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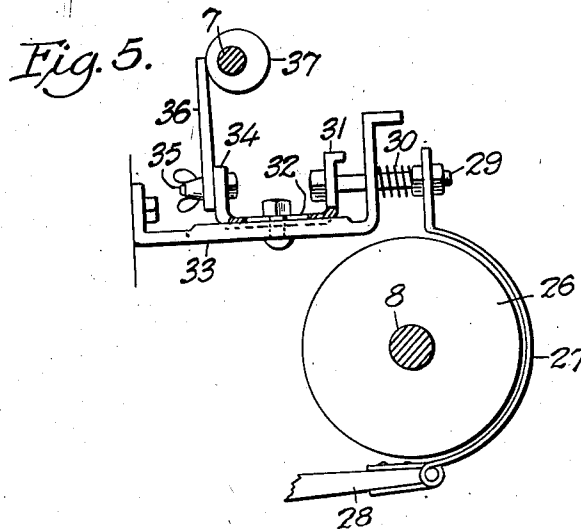
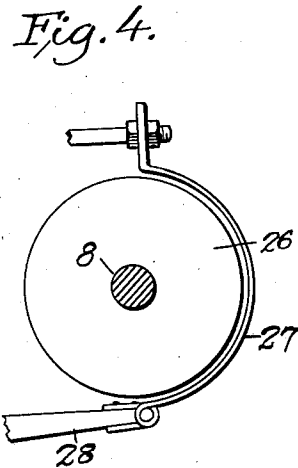
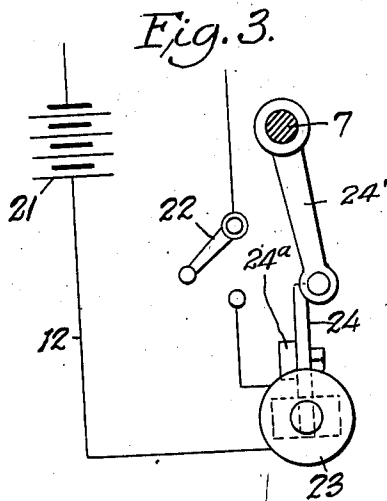
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STOP MOTION FOR WARP KNITTING MACHINES

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STOP MOTION FOR WARP KNITTING
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This invention relates to stop motions for warp knitting machines, and particularly fast knitting machines of this type.

In the operation of machines of this character breakage of the yarn and needles often occurs, requiring stoppage of the machine and tying of the broken threads and replacement of the broken needles at the cost of much time and labor. Cloth produced by such machines are frequently full of "bullet holes", stop marks and other large imperfections and cannot be sold at the price brought by perfect goods.

One object of my invention is to provide a stop motion for warp knitting machines which ensures a quick and easy automatic stop of the machine within a minimum period after a thread or needle breaks, enabling cloth of more perfect knit, i. e., with smaller imperfections, to be produced, and at the same time reducing the amount of repairs to be made and the time periods of stoppage of the machine, whereby better quality goods at less cost may be made on the machine.

Another object of the invention is to provide a stop motion mechanism which is simple of construction, positive, reliable, easy and efficient in action, adapted to permit of replacement of tied threads in their guides in an expeditious manner, and which may be constructed and operated at a low cost.

Still another object of my invention is to provide an electrically controlled stop motion mechanism embodying a control circuit make and break switch member engaged and normally held by a feeding thread in open position and adapted on breakage of a thread or in case of an undue amount of slack appearing in the thread to move to closed position and energize the control circuit, said switch being so constructed and mounted as to engage the thread close to the knitting point so as to serve the additional function of a slack take-up device operating to maintain a tension in the region of the needle mechanism on a vertically disposed stretch of the thread extending between guiding and tensioning means arranged above and substantially in the vertical plane of the needle mechanism, whereby to not only energize the stop motion mechanism when necessity exists but take up slack to a certain degree, short of an undesirable degree, at the most effective point with the result of securing a more efficient and reliable knitting action.

Still another object of the invention is to provide a switch and slack take-up device located

adjacent to the knitting point, which switch has a forked thread engaging arm with a projecting guard and guide nose or shoulder adapted to prevent complete disengagement of the slacked thread from the switch in the event that, from any cause, an unbroken thread should become displaced from its eye or guide opening in the forked switch arm, and which construction and arrangement of the battery of thread engaging switches will permit ready engagement of the threads carried by slewing-brasses with the switches in a slewing action, or the reengagement of a broken thread with a switch whenever a break occurs without the necessity of compelling the operator to use a ladder or climb to a high point on the machine in order to reach the switches for these purposes.

