April 26, 1949. C. W. ARROWOOD 2,468,611

ELECTRICAL STOP MOTION FOR KNITTING MACHINES

Filed May 13, 1947 2 Sheets-Sheet 1

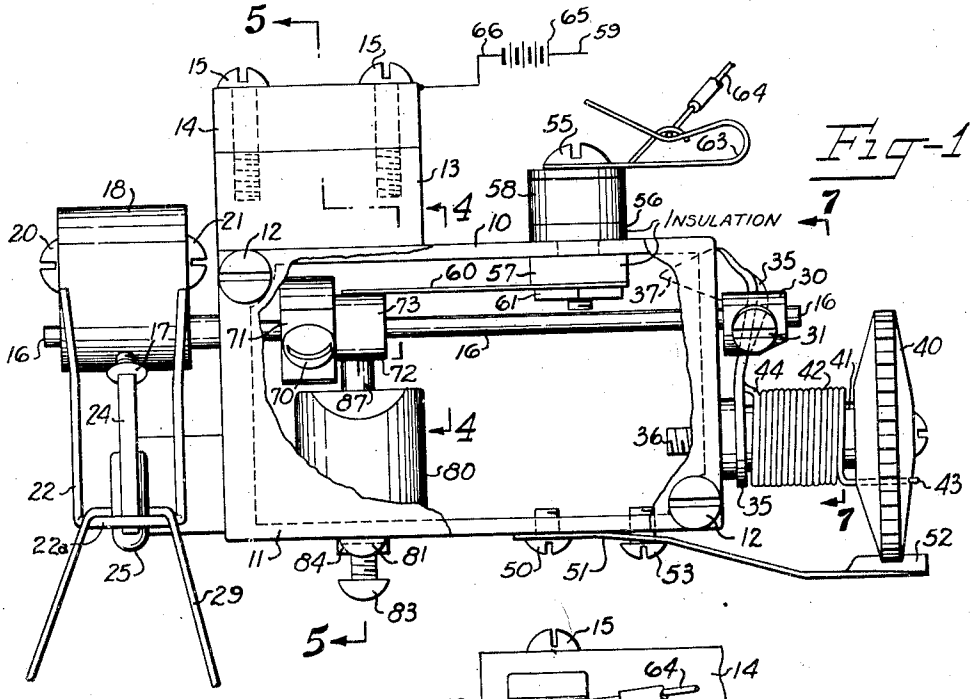


Fig-1

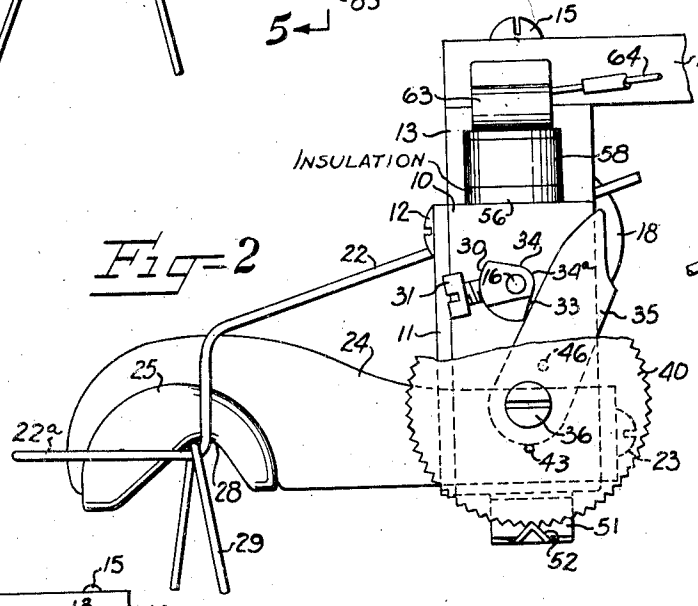


Fig-2

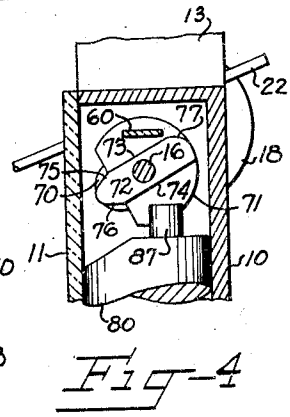


Fig-4

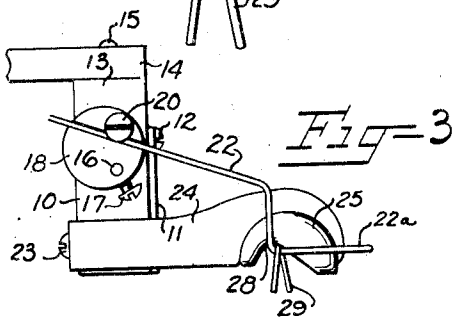


Fig-3

CHARLES W. ARROWOOD,
Inventor.

