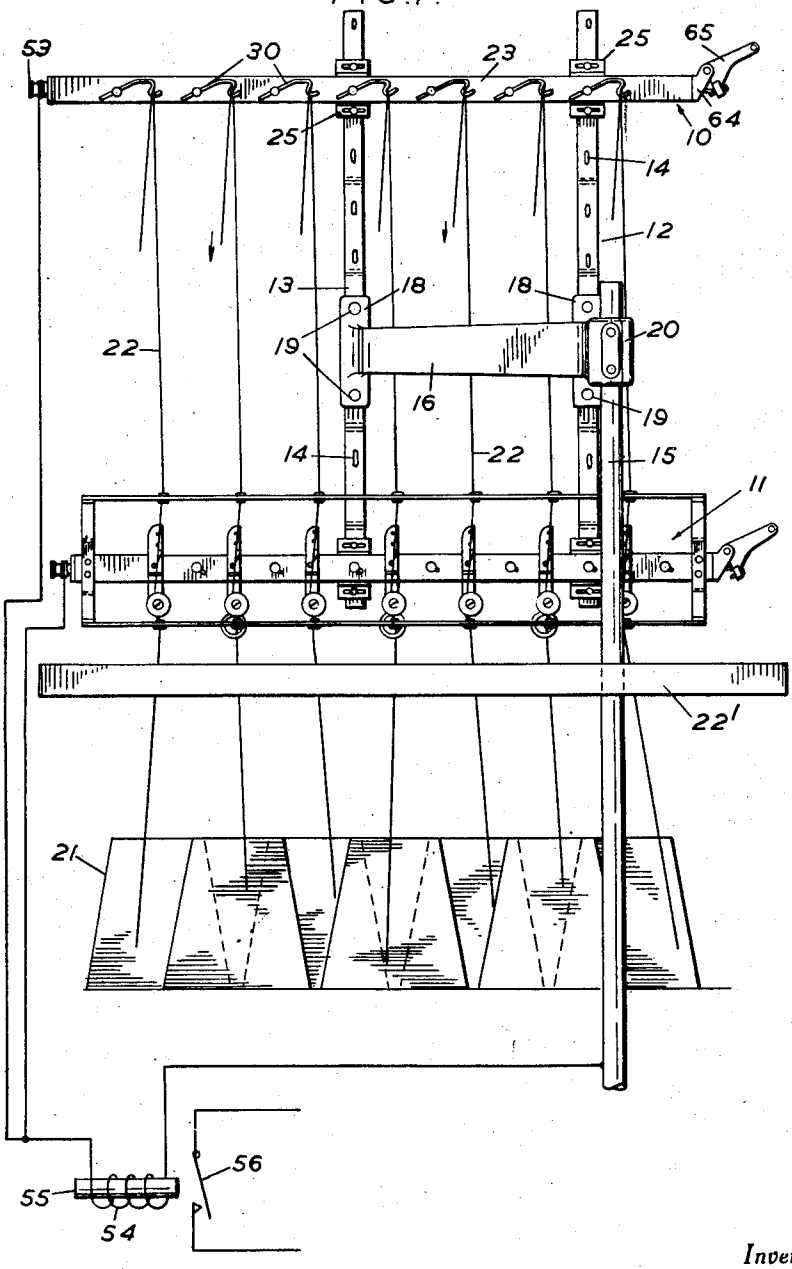
Oct. 6, 1953 W. O. HEYNE 2,654,238

ELECTRICAL STOP MOTION FOR KNITTING MACHINES

Filed Sept. 16, 1950 5 Sheets-Sheet 1

FIG. 1.



