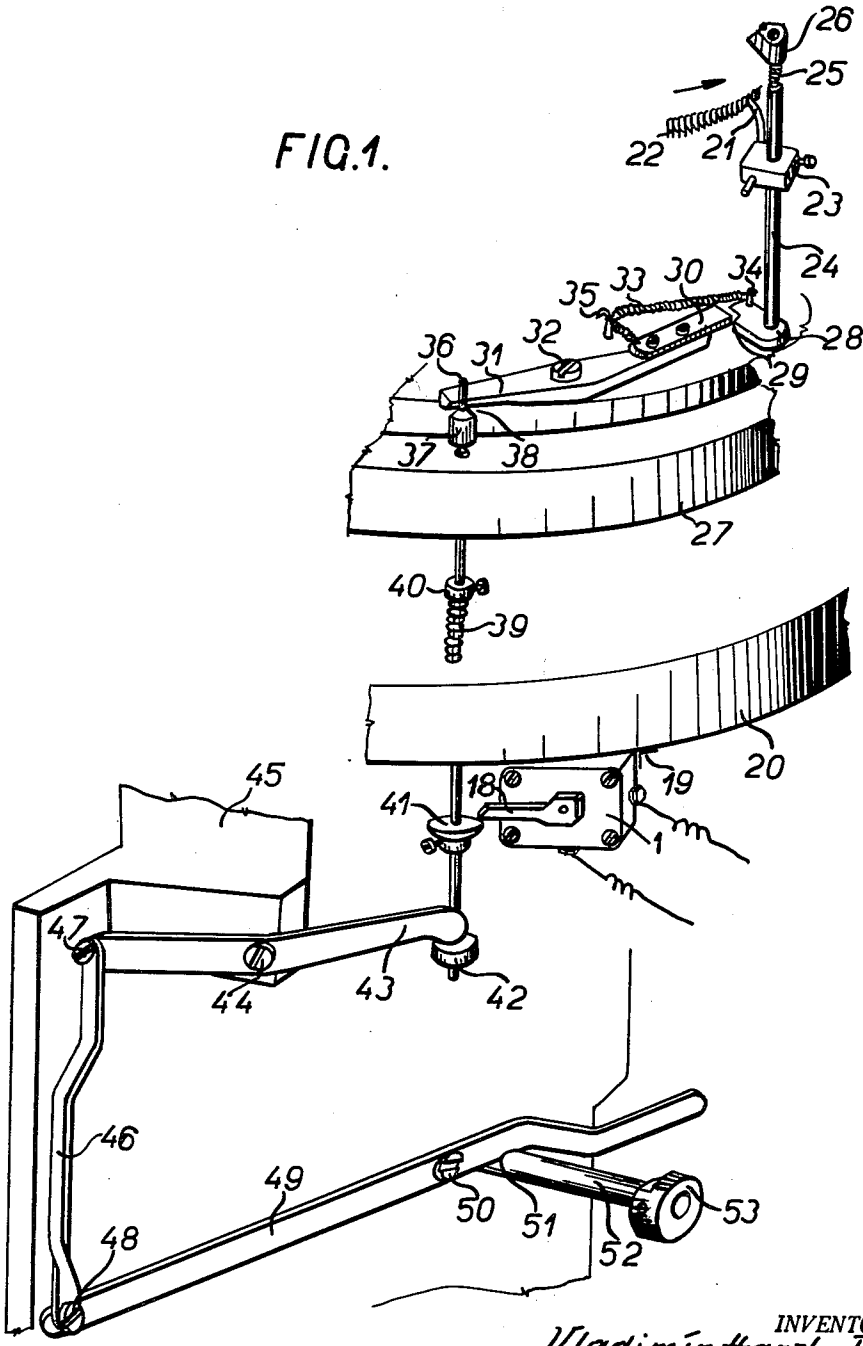
July 10, 1962 V. HANZL ET AL 3,043,122

STOPPING MECHANISM FOR KNITTING MACHINES AND MORE PARTICULARLY FOR TWO-CYLINDER CIRCULAR KNITTING MACHINES

Filed June 12, 1959 3 Sheets-Sheet 1

FIG.1.