By Paul & Eaton

Attorney

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ELECTRICAL STOP MOTION FOR KNITTING MACHINES

Filed May 13, 1947 2 Sheets-Sheet 2

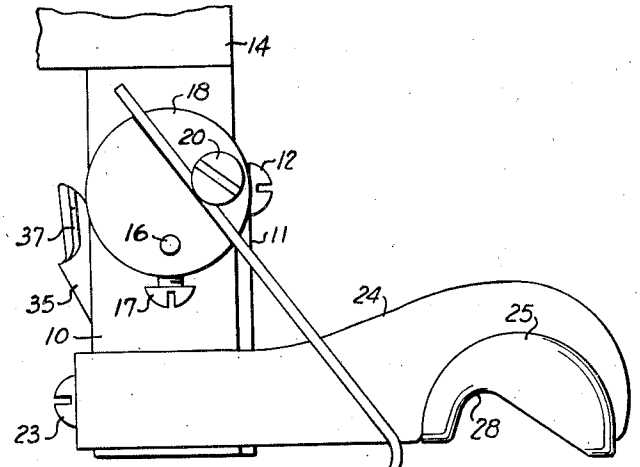


Fig-6

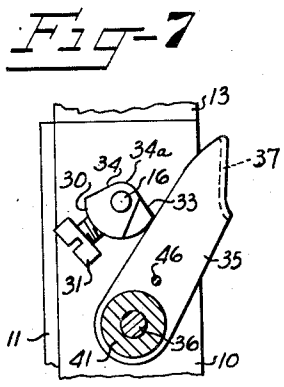


Fig-7

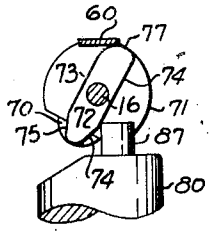


Fig-8

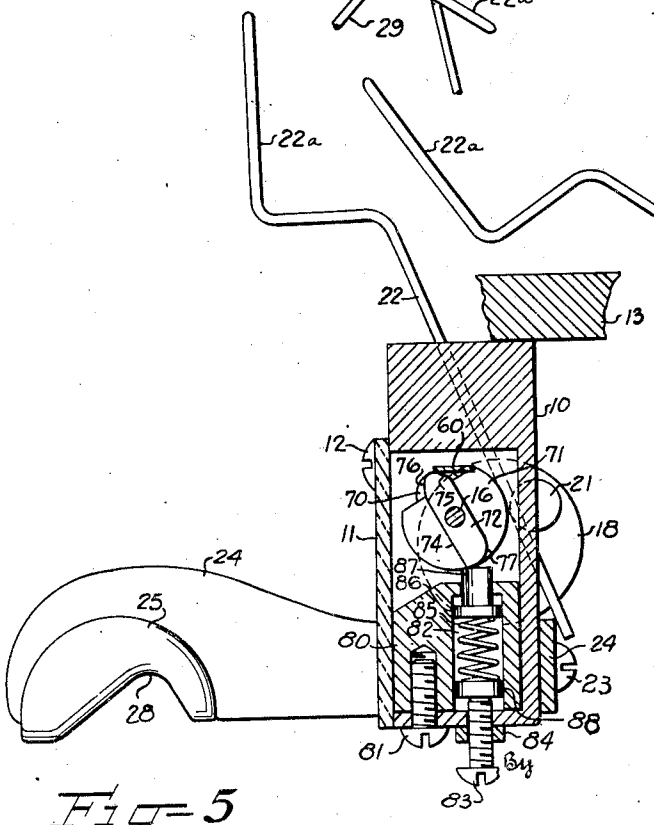


Fig-5

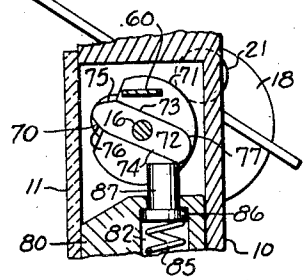


Fig-9

Inventor:
CHARLES W. ARROWOOD.

Attorney

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UNITED STATES PATENT OFFICE

2,468,611

ELECTRICAL STOP MOTION FOR KNITTING MACHINES

Charles W. Arrowood, Charlotte, N. C.

Application May 13, 1947, Serial No. 747,706

9 Claims. (Cl. 66—163)

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This invention relates to a stop motion for knitting machines and more especially to a very delicately arranged mechanism which is capable of being used with fine denier nylon yarns, which heretofore have not operated satisfactorily with conventional stop motions. The present stop motion mechanism is so designed that it will accurately control the machine and while the yarn is being used, it will hold the parts in the proper position and when the yarn is thrown out of operation by a change of feed, the vibration of the machine will not gradually move the switch to closed position to stop the machine, but a sudden parting of the yarn will allow centrifugal force of the operating mechanism to move the parts to a position where the machine will be instantly stopped. Great difficulty has been experienced in stop motions where, when a yarn is thrown out of operation by the knitting machine, the increasing slackness in the yarn and vibration of the machine will allow a sweep which is engaged by the yarn to gradually continue to move until a switch will be closed which will stop the machine when the machine should not be stopped.

It is an object of this invention to provide a stop motion mechanism comprising a circuit which is normally held open by the normal tension of a yarn being knitted by the knitting machine and which switch will remain open when the yarn is thrown out of operation and is not being used, due to the fact that a sweep which is engaged by the arm will not move far enough due to slackening of the yarn on account of vibration, when not