The invention consists of the features of construction, combination and arrangement of parts, hereinafter fully described and claimed, reference being had to the accompanying drawings, in which:—

Fig. 1 is a diagrammatic perspective view of the stop motion mechanism, with parts in running position, showing in connection therewith only so much of parts of a warp knitting mechanism as is necessary to illustrate the application of the invention.

Fig. 2 is a similar view showing the parts in stop position.

Fig. 3 is an enlarged view of the latch mechanism.

Fig. 4 is a similar view of the brake.

Fig. 5 is a view showing the manner of releasing the brake.

Referring now more particularly to the drawings, 1 designates the warp beam, 2 the cloth beam, 3 a guiding and tensioning rod or bar, 4 the sinkers, 5 one of the needles of the needle mechanism, 6 one of the thread guides, disposed adjacent to and about the needle 5 and between the same and the rod 3, 7 the shifting rod of the throw-off mechanism, and 8 the hand shaft of a warp knitting machine of the character described, all of which parts may be of ordinary or any approved construction. 9 denotes a warp thread which feeds from the beam, over the tension rod, which, as shown, is disposed above and substantially in the vertical plane of the guide 6 and needle mechanism and then vertically down to and through the guide 6 and needle 5, and 10 denotes a portion of knitted cloth which winds on beam 2.

In accordance with my invention, I provide a thread-controlled, automatic switch 11 for gov-

erning a control circuit 12, one of which is provided for each warp thread and coacting elements of the knitting mechanism. This switch is of angle form and comprises a body portion 13 having obliquely disposed thread-engaging and contact arms 14 and 15, respectively. The body portion of the switch is pivotally mounted upon a rod or other support 16 forming one of the terminals of the circuit 12 and the arm 15 is adapted for engagement with a contact 17 forming the other terminal of the circuit, whereby said circuit is adapted to be closed by the switch in a certain position of the latter. The arm 14 of the switch is provided with an aperture 18 for passage of that portion of the thread 9 lying between the tension rod 3 and guide 6 and with a passage 19 allowing such portions of the thread to be manually inserted into and withdrawn from the aperture when desired. The passage 18' bifurcates the arm to provide upper and lower jaws or limbs 18a and 18b, the upper jaw being longer than the lower and terminating at its outer end in a guard or stop nose forming a guard or stop shoulder 19 extending in advance of the outer end of the lower jaw. The arm 15 is of greater weight than the arm 14, and normally tends by its greater weight to tilt the switch to the circuit closing position shown in Fig. 2, in which arm 15 engages contact 17, but the switch is so arranged, i. e., with its pivot 16 so disposed with relation to the plane of that part of the thread extending between the tension rod 3 and the guide 6, that when such portion of the thread is engaged with arm 14 in the manner set forth arm 15 will be tilted upward into contact with a stop 20, while arm 14 will be drawn downward by the tension pull of the thread, in which position it forms an auxiliary guide for the thread and is held by the thread so as to maintain the switch in normally open or inoperative position as shown in full lines in Fig. 1. As long, therefore, as the feeding thread is intact and under working tension, the switch will be open, but in the event of the breaking of the thread, or of undue slack occurring in the thread due to breaking of the needle, the switch will be released by or relieved from the restraining action of the thread, and the switch, under the weight of arm 15, will move into engagement with contact 17 and close the electric circuit.

The circuit 12 includes a battery or other source of electric energy 21, a cut out switch 22 and an electro-magnet or solenoid 23. Arranged within the field of influence of the magnet is a pivoted armature-latch 24 carried by a suitable support 24a independent of the shifting rod 7, which armature-latch is adapted to be normally held in the path of a detent 24' on the rod by the spring 25 to lock said shifter rod from shifting movement. When the switch 11 closes the circuit 12 the magnet 23 is energized to attract and move the latch 24 out of the path of the detent 24', thereby releasing the rod 7 so that it may be actuated by its actuating coil spring attached to the body of the throw-off mechanism.