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FIG.2.

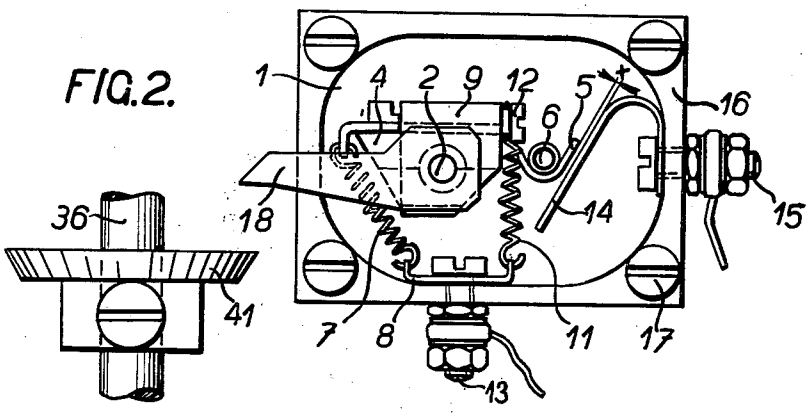


FIG.3.

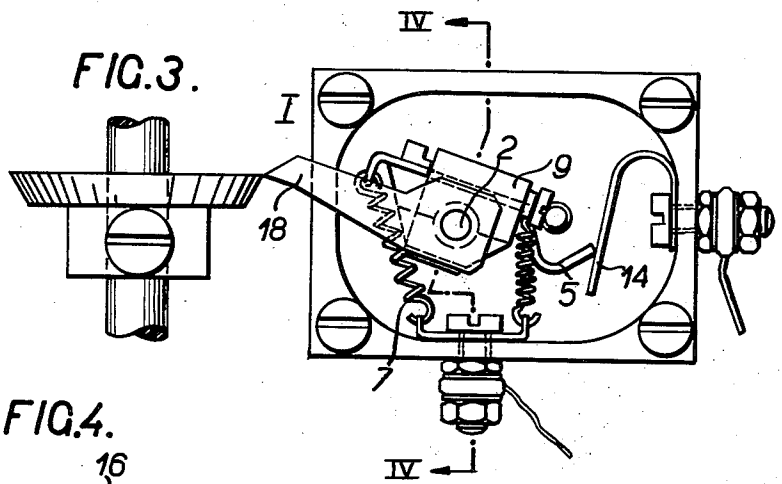
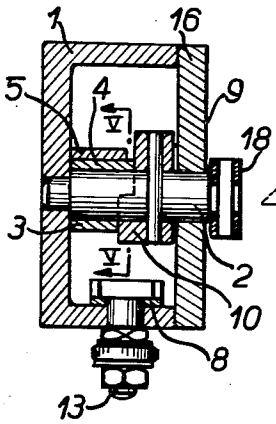


FIG.4.



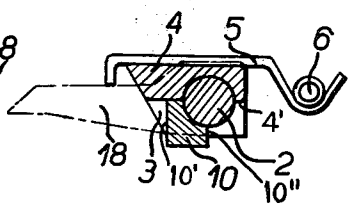
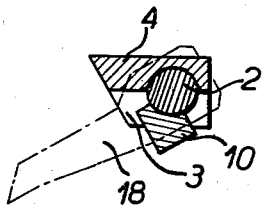


FIG.5.

FIG.6.