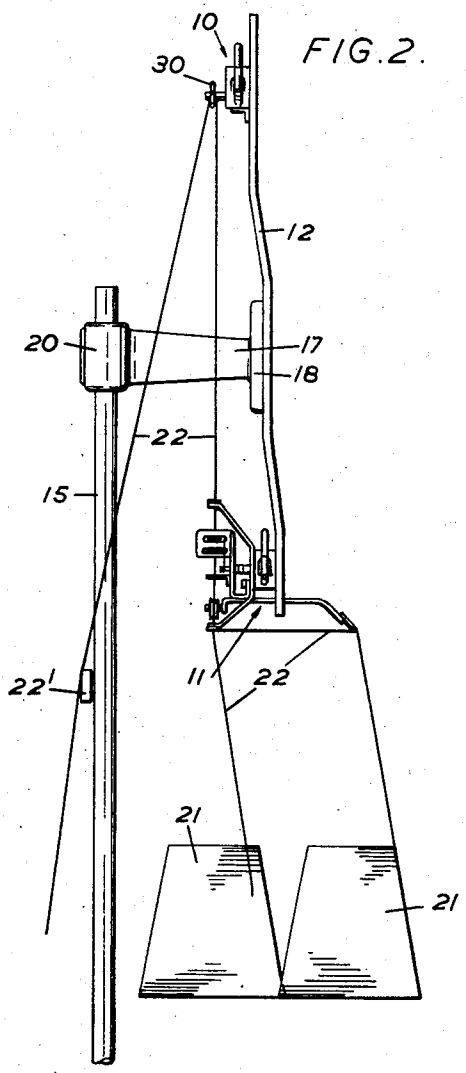
Inventor
William O. Heyne
By Jerome W. Patton
Agt.

Oct. 6, 1953 W. O. HEYNE 2,654,238

ELECTRICAL STOP MOTION FOR KNITTING MACHINES

Filed Sept. 16, 1950 5 Sheets-Sheet 2

FIG. 2.



Inventor
William O. Heyne
By
Jerome W. Rubin
Atty.

Oct. 6, 1953 W. O. HEYNE 2,654,238

ELECTRICAL STOP MOTION FOR KNITTING MACHINES

Filed Sept. 16, 1950 5 Sheets-Sheet 3

FIG. 3.

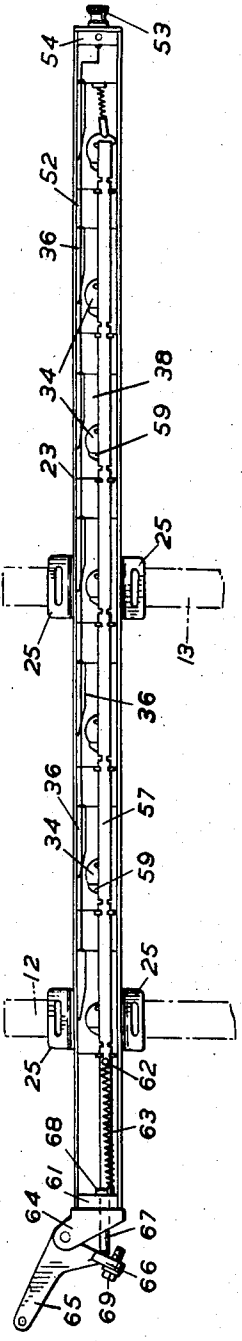
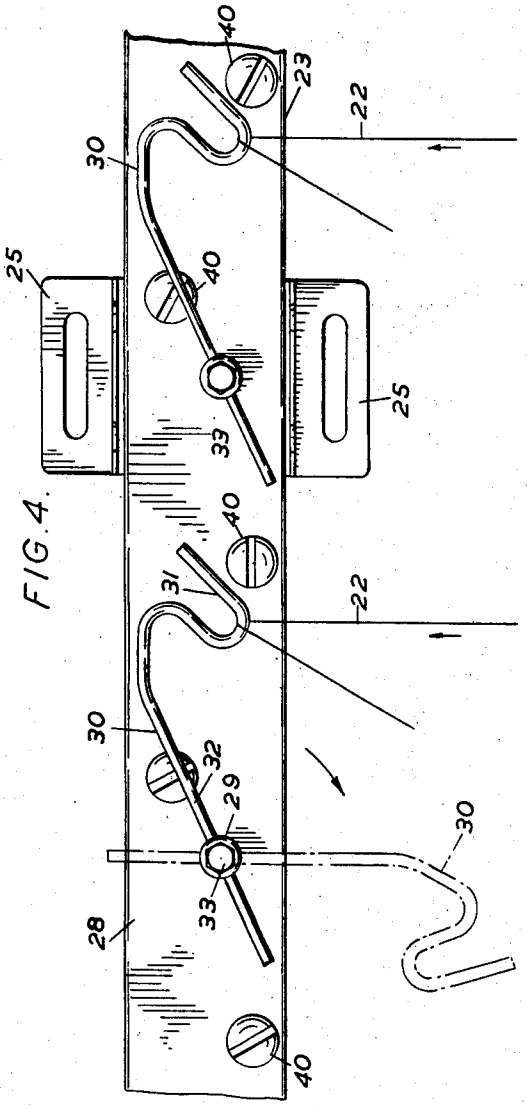


