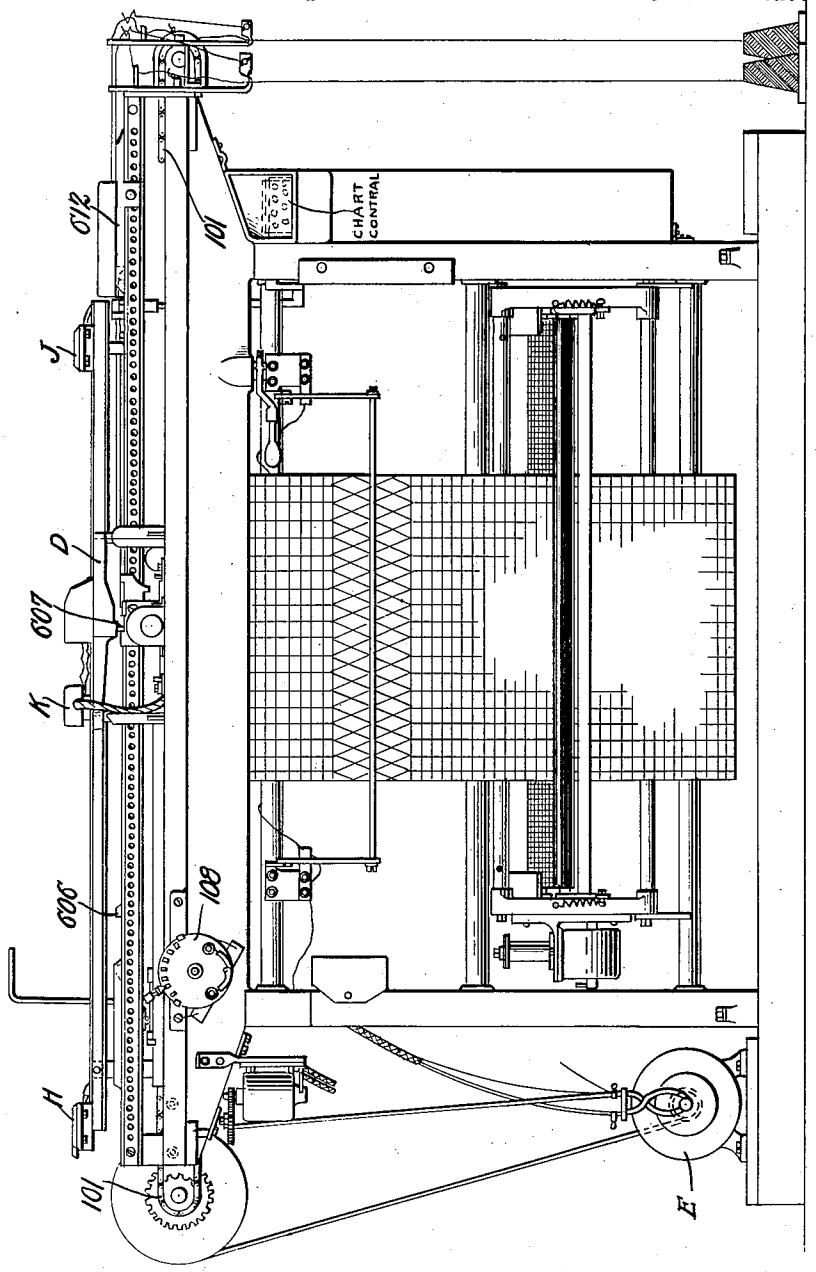


Fig. 1.