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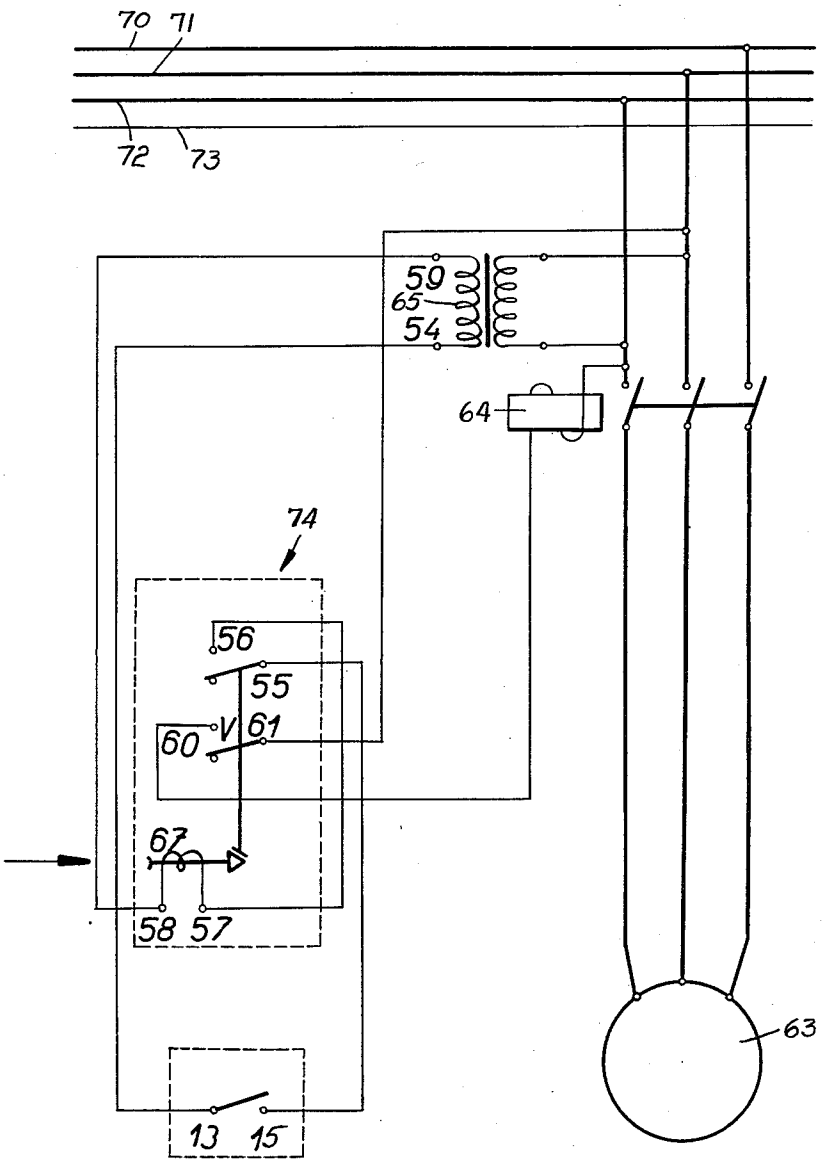


FIG. 7

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STOPPING MECHANISM FOR KNITTING MACHINES AND MORE PARTICULARLY FOR TWO-CYLINDER CIRCULAR KNITTING MACHINES

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6 Claims. (Cl. 66—157)

The present invention relates to a stop motion mechanism for knitting machines, and more particularly for double cylinder circular knitting machines, employing an electric circuit breaker which interrupts the circuit of the driving motor by means of a contactor, the circuit breaker being actuated mechanically by sensing means such as a detector acted upon by the needles of the machine.

In a known stop motion device used with a double cylinder knitting machine the latter is stopped, when a defect of any needle occurs or when yarn loads the needles. The stoppage is initiated by lateral deflection of a detector feeler which shifts a drive belt to an idle pulley.

It is a drawback of this mechanical stopping device that the time required for shifting the belt to the idle pulley is relatively long so that upon failure of a needle the needle cylinder still moves through several revolutions before the machine comes to a standstill. If a thread breaks, the needles do not receive thread, so that either the knitted work falls off the needles or the needle latches are closed and may be damaged by the sliders during the transfer of needles from one cylinder to the other.

It is an object of the present invention to provide means permitting a circular knitting machine to be stopped substantially instantaneously upon failure of the needle latches to close or upon accumulation of material on the latch needles.