FIG. 4.



Inventor
William O. Heyne
By Jerome W. Bates
Atty.

Oct. 6, 1953 W. O. HEYNE 2,654,238

ELECTRICAL STOP MOTION FOR KNITTING MACHINES

Filed Sept. 16, 1950 5 Sheets-Sheet 4

FIG. 5.

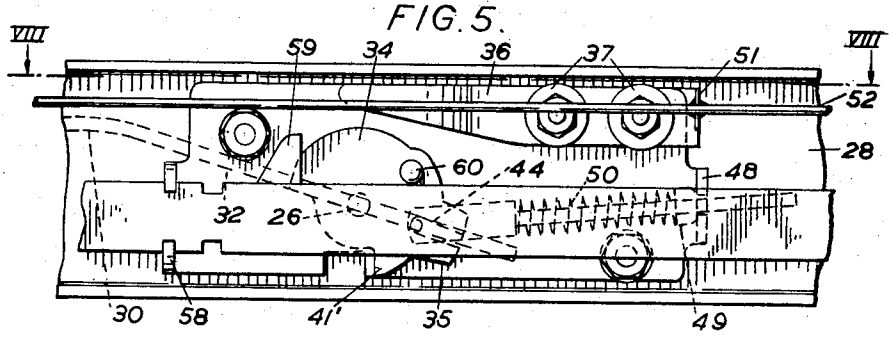


FIG. 6.

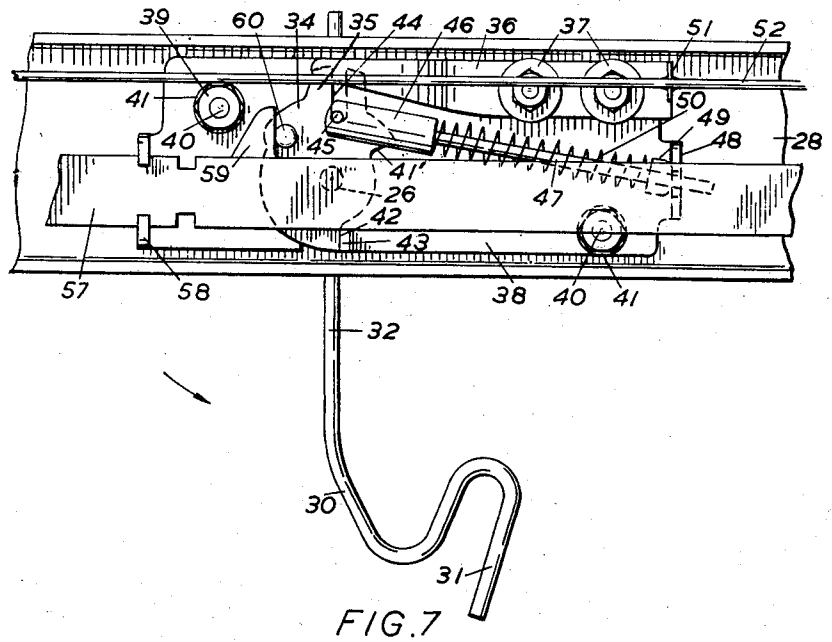
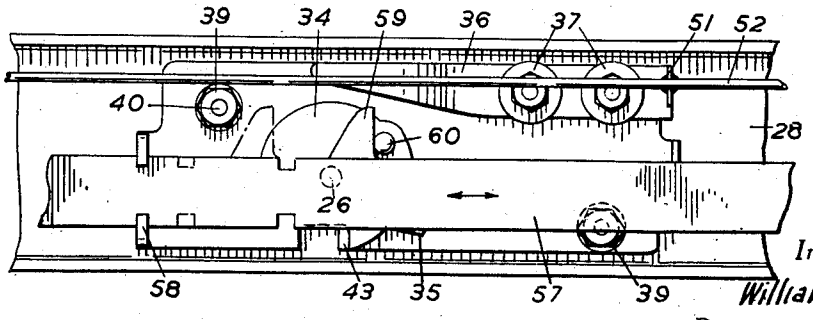