INVENTOR
William Fels
BY
Emery Vanney Blair and Hayes
ATTORNEY

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W. FELS

SELECTIVE THREAD CHANGE MECHANISM FOR KNITTING MACHINES

Original Filed July 8, 1920 6 Sheets-Sheet 2

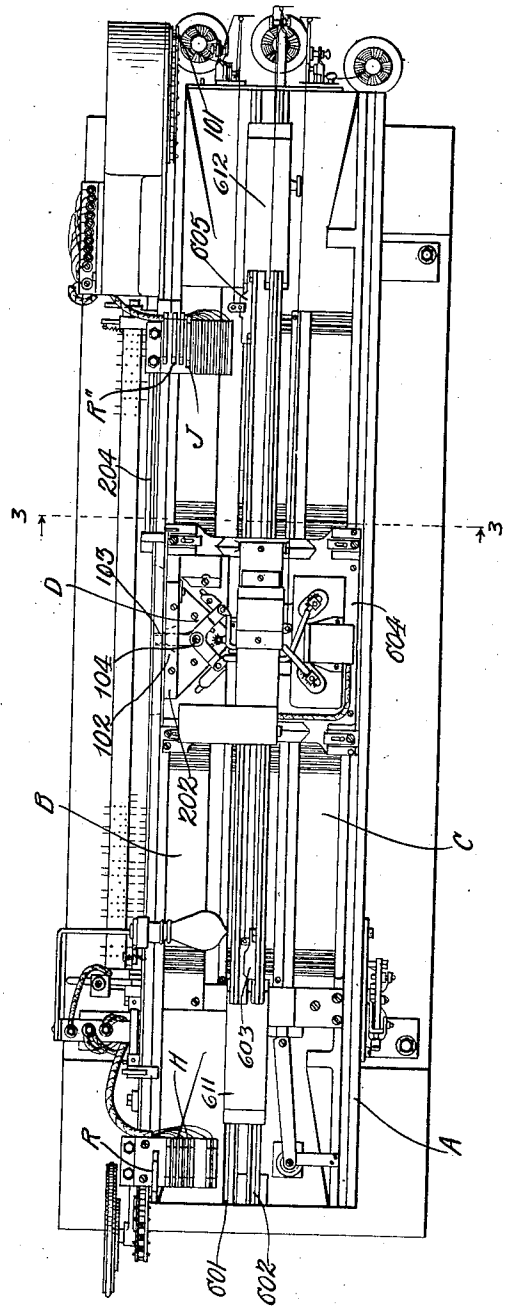


Fig. 2.

INVENTOR

William Fels

BY

Emery Varney Clark & Hyde

ATTORNEY

Feb. 2, 1926. 1,571,769

W. FELS

SELECTIVE THREAD CHANGE MECHANISM FOR KNITTING MACHINES

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Fig. 4

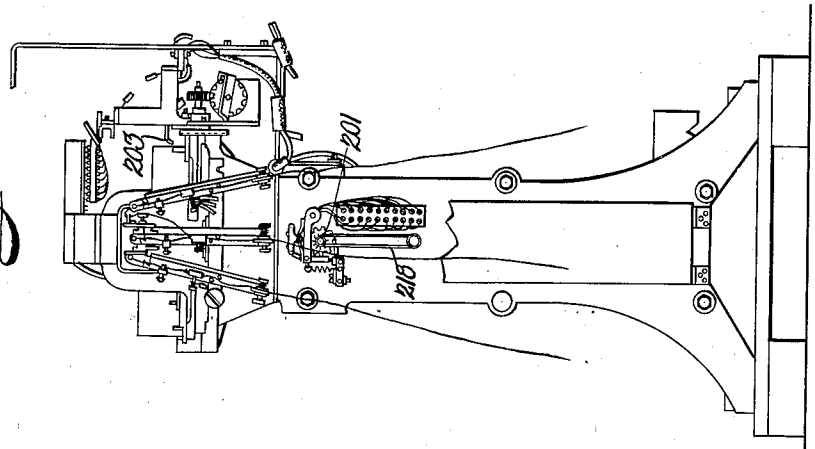


Fig. 3

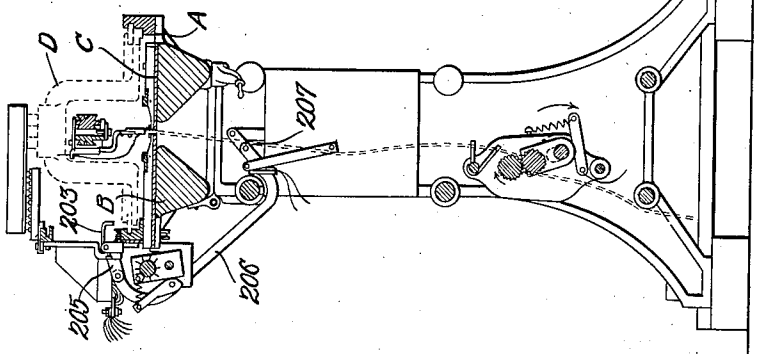
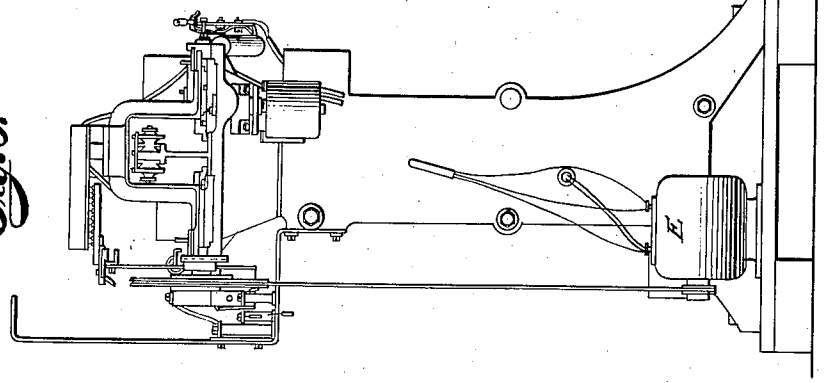


