

Sept. 27, 1938.

J. STEINHART

2,131,600

ELECTRIC STOP MOTION SYSTEM FOR KNITTING MACHINES

Filed Oct. 1, 1937

5 Sheets-Sheet 1

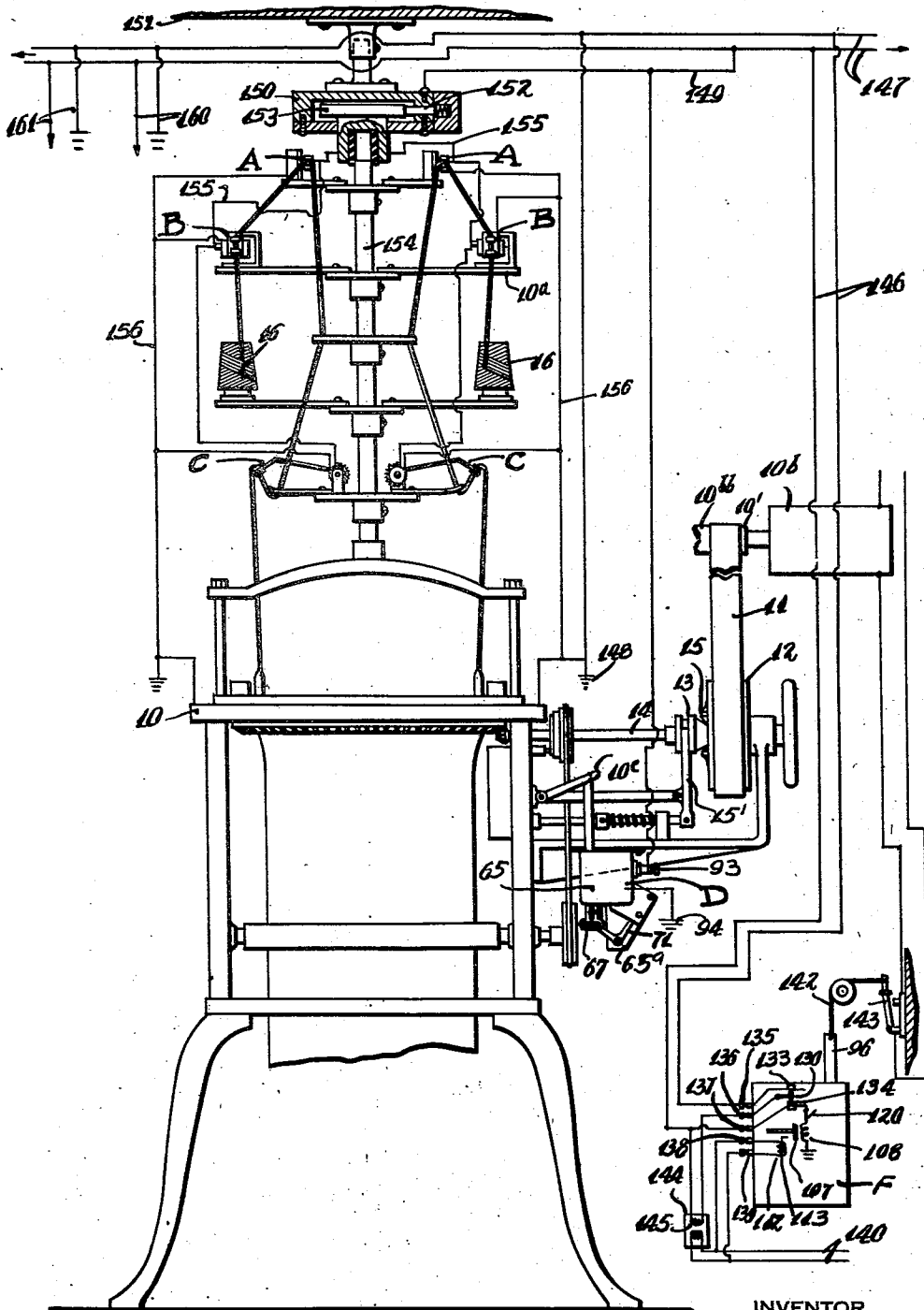


FIG. 1

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5 Sheets-Sheet 2

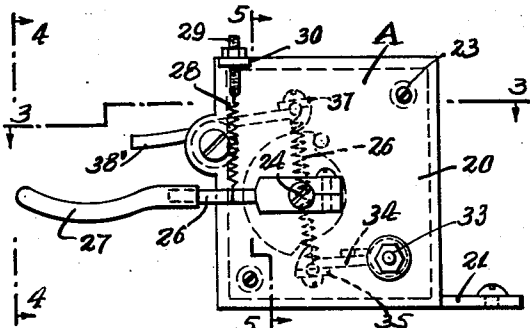


Fig. 2.

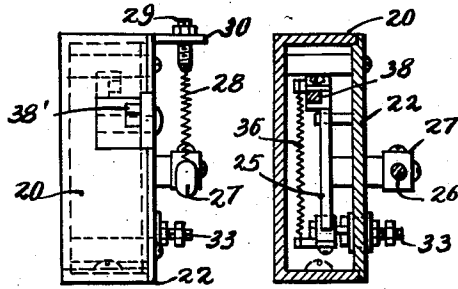


Fig. 4.

Fig. 5.

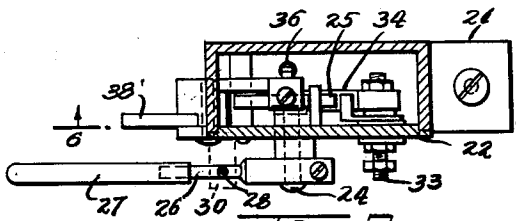


Fig. 3.

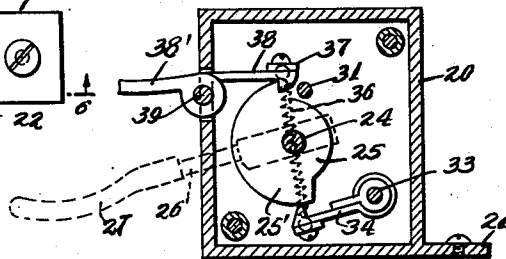


Fig. 7.