On the hand shaft 8 is a brake wheel 26 and adapted for engagement therewith is a brake band 27. One end of the band is pivotally connected with a bracket 28 on the machine, while the other end of the band is slidably coupled by a pressure spring connection, including a bolt 29 and a brake retracting spring 30, with the motion transmitting arm 21 of a U-shaped bracket 32 slidably mounted by a bolt and slot connection on a stationary supporting bracket 33 on

the machine, the actuating arm 34 of which bracket 32 is coupled, as at 35, to an operating staff 36. This staff is arranged to be engaged by a brake operating cam 37 on the rod 7, and this rod 7, or the cam 37, is connected to one end of a coiled throw-off spring 37' fastened to or arranged to bear at its opposite end against a fixed part 37a of the machine, which spring is tensioned for action by movement of the shaft in the direction to retract cam 37 and engage detent 24' with latch 24, whereby, when the electric circuit is closed by the breaking of a thread or needle and the latch is retracted to release the detent, the rod 7 will be turned in the reverse direction to operate the throw-off mechanism and cam 37 will actuate band brake 27 to easily, but positively and quickly, stop the machine. The coupling 35 forms a quick-detachable connection between the brake lever and its staff, whereby the staff may be freed for removal, so that it may be swung out of the path of the cam, thus permitting retraction of the brake band, allowing adjustment of the machine for replacement of a broken needle or turning over of the machine by hand to move the needles down into the sinkers in order that a broken and tied thread may be replaced in its proper guide.

In the normal operation of the machine, the switch 11 is held by the tension of the thread 9 in the open or full line position shown in Fig. 1, and the brake band is in its release position and the shifting rod 7 held from action by the armature latch 24. When a thread breaks, the switch 11 is wholly relieved from any tension pull of the thread and moves to the dotted line position shown in Fig. 3 by the action of its arm 15 which drops by gravity into engagement with the contact 17. The electric circuit 12 is thus closed and the magnet 23 is energized to attract and retract the armature latch 24, thereby freeing the shifting rod 7 for movement by its actuating spring to operate the throw-off mechanism. On the actuation of rod 7 the cam 37 engages staff 36 and applies the brake band 27, and which will be locked in applied position by the pressure of the cam, the band operating to smoothly and quickly bring the machine to a stop so that the ends of the broken thread may be tied and placed back in the proper thread guide. As set forth, the brake staff is jointed or connected by a quick detachable coupling 35, which may be operated to disconnect or loosen the engagement between the staff and brake lever sufficiently to permit the staff to be moved out of engagement with the cam. The brake will thus be released, so that the hand shaft may be turned to operate the machine by hand to move the needles back into the sinkers in order that the broken thread may be placed in its proper guide. The stop mechanism also operates when a needle breaks, owing to the fact that the broken needle does not take up the entire amount of yarn which is pulled out from the warp by the other threads. Therefore, the undue slackening of the thread, occurring after two or three motions of knitting, allows the switch to engage the electrical contact 17 which closes the circuit and stops the machine. Owing to the fact that the circuit closing switch normally operates immediately to close the circuit for actuation of the throw-off and brake on the breakage or undue slackening of a thread, it will be evident that the amount of damage done in the knitting action and showing up in the fabric will be reduced to the minimum, so

that the imperfections in the fabric due to repaired broken threads and broken needles will be of very small or minute character, allowing a fabric much freer than ordinary fabrics from knitting imperfections to be produced and a higher price obtained for such fabric.

It will be observed that the switch 11 is so constructed and mounted as to engage the vertical portion or stretch of the feeding thread 9 between the tension bar or rod 3 and the guides 6 located immediately above the needles 5, so that the point of engagement of the switch with the thread will be close to the knitting point or in the immediate region of the needle mechanism. This engaging point is preferably placed adjacent to but above the guides 6 so that the switch member may be employed to serve the added function of a slack take-up device within certain limits, so located for controlling the thread tension as to secure a more efficient and reliable knitting action. It will be understood that more or less slack is liable to be present in individual feeding threads due to various causes notwithstanding the use of ordinary tensioning means, as a result of which an imperfect knitting action may take place, that is, a cloth produced which is not of uniform texture because of lack of uniform tension on the threads at the knitting point and the consequent knitting of the cloth with relatively tight and loose threads. A certain minimum degree of this slack may at all times be allowed without injury, and it is, therefore, unnecessary and undesirable to throw the stop motion mechanism into operation at such times. A condition or degree of slack, herein called undue slack, may be present, however, which will require operation of the stop motion mechanism, as for example, that caused by breakage of the needle, otherwise a faulty knitting action will take place, and at such times the switch 11 will be allowed, owing to the comparatively large amount of slack, to move to closed position and energize the circuit to throw the stop motion mechanism into operation. Between these two degrees of slack, namely, the said certain minimum degree and the undue degree, are degrees of slack within a range which for the purpose of my invention may be termed "permissible" degrees, allowable with certain sizes of threads and/or in loose knitting actions, but which, if allowed to throw the stop motion mechanism into action every time they occur, would result in a too frequent stoppage of the machine and consequent loss of time and decrease in production. This objection is overcome by constructing and mounting the switch device 11 so that it will serve also as a slack take-up device to take up the slack within such "permissible" range and thus prevent too frequent stoppage of the machine which might otherwise occur. To this end the switch pivot 16 is situated at a point in rear of the stretch of the thread extending between the tension bar 3 and the needles 5, and preferably between the tension bar 3 and guides 6, and is constructed as shown, that is to say, its arms 14 and 15 are arranged in planes which are offset from each other by an angularly arranged intermediate or pivoting portion 13. This offset arrangement is such that the arm 14 is disposed below the arm 15, with its forked portion in a plane parallel with or at a slight angle to the plane of the arm 15, and with the portion 13 of the switch member extending at such an angle between said arms as to place the pivot point 16 at the for-