Fig. 5



INVENTOR

William Fels

BY

Emery Vanney Blair & Hazard

his ATTORNEYS

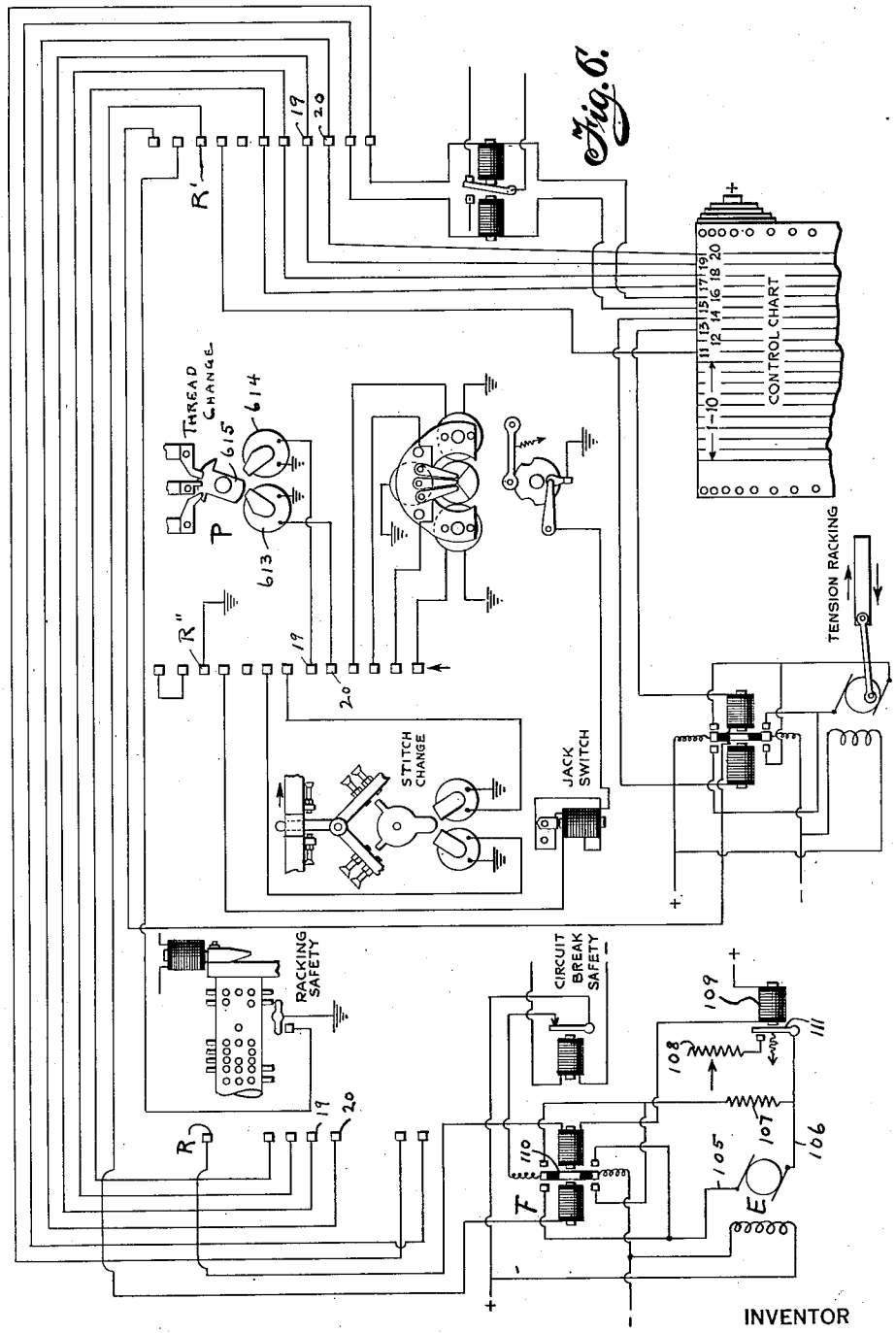
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W. FELS

SELECTIVE THREAD CHANGE MECHANISM FOR KNITTING MACHINES

Original Filed July 8, 1920 6 Sheets-Sheet 4

Fig. 6.



INVENTOR

William Fels

BY

Emery Vanney Blair & Hogan

ATTORNEY

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W. FELS

SELECTIVE THREAD CHANGE MECHANISM FOR KNITTING MACHINES

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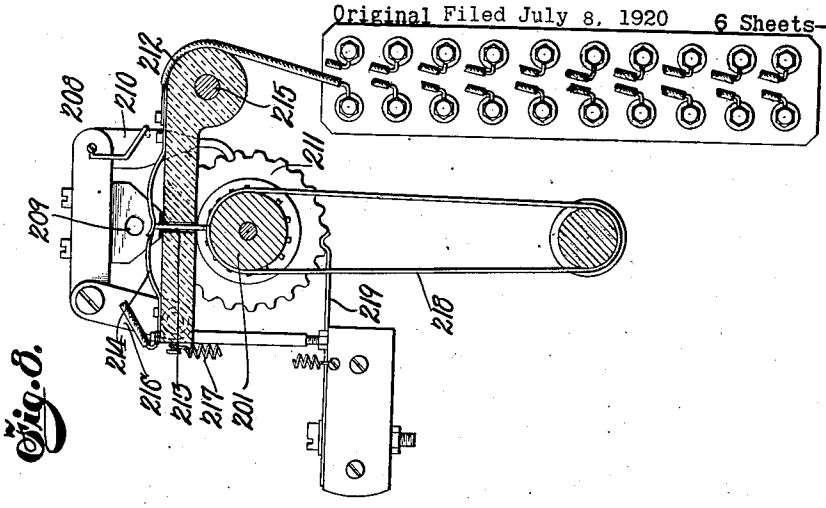


Fig. 8.