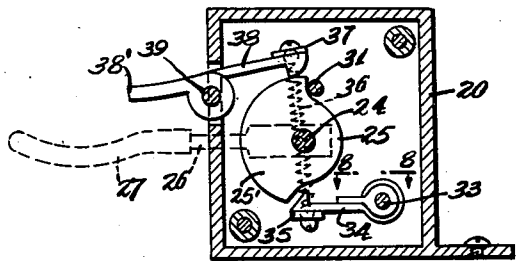


Fig. 6.

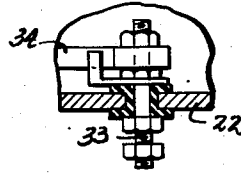


Fig. 8.

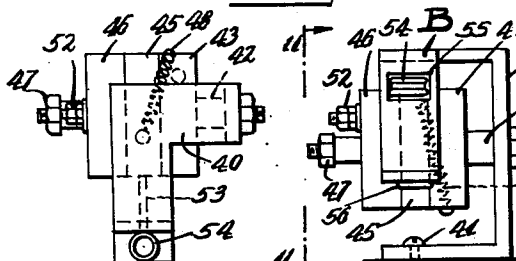


Fig. 10.

Fig. 9.

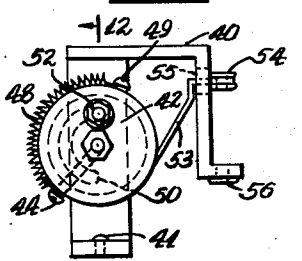


Fig. 11.

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5 Sheets-Sheet 3

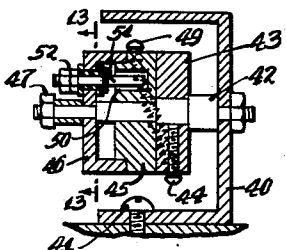


Fig. 12.

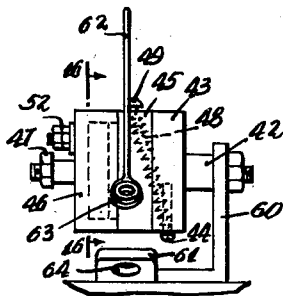


Fig. 15.

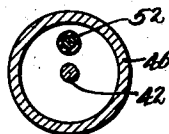


Fig. 19.

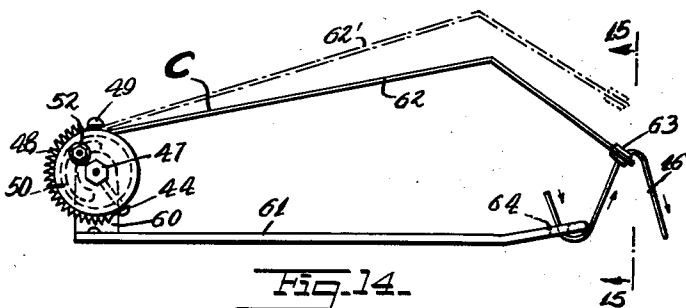


Fig. 14.

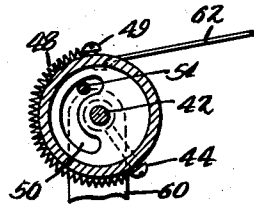


Fig. 16.

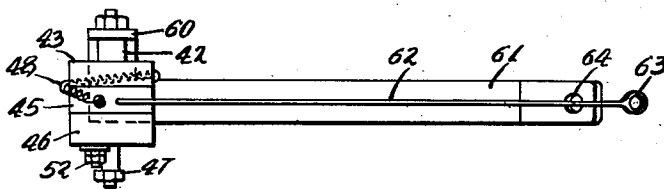


Fig. 17.

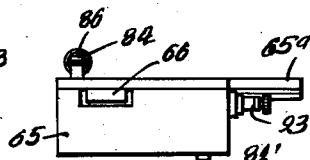


Fig. 20.

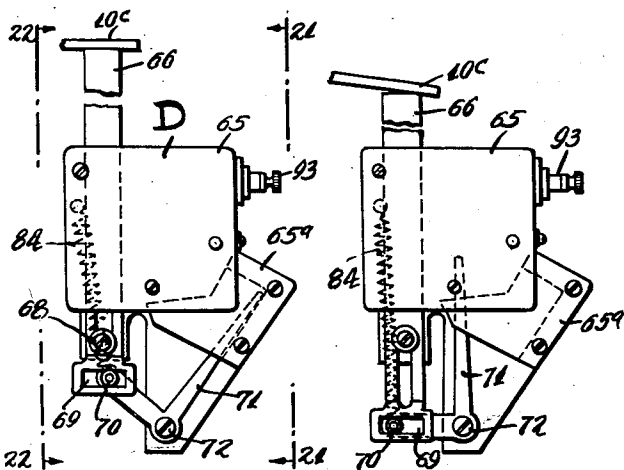


Fig. 18.

Fig. 19.

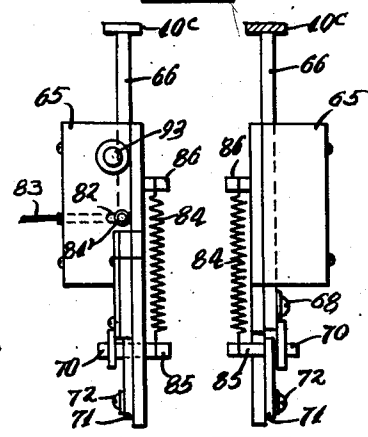


Fig. 21.

Fig. 22.