in use, to allow the switch to be closed. The mechanism employs a switch which is normally held in open position while the yarn is passing therethrough and which will remain open when the yarn is thrown out of operation, but which switch will be closed upon excessive tension occurring in the yarn while it is being knitted or in the event of a parting of the strand of yarn which will allow the sweep engaged by the yarn to move further than it would move under a slackening of the yarn and to thereby close this switch to stop the machine upon a sudden parting of the yarn.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds when taken in connection with the accompanying drawings, in which

Figure 1 is a front elevation of the stop motion mechanism with its parts in normal running position with a portion of the transparent cover broken away;

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Figure 2 is an end elevation looking to the left from the right-hand end of Figure 1 and showing portions broken away;

Figure 3 is an elevation of the left-hand end of the apparatus as shown in Figure 1;

Figure 4 is a vertical sectional view taken along the line 4—4 in Figure 1;

Figure 5 is a vertical sectional view taken along the line 5—5 in Figure 1, but showing the parts in the position they will occupy after a strand has parted;

Figure 6 is an elevation similar to Figure 3 but showing the position of parts when excessive tension has been applied to the strand;

Figure 7 is a vertical sectional view taken along the line 7—7 in Figure 1, but showing the parts in the position as shown in Figure 5;

Figure 8 is a view similar to Figure 4, but showing the parts in the position they will occupy when the sweep is in the position shown in Figure 6;

Figure 9 is a view similar to Figure 4 but showing the parts in position when a yarn has been thrown out of operation but the strand not parted.

Referring more specifically to the drawings, the numeral 10 indicates a metallic electrically conductive housing which is adapted to have a transparent covering 11 secured over its front open side by any suitable means such as screws 12. The housing 10 has integral therewith an uprising block portion 13 which is adapted to be secured to a bracket or arm 14 of a knitting machine by means of suitable screws 15.