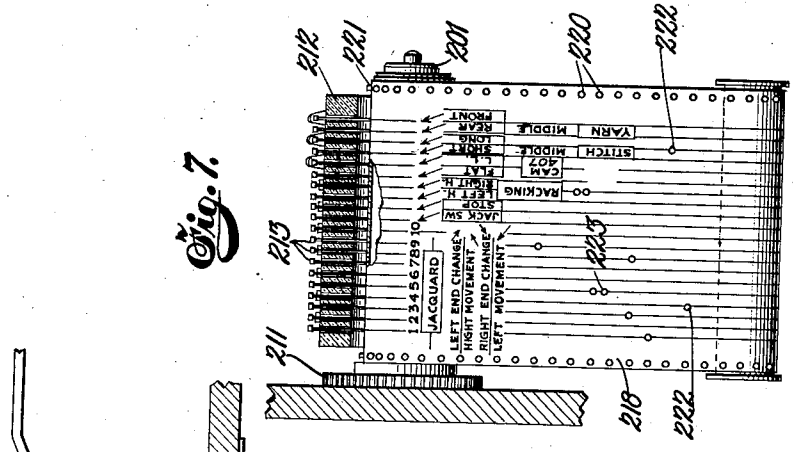


Fig. 7.

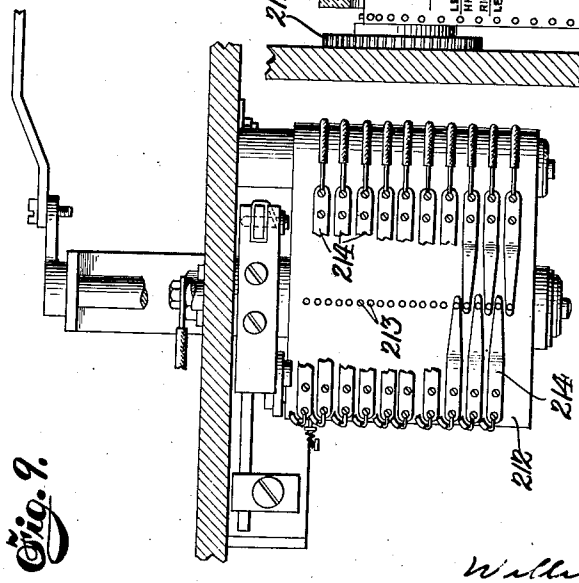


Fig. 9.

INVENTOR

William Fels

BY

Emery Vanney Blair & Hogue

ATTORNEYS

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W. FELS

SELECTIVE THREAD CHANGE MECHANISM FOR KNITTING MACHINES

Original Filed July 8, 1920 6 Sheets-Sheet 6

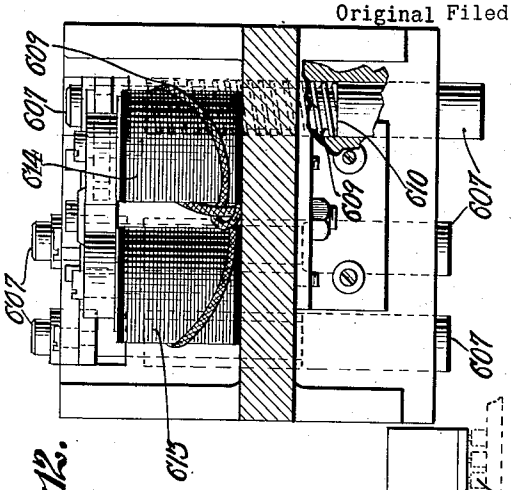


Fig. 12.