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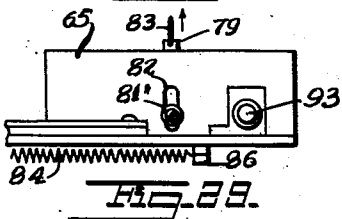
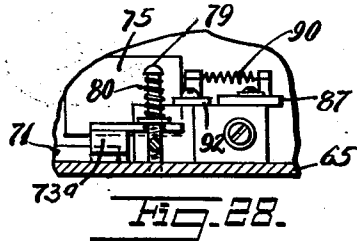
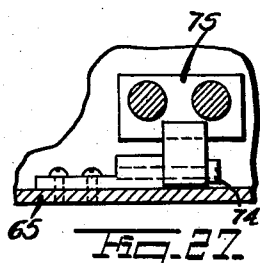
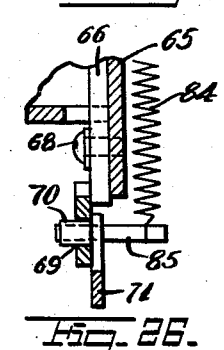
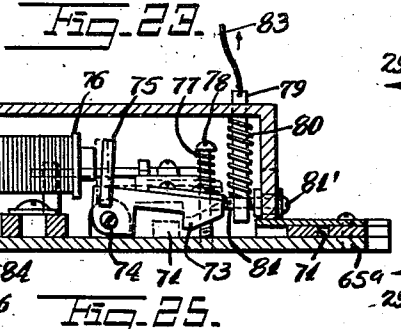
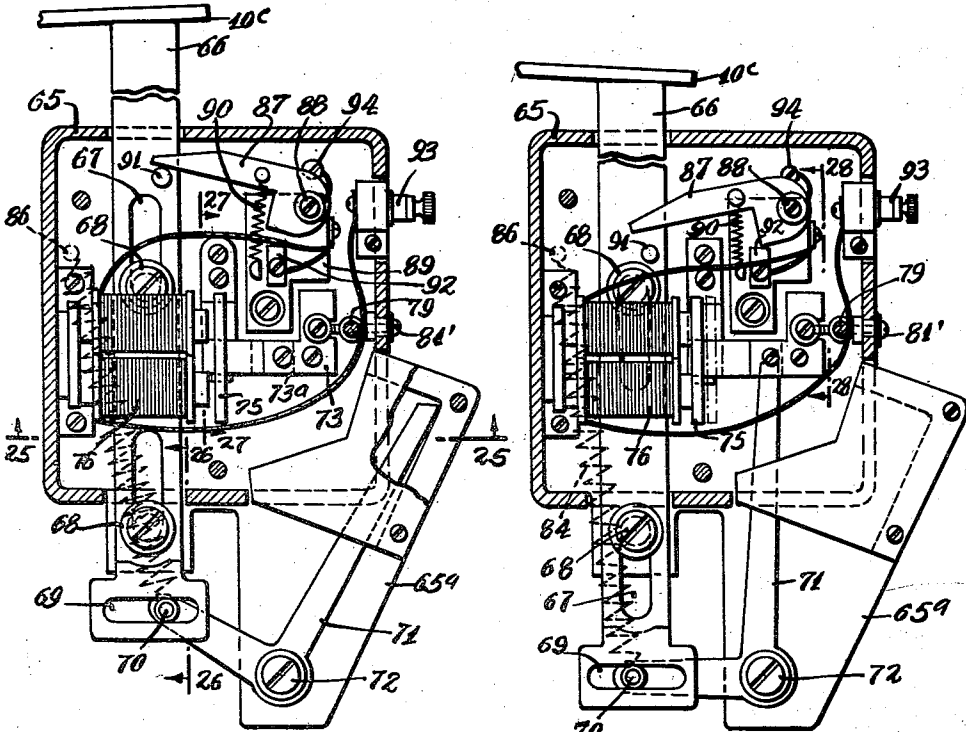
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5 Sheets-Sheet 4



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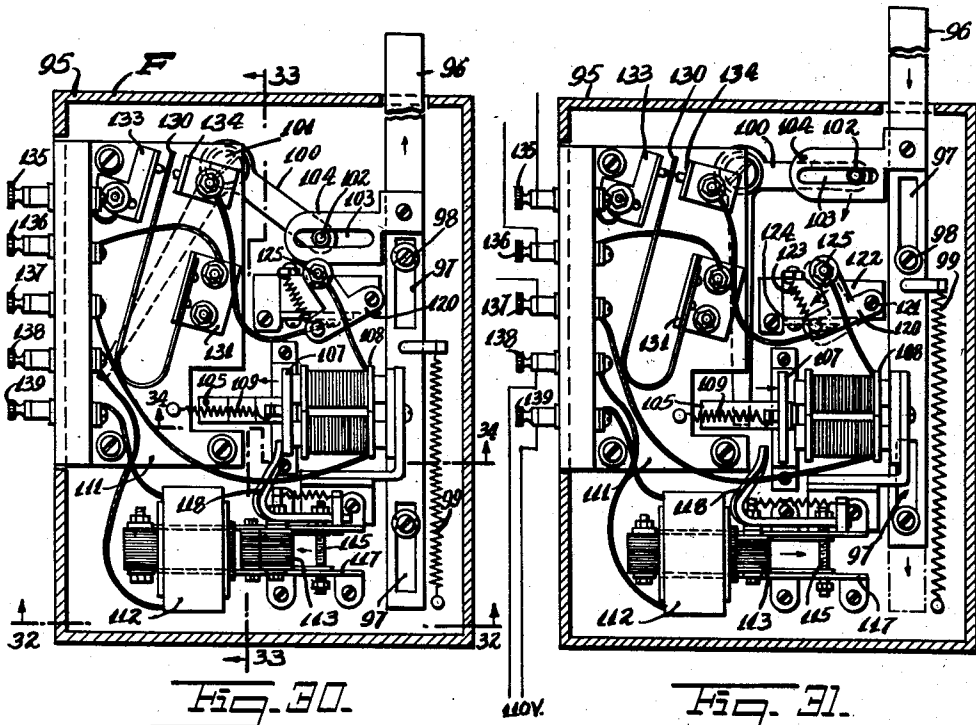
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ELECTRIC STOP MOTION SYSTEM FOR KNITTING MACHINES

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UNITED STATES PATENT OFFICE

2,131,600

ELECTRIC STOP MOTION SYSTEM FOR KNITTING MACHINES

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Safety Stop Motion Co., a firm

Application October 1, 1937, Serial No. 166,713

20 Claims. (Cl. 66—163)

This invention relates to new and useful improvements in a multiple circuit breaking device for knitting machines.

The invention has for an object the construction of a device as mentioned which is characterized by the fact that it may be used in combination with a knitting machine having a rotative spool carriage, a driving motor which rotates a main drive shaft and a clutch for disconnecting the machine from the main drive shaft.

The invention contemplates the provision of a means on the spool carriage for detecting whether the yarn drawn from the spools of said carriage is knotted, bunched, or has a rough surface. It is proposed to include in said means, switches and devices for closing said switches upon detection of any deficiencies in the yarn. It is proposed to also incorporate an arrangement whereby when one of the switches is closed the clutch device of the corresponding knitting machine is caused to be opened, or if either there is a short circuit in the system or if no power is supplied, the said motor is to be turned off.