FIG. 7.



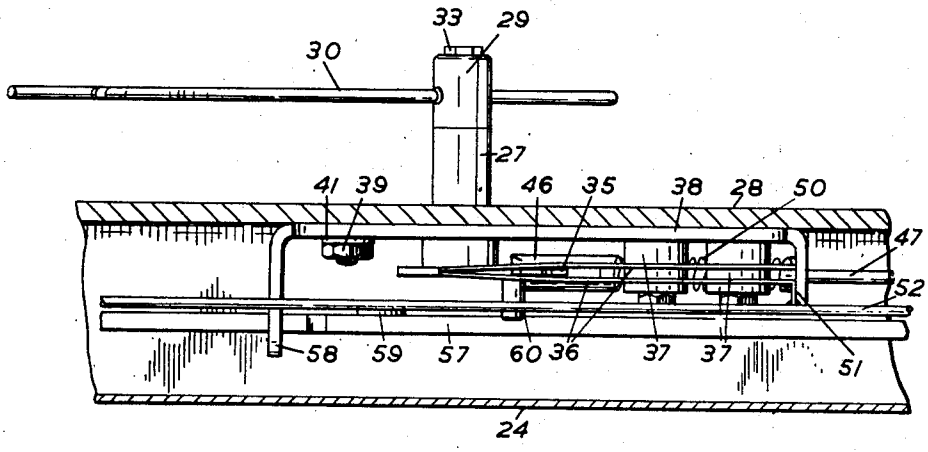
Inventor
William O. Heyne
By James Taylor
Agt.

Oct. 6, 1953 W. O. HEYNE 2,654,238

ELECTRICAL STOP MOTION FOR KNITTING MACHINES

Filed Sept. 16, 1950 5 Sheets-Sheet 5

FIG. 8.



Inventor
William O. Heyne
By Jerome M. Paxton
Atty.

Patented Oct. 6, 1953

2,654,238

UNITED STATES PATENT OFFICE

2,654,238

ELECTRICAL STOP MOTION FOR KNITTING MACHINES

William Oscar Heyne, Epsom, England, assignor of one-half to T. J. Brooks (Autos) Limited, Leicester, England, a British company

Application September 16, 1950, Serial No. 185,227
In Great Britain September 28, 1949

12 Claims. (Cl. 66—163)

1

This invention relates to electrical stop motions for knitting machines, and has reference particularly to a yarn-controlled device for incorporation in such a motion and of the kind comprising, in combination, a yieldable guide in the form of an arm for guiding a yarn running from a yarn supply to a feeder of a knitting machine, and a switch operable to close an electrical circuit and thereby bring about stoppage of the knitting machine, automatically, upon movement of the yieldable yarn guide angularly to an appropriate extent in the event of undue tensioning of the yarn for any reason.

Now heretofore, a yarn-controlled device of the kind concerned has usually been so constructed that as the yarn guide yields in the event of undue tensioning of the yarn, the effective strength of a spring controlling the guide progressively increases right up to the point where the electrical switch operates to close the electrical circuit so that in effect, this switch is closed against spring action. As the guide turns the tensioning of the running yarn commensurately increases, and there is accordingly a tendency for the unduly tensioned yarn to break before the switch is closed. But even if this does not happen, the progressively increasing tension on the yarn has a tendency to prevent the switch from closing properly and quickly enough. Moreover, there is a delay before the unduly tensioned yarn drops off the guide.