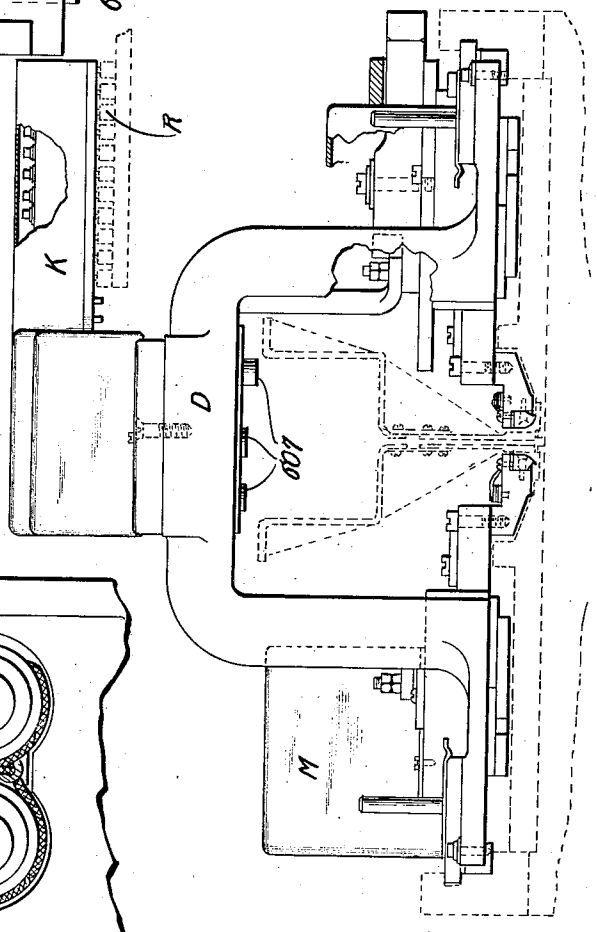


Fig. 10.

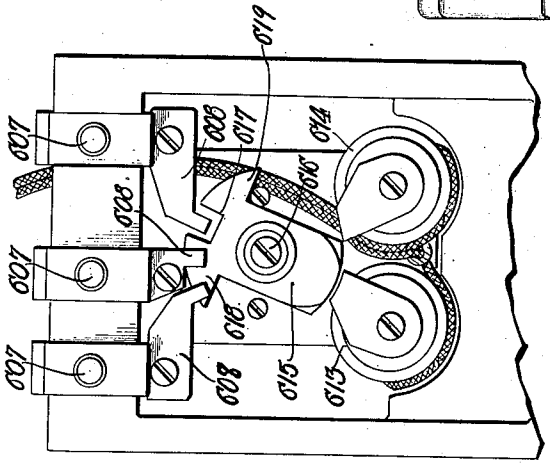


Fig. 11.

INVENTOR
William Fels
BY
Emery Vanney Blair & Hopgood
his ATTORNEYS

Patented Feb. 2, 1926. 1,571,769

UNITED STATES PATENT OFFICE.

WILLIAM FELS, OF ELBERTA, ALABAMA, ASSIGNOR TO MAX NYDEGGER, OF ELIZABETH, NEW JERSEY.

SELECTIVE-THREAD-CHANGE MECHANISM FOR KNITTING MACHINES.

Original application filed July 8, 1920, Serial No. 394,678. Divided and this application filed September 3, 1921, Serial No. 498,312. Renewed July 21, 1925.

To all whom it may concern:

Be it known that I, WILLIAM FELS, a citizen of Austria, residing in Elberta, county of Baldwin, and State of Alabama, have invented an Improvement in Selective-Thread-Change Mechanism for Knitting Machines, of which the following is a specification.

The present invention relates to an improvement in knitting machines, and more particularly to the thread or yarn change mechanism thereof. One object has been to provide a machine which shall be fully or partly automatic and at the same time of relatively simple construction with a minimum of mechanically controlled and actuated parts. A further object has been to provide relatively simple means for preventing injury to the machine in case of careless or erroneous operation.

It is known that knitting machines, automatic in varying degrees, have been devised but these machines are usually of complicated design and involve a multiplicity of mechanical movements which not only make the machine expensive to manufacture, but also cause frequent breakdowns and make it necessary for the operator to devote considerable attention to repairs and adjustments.

According to the present invention, I utilize substantially the well known framework and opposed front and rear needle beds of a flat links links machine, although I do not intend to limit the application of the present invention to machines of this type, it being contemplated that the same or similar principles of operation may be applied to other types of knitting machines with suitable modifications. In connection with the flat double bed machine, I use a reciprocating carriage preferably automatically reversible in direction and which carries with it suitable means for effecting the yarn or thread changes to introduce different kinds or colors of yarn or thread into the fabric. A complete operative knitting machine will also preferably include cam positioning means for controlling the action of the needle jacks to produce either flat or links links operation according to a predetermined order, and means for varying the stitch length according to a predetermined arrangement, although the device forming the subject matter of the present application will perform its functions independently of the operation of the aforesaid cam positioning and stitch length controlling means.

It is contemplated that yarn changes may be controlled automatically with other pattern changes if desired, and by electrical means through the instrumentality of a suitable pattern chart having perforations arranged in the path of contacts, said contacts forming part of electrical circuits connected with and controlling the operation of corresponding change mechanisms of the machine. Thus, the chart may be rotated around the periphery of a drum in such a way that perforations will occur in predetermined relative positions in the path of the contacts and at the proper time to effect corresponding changes in the operation of the machine and thus in the pattern of the fabric. The claims of the present application will, however, be limited to the invention embodied in the yarn or thread change mechanism as described and disclosed in my co-pending application, Serial No. 394,678 filed July 8, 1920, of which the present application is a division.