Still further the invention proposes to also arrange on the spool carriage, means for detecting breaks in the yarn, and this means to include switches and devices for closing said switches upon detection of a break. It is proposed that these switches also control the clutch of the corresponding knitting machine.

Another object of the invention is to provide a safety device for the main electric stop motion line supplying current to the individual machines, and for the wiring of the knitting machines, so that in case of a short circuit or if no current is supplied to the system, the motor driving the main drive shaft will be disconnected and stops the motion of all the machines.

For further comprehension of the invention, and of the objects and advantages thereof, reference will be had to the following description and accompanying drawings, and to the appended claims in which the various novel features of the invention are more particularly set forth.

In the accompanying drawings forming a material part of this disclosure:—

Fig. 1 is a side elevational view of a knitting machine equipped with a multiple circuit breaking device constructed according to this invention, certain portions thereof being shown in section.

Fig. 2 is a fragmentary enlarged side elevational view of one of the detecting means used in the device.

Fig. 3 is a horizontal sectional view taken on the line 3—3 of Fig. 2.

Fig. 4 is an elevational view looking in the direction of the line 4—4 of Fig. 2.

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 2.

Fig. 6 is a vertical sectional view taken on the line 6—6 of Fig. 3.

Fig. 7 is a view similar to Fig. 6 but illustrating the parts in a different condition.

Fig. 8 is a fragmentary elevational view looking in the direction of the line 8—8 of Fig. 6, a portion thereof being broken away and shown in section.

Fig. 9 is an enlarged detailed view of another one of the devices shown in Fig. 1.

Fig. 10 is a plan view of Fig. 9.

Fig. 11 is an elevational view looking in the direction of the line 11—11 of Fig. 9.

Fig. 12 is a sectional view taken on the line 12—12 of Fig. 11.

Fig. 13 is a sectional view taken on the line 13—13 of Fig. 12.

Fig. 14 is an enlarged side elevational view of another one of the devices shown in Fig. 1.

Fig. 15 is an end elevational view of Fig. 14 looking in the direction of the line 15—15 thereof.

Fig. 16 is a sectional view taken on the line 16—16 of Fig. 15.

Fig. 17 is a plan view of Fig. 14.

Fig. 18 is an enlarged detailed view of another portion of Fig. 1.

Fig. 19 is a view similar to Fig. 18 but illustrating the parts in a different position.

Fig. 20 is a plan view of Fig. 18.

Fig. 21 is an elevational view looking in the direction of the line 21—21 of Fig. 18.

Fig. 22 is an elevational view looking in the direction of the line 22—22 of Fig. 18.

Fig. 23 is an enlarged view of Fig. 18 with further parts being broken away to disclose interior parts.

Fig. 24 is an enlarged view of Fig. 19 with further parts being broken away to disclose interior parts.

Fig. 25 is a sectional view taken on the line 25—25 of Fig. 23.

Fig. 26 is a sectional view taken on the line 26—26 of Fig. 23.

Fig. 27 is a sectional view taken on the line 27—27 of Fig. 23.

Fig. 28 is a sectional view taken on the line 28—28 of Fig. 24.

Fig. 29 is an elevational view looking in the direction of the line 29—29 of Fig. 25.

Fig. 30 is an enlarged detailed view of another

portion of Fig. 1 illustrated with the front portion thereof broken away to illustrate interior parts.

Fig. 31 is a view similar to Fig. 30 but illustrating the parts in a different position.

5 Fig. 32 is a sectional view taken on the line 32—32 of Fig. 30.

Fig. 33 is a sectional view taken on the line 33—33 of Fig. 30.

10 Fig. 34 is a sectional view taken on the line 34—34 of Fig. 30.

The multiple circuit breaking device for knitting machines, according to this invention, is intended to be used in conjunction with a knitting machine generally indicated on the drawings by reference numeral 10. It is intended that this machine have a rotative spool carriage 10^a, a driving motor 10^b, and a clutch 10^c for disconnecting the machine from the motor drive. More specifically, the motor 10^b drives a main drive shaft 10^{bb} on which pulleys 10' are provided. Each pulley 10' is connected by a belt 11 to a rotatively supported pulley 12. A clutch jaw 13 is mounted upon a drive shaft 14 for the knitting machine and is cooperative with a complementary clutch jaw 15 associated with the pulley 12. The clutch jaw 13 is movable and controlled by a leverage system which includes the lever 15' connected by various links to the handle of the clutch 10^c. The arrangement is such that when 30 the handle of the clutch 10^c is moved upwards the clutch is open.

A plurality of spools of yarn 16 are mounted on the spool carriage 10^a. The yarn from each spool is passed through certain devices before 35 it is fed to the knitting machine, and it is these devices which detect the various deficiencies in the yarn. Several of these devices are shown in Fig. 1. There are devices indicated by the letters "A" which comprise a means on the spool carriage for detecting whether the yarn drawn from 40 the spool on said carriage is either knotted, bunched, or has a rough surface. These means include switches and a means for closing the switches upon detection of said deficiencies in the yarn, as hereinafter more fully described. At 45 other locations on the spool carriage 10^a there are devices "B" for detecting breaks in the yarn and these devices include switches and means for closing the switches upon detection of a break. 50 At other locations on the spool carriage 10^a there are devices "C" which assist in tensioning the yarn from the spools and detecting breaks. These devices will be explained in greater detail as this specification proceeds.

55 A special mechanism is provided, indicated generally by the letter "D", which mechanism is adapted to operate the handle of the clutch 10^c as hereinafter more fully described. Another mechanism, indicated by the letter "E", is provided for operating the main switch of the motor 10^b under certain circumstances as hereinafter 60 more fully described.

To better understand the invention, it is advisable at this point to consider the details of 65 construction of the various devices mentioned. When this is fully understood the association of the devices with each other and with suitable circuits will be described.