Essentially, the stop motion arrangement of the invention consists of a fixed contact member mounted on the knitting machine frame and a movable contact member which is reciprocable between a position of conductive contact with the fixed member and an inoperative position. A contact actuator member is movable between first, second, and third consecutive positions and is connected to the movable contact member by engaging means which move the movable contact member from one of its positions to the other when the actuating member moves from its second to its third position, but which are inoperative when the actuating member is between its first and second position. The stop motion arrangement of the invention is further equipped with sensing means which are moved by an open knitting machine latch and the like in a certain direction, and are moved back again by resetting means. The sensing means are connected to the contact actuator member in such a manner that the actuator member is moved toward its third position when the sensing means are moved by an open latch needle, and toward its first position when the sensing means are being reset.

The exact nature of this invention as well as other objects and advantages thereof will be readily apparent from consideration of the following specification relating to the annexed drawing in which:

FIG. 1 is a fragmentary perspective view of a knitting machine equipped with a stop motion device of the invention;

FIG. 2 shows a detail of the apparatus of FIG. 1 in side elevation on an enlarged scale;

FIG. 3 shows the apparatus of FIG. 2 in a different operational position;

FIG. 4 illustrates the apparatus of FIG. 3 in front elevational section on the line IV—IV;

FIG. 5 is a side elevational sectional view of a portion of the apparatus of FIG. 4 taken on the line V—V;

FIG. 6 shows elements of the device of FIG. 5 in another position; and

FIG. 7 is a wiring diagram of the stop motion device of FIG. 1.

Referring to the drawing in detail, and initially to FIG. 1, there is shown a basically conventional double cylinder knitting machine with axially aligned cylinders and with double-ended needles independently movable and transferable between the two cylinders. The machine has only been shown to the extent necessary to explain the mounting of the stop motion device of the invention and its cooperation with the other elements of the knitting machine.

The stop motion device consists of a mechanical detecting device, a switch or circuit breaker actuated by the detecting device, and an electrical circuit connecting the switch with the drive of the knitting machine.

The mechanical detecting device for open needle latches comprises a sensing finger **21** which is in position for contact with open latches of the rotating needles **22**. The sensing finger **21** is secured in a holder **23** on a vertical shaft **24**, the upper end of which is rotatable on the pointed tip of a screw **25** secured by a bracket **26** to an upper bed plate of the knitting machine (not shown). The lower end of the vertical shaft **24** is rotatably supported on an intermediate bed plate **27**.

Mounted on the shaft **24** is an arm **28** provided with a notch **29** which is normally engaged by a detent **30** on one arm of a lever **31**. The lever is mounted for rocking movement on a pivot **32** fastened to the intermediate bed plate **27**. The engagement of the detent **30** with the notch **29** is secured by a tension spring **33** which is stretched between a hook **34** on the arm **28** and a hook **35** on the intermediate bed plate **27**. The other arm of the lever **31** abuts against the top end of a vertical rod **36** which is slidably mounted in the intermediate bed plate **27** and in a lower bed plate **20**. The rod **36** carries at its top end a sleeve **37** with a conical taper **38** which is in contact with the free end of the lever **31**. A pressure spring **39** fitted on the rod **36** bears with its lower end against the lower bed plate **20**, its upper end bearing against an adjustable collar **40**, which is secured to the rod **36**. A stop collar **41** is adjustably fixed to the rod **36** below the bed plate **20**. An adjustable collar **42** secured to the lower end of the rod **36** cooperates with the rounded tip of a lever **43**, which is mounted for rocking movement on a pivot **44** fastened on the frame **45** of the machine.

By means of a link **46** one end of which is hinged to a pivot **47** of the lever **43** and the other end of which is mounted on a pivot **48**, the lever **43** is connected to an arresting lever **49**, which is mounted for rocking motion on a pivot **50** fastened to the frame **45** of the machine, the arrangement being such that the arresting lever **49** may drop into a notch **51** in a control rod **52**, which is slidably

mounted in the frame 45 of the machine. The rod 52 forms part of a belt shift mechanism, not otherwise shown. It is provided at one end with an abutment sleeve 53 and is connected at its other end to a shifting lever and fork of the belt drive (not shown) of the knitting machine.

