June 6, 1939. E. VOSSEN 2,161,209

ELECTRIC STOP MECHANISM FOR KNITTING MACHINES

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Fig. 1.

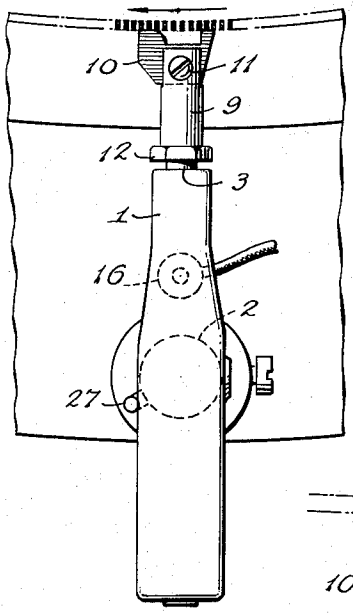


Fig. 2.

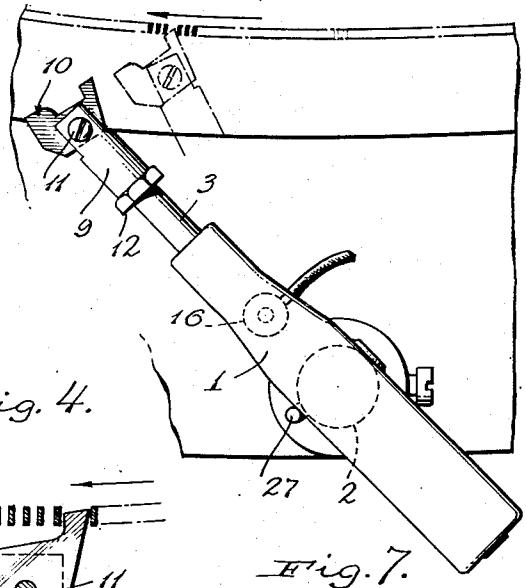


Fig. 4.

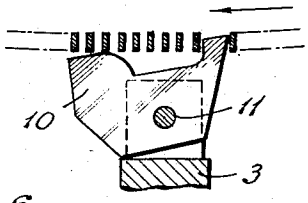


Fig. 7.



Fig. 3.

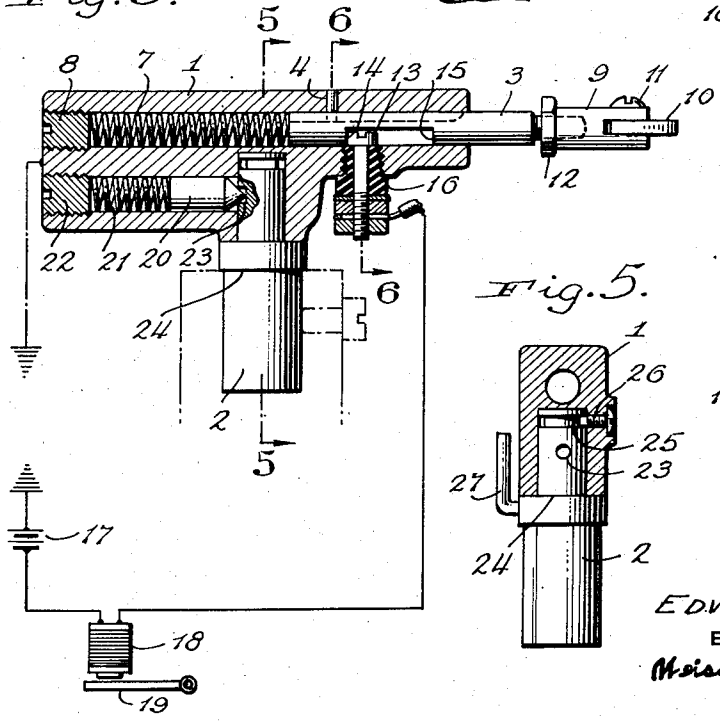
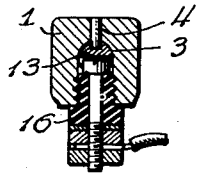


Fig. 5.

Fig. 6.



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Fig. 8.