70 With specific reference to the devices A, each device A (see Figs. 2-3 inclusive and particularly note "A" in Fig. 2), comprises a hollow body 20 which has a lug portion 21 by which it may be attached on the carriage 10^a. The hollow body 20 is provided with a removable cover 22 held in 75 position by several screws 23. A shaft 24 is ro-

tatively supported through the cover 22. A cam 25 is mounted on the inner end of the shaft 24. A radial arm 26 is secured on the outer end of the shaft. This radial arm 26 is provided with a curved head piece 27 over which the yarn is adapted to pass. A spring 28 is connected with the radial arm 26 and with a screw 29 adjustable on a lug 30 projecting from the cover 22. The spring 28 may be properly tensioned to require a certain predetermined stress to be applied to the head piece 27 before the radial arm 26 moves downwards. A pin 31 projects from the cover 22 and acts against a portion of the cam 25 to limit the upward position of the radial arm 26. 10

A binding post 33 for an electric lead is mounted through the cover 22 and is insulated therefrom and supports a contact finger 34 engageable against a portion of the cam 25 to close a circuit to the ground of the device. The contact finger 34 is provided with an insulation piece 35 which 20 is connected with a spring 36, the other end of which is connected with an insulation piece 37 on a lever 38. This lever 38 is pivotally mounted by a pintle 39 on the body 20 and has one end 38' extending to the exterior. The inner end of the lever 38 is cooperative with the cam 25 to lock the cam as shown in Fig. 7. In Fig. 6 the contact finger 34 is shown disconnected from the cam 25. It should be noted that when the radial arm 26 30 is turned anti-clockwise, a portion 25' of the cam 25 will contact with the contact finger 34 to close the circuit. Another portion of the cam will ride beneath the inner end of the lever 38 so that the cam is locked in its new position in which the circuit is closed. 35

Each device "B", referred to relative to Fig. 1, is shown in detail in Figs. 9-13 inclusive. In Fig. 9, the device is generally indicated by the letter "B". The device comprises a frame 40 adapted to be secured by a screw 41 upon the spool carriage 10^a. This frame is provided with a horizontally positioned shaft 42 upon which there is a disc 43 fixedly mounted by a set screw 44. Adjacent the disc 43 there is a rotative disc 45, and adjacent this rotative disc there is a stationary cap 46. The stationary cap 46 is held on the shaft 42 by a nut 47 which presses a portion of the cap against a shoulder formed on the shaft 42. A spring 48 is wound about a portion of the circumferences of the discs 43 and 45 and has one end secured to the screw 44 and the other end secured to a screw 49 mounted upon the disc 45. The arrangement is such that the spring 48 tends to maintain the disc 45 in pre-determined position. The disc 45 is formed with an arcuate recess 50 into which a contact 51 projects. This contact 51 is supported upon the cap 46 and its outer end is provided with binding post 52 so that a wire may be connected with it, as fully described hereafter. 40 45 50 55

The contact 51 is insulated from the cap 46 and makes contact with the disc 45 only when the spring 48 is permitted to turn the disc 45 into one position. A band 53 is connected with the disc 45 and terminates in an end portion provided with an eyelet 54. The band 53 extends through an opening 55 in the frame 40. The frame 40 is provided with a stationary eyelet 56. When the eyelets 54 and 56 are superimposed and the yarn from one of the spools 16 passes through 70 these eyelets then the disc 45 is held in a position in which the contact 51 does not touch the disc 45. But should the yarn break the spring 48 may turn the disc 45 because now the yarn no longer passes through the eyelet 54, which 75

is now free. Thus the disc 45 is turned to a position in which one end of the groove 50 makes contact with the contact 51.

In Figs. 14-17 inclusive one of the devices "C" has been disclosed. This device is generally indicated in Fig. 14 by the letter "C". It comprises a frame 60 having an extending arm 61 and adapted to be secured upon the spool carriage 10^a. A shaft 42 is supported on the frame 60 and supports the discs 43 and 45, and the cap 46 as previously explained. A spring 48 is connected between the screw 44 and the screw 49. The contact 51 is mounted on the cap 46 and is provided with binding post nuts 52. The nut 47 serves to hold the cap 46 in position. It is believed from this cursory description that the parts which correspond with the same parts described in device "B" will be readily identified. The device "C" distinguishes in the fact that there is a stiff wire 62 which is attached at one end to the periphery of the disc 45, and at the other end is provided with an eyelet 63. The arm 61 has an opening 64. The yarn 16 (see Fig. 14) is adapted to pass through the opening 64 and the eyelet 63 to normally hold the arm 62 in a slightly lowered position due to the tension of the yarn. When the yarn is broken the arm 62 is freed and may move upwards to the dot and dash line position 62'. When the arm so moves the circuit is closed between the contact 51 and the disc 45 similar to that previously described.

The device "D" previously referred to is shown in detail in Figs. 18-29 inclusive, and indicated generally by letter "D" in Fig. 18. This device comprises a hollow body 65 which is attached to a portion of the knitting machine. A vertical bar 66 slidably extends through the body and is limited to slide by reason of having several slots 67 which are engaged by headed holding elements 68. The upper end of the bar 66 engages against the handle of the clutch 10^c and is adapted to lift this lever to throw open the clutch, as hereinafter more fully described.

The lower end of the bar 66 extends from the body 65 and is formed with a horizontal slot 69. A roller 70 is slidable in this horizontal slot. This roller 70 is mounted upon one end of a bell crank 71 which is pivotally supported by a screw 72 on an extension portion 65^a of the body 65. The other end of the bell crank 71 is adapted to swing from the position shown in Fig. 23 to the position shown in Fig. 24. In the latter position it engages against a shoulder 73^a of a catch 73. This catch 73 is pivotally supported by a pintle 74 and supports the armature 75 of an electro-magnet 76 stationarily mounted within the body 65. The catch 73 is urged into its lower operative position by a spring 77 coaxial on the screw 78 passing through a slot in the end of the catch 73 and mounted on the body 65. The arrangement is such that the electro-magnet 76 may open the catch 73.

A hand device is also provided to open the catch so that the clutch of the knitting machine may be thrown open by actuating the hand device. This hand device comprises a plunger 79 which is slidable through the casing 65 and which is provided with a coaxial spring 80 tending to normally urge the plunger inwards. The inner end of the plunger is provided with a screw 81 which has its head 81' passing through a slot 82 formed in one of the side walls of the body 65. The other end of the screw 81 engages beneath a portion of the catch 73 so as to be capable of lifting the catch when the plunger 79

is thrown. A cord or cable 83 is connected with the plunger 79 by which it may be conveniently drawn.