The housing 10 has oscillatably mounted therein a shaft 16 which extends from both of the two end walls of the housing and on one end has secured thereon by means of a set screw 17 an eccentric member 18. This eccentric member has screws 20 and 21 threadably mounted in opposed sides thereof which are adapted to engage the two arms of a sweep member 22 which is substantially U-shaped and projects outwardly and downwardly and has a horizontal portion 22a which normally occupies a substantially horizontal position during normal operation.

Secured on the back of the housing 10, by any suitable means such as a screw 23, is an arm 24 having a porcelain fitting 25 thereon providing a gap 28 in which a strand of yarn 29 is adapted to have movement when the parts are in the position shown in Figures 1, 2, 3 and 4.

The shaft at the end remote from the weight 18 has secured thereon a segmental cam member 30 by any suitable means such as a set screw 31. This cam member has two cam surfaces 33

and 34 which are adapted to engage one at a time a tension arm 35 oscillatably secured on a screw 36 threadably imbedded in the right-hand end wall of the housing 10 when viewed in Figure 1.

The tension arm 35 has an inturned portion 37 fitting against the back of the housing 10. The screw 36 has a serrated disk member 40 fixedly secured on its outer end and the screw has loosely mounted thereon a sleeve 41 which is surrounded by a torsion spring 42 having one end 43 penetrating a suitable hole in disk 40, and the other end of the spring is secured in a hole 46 in the tension member 35.

Secured to the lower exterior surface of the housing 10 by means of a screw 50 is a leaf spring 51 which has a projection 52 on its free end which is adapted to engage the serrations in the periphery of the wheel 40. The amount of tension exerted by the spring 51 can be regulated by means of a suitable screw 53.

It is evident that the wheel 40 can be rotated in a counter clockwise direction, looking at the right-hand end of Figure 1, which will increase the tension applied to the member 35 while clockwise motion of hand wheel 40 would decrease the tension.

Penetrating a suitable hole in the upper wall of the housing 10 is a screw 55 which has suitable insulating washers 56 and 57 on the upper and lower surfaces of the upper wall of the housing 10 and also has therearound a suitable spacer washer 58 if desired. The screw 55 penetrates a leaf spring contact member 60 and the contact member 60 is held in position by means of a suitable nut 61 separately secured on the lower end of screw 55. This arrangement insulates the screw 55 from the housing 10.

The screw 55 secures in position a suitable terminal clip 63 in which a conducting wire 64 is adapted to be secured, and this conducting wire 64 leads to a suitable stop motion mechanism and then through wire 59 to a suitable source of current 65 and from the other side of the source of current 65, a wire 66 is connected to the bracket 14 or to the knitting machine of which it forms a part, and thus the housing 10 is grounded to thus complete a circuit when the switch in the housing is closed.

Secured on the shaft 16 by any suitable means such as a set screw 70 is a collar 71 which has projecting from one side thereof a flattened double-ended cam portion 72 having an upper planar portion 73 and a lower planar portion 74 while the planar portions 73 and 74 are beveled as at 75 and 76 respectively. The planar portion 73 is also beveled as at 77. Disposed below the portion 72 is a block 80 which is secured to the bottom of the housing by any suitable means such as a screw 81. This block 80 has a cavity 82 extending upwardly from the bottom of the block 80 to near the top and the lower wall of the housing 10 has threadably mounted therein a screw 83 which is locked in position by jamb nut 84 and which projects into the cavity 82, and resting on the upper end of the screw 83 is a disk member 88. Resting on top of the disk 88 is a compression spring 85 whose upper end presses against an enlarged portion 86 of a plunger 87, the plunger 87 being adapted to cooperate with the portion 72 previously described. The enlarged portion 86 limits upward movement of the plunger 87, this plunger 87 being in uppermost position in Figures 4 and 9.

Method of operation

With the parts in the position shown in Figures 1, 2, 3 and 4 the normal tension of the yarn 29 passing above the horizontal portion 22*a* of the sweep will thus cause the cam surface 33 to be slightly engaging the tensioned member 35, but not enough tension will be imparted to the sweep 22 to move the tensioned member 35 appreciably from the back wall of the housing 10. In this position, cam portion 72 will be occupying the position shown in Figure 4, and thus the cam portion will not be engaging the leaf spring contact member 60.