ward end of the arm 15 but in rear of the vertical plane of the forked portion of the arm 14. This adapts the pivot point 16 to be situated close to and immediately in rear of the vertical stretch of the thread 9 and the forked arm 14 to be engaged with the thread, in the normally taut condition of the latter, sufficiently below said pivot point as to adapt said arm 14 to have a comparatively long range of upward and forward motion under slack conditions of the thread and the arm 15 to similarly have a comparatively long range of motion between its extreme upper position, in which it engages stop 20, to its extreme lower positions, in which it engages contact 17 and closes the control circuit. Thus it will be seen that the arm 14 under certain slack conditions of the thread, has a range of forward movement in which it compensates for and takes up slack in the thread before the amount of slack is sufficient to reach the undue point, at which the switch passes beyond a slack take up point in its arc and moves on to closed position. This compensating and take-up range of movement of the switch is sufficient to take up thread slack which would otherwise either cause the production of faulty cloth or which, with other types of stop motion control devices, would throw the stop motion mechanism into action. I am thus enabled to employ the switch as a take-up device to overcome the noted objection and to secure a better and more uniform knitting action before the amount of slack in any thread requires stoppage of the machine, so that losses due to imperfect knitting and frequent machine stoppages will be still further reduced. The switch devices will in the manner indicated act perfectly as an added tension and slack take-up device with all yarns except very fine yarns in which the permissible extent of slack may exceed that allowable by the switch action.

In the operation of slewing or threading the needle mechanism for a knitting operation it is the practice to pass the threads from the warp beam through guide holes in slewing brasses, which are brass plates, of which a number may be used, each having perforations for a large number of threads, as, for example, three hundred or more, by means of which brasses the threads may be moved down to the slewing point and held secure and separated for manual removal and individual engagement with the needles. By disposing the thread engaging arms 14 of the switches close to the slewing point each thread may first be engaged with its switch lever by passing it under and in guided engagement with the shoulder 19 and sliding it through the fork slot of the arm 14 back into the eye or opening 18 and then passed down and engaged with its needle, thus allowing the operator to easily and conveniently perform both operations while standing on the floor before the loom in front of the slewing point. By this means the necessity of the operator climbing up on the machine or upon a ladder in order to reach stop motion actuation switches located above the loom or between the warp beam and the guide and tension device 3 is avoided and annoyance, time and labor saved. Also by arranging the switches 11 so as to engage the thread stretches or portions between the needle mechanism and the guide and tension device 3 the described form of construction of needle with guide or guard nose or shoulder 19, allowing quick engagement of the threads with the switches, with a positive re-

taining action of the threads by the switches while being engaged with the needles, is ensured. Also, in the rare event that an unbroken thread should become disengaged from its opening 18 and move outward in the fork slot of the switch its complete disengagement from the switch will be prevented by the nose or shoulder 19 and it will still be held under tension and guided during a feed action until its displacement is detected by the operator and returned by him to the opening 18. Furthermore, in the event of the breakage of individual threads and stoppage of the machine the operator may re-engage each thread with its switch and needle without the necessity of ascending to the top of the machine each time a break occurs, which would be required if the switches were arranged to engage the portions of the threads between the warp beam 1 and guide and tension device 3. My invention, therefore, affords greater conveniences in the respects noted and saves valuable working time and labor costs in the operation of the machine.