A bracket 19 on the lower bed plate 20 carries the housing 1 of the switch of the stop motion device. An actuating lever 18 projects from the housing for engagement with the stop collar 41.

The switch is seen in more detail in FIGS. 2 to 6. The housing 1 which is made of insulating material is closed by a transparent cover 16 fastened by screws 17 which permits inspection of the working parts of the switch without disassembly. These parts are mounted on a pin 2 rotatably supported in the cover 16 and the bottom wall of the housing 1. The actuating lever 18 is fixedly fastened on the pin.

The pin 2 carries two axially juxtaposed blocks 3 and 9 having respective axial engageable projections 4 and 10. The block 3 is rotatable on the pin 2. Its projection 4 has an abutment face 4' in an axial plane passing through a diameter of the pin 2. The projection 10 of the block 9 has two axially and radially extending faces 10', 10'' at right angles to each other. The block 9 is fastened to the pin 2 and is rotatable therewith relative to the block 3 through an angle of 90° between respective positions of abutment of the faces 10' and 10'' against the abutment face 4' of the block 3.

A leaf spring 5 which constitutes the movable contact member of the switch is fastened to the block 3. Its two ends project beyond the block 3. One of the ends is arcuately bent for abutting engagement with a pin 6 mounted in the bottom wall of the housing 1 whereby the counterclockwise rotation of the block 3, as viewed in FIGS. 2, 3, 5, and 6, is limited. The other end of the spring 5 is bent at right angles and serves as an attachment for a tension spring 7. The other end of the spring is hooked into an opening in a washer 8 fastened to a side wall of the housing 1 by a bolt 13 which simultaneously serves as a binding post for connecting the moveable contact member 5 into the stop-motion circuit. The spring 7 urges the movable contact member into engagement with the pin 6 as shown in FIG. 2.

The block 9 is urged to move clockwise about the axis of the pin 2 by a tension spring 11 fastened to the block 9 by a screw 12 and also hooked into an opening of the washer 8. The spring 11 urges the block 9 into abutting engagement of the face 10' of the axial projection 10 with the abutment face 4' of the block 3.

The vertical movement of the rod 36 in an upward direction from the position shown in FIG. 2 causes the stop collar 41 to tilt the actuating lever 18 clockwise, as seen in FIG. 2, and thereby also to rotate the block 3 with the movable contact member 5. The fixed contact member of the switch is a leaf spring 14 held to a side wall of the housing 1 by a second binding post 15. In the position of the switch illustrated in FIG. 2, the contact members 5 and 14 are spaced from each other a distance *x*, and the switch is open. When the stop collar 41 tilts the lever 18, the contact members 5, 14 make contact and the switch is closed.

The wiring diagram of the stop motion arrangement is shown in FIG. 7 which shows a three-phase alternating current supply equipped with four conductors 70, 71, 72, and 73 for energizing the drive motor 63 of the knitting machine of FIG. 1 which is controlled by a magnetic contactor 64. A step-down transformer 65 connected to the conductors 71 and 72 provides low voltage alternating current for a relay 59.

The relay 74 has two sets of contacts 55—56, and 60—61. The former set is arranged in series with the secondary terminals 54, 59 of the transformer 65, the binding posts 13 and 15, and the terminals 57 and 58 of the coil actuating the relay 59. The second set 60—61 is arranged in series with the coil of the electric contactor 64 between the conductors 71 and 72. The relay 59 may be reset by a push button 67 to close both sets of contacts. As shown in FIG. 7, all contacts are open for the sake of clearer illustration. This position is normally assumed by the circuit elements prior to knitting.

The afore-described apparatus operates as follows:

To start the knitting operation, the button 67 is pressed, thereby closing both sets of contacts of the relay 59. The contactor 64 is energized and closes the circuit of the motor 63. The closing of the contacts 55 and 56 is without consequence since the low-voltage circuit is open between the binding posts 13 and 15.