It will also be noted that the eccentric weight member 18 will be moved to such a position that a large part of the weight will be balanced on the shaft 16 decreasing any additional tension on yarn while active, but there will still be enough weight tending to rotate the member 18 in a counter clockwise manner in Figure 3 to exert tension on the yarn, and the tension of the yarn will hold the member 72 out of contact with the leaf spring contact member 60 during normal operation of the machine.

Now when the tension in the yarn increases by reason of the yarn being hung on the cone for other reasons, the sweep 22 will be moved downwardly towards the position shown in Figure 6. This will cause the cam member 72 to occupy the position shown in Figure 8, and the beveled portion 77 will engage the leaf spring contact member 60 and thus close the circuit to stop the machine since the circuit leads through a suitable and conventional stop motion mechanism on the machine which is not shown or described. After the cam portion 77 has made contact with the leaf spring contact 60 and the various parts occupy the position shown in Figures 6 and 7 the sweep 22 continues in its downward path until the yarn is pulled free of the portion 22*a*. In this case the peripheral portion of cam 30 will slide on the tension arm 35 thereby maintaining the same amount of tension on the yarn during the time required to stop the machine and without increasing the tension on the yarn until the yarn slides off the sweep portion 22*a*. The cam portion 72 will occupy the position shown in Figure 8 when this takes place. The wire 64 leads to a suitable stop motion mechanism and then from the stop motion mechanism may lead back by means of wire 59 to the source of current and to the grounded framework of the machine. In this position the plunger 87 will serve as a stop to the downward movement of the sweep 22 since the flat surface 74 engages the side edge of the plunger 87 and will not depress it.

Now let us assume that during normal operation of the machine, one yarn is thrown out of operation and another yarn called into use and in which case there usually results a gradual slackening of the discontinued yarns. This will cause the sweep 22 to move upwardly with the yarn 29 disposed still above the two legs of the sweep and below the porcelain guide 25. As the yarn gradually slackens the sweep may move upwardly to the position shown in Figure 9 where the cam surface 74 will engage the upper end of plunger 87, but the inertia of eccentric portion 18 will not be sufficient to depress the plunger 87, and therefore, the cam surface 73 or its sloping or beveled surface 75 will not engage the leaf spring contact 60, and thus the circuit will not be completed, and the machine will not be stopped on account of the slackening of the yarn because

this movement would be gradual, and there would not be enough centrifugal force exerted by the eccentric member **18** to move the sweep **22** up to the position shown in Figure 5.

With the sweep lowered by excessive tension in the yarn to the position shown in Figure 6, it is seen that the cam surface **33** will move the tensioned member **35** away from contact with the back surface of the housing **10** and the resistance to this movement will be gradually increased on account of building up resistance in the torsion spring **44**. The cam member **34** will in this case occupy the position shown in Figure 7.

Now when the sweep **22** moves upwardly as a result of slackening of the tension in the yarn due to its non-use, the cam member likewise will rotate in a clockwise manner in Figure 2 to the position shown in Figure 9 the portion **75** will not engage contact **60**.

Now in the event there is a sudden parting of the strand of yarn, the sweep **22** not being held in lowered position by the yarn, will suddenly swing upwardly and due to the centrifugal force of inertia in the eccentric member **18**, the shaft **16** will be rotated to a greater amount than would be the case in a gradual slackening of the yarn, and the parts would move to the position shown in Figure 5. This will cause one end of the cam portion **72** to depress the plunger **87** and the beveled portion **75** of the cam portion **70** will engage and slightly raise the leaf spring contact member **60** to hold the parts in the position shown in Figure 5 and stop the machine also. When the parts assume the position shown in Figure 5 as a result of a sudden parting of the yarn, the surface **34** of member **30** will occupy a position parallel to and in contact with the front edge of the tensioned member **35**, but will not move it on its pivot for the reason that one of the projecting ends of the sweep **22** which is nearest the housing **10** will engage the back leg of the bracket **24** and stop counter clockwise rotation of the member **18** as viewed in Figure **6**.