One embodiment of my invention is illustrated in the drawings accompanying the present specification, and in which

Figure 1 is a front elevation,

Figure 2, a top plan view,

Figure 3, a transverse vertical section on the line 3—3 of Figure 2,

Figure 4, an end elevation showing the arrangement of the electrical pattern control chart,

Figure 5, an end elevation showing the driving mechanism,

Figure 6, a diagrammatic representation of a portion of the electrical pattern control and safety stop system,

Figure 7, a detail fragmentary view of the patern control chart and co-operating contacts,

Figure 8, a detail view partly in vertical section of the pattern control chart and contact making and breaking mechanism associated therewith,

Figure 9, a top view of the contact making and breaking mechanism associated with the pattern control chart,

Figure 10, an end view of the carriage with portions broken away,

Figure 11, a detail view in plan of the thread carrier control mechanism,

Figure 12, a vertical section of the same.

Referring to the drawings, a machine embodying my invention may conveniently comprise a framework A supporting a fixed rear needle bed B and a front needle bed C preferably slidable both longitudinally and laterally (Figure 2). A reciprocating carriage D is arranged above the needle beds B and C, said carriage being driven by any suitable means such as a motor E operatively connected to a drive chain 101, said chain having a slotted member 102 adapted to receive and engage the free end 103 of a lever pivotally mounted on the carriage at 104 (Figure 2). As shown more clearly in Figures 1 and 2, the chain 101 is mounted on sprockets arranged at opposite ends of the machine, said sprockets being driven by a belt or other connection with the motor E. To effect the reciprocating motion of the carriage, means are provided for periodically reversing the direction of the current through the armature of the motor thus reversing the direction of the chain 101. To accomplish this reversing operation automatically, a reversing switch indicated at F in Figure 6 of the drawings, is interposed in the power circuit, said switch being controlled by a double relay, the opposed magnets of which are alternately energized at the end of each run of the carriage, the circuit being closed through suitable contacts mounted on the framework of the machine and on the carriage respectively. However, before reversing the current in the armature of the motor, it is desirable to reduce the current or otherwise impede the movement of the carriage so as to avoid harmful impact thereof at the ends of its course. As shown in Figure 6, the motor circuit includes the conductors 105 and 106, the latter of which contains a resistance 107 and also a parallel resistance or rheostat 108. Thus, to increase the resistance in the conductor 106, the rheostat 108 may be periodically cut out. This is conveniently accomplished by means of a relay including a magnet 109, said magnet being in circuit with both magnets of the double relay F and also with the fixed contact R at one end of the machine, an adjustable contact R′ at the opposite end of the machine, and a movable circuit closing contact R″ mounted on the carriage D. For practical purposes, the magnet 109 and the double relay may operate substantially simultaneously. However, the action of the double relay may be effectively delayed by making the bar 110 thereof heavier than the bar 111. Thus, the current in the motor E will be reduced either simultaneously with or just before the change of direction of the current therein. Obviously, although I have described an automatically reciprocating drive for the carriage, any other suitable means for oscillating the carriage may be employed.

In addition to the automatic features associated with the reversing mechanism, I have also provided automatic means for controlling and actuating in predetermined succession those parts of the device which operate more particularly to form the fabric and to govern the character of the pattern thereof. This automatic control is effected through a combination of electrical and mechanical arrangements which are measurably simpler than those commonly utilized for a similar purpose in the knitting art and, at the same time effect a highly desirable uniformity and certainty of operation. The control apparatus, according to my invention, co-operates with the driving mechanism in such a manner that the necessary changes of certain parts are effected at the proper time to secure the desired design of fabric and also to prevent injury to the machine, the latter result being accomplished through the instrumentality of suitable safety devices. The general scheme of control includes a system of circuits each having one set of contacts which engage according to a predetermined arrangement, so that no change is effected unless both sets of contacts are in engagement simultaneously. Referring to Figures 2 and 6 of the drawings, the periodically operating contacts are represented at H, J and K, the contacts H being fixed at one end of the machine, the contacts J being slidably mounted at the other end of the machine, so that the length of stroke of the carriage may be varied, and the contacts K being mounted on the carriage to reciprocate therewith. Thus, some of the contacts K engage all of the contacts H at each stroke or run of the carriage toward the left end of the machine, while some of the contacts K engage all of the contacts J at each stroke or run toward the right end of the machine. All of the contacts H and J are in circuit with a rotating drum 201, the details of which are more clearly disclosed in Figures 7 to 9 inclusive. Intermittent movement is imparted to the drum 201 by suitable means connected with the reciprocating carriage and operated thereby. Thus, the carriage is provided with an upwardly projecting cam shaped member 202 (Figure 2) which moves in the path of a lever 203 (Figure 3) and deflects one end of said lever upwardly. The lever 203 is securely fastened to a rod 204 (Figure 2) journaled in the framework of the machine and having a lever arm 205 secured at one end. A link 206 pivoted at 207 imparts a rocking motion to a pawl carrier 208 pivotally mounted at 209 (Figure 8). A spring pressed pawl 210 engages a ratchet 211 which is operatively connected