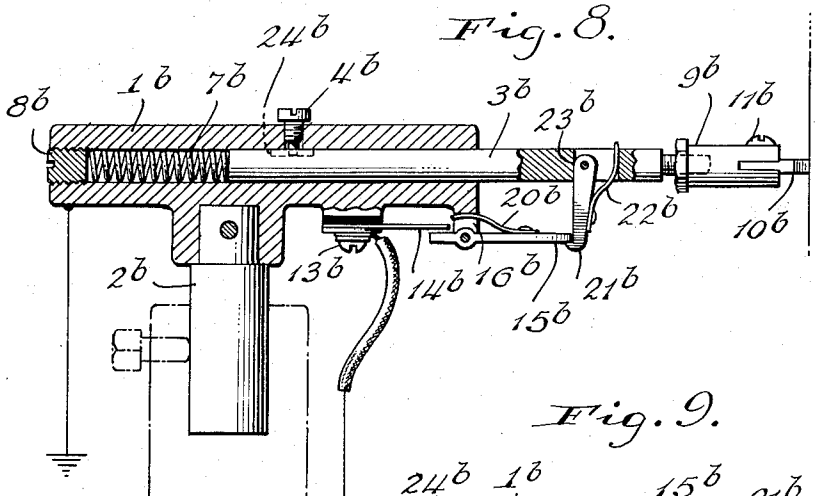
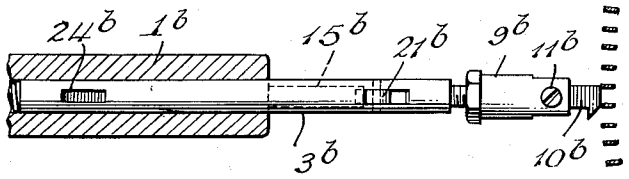
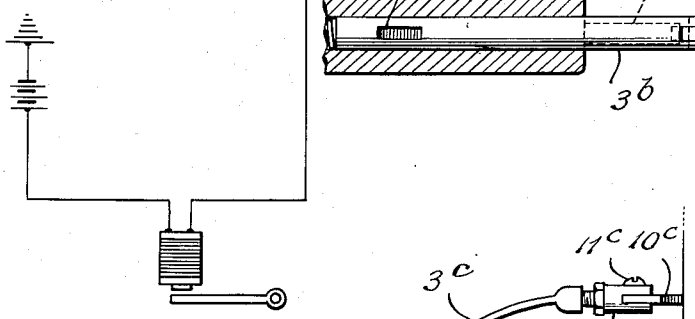


Fig. 9.





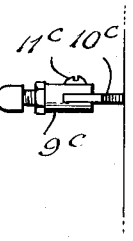


Fig. 10.

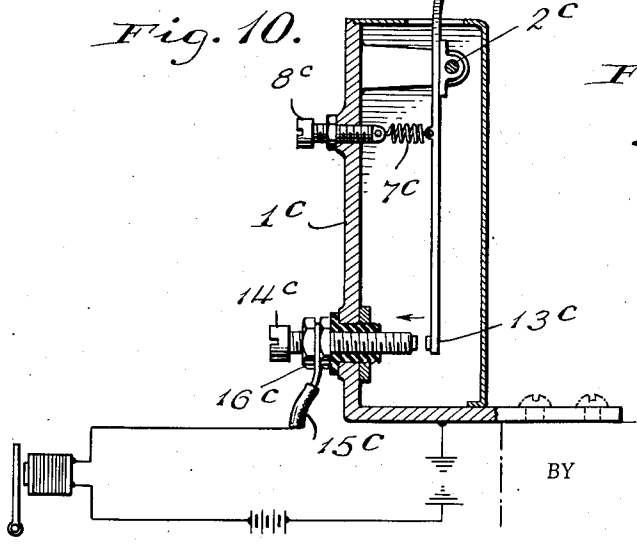
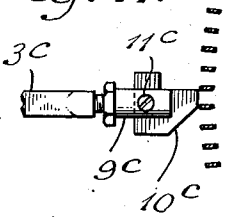


Fig. 11.



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2,161,209

ELECTRIC STOP MECHANISM FOR KNITTING MACHINES

Edward Vossen, Brooklyn, N. Y., assignor to Stop Motion Devices Corporation, Brooklyn, N. Y., a corporation of New York

Application January 3, 1939, Serial No. 249,