In the drawings and specification there has been set forth a preferred embodiment of the invention, and although specific terms are employed, they are used in a generic and descriptive sense only, and not for purposes of limitation, the scope of the invention being defined in the claims.

I claim:

1. An electric stop motion for knitting machines comprising a housing having a guide arm extending therefrom in fixed position, an oscillatable shaft mounted within the housing and having a weight member eccentrically mounted thereon, a sweep arm attached to said eccentrically mounted weight member and extending outwardly on each side of the fixed arm so that a strand passed below the fixed arm and the sweep member while under tension will hold the sweep member in a definite position relative to the fixed arm, said shaft extending outside the other end of the housing and having a cam member thereon and a tensioned arm adapted to engage the cam member, the housing being grounded to one side of an electrical circuit and a leaf spring contact member disposed within the housing and connected to another side of the electrical circuit, cam means mounted on said shaft and adapted to engage said leaf spring contact member when excessive tension occurs in the yarn and the said cam member being adapted to also engage the leaf spring member when the yarn suddenly parts and allows the eccentrically mounted weight member to rotate the shaft to its limits to thereby move the sweep upwardly far enough to allow the cam member to engage said leaf contact member.

2. Electrical stop motion means for knitting machines comprising a housing and an oscillatable shaft mounted thereon, and a sweep arm mounted on the shaft and adapted to be held in one position by normal tension in the yarn, means on the shaft for closing a circuit when excessive tension is present in the yarn, means for preventing the means on the shaft from closing a circuit when tension gradually decreases in the yarn due to increasing slackness, and weight means on said shaft adapted to rotate said shaft upon slackness occurring gradually in the yarn, said weight means also being adapted to rotate said shaft, upon a sudden parting of the yarn, a greater distance than can occur due to gradually increasing slackness in the yarn.

3. A switch structure for electric stop motions for knitting machines and the like comprising a casing, an oscillatable shaft mounted in the casing and extending from both ends thereof, a sweep member having two arms mounted on said shaft, a collar having a flattened double ended cam portion and being mounted on said shaft, tension means adapted to be engaged by one end of said flattened portion when the sweep member is swung to one position to retard movement of said shaft, an electrical terminal element within the casing and engageable by the other end of said flattened portion when the sweep member is moved a predetermined amount by excessive tension in the yarn, weight means mounted on one end of the shaft and adapted to move the shaft far enough upon a sudden parting of the yarn to cause the other first-named end of said flattened portion to engage said terminal to close a circuit and a cam member mounted on one end of the shaft extending beyond the housing and tension means adapted to be engaged by the cam member when excessive tension is imparted to the yarn to gradually increase the resistance to movement of the shaft by the excessive tension on the yarn, until a predetermined tension is reached, and then maintaining a constant resistance to movement of the sweep member until the sweep member is moved far enough to allow the yarn to move off the free end of the sweep member.

4. In a switch structure comprising a casing and an oscillatable shaft mounted in the casing, and an eccentric member mounted on the shaft and having a sweep extending therefrom adapted to be held in lowered position by the tension of the yarn passing thereover, an electric contact mounted in close proximity to the shaft, a double-ended cam portion mounted on the shaft, one end of the cam portion adapted to engage said contact when excessive tension appears in the yarn, the other end of said lever being adapted to engage said contact when the yarn parts to allow the shaft to oscillate to its extreme limit, and resilient means adapted to engage one of the ends of the double-ended cam portion on said shaft to prevent oscillation of the shaft far enough to engage the electric contact upon a gradual slackening of the tension in the yarn.