to the drum 201 and imparts intermittent movement to said drum to the extent of one step during each stroke of the carriage. A contact carrier 212 is mounted adjacent to the drum 201 and is provided with a plurality of perforations adapted to accommodate plunger contacts 213 normally pressed toward the drum by means of springs 214. The carrier 212 is pivotally mounted at 215 and is connected to the pawl carrier 208 by means of a link 216. A spring 217 may be provided to hold the contact carrier normally in position to permit the plunger contacts 213 to engage the peripheral surface of the drum 201 or, when in operation, the surface of a pattern chart 218 arranged to cover the surface of said drum. A yielding detent 219 engages the ratchet 211 to prevent lost motion. As indicated in Figure 7, the pattern chart 218 is provided with perforations 220 which receive corresponding sprocket projections 221 extending from the peripheral surface of the drum 201. The surface of the chart may be provided with transverse and longitudinal markings by which the pattern controlling perforations 222 and 223 may be more readily located and identified as to function. In the embodiment of my invention illustrated in the drawings, the pattern chart will move twice between each two of the perforations 220. In other words, the pattern chart will travel a distance equal to the distance between two perforations 220 during a complete oscillation of the carriage D, but the movement will take place in two increments. Thus, a change perforation 222 occurring on the same transverse line with the perforations 220 will indicate a change to be effected at the end of a run of the carriage in one direction while a change perforation 223 indicates a change to be effected at the end of a run of the carriage in the opposite direction.

In operation, the plunger contacts 213 bear yieldingly against the surface of the pattern chart 218 and, as the perforations 222 and 223 come into register with said plunger contacts, the latter are permitted to extend through said perforations, thus, in each case, closing a circuit. This operation takes place intermediate the ends of the carriage runs so that, when the carriage reaches one end or the other of its course, one or more changes will take effect, depending upon the number of perforations through which the plungers 213 are properly projecting into contact with the drum 201.

In addition to the mechanism thus far described and intended to effect pattern changes in connection with the operation of the illustrated embodiment of my invention, there is also mechanism by means of which various kinds and colors of yarn or thread may be introduced into the fabric. It is well known in the knitting machine art to provide a plurality of thread carriers operating in the well known manner in connection with the cam carriage. My invention presents novel apparatus for automatically dropping one thread carrier and placing another thread carrier in operation. Referring to Figure 2 of the drawings, thread carrier guides 601 and 602 are supported in suitable position with respect to the front and rear needle beds C and B respectively and in operative relation to the carriage D which carries means for engaging and disengaging, one at a time, a plurality of thread carriers 603, 604 and 605, said thread carriers each being provided with a shoulder 606 arranged to intercept and engage a plunger 607 (Figure 11) slidably mounted in the framework of the carriage D, there being a plunger for each thread carrier. As indicated in Figure 11, each plunger 607 is provided with a projecting lug 608 which may vary in contour or shape to suit any predetermined arrangements of parts. Each of the plungers 607 may be mounted in a recess of the framework of the machine and will be held normally in depressed thread carrier engaging position by a spring 609 surrounding said plunger and bearing against a shoulder 610 thereon. When the plunger is in this depressed position, it will engage the shoulder 606 and, when the carriage is moved away from the end at which the engagement has taken place, the thread carrier will be moved along with it. The plungers are disengaged from their respective thread carriers by means of cams, such as cam 611 arranged at one end of the machine and cam 612 slidably adjustable at the opposite end of the machine. These cams straddle the carrier guides 601 and 602 pressing inclined plunger engaging faces in the paths of the plungers so that, as any one of the latter moves along in depressed carrier engaging position, its lower end will encounter and ride up on one of said inclined faces and against the yielding resistance of the springs 609.

In accordance with the present invention, the operation of the plungers is controlled automatically and by electrical means, the mechanical features of which are more clearly shown in Figures 10 to 12 while the diagrammatic illustration thereof is shown at P in Figure 6. Referring to Figure 11, two magnets 613 and 614 are mounted on the cam carriage adjacent to the lugs 608, an armature 615 is pivotally mounted at 616 in operative relation to the coils 613 and 614 and is provided with a recess 617 at that end which lies remote from the coils 613 and 614. The recess 617 is adapted to permit the passage of the free end of the lugs 608 while at either side of said recess are provided detents 618 and 619, the purpose of which

is to restrain downward movement of the remaining plungers whereby they remain out of operative relation to their respective thread carriers. Thus, if the magnet 613 is energized when the plungers are riding up on one of the cams 611 or 612, armature 615 will be deflected into the position shown in Figure 11, and the plungers will occupy the relative vertical positions shown in Figure 12. If both magnets are energized simultaneously, while the plungers are riding up on one of the cams 611 or 612, the armature will take such a position that the lug 608 on the middle plunger will be permitted to pass through the recess 617 and the opposite end of the plunger will then engage the corresponding thread carrier. Referring now to Figure 6, it will be seen that the energizing of magnets 613 and 614 is effected upon the closing of control circuits 19 and 20. Inasmuch as contacts lying in these circuits occur in both of the groups H and J, the thread change may take effect at either end of the machine.