The bar 66 is urged into a raised position by a tension spring 84 which is connected at one end with a pintle 85. The roller 70 is turnably mounted on a portion of this pintle 85, the pintle 85 extending through the arm of the bell crank 71. The upper end of the spring 84 connects with a fastening element 86 secured on the body 65. When the bar 66 is in its raised position the bell crank 71 is in the position shown in Fig. 23. Then the handle of the clutch 10^c is raised. In the lowered position of the bar 66, the handle of the clutch 10^c is in its lowered position, and the clutch jaws 13 and 15 are engaged. The bar 66 is held in the lowered position by reason of the bell crank 71 being caught and held by the catch 73.

A switch is associated with the device "D" and is adapted to be opened when the bar 66 is in its raised position. This switch comprises a contact arm 87 which is pivotally mounted by a pintle 88 upon an insulation block 89. A spring 90 acts between the contact arm 87 and a projection from the block 89 to normally urge the contact arm 87 downwards. A pin 91 is mounted on the bar 66 and is adapted to strike and pivot the contact arm 87 when the bar 66 is raised. A stationary contact 92 is mounted on the block 89 and in the lowered position of the contact arm 87 is adapted to connect therewith, as shown in Fig. 24, and so the switch is closed.

The circuit of the device may be traced from a binding post 93 which is mounted on the body 65 to the electro-magnet 76 and then to the switch arm 87 and the stationary contact 92. The switch arm 87 is grounded at the point 94. Thus the circuit connects the switch and the electro-magnet in series.

The device "F" is shown in detail in Figs. 30-34 inclusive and is generally indicated by the letter "F" in Fig. 30. This device comprises a casing 95 adapted to be stationarily mounted on a "ground" or other support. A bar 96 is slidably extended from the casing. This bar is slidably supported by reason of slots 97 formed therein and engaged by screws 98 supported on the casing 95. Thus the bar 96 is limited to vertical sliding. A spring 99 connects with a fork mounted on the bar 96 and with a fork mounted on the casing 95 and acts to normally urge the bar 96 into a retracted position. A bell crank 100 is pivotally mounted at its center by a pintle 101, and one end of this bell crank is provided with a roller 102 which engages in a horizontal slot 103 in a bracket 104 mounted on the bar 96. The other end of the bell crank 100 is adapted to be caught and held by a catch 105 (see Figs. 31 and 34). This catch 105 is pivotally supported by a pintle 106 and is connected with an armature 107 of an electro-magnet 108. The electro-magnet is stationarily mounted within the casing 95. A spring 109 connects with the armature 107 and with a pin 110 mounted on an insulation member 111 secured within the casing 95. The spring 109 serves to urge the catch 105 into its closed position.

An electro-magnet 112 within the casing 95 adjacent the electro-magnet 108 and has an armature 113 which is pivotally mounted by a pintle 114. The armature 113 has one end thereof provided with a bolt 115 slidably disposed in slots 116 formed in a frame 117 arranged to support the electro-magnet. The bolt 115 also

supports an arm 118 which extends over adjacent the armature 107. The arrangement is such that when the electro-magnet 112 is operative and is pulling on its armature the arm 118 does not touch the armature 107, as shown in Fig. 31, but when the electro-magnet 112 is deenergized the armature 113 moves to the position shown in Fig. 32 by reason of a spring 119 which is connected with the armature and with the frame 117. In the latter position of the armature the arm 118 strikes the armature 107 to move the catch to its open position so that the bell crank 100 is free.

A switch is also arranged within the device controlled by the position of the bar 96. This switch comprises a contact 120 pivotally supported by a pintle 121 on an insulation block 122. A spring 123 acts to normally urge the contact 120 upwards. In the forward position it engages a contact plate 124. The contact 120 has a binding post 125 to which a wire may be connected. This binding post end of the contact is in the path of motion of the bracket 104. The arrangement is such that when the bar 96 is in its lowered position, as shown in Fig. 30, the bracket 104 rests against an insulated portion of the contact 120 and holds the contact in a pivoted position in which the circuit is open. But when the bar 96 is in its raised position, as shown in Fig. 31, the circuit is closed.

A thermostatic switch is also provided within the casing. This thermostatic switch comprises a thermostatic leaf 130 supported at one end on a bracket 131 which is mounted on the insulation member 111. The free end of the thermostatic leaf normally engages a conductor bracket or contact 133 also mounted on the insulation member 111. Opposed to the contact 133 there is a contact 134 also mounted on the insulation member 111. Several binding posts 135, 136, 137, 138 and 139 are also mounted on the insulation member 111. The binding posts 138 and 139 are connected in a circuit which includes the electro-magnet 112. The binding post 137 is connected in a circuit which includes the contact 120 and the electro-magnet 108. The binding post 136 is connected directly with the thermostatic leaf spring 130. The binding post 135 is connected with the bracket 133. The bracket 134 is connected in the circuit within the binding post 137. This description may best be understood by examining Fig. 1 in which there is a schematic showing of the wiring arrangement.

Attention is now called to Fig. 1 so that the electric wiring of the device may be understood. A supply circuit 140 connects with the terminals 138 and 139 and joins up with the circuit to the electro-magnet 112. It should be noted that should the circuit 140 be interrupted for any reason whatsoever the electro-magnet 112 loses its magnetism and its core 113 moves open so that the arm 118 strikes the armature 107 and opens the catch 105. This releases the bell crank 100 and the spring 99 then pulls the bar 96 inwards. The bar 96 is connected with a cable 142 connected with a switch 143 in the circuit of the electric motor 10^b. The parts are arranged so that when the bar 96 moves inwards, the switch 143 is open and the motor will stop the rotation of the main drive shaft 10^{bb}, thereby stopping all knitting machines and prevent them from causing any damage.

The circuit 140 also connects with the primary of a transformer 144. The secondary 145 of this transformer is in circuit with the binding posts

136 and 137. When the thermostatic leaf 130 is cool, it connects with the contact bracket 133 and the secondary circuit continues through the circuit 146. This circuit 146 supplies current to the main "stop motion" line circuit 147 to which any number of the multiple circuit breaking devices of any number of knitting machines may be connected. One side of the circuit 147 is grounded at the point 148. The other side connects with a lead 149 to a brush device which includes a stationary casing 150 supported from the ceiling 151 of an establishment.