From the foregoing description, taken in connection with the accompanying drawings, the construction, mode of operation and advantages of my improved stop motion mechanism for knitting machines of the character described will be understood and its advantages appreciated by those versed in the art without a further and extended description. While the structure disclosed, for purpose of exemplification, is preferred, it will, of course, be understood that changes in the form, proportions, construction and arrangement of parts may be made, within the scope of the appended claims, without departing from the spirit or sacrificing any of the advantages of the invention.

What I claim is:

1. In a stop motion mechanism for warp knitting machines, the combination with a warp beam, a needle mechanism, and thread guiding and tensioning means arranged above the needle mechanism and between the same and the warp beam, for guiding and tensioning a thread so as to dispose a portion of the thread vertically between the said guiding and tensioning means and the warp beam, and a stop motion actuating member, of normally inactive actuating means for effecting actuation of said member, and a control device governing said actuating means to render the same active or inactive, said device comprising a bell crank-like lever pivotally mounted in rear of and adjacent to the vertically disposed portion of the thread and having a control arm movable between a fully retracted position and a position in which it renders said actuating means active and a thread engaging arm having a forked portion for engagement with said vertical portion of the thread, said thread engaging arm of the lever being so angularly disposed with relation to the control arm as to be movable toward the needle mechanism by the feeding thread to retract the control arm and so as to be movable in a direction transverse to the plane of feed movement of said portion of the thread to take up existing slack therein during movement of the control arm in its activating direction.

2. In a stop motion mechanism for warp knitting machines, the combination with a warp beam, a needle mechanism, and thread guiding and tensioning means arranged above the needle mechanism and between the same and the warp beam, for guiding and tensioning a thread so as to dispose a portion of the thread vertically between

the said guiding and tensioning means and the warp beam, and a stop motion actuating member, of normally inactive actuating means for effecting actuation of said member, and a control device governing said actuating means to render the same active or inactive, said device comprising a bell crank-like lever pivotally mounted in rear of and adjacent to the vertical portion of the thread and having a control arm movable between a retracted position and an activating position in which it renders said actuating means active and a thread engaging arm provided with an angularly disposed portion having a thread passage, a guide slot extending therefrom through the outer end of said arm for movement of the thread into and out of said passage, said thread engaging arm being movable in the direction toward the needle mechanism in the movement of the control arm to retracted position and in a plane transverse to the feed plane of said portion of the thread to take up slack therein during the activating movement of the control arm, the thread engaging arm being provided at its extremity with a projecting shoulder overhanging the guide slot to facilitate engagement of the thread therewith and reduce liability of disengagement of the thread from the arm.

3. In a stop motion for warp knitting machines, a stop motion actuating rod having a brake actuating member thereon, a latch device for locking and releasing the rod, an electric circuit for operating said latch and including a switch operative on breaking of a thread or needle to close the circuit, a hand shaft, a brake for holding said shaft from movement, and a brake setting and releasing member arranged to be engaged and operated by the brake actuating member on the rod to set the brake, said setting and releasing member being manually shiftable to an inoperative position out of the path of said brake actuating member on the rod for releasing the brake so as to adapt the hand shaft to be operated for actuation of the machine.

4. In a stop motion mechanism for warp knitting machines, the combination with a warp beam, a needle mechanism, and thread guiding and tensioning means arranged above the needle mechanism and between the same and the warp beam, for guiding and tensioning a thread so as to dispose a portion of the thread vertically between the said guiding and tensioning means and the warp beam, and a stop motion actuating member, of normally inactive actuating means for effecting actuation of said member, and a control device governing said actuating means to render the same active or inactive, said device comprising a member separate from and movably mounted below the level of and at a point between said thread guiding and tensioning means and the needle mechanism, said member having a control part movable toward and from a coacting part of said actuating means and a forked part engaged by said vertical portion of the thread and movable by said portion of the thread in its feed travel in the direction toward the needle mechanism so as to move said control part away from the coacting part of the actuating means, said forked thread engaging part of the device being so mounted with relation to said vertical portion of the thread as to be movable, on the movement of the control part toward the actuating means, in a direction transverse to the plane of feed movement of said portion of the thread in the presence of slack therein so as to take up such slack in the thread.