5. In an electrical stop motion for knitting machines comprising a casing and an oscillatable shaft mounted in the casing and an eccentrically mounted weight member mounted on the shaft and a sweep arm extending from the weight member adapted to be held in a predetermined position by normal tension of the yarn, an electrical terminal mounted in the casing, a double-ended cam portion mounted on said shaft, movement of the

sweep arm on account of excessive tension in the yarn being adapted to move the shaft sufficiently to cause one end of the double-ended cam portion to engage the electric terminal to close a circuit to stop the machine, spring means adapted to engage the other end of said cam portion when the shaft is allowed to oscillate on account of a gradual slackening of the yarn to prevent the other end of said cam portion from engaging the electric terminal, the weight member being adapted to oscillate said shaft sufficiently to overcome the tension means and allow one end of said cam portion to engage the terminal to close a circuit to stop the machine upon a sudden parting of the yarn, said shaft also having a cam member mounted thereon and other tension means engageable by the cam member to gradually increase resistance to oscillation of the shaft due to an increased tension of the yarn beyond normal tension.

6. In an electrical stop motion for knitting machines comprising an electrical terminal, a member adapted to engage said electric terminal, means controlled by normal tension in the yarn for preventing the member from engaging the electrical terminal, means for causing the member to engage the electrical terminal upon a sudden parting of the yarn, resilient means for preventing the member from engaging the terminal upon a gradual slackening of the yarn and other resilient means for offering increased resistance to movement of the member upon excessive tension appearing in the yarn.

7. In a switch structure comprising a casing and an oscillatable shaft mounted in the casing, and an eccentric member mounted on the shaft and having a sweep extending therefrom adapted to be held in lowered position by the tension of the yarn passing thereover, an electric contact mounted in close proximity to the shaft, a double-ended cam portion mounted on the shaft, one end of the cam portion adapted to engage said contact when excessive tension appears in the yarn, the other end of said cam portion being adapted to engage said contact when the yarn parts to allow the shaft to oscillate to its extreme limit, and resilient means adapted to engage one of the ends of the double-ended cam portion on said shaft to prevent oscillation of the shaft far enough to engage the electric contact upon a gradual slackening of the tension in the yarn, a segmental member mounted on the shaft, an adjustable spring-pressed member in close proximity to the segmental member and limited in its movement towards the segmental member and adapted to be engaged by one of the radially disposed sides of the segmental member, and by the arcuate periphery of the segmental member after the sweep has been lowered a predetermined amount by an increase in the tension of the yarn.

8. In an electrical stop motion for knitting machines comprising a casing and an oscillatable shaft mounted in the casing and an eccentrically mounted weight member mounted on the shaft and a sweep arm extending from the weight member adapted to be held in a predetermined position by normal tension of the yarn, an electrical terminal mounted in the casing, a double-ended cam portion mounted on said shaft, movement of the sweep arm on account of excessive tension in the yarn being adapted to move the shaft sufficiently to cause one end of the double-ended cam portion to engage the electric terminal to close a circuit to stop the machine, spring means adapted to engage the other end of said cam portion when the shaft is allowed to oscillate on account of a gradual slackening of the yarn to prevent the other end of said cam portion from engaging the electric terminal, the weight member being adapted to oscillate said shaft sufficiently to overcome the tension means and allow one arm of said cam portion to engage the terminal to close a circuit to stop the machine upon a sudden parting of the yarn, said shaft also having a cam member mounted thereon and other tension means engageable by the cam member to gradually increase resistance to oscillation of the shaft due to an increased tension of the yarn beyond normal tension, until the yarn tension has reached a predetermined pull, after which the last-named tension means exerts a constant resistance to oscillation of the shaft.

9. In an electrical stop motion for knitting machines comprising an electric terminal, a member adapted to engage said electric terminal, means controlled by normal tension in the yarn for preventing the member from engaging the electrical terminal, means for causing the member to engage the electric terminal upon a sudden parting of the yarn, resilient means for preventing the member from engaging the terminal upon a gradual slackening of the yarn and other resilient means for offering increased resistance to movement of the member upon excessive tension appearing in the yarn, the resilient means for offering increased resistance to the movement of the member, exerting a constant resistance after a predetermined amount of resistance has been reached.

CHARLES W. ARROWOOD.

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Certificate of Correction

Patent No. 2,468,611. April 26, 1949.

CHARLES W. ARROWOOD

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 6, line 59, claim 4, for the word "lever" read *cam portion*;

and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 9th day of August, A. D. 1949.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.

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