When an open needle or an accumulation of material strikes the sensing finger 21 in the direction of the arrow in FIG. 1, the arm 28 is moved in the same direction about the axis of the vertical shaft 24, and releases the detent 39, permitting the spring 39 to displace the rod 36 in an upward direction without hindrance by the engagement of the lever 31 with the conical taper 38 of the sleeve 37. The stop collar 41 moves with the rod 36. It tilts the lever 18 from the position shown in FIG. 2 into that of FIG. 3 and finally moves upward out of reach of the lever 18 which then is returned to the position of FIG. 2 by the tension spring 7.

During the brief period in which tilting of the lever causes contact between the leaf springs 5 and 14, as seen in FIG. 3, the relay 59 is energized and both sets of its contacts are opened. The contactor 64 reverts to its normal open position. Opening of the contacts 55, 56 interrupts the low voltage circuit and keeps it open until the relay 59 is manually reset. When the lever 18 is returned to the position of FIG. 2, the connection between the binding posts 13, 15 is broken and the condition of the circuit shown in FIG. 7 is restored.

The upward movement of the rod 36 also causes the adjustable collar to pivot the lever 43 on the pivot 44 whereby the arresting lever 49 is moved out of the notch 51 on the control rod 52. A spring (not shown) axially moves the rod until the sleeve 53 abuts against the lever 49. The control rod 52 is an element of a conventional belt control mechanism, not otherwise shown. When the sleeve moves toward the lever 49, a drive belt of the knitting machine is moved by a belt guide mounted on the rod from a fast pulley to a slow pulley of a transmission arrangement interposed between the electric motor 63 and the knitting machine. Any residual rotary energy of the knitting machine and of the deenergized motor is dissipated by the sudden change in the transmission ratio, and the needle cylinder of the machine barely moves beyond the position in which the defective needle was sensed by the finger 21.

If so desired, the belt may further be shifted manually to an idle pulley, and necessary repairs or adjustments may then be made in the needles 22.

To restart the machine, the motor 63 is energized by pressing the button 67. The belt (not shown) is shifted from the idle pulley to the full-speed pulley and the arresting lever 52 is engaged in the notch 51 of the control rod 52. The resulting downward movement of the rod 36 and of the stop collar 41 deflects the lever 18 downward into the position shown in phantom view in FIG. 6 without moving the movable contact member 5. After passage of the collar 41 downward into the original position of FIG. 2, the lever 18 returns into the same position under the urging of the spring 11.

It should be understood, of course, that the foregoing disclosure relates to only a preferred embodiment of the invention and that it is intended to cover all changes and modifications of the example of the invention herein chosen for the purpose of the disclosure which do not constitute departures from the spirit and scope of the invention set forth in the appended claims.

We claim:

1. In a stop motion arrangement for a knitting machine having latch needles, a support; a fixed contact member

on said support; a movable contact member reciprocable between a position of conductive contact with said fixed contact member and an inoperative position; a contact actuator member on said support movable from a first to a second, and thence to a third position; engaging means on said movable contact member and on said actuator member engageable for moving said movable contact member from one position to the other position thereof when said actuating member moves from the second to the third position thereof, and out of engagement when said actuating member is positioned between said first and said second positions thereof; sensing means movable in one direction responsive to an open latch of said knitting machine; and resetting means for moving said sensing means in a direction opposite to said one direction, said sensing means being connected to said contact actuator member for moving the same in a direction toward said third position when said sensing means moves in said one direction, and for moving said actuating member in a direction toward said first position when said sensing means moves in the opposite direction.

2. In a stop motion arrangement for a knitting machine having latch needles, a support; a fixed contact member on said support; a movable contact member reciprocable between a position of conductive contact with said fixed contact member and an inoperative position; a contact actuator member on said support movable from a first to a second, and thence to a third position; engaging means on said movable contact member and on said actuator member engageable for moving said movable contact member from one position to the other position thereof when said actuating member moves from the second to the third position thereof, and out of engagement when said actuating member is positioned between said first and said second positions thereof; resilient means permanently urging said contact member into said one position and said actuating member into said second position; sensing means movable in one direction responsive to an open latch of said knitting machine; and resetting means for moving said sensing means in a direction opposite to said one direction, said sensing means being connected to said contact actuator member for moving the same from said second toward said third position when said sensing means moves in said one direction, and for moving said actuating member from said second toward said first position when said sensing means moves in the opposite direction.