5. In a stop motion mechanism for warp knitting machines, the combination with a warp beam, a needle mechanism, and thread guiding and tensioning means arranged above the needle mechanism and between the same and the warp beam, for guiding and tensioning a thread so as to dispose a portion of the thread vertically between the said guiding and tensioning means and the warp beam, and a stop motion actuating member, of normally inactive actuating means for effecting actuation of said member, and a control device governing said actuating means to render the same active or inactive, said device comprising a bell crank-like lever pivotally mounted below the level of the thread guiding and tensioning means adjacent to said vertical portion of the thread and having a control arm movable away from and into and out of contact with said actuating means to render the same active or inactive and a forked thread engaging arm adapted for engagement with said vertical portion of the thread and movable thereby in the direction toward the needle mechanism to effect movement of the control arm in the second-named direction, said forked arm being so arranged as to have movement in a direction transverse to the feed plane of the vertical portion of the thread in the presence of slack therein for taking up such slack and having one of its fork members extended beyond its other fork member to form a guard to facilitate engagement of the thread with the fork and reduce liability of casual disengagement of the thread therefrom.

6. In a stop motion mechanism for warp knitting machines, the combination with a warp beam, a needle mechanism, thread guiding and tensioning means located in the line of feed of the thread between the warp beam and needle mechanism and above the latter, and a stop motion actuating member, of normally inactive actuating means for effecting actuation of said member, and a combined gravity and thread controlled control device governing said actuating means to render the same active or inactive, said device comprising a bell-crank-like lever pivotally mounted in rear of and adjacent to the vertically extending portion of the thread leading from the thread guiding and tensioning means to the needle mechanism and including a control arm movable by gravity between a retracted position and an activating position in which it renders said actuating means active and a second arm depending below the horizontal plane of its pivot and terminating in a forked extremity arranged at an angle thereto and engageable with said vertically extending portion of the feeding and tensioned thread, said thread engaging arm of the control device being movable by said vertically extending portion of the feeding thread in the direction toward the needle mechanism to retract the control arm and hold it from activating relation with respect to the actuating means, and said thread engaging arm being movable under control of the said vertically extending portion of the thread to predetermined degrees in a direction transverse to the plane of feed movement of said thread portion in the presence of slack in the thread to maintain a tension on the thread in the region of the knitting point so long as the thread is unbroken and slacked to a degree short of a predetermined maximum degree allowing movement of the control arm to activating position.

7. In a stop motion mechanism for warp knitting machines, the combination with a warp beam, a needle mechanism, and thread guiding and tensioning means arranged above the needle mechanism and between the same and the warp beam, for guiding and tensioning a thread so as to dispose a portion of the thread vertically between the said guiding and tensioning means and the warp beam, and a stop motion actuating member, of normally inactive actuating means including an electric control circuit for effecting actuation of said member, and a control device governing said actuating means to render the same active or inactive, said device comprising a bell-crank-like lever pivotally mounted in rear of and adjacent to the vertically disposed portion of the thread and having a control arm forming a switch member movable between a full retracted position and a position in which it energizes said circuit to render said actuating means active and a thread engaging arm having a forked portion for engagement with said vertical portion of the thread, said thread engaging arm of the lever being so angularly disposed with relation to the control arm as to be movable toward the needle mechanism by the feeding thread to retract the control arm and so as to be movable in a direction transverse to the plane of feed movement of said portion of the thread to take up existing slack therein during movement of the control arm in its activating direction.

8. In a stop motion mechanism for warp knitting machines, the combination with a warp beam, a needle mechanism, and thread guiding and tensioning means arranged above the needle mechanism and between the same and the warp beam, for guiding and tensioning a thread so as to dispose a portion of the thread vertically between the said guiding and tensioning means and the warp beam, and a stop motion actuating member, of normally inactive actuating means including an electric control circuit for effecting actuation of said member, and a control device governing said circuit to render the actuating means active or inactive, said device comprising a bell-crank-like lever pivotally mounted in rear of and adjacent to the vertical portion of the thread and having a control arm forming a switch member movable between a retracted position and an activating position in which it energizes said circuit to render said actuating means active and a thread engaging arm provided with an angularly disposed portion having a thread passage and a guide slot extending therefrom through the outer end of said arm for movement of the thread into and out of said passage, said thread engaging arm being movable in the direction toward the needle mechanism in the movement of the control arm to retracted position and in a plane transverse to the feed plane of said portion of the thread to take up slack therein during the activating movement of the control arm, the thread engaging arm being provided at its extremity with a projecting shoulder overhanging the guide slot to facilitate engagement of the thread therewith and reduce liability of disengagement of the thread from the arm.

PAUL H. QUICK. 70