The object of the present invention is to provide a yarn-controlled device of the kind herein referred to of an improved construction designed to obviate the aforementioned disadvantages.

The device of this invention, then, includes a yarn guide comprising an arm pivotable upon a spindle, and spring means adapted normally to act at one side of a line coincident with the pivotal axis of the guide spindle and to control movements of the latter resulting from the comparatively small changes in the tensioning of a normally running yarn, but to be transferred for action at the opposite side of said line suchwise as relieve the tension of the yarn and effect operation of a switch controlling the stop motion in the event of the yarn becoming abnormally tensioned and turning the guide beyond a predetermined angular extent.

Conveniently the movable member of the switch is in the form of a plate which co-operates with a pair of fixed contacts represented by opposed blades in the manner of a knife switch. The spring may be associated with this switch plate through a guide in which the spring is mounted and which is slidable and rockable relatively to a fixed part of the device and is connected to the switch plate.

2

Advantageously the guide for the spring is furnished with a pin engaging transversely in a slot in the switch plate and dimensioned vis-a-vis the slot so as to have lateral play therein: thus, when the light and permissible yarn tensions prevail the transverse pin is located to one side of its slot whereas, when the dead centre position is reached, the pin moves to the other side of the slot thus positively initiating the "throw" of the switch plate.

According to another feature of this invention mechanical means are provided for returning the switch plate to its starting position after closure of the switch.

The device of this invention can be employed separately, or a group of these devices can be employed together to deal with cases where there are a plurality of running yarn lengths to be passed to the feeding points of the knitting machine. In this event the various yarn controlled devices can be housed in a common casing and may have a common electrical conductor capable of being supplied by the closing of the switch of any of the devices.

Furthermore, in such an arrangement, a resetting means capable of dealing with any tripped devices in one operation may be employed.

Other features of the invention are set forth in the appended claims.

To enable the invention to be more fully understood I have appended hereto drawings illustrating, by way of example, an embodiment of the yarn controlled device according to this invention. In these drawings:

Figure 1 is a front elevational representation of an assembly incorporating a group of yarn-controlled devices according to this invention, for use in connection with a multi-feeder knitting machine.

Figure 2 is a side view of the assembly.

Figure 3 is an enlarged view of the group, as seen from the opposite side to the view of Figure 1 and located in their common housing, the cover of which has been removed.

Figure 4 is a further enlarged view of part of the group, seen from the front.

Figures 5, 6 and 7 are rear views of one of the yarn-controlled devices, illustrated in different operative positions.

Figure 8 is a plan view taken on the line VIII—VIII of Figure 5.

Referring first to Figures 1 and 2 of the drawings, the assembly therein illustrated includes a structure, generally designated 10, comprising

a group of yarn-controlled devices which form part of the stop motion of the knitting machine, and a structure incorporating a group of yarn-failure devices, indicated at 11, also included in the stop motion. The yarn-failure group 11 forms no part of the present invention but is the subject of my co-pending patent application Serial No. 192,194, filed October 26, 1950.

The structures 10 and 11 are both secured to a pair of spaced upright bars 12 and 13 which conveniently are, as illustrated, undulated along their length and provided with a series of holes 14 for receiving fastening means. The bars 12 and 13 are supported by an upstanding pillar 15, provided in the superstructure of the knitting machine, by means of a pair of arms 16 and 17 diverging from a common sleeve 20 on pillar 15 and with flange plates 18 at their outer ends which are attached by bolts 19 passed into appropriate holes 14.

Yarn lengths 22 for the feeders of the knitting machine are supplied from two rows of relatively staggered bobbins 21 and, after traversing the structure 11, pass upwards over the individual tension-responsive devices of the structure 10 and then down again, over a guide bar 22', to their respective feeders.