3. In a stop motion arrangement for a knitting machine having latch needles, a support; a fixed contact member on said support; a movable contact member reciprocable between a position of conductive contact with said fixed contact member and an inoperative position; a contact actuator member on said support movable from a first to a second, and thence to a third position; engaging means on said movable contact member and on said actuator member engageable for moving said movable contact member from said inoperative position to said contact position thereof when said actuating member moves from the second to the third position thereof, and out of engagement when said actuating member is positioned between said first and said second positions thereof; resilient means permanently urging said contact member into said inoperative position and said actuating member into said second position; sensing means movable in one direction responsive to an open latch of said knitting machine; and resetting means for moving said sensing means in a direction opposite to said one direction, said sensing means being connected to said contact actuator member for moving the same from said second toward said third position when said sensing means moves in said one direction, and for moving said actuating member from said second toward said first position when said sensing means moves in the opposite direction.

4. In a stop motion arrangement for a knitting machine having latch needles, a support; a fixed contact member

on said support; a movable contact member reciprocable between a position of conductive contact with said fixed contact member and an inoperative position; a contact actuator member on said support movable from a first to a second, and thence to a third position; engaging means on said movable contact member and on said actuator member engageable for moving said movable contact member from said inoperative position to said contact position thereof when said actuating member moves from the second to the third position thereof, and out of engagement when said actuating member is positioned between said first and said second positions thereof; resilient means permanently urging said contact member into said inoperative position and said actuating member into said second position; sensing means movable in one direction responsive to an open latch of said knitting machine; and resetting means for moving said sensing means in a direction opposite to said one direction, said sensing means being connected to said contact actuator member for moving the same from said second toward said third position against the restraint of said resilient means, and then releasing said actuator member to the urging of said resilient means when said sensing means moves in said one direction, and for moving said actuating member from said second toward said first position against the restraint of said resilient means, and then releasing said actuator member to the urging of said resilient means when said sensing means moves in the opposite direction.

5. In a stop motion arrangement for a knitting machine having latch needles and electric drive means, a support; a fixed contact member on said support; a movable contact member reciprocable between a position of conductive contact with said fixed contact member and an inoperative position; a contact actuator member on said support movable from a first to a second, and thence to a third position; engaging means on said movable contact member and on said actuator member engageable for moving said movable contact member from said inoperative position to said contact position thereof when said actuating member moves from the second to the third position thereof, and out of engagement when said actuating member is positioned between said first and said second positions thereof; resilient means permanently urging said contact member into said inoperative position and said actuating member into said second position; sensing means movable in one direction responsive to an open latch of said knitting machine; resetting means for moving said sensing means in a direction opposite to said one direction, said sensing means being connected to said contact actuator member for moving the same from said second toward said third position when said sensing means moves in said one direction, and for moving said actuating member from said second toward said first position when said sensing means moves in the opposite direction; and switch means in circuit with said contact members and said electric drive means for deenergizing said drive means when said contact members are in conductive contact.

6. In a stop motion arrangement for a knitting machine having latch needles, a support; a fixed contact member on said support; a movable contact member reciprocable between a position of conductive contact with said fixed contact member and an inoperative position; a contact actuator member on said support movable from a first to a second, and thence to a third position; engaging means on said movable contact member and on said actuator member engageable for moving said movable contact member between said inoperative position and said contact position thereof when said actuating member moves between the second and the third position thereof, and out of engagement when said actuating member is positioned between said first and said second positions thereof; resilient means permanently urging said contact member into said inoperative position and said actuating member

into said second position; sensing means movable in one direction responsive to an open latch of said knitting machine; and resetting means for moving said sensing means in a direction opposite to said one direction, said sensing means being connected to said contact actuator member for moving the same from said second toward said third position when said sensing means moves in said one direction, and for moving said actuating member from said second toward said first position when said sensing means moves in the opposite direction.

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