Within this stationary casing there is a brush 152 ground thereto so as to receive current. This brush 152 is in electric connection with a member 153 which is insulated from and supported upon the top end of a center shaft 154 included in the spool carriage 10^a. The disc 153 frictionally engages the shaft 154 so as to turn with the spool carriage. The arrangement is such that the electric disc 153 receives current from the lead 149. The disc 153 is connected by lines 155 to the various devices A, B and C. The line 155 is continuous to the three devices and branches from the line connected with the contacts 33 of the devices A with the contacts 51 of the devices "B", and with the terminals 52 of the devices "C". The output or second terminals from each of the devices A, B and C are connected to the ground line 156. The device D is also connected to the lead 149 by its binding post 93 and is grounded at the point 94. The arrangement is such that when any one of the devices A, B or C operates to close the circuit, current will flow to the terminal 93 through the magnet 76 which will then function to move the armature 75 and release the bell crank 71. The spring 84 then moves the bar 66 upwards to open the clutch 10^c of the knitting machine. When the bar 66 moves upwards the electric circuit which actuated the device D will be broken by the switch 87, 92, thus preventing any further current to pass through magnet 76 of device D.

While I have illustrated and described the preferred embodiments of my invention, it is to be understood that I do not limit myself to the precise constructions herein disclosed and the right is reserved to all changes and modifications coming within the scope of the invention as defined in the appended claims.

Having thus described my invention, what I claim as new, and desire to secure by United States Letters Patent is:—

1. In combination with a knitting machine having a rotative spool carriage, a motor driving a main drive shaft, and a clutch for disconnecting the machine from the motor drive, means on said spool carriage for detecting whether the yarn drawn from spools on said carriage is either knotted, bunched, or has a rough surface, and including switches, and means for closing and keeping closed said switches upon detection of said deficiencies in said yarn, means on said spool carriage for detecting breaks in said yarn and including switches, and means for closing and keeping closed said switch upon detection of a break, means for opening said clutch controlled with an electro-magnet, and a circuit including said electro-magnet and switches for energizing said magnet when one of said switches is closed.

2. In combination with a knitting machine having a rotative spool carriage, a motor driving a main drive shaft, and a clutch for disconnecting the machine from the motor drive, means on

said spool carriage for detecting whether the yarn drawn from spools on said carriage is either knotted, bunched, or has a rough surface, and including switches, and means for closing and
 5 keeping closed said switches upon detection of said deficiencies in said yarn, means on said spool carriage for detecting breaks in said yarn and including switches, and means for closing and keeping closed said switch upon detection
 10 of a break, means for opening said clutch controlled with an electro-magnet, and a circuit including said electro-magnet and switches for energizing said magnet when one of said switches is closed, a switch for controlling said motor drive,
 15 means for opening said latter switch including an electro-magnet when no current flows through said electro-magnet, and a circuit including the switches of said detecting means and said latter electro-magnet so that in case of a short in the
 20 circuit, or in the detecting means, the said motor switch is also opened.

3. In combination with a knitting machine having a rotative spool carriage, a motor driving a main drive shaft, and a clutch for disconnecting the machine from the motor drive, means
 25 on said spool carriage for detecting whether the yarn drawn from spools on said carriage is either knotted, bunched, or has a rough surface, and including switches, and means for closing and
 30 keeping closed said switches upon detection of said deficiencies in said yarn, means on said spool carriage for detecting breaks in said yarn and including switches, and means for closing and
 35 keeping closed said switch upon detection of a break, means for opening said clutch controlled with an electro-magnet, and a circuit including said electro-magnet and switches for energizing
 40 said magnet when one of said switches is closed, said circuit including a thermostatic switch, a switch for controlling said motor drive, means for opening said latter switch including an electro-magnet, and a circuit including said thermostatic switch and said electro-magnet for opening the motor switch when the thermostatic
 45 switch operates.

4. In a device of the class described, a means for the spool carriage of a knitting machine for detecting whether the yarn drawn from the spool
 50 on said carriage is either knotted, bunched, or has a rough surface, comprising a casing, a shaft turnably mounted through said casing, a radial arm on the outer end of the shaft, a cam upon the inner end of the shaft, a contact arm engageable with the cam in a turned position of
 55 the shaft, and a catch for holding said shaft in turned position.

5. In a device of the class described, a means for the spool carriage of a knitting machine for detecting whether the yarn drawn from the spool
 60 on said carriage is either knotted, bunched, or has a rough surface, comprising a casing, a shaft turnably mounted through said casing, a radial arm on the outer end of the shaft, a cam upon the inner end of the shaft, a contact arm engageable with the cam in a turned position of
 65 the shaft, and a catch for holding said shaft in turned position, said catch being provided with a projecting portion by which it is manually releasable.

6. In a device of the class described, a means for the spool carriage of a knitting machine for detecting whether the yarn drawn from the spool
 70 on said carriage is either knotted, bunched, or has a rough surface, comprising a casing, a shaft turnably mounted through said casing, a radial

arm on the outer end of the shaft, a cam upon the inner end of the shaft, a contact arm engageable with the cam in a turned position of the shaft, and a catch for holding said shaft in
 5 turned position, and a spring connected between said catch and radial arm for urging same against said cam.

7. In a device of the class described, a means for the spool carriage of a knitting machine for detecting whether the yarn drawn from the spool
 10 on said carriage is either knotted, bunched, or has a rough surface, comprising a casing, a shaft turnably mounted through said casing, a radial arm on the outer end of the shaft, a cam upon the inner end of the shaft, a contact arm engageable with the cam in a turned position of
 15 the shaft, and a catch for holding said shaft in turned position, and a spring connected between said catch and radial arm for urging same against said cam, and another spring indirectly connected
 20 with said shaft for holding the shaft in a controlled position, said latter spring being associated with an adjustment means for controlling its tension.

8. In a device of the class described, a means
 25 for the spool carriage of a knitting machine for detecting breaks in the yarn thereof comprising a frame, a shaft supported on the frame, a disc fixed on the shaft, a turnable disc on the shaft adjacent said fixed disc, a clip fixed on the shaft
 30 adjacent said turnable disc, resilient means acting between the shaft and turnable discs for urging the turnable disc into one direction, an element connected with the turnable disc, a contact mounted on the stationary cap and extending
 35 into a groove or recess in the turnable disc, and eyelets on said element and frame through which the yarn may pass to provide tension to hold the turnable disc in a position in which the contact does not engage the wall of the groove.
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9. In a device of the class described, a means for the spool carriage of a knitting machine for detecting breaks in the yarn thereof comprising a frame, a shaft supported on the frame, a disc
 45 fixed on the shaft, a turnable disc on the shaft adjacent said fixed disc, a clip fixed on the shaft adjacent said turnable disc, resilient means acting between the shaft and turnable discs for urging the turnable disc into one direction, an element connected with the turnable disc, a contact mounted on the stationary cap and extending
 50 into a groove or recess in the turnable disc, and eyelets on said element and frame through which the yarn may pass to provide tension to hold the turnable disc in a position in which the contact does not engage the wall of the groove,
 55 said frame having an opening through which said element extends.