The structure 10 comprises a straight, pressed sheet metal casing 23 which is closed at the back by a removable cover 24 and has a pair of lugs 25 at the upper and lower sides thereof for attachment to the bars 12 and 13.

To enable the construction and functioning of the tension-responsive mechanism to be understood, I will now describe one of the individual devices, since all these devices are similarly constructed and arranged.

This device includes a yarn guide spindle 26 which is rotatably mounted in a bearing boss 27 on the front side 28 of the casing 23. To the outer end of the spindle 26 is secured a cylindrical fitting 29 which is drilled to receive a yarn guide arm 30. This latter is constituted by a length of metal rod or stout wire which is crooked at its outer, operative end portion to produce a substantially V-shaped formation 31 for receiving and guiding a yarn length 22, this portion 31 having its axis nearly parallel with the main length 32 of the arm. The arm 30 is adjustable in the fitting 29 to vary its effective length and thus the leverage action of the yarn on the spindle 26, so enabling the arm to be set to different degrees of tension. A set screw 33 is provided for fixing the arm 30 in position after adjustment.

Rigidly secured to the inner end of the spindle 26 is a thin disc 34 of good electrically conducting metal, e. g. brass, constituting the movable contact of a knife switch. Thus, this disc has a radially projecting nose portion 35 of more or less rectangular shape which co-operates with a pair of closely spaced parallel blades 36 of spring metal secured in insulated fashion to a mounting plate 38, with the use of non-conducting washers 37. The plate 38 is itself secured to the front wall 28 of the casing by nuts 39 and bolts 40, again with the use of insulating washers 41.

The disc 34 is peripherally recessed at a part spaced from the nose 35 to form a pair of angularly spaced shoulders 41' and 42, and the mounting plate 38 is furnished with an out-turned lug 43 forming a stop which is sited in the path of the shoulders 41' and 42 and co-operates with these to determine the limits of the angular turning movement of the disc.

The nose 35 of disc 34 is centrally slotted at 44 to receive a pin 45 between the two arms of a bifurcated cylindrical element 46. At its inner end the slot is of somewhat greater width than the diameter of the pin 45. Secured to element 46 is a stem 47, this stem passing through an opening, horizontally aligned with the guide spindle 26, in a flange 48 bent out of the mounting plate 38 so as to be capable of sliding, and a limited pivoting movement, relatively to this flange. Located around the stem at its nether end and bearing against flange 48 is a cup 49 which serves to locate and support one end of a loaded compression spring 50, the other end of which is connected to the element 46.

Hence the spring 50 is supported against cup 49 and acts on a fixed point on the disc 34, and when the axis of the stem 47 intersects the spindle 26 the spring 50 is disposed in a dead centre position.

In the normal position illustrated in full lines in Figure 4 and in Figure 5 of the drawings, the stem 47 is located beneath this dead centre position that is to say the guide arm portion 32 is inclined upwards at an angle to the horizontal and the stem 47 and spring 50 are inclined slightly downwards from the outer end and press the shoulder 41' of disc 34 against stop 43. In this condition the knife switch is open and the yarn runs over the loop 31 as seen in Figure 4.

Light tensions on the yarn length 22 will pull the arm 30 downwards slightly and move the shoulder 41' temporarily clear of its stop but, depending on the setting of arm 30, not to an angular extent sufficient to swing the stem 47 beyond its dead centre position.

If, however, the yarn becomes unduly tensioned, then the stem 47 will be swung beyond this dead centre position. The fact that the pin 45 has a little lateral play in the bottom of slot 44 militates against any sticking or jamming in the dead centre position and ensures that the transfer will take place positively from one side of this position to the other. As a result the spring 50 will expand to throw the disc round until the shoulder 42 thereof collides with the stop 43 and stops the disc. Thus the arm 30 will be swung rapidly downwards, as illustrated in Figure 6, instantaneously relieving the yarn tension and dropping it out of the loop 31.