In operation, it is contemplated that the points in the formation of the fabric at which thread changes are to occur will be indicated on the control chart by means of suitably positoned perforations. Thus, when one of such perforations is brought into register with one of the pins 213, Figure 7, the corresponding circuit will be closed at the end of the run of the carriage and when one of the contacts 19 or 20 on the carriage engages a contact 19 or 20 at either end of the machine, the armature 615 will operate in the manner hereinabove described in co-operation with the thread carriers.

From the foregoing description of my improved thread change mechanism for knitting machines and its method of operation, it will be clear that I have provided a device by the use of which pattern variations involving yarn or thread changes can readily be produced automatically and as frequently as desired with a minimum of labor. Other advantages arising out of the improved construction both by itself and associated with other devices common to knitting machines will be apparent.

I claim as my invention:

1. In a knitting machine, the combination of a reciprocatable cam carriage, a plurality of thread carriers, means mounted on the carriage for moving said carriers including a plurality of spring pressed plungers, a movable plunger detent adapted to retain some of said plungers in inoperative retracted position while permitting another of said plungers to move into carrier engaging position and means for selectively positioning said detent to prevent operative movement of predetermined plungers.

2. In a knitting machine, the combination of a reciprocatable cam carriage, a plurality of thread carriers, means mounted on the carriage for moving said carriers including a plurality of spring pressed plungers, a movable plunger detent adapted to retain some of said plungers in inoperative retracted position while permitting another of said plungers to move into carrier engaging position and means for selectively positioning said detent to prevent operative movement of predetermined plungers, comprising magnets operatively arranged with respect to said detent, and means for energizing a predetermined magnet or magnets.

3. In a knitting machine, the combination of a reciprocatable cam carriage, a plurality of thread carriers, means mounted on the carriage for moving said carriers including a plurality of spring pressed plungers, a movable plunger detent adapted to retain some of said plungers in inoperative retracted position while permitting another of said plungers to move into carrier engaging position and means for selectively positioning said detent to prevent operative movement of predetermined plungers, comprising magnets operatively arranged with respect to said detent and means for energizing said magnets including periodically engaging contacts and contacts adapted to engage in predetermined sequence and simultaneously with a circuit closing engagement of said periodically engaging contacts.

4. In a knitting machine, the combination of a reciprocatable cam carriage, a plurality of thread carriers, carrier engaging members on the carriage, means at the end of each run for moving said carrier engaging members out of carrier engaging position and a selectively operated detent on the carriage for retaining some of said members in disengaged position.

5. Selective thread change mechanism for knitting machines having a cam carriage, including a plurality of thread carriers, a plurality of carrier engaging members on the cam carriage, means for moving the carrier engaging members to disengaging position at the end of each run of the carriage and a detent on the carriage for retaining some of the carrier engaging members in disengaged position.

6. Selective thread change mechanism for knitting mechines having a cam carriage, including a plurality of thread carriers, a plurality of carrier engaging members on the cam carriage, means for moving the carrier engaging members to disengaging position at the end of each run of the carriage and a pivoted detent movable in both directions on the carriage for retaining all but one of the carrier engaging members in disengaged position.

7. Selective thread change mechanism for knitting machines having a cam carriage, including a plurality of thread carriers, a

plurality of yielding carrier engaging members on the carriage tending normally to engage the carriers, means on the carriage to retain all but one of said yielding members in disengaged position during the run of the carriage and means for moving the yielding members out of carrier engaging position at the end of each run of the cam carriage.

8. In a knitting machine, the combination of a reciprocatable cam carriage, a plurality of thread carriers, means mounted on the carriage for moving said carriers including a plurality of carrier engaging members, a detent adapted to retain some of said members in inoperative retracted position while permitting another of said members to move into carrier engaging position, and means for selectively positioning said detent to prevent operative movement of predetermined members, comprising electrically operated detent moving and holding means.

9. In a knitting machine, the combination of a reciprocatable cam carriage, a plurality of thread carriers, means mounted on the carriage for moving said carriers including a plurality of spring pressed carrier engaging members, a detent adapted to retain some of said members in inoperative retracted position while permitting another of said members to move into carrier engaging position and means for selectively positioning said detent to prevent operative movement of predetermined members, comprising magnetic detent moving and holding means and means for energizing said magnetic means including periodically engaging contacts and contacts adapted to engage in predetermined sequence and simultaneously with a circuit closing engagement of said periodically engaging contacts.

In testimony whereof, I have signed my name to this specification this 13 day of July 1921.

WILLIAM FELS.