10. In a device of the class described, a means for the spool carriage of a knitting machine for
 60 detecting breaks in the yarn thereof comprising a frame, a shaft supported on the frame, a disc fixed on the shaft, a turnable disc on the shaft adjacent said fixed disc, a clip fixed on the shaft adjacent said turnable disc, resilient means acting
 65 between the shaft and turnable discs for urging the turnable disc into one direction, an element connected with the turnable disc, a contact mounted on the stationary cap and extending into a groove or recess in the turnable disc,
 70 and eyelets on said element and frame through which the yarn may pass to provide tension to hold the turnable disc in a position in which the contact does not engage the wall of the groove,
 75 said frame having an opening through which said

element extends, said element being provided with an eyelet, said frame having an eyelet in line with said eyelet.

11. In a device of the class described, a means for the spool carriage of a knitting machine for detecting breaks in the yarn thereof comprising a frame, a shaft supported on the frame, a disc fixed on the shaft, a turnable disc on the shaft adjacent said fixed disc, a clip fixed on the shaft adjacent said turnable disc, resilient means acting between the shaft and turnable discs for urging the turnable disc into one direction, an element connected with the turnable disc, a contact mounted on the stationary cap and extending into a groove or recess in the turnable disc, and eyelets on said element and frame through which the yarn may pass to provide tension to hold the turnable disc in a position in which the contact does not engage the wall of the groove, said element being in the form of an extending wire, and said frame having a projecting arm with an aperture, said arm and wire being provided with eyelets for the passage of the yarn.

12. In a device of the class described, a means for opening the clutch connecting a drive with a knitting machine, comprising a casing, a bar slidably mounted through said casing, resilient means urging said bar into a raised position, a bell crank pivotally mounted and provided with a roller on one of its arms engaging a slot in the bar, a catch for holding said bell crank with the bar in a lowered position, and an electro-magnet for opening the said catch.

13. In a device of the class described, a means for opening the clutch connecting a drive with a knitting machine, comprising a casing, a bar slidably mounted through said casing, resilient means urging said bar into a raised position, a bell crank pivotally mounted and provided with a roller on one of its arms engaging a slot in the bar, a catch for holding said bell crank with the bar in a lowered position, an electromagnet for opening the said catch, and an auxiliary hand device for opening the catch.

14. In a device of the class described, a means for opening the clutch connecting a drive with a knitting machine, comprising a casing, a bar slidably mounted through said casing, resilient means urging said bar into a raised position, a bell crank pivotally mounted and provided with a roller on one of its arms engaging a slot in the bar, a catch for holding said bell crank with the bar in a lowered position, an electromagnet for opening the said catch, and an auxiliary hand device for opening the catch, comprising a plunger, resilient means holding the plunger in a lowered position, an element on the plunger engaging the catch, and a rod connected with said plunger.

15. In a device of the class described, a means for opening the clutch connecting a drive with a knitting machine, comprising a casing, a bar slidably mounted through said casing, resilient means urging said bar into a raised position, a bell crank pivotally mounted and provided with a roller on one of its arms engaging a slot in the bar, a catch for holding said bell crank with the bar in a lowered position, an electro-magnet for opening the said catch, a switch within said casing, an element on said arm engageable with a portion of said switch to open the switch after the arm is moved to its raised position.

16. In a device of the class described, means for opening a switch controlling the operation

of the knitting machine comprising a casing, a bar slidably mounted in the casing, a resilient means urging said bar inwards, a bell crank pivotally mounted and having one arm provided with a roller engaging a slot in a bracket mounted on the bar, a catch for holding said bell crank so that the bar is in an extended position, an electro-magnet for operating said catch to open same.

17. In a device of the class described, means for opening a switch controlling the operation of the knitting machine comprising a casing, a bar slidably mounted in the casing, a resilient means urging said bar inwards, a bell crank pivotally mounted and having one arm provided with a roller engaging a slot in a bracket mounted on the bar, a catch for holding said bell crank so that the bar is in an extended position, an electro-magnet for operating said catch to open same, an electro-magnet and a pivoted armature therefor, and an arm on said armature of the electro-magnet for opening said catch, said latter electro-magnet being adapted to be connected in a main current supply circuit.

18. In a device of the class described, means for opening a switch controlling the operation of the knitting machine comprising a casing, a bar slidably mounted in the casing, a resilient means urging said bar inwards, a bell crank pivotally mounted and having one arm provided with a roller engaging a slot in a bracket mounted on the bar, a catch for holding said bell crank so that the bar is in an extended position, an electro-magnet for operating said catch to open same, an insulation member within said casing, a thermostatic switch mounted on said insulation member, and a circuit for operating the thermostatic switch to operate the electro-magnet which operates the catch.

19. In a device of the class described, means for opening a switch controlling the operation of the knitting machine comprising a casing, a bar slidably mounted in the casing, a resilient means urging said bar inwards, a bell crank pivotally mounted and having one arm provided with a roller engaging a slot in a bracket mounted on the bar, a catch for holding said bell crank so that the bar is in an extended position, an electro-magnet for operating said catch to open same, an insulation member within said casing, a thermostatic switch mounted on said insulation member, and a circuit for operating the thermostatic switch to operate the electro-magnet which operates the catch, and a switch within said casing, and means for opening said switch in the retracted position of said bar.

20. In a device of the class described, means for opening a switch controlling the operation of the knitting machine comprising a casing, a bar slidably mounted in the casing, a resilient means urging said bar inwards, a bell crank pivotally mounted and having one arm provided with a roller engaging a slot in a bracket mounted on the bar, a catch for holding said bell crank so that the bar is in an extended position, an electro-magnet for operating said catch to open same, an insulation member within said casing, a thermostatic switch mounted on said insulation member, and a circuit for operating the thermostatic switch to operate the electro-magnet which operates the catch, and a switch within said casing, and means for opening said switch in the retracted position of said bar, said switch having a pivoted portion engageable by said bracket which is mounted on said bar.