By this same action the nose 35 of the disc 34 enters between the blades 36, so closing the electrical switch. Each pair of blades 36 has a rearwardly-projecting lug 51, and these pairs are all connected to a common conductor or bus-bar 52 which extends to the end of the casing to be connected to a terminal 53 mounted on an insulating block 54. Thus closure of any one of the knife switches by undue tensioning of the corresponding length of running yarn will result in grounding of the conductor 52. This will energize a control circuit, such as that diagrammatically indicated in Figure 1, to excite the windings 54 and actuate a solenoid 55 to close a switch 56 effective to cause de-clutching of the drive of the knitting machine. The latter will therefore come to a standstill.

When the faulty yarn length, which will be detected if only by the dropping of the corresponding arm 30, has been replaced or corrected, the machine can be set running again. To provide for the re-setting of the thrown-down arm or arms, the opening of the affected knife switch or switches and the conditioning of the assembly for re-use, we have devised a re-setting mechanism common to all devices of the group.

This comprises a bar 57 extending in and along the casing 23 and guided and supported in an undercut recess in a further outstanding lug 58 on each of the mounting plates 38. This bar carries a series of nibs 59, one corresponding each disc 34, and these latter each have a projecting pin 60 for contact with the related nib. At its operating end the re-setting bar 57 slides in an end wall 61 of the casing 23 and, at a distance from this part, has a pin 62 for anchoring the end of a return tension spring 63 which is connected to the wall 61. At its outer side the latter is furnished with a bracket 64 having a pair of arms between which is pivoted a lever 65. This latter has an end piece 66 bearing against a rod-form extension 67 of the bar 57 which is provided with a collar 68 abutting against the casing wall 61. The end piece 66 carries an adjustable limiting stud 69 (see Figure 3).

Hence, to re-act the mechanism the lever 65 is pulled down causing the end piece 66 to push the rod 67 and bar 57 inwards against the action of spring 63 and until the stud 69 meets the casing end wall 61. This results in the appropriate nib or nibs 59 carrying around any pin 60 in the path thereof, so swinging any tripped disc 34 back, as exemplified in Figure 7, to its original or normal position.

It will be understood that modifications of the structure described are possible within the scope of the invention. For example the electrical switches may be arranged to close a circuit through the removable cover plate.

Again, it will be appreciated that the structure may include as many yarn tension-responsive devices as may be required. In fact it may, in some instances, be convenient to have one only of these devices, with the mechanism housed in a comparatively short casing.

It will further be understood that yarn-controlled devices and groups of devices according to this invention are applicable to the stop motions of circular knitting machines, as well as to straight-bar or flat knitting machines.

What I claim then is:

1. In or for the electrical stop motion of a knitting machine, a control device responsive to the tension of running yarn and comprising a support, a yarn guide pivotally mounted on said support, an electrical switch for controlling the operation of said stop motion, rotary means on said support for controlling the opening and closing of said switch and connected to said yarn guide to rotate in response to movement of the latter, and spring means on said support acting at a fixed point on said rotary means to oppose rotation thereof up to a predetermined angular position thereof and reinforce this rotation beyond the aforesaid position.

2. In or for the electrical stop motion of a knitting machine, a control device responsive to the tension of running yarn and comprising a support, a yarn guide pivotally mounted on said support, a member rotatably mounted on said support and movable with said guide, fixed contact means for incorporation in the stop motion, movable contact means on said rotary member for cooperation with said fixed contact means, and a compression spring mounted at one end on said support and connected at its other end to said rotary member, said spring having its axis normally disposed on one side of the dead-centre line joining its mounted end to the rotatable axis of said rotary member but adapted, at a predetermined yarn tension applied on said guide, to be swung to the other side of said dead centre line by the rotary member, whereby its action on the latter changes from a retarding to an acceleration of the rotary movement.

3. In or for the electrical stop motion of a knitting machine, a control device responsive to the tension of running yarn and comprising a support, a yarn guide pivotally mounted on said support, a plate member rotatably mounted on said support and movable with said guide, a pair of opposed fixed contact blades on said support, a movable contact on said rotary member for contact engagement between said contact blades, and spring means on said support acting on said plate member to oppose rotation thereof up to a predetermined angular position and reinforce this rotation beyond the aforesaid position.

4. In or for the electrical stop motion of a knitting machine, a control device responsive to the tension of running yarn and comprising a support, a yarn guide pivotally mounted on said support, a plate member rotatably mounted on said support and movable with said guide, fixed contacts, a movable contact on said rotary member for contact engagement between said fixed contacts, a compression spring mounted at one end on said support, and a pin carried by the other end of said spring and engaging with lateral play in the bottom of a slot in said plate member.

5. In or for the electrical stop motion of a knitting machine, a control device responsive to the tension of running yarn and comprising a support, a yarn guide pivotally mounted on said support, an electrical switch for controlling the operation of said stop motion, rotary means on said support connected to said yarn guide and rotatable in response to movement of the latter, spring means on said support acting on said rotary means to oppose rotation thereof up to a predetermined angular position and reinforce this rotation beyond the aforesaid position, stop means for delimiting the rotary travel of said rotary means, and mechanical means for re-setting said rotary means and restoring the parts to their original position after operation.

6. In or for the electrical stop motion of a knitting machine, a control device responsive to the tension of running yarn and comprising a support, a yarn guide spindle pivotally mounted on said support a yarn guide arm of variable effective length adjustably secured to said spindle, said arm having a V-formation at its outer end for receiving the yarn, a plate member secured to said yarn guide spindle a pair of opposed fixed contact blades on said support, a movable contact on said rotary member for contact engagement between said contact blades and spring means on said support acting on said plate member to oppose rotation thereof up to a predetermined angular position and reinforce this rotation beyond the aforesaid position.

7. In or for the electrical stop motion of a knitting machine, a control device responsive to the tension of running yarn and comprising a support, a yarn guide spindle pivotally mounted on said support a yarn guide arm of variable effective length adjustably secured to said spindle, said arm having a V-formation at its outer end for receiving the yarn, a plate member secured to said yarn guide spindle a pair of opposed fixed contact blades on said support, a movable contact on said rotary member for contact engagement between said contact blades, a compression spring mounted at one end on said support, a pin carried by the other end of said spring and

engaging with lateral play in the bottom of a slot in said plate member, stop means for delimiting the rotary travel of said plate member, and mechanical means for re-setting said rotary means and restoring the parts to their original position after operation.

8. In or for the electrical stop motion of a knitting machine, a control device responsive to the tension of running yarn and comprising a casing, and a plurality of yarn-tension responsive devices carried by said casing, each said device including a yarn guide pivotally mounted on said casing, an electrical switch for controlling the operation of said stop motion, rotary means on said casing for controlling the opening and closing of said switch and connected to said yarn guide to rotate in response to movement of the latter, and spring means on said casing acting at a fixed point on said rotary means to oppose rotation thereof up to a predetermined angular position and reinforce this rotation beyond the aforesaid position.

9. In or for the electrical stop motion of a knitting machine, a control device responsive to the tension of running yarn and comprising a casing, an electrical conductor extending along and mounted in insulated manner in said casing, and a plurality of yarn tension responsive devices carried by said casing, each said device including a switch plate rotatably mounted in said casing and carrying a movable contact, fixed contact means insulatedly mounted in said casing and

connected to said electrical conductor, a yarn guide arm pivotally mounted on said casing and connected to the switch plate, and spring means connected to said casing and to a fixed point on said switch plate and arranged to oppose rotation thereof up to a predetermined angular position of the plate and thereafter to hasten this rotation.

10. A control device according to claim 9, including common mechanical means for re-setting the parts after operation.

11. A control device according to claim 10, in which the mechanical means include a common re-setting slide movable longitudinally in the casing and formed to contact and rotate in the return direction each operated switch plate, and operating means for this slide located outside the casing.

12. A control device according to claim 11, in which the operating means include a manually-actuated pivoted lever, and return spring means connected to said slide and to the casing.

WILLIAM OSCAR HEYNE.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,335,979	Wachsman	Dec. 7, 1943
2,432,953	Vossen	Dec. 16, 1947
2,537,000	Stibbe et al.	Jan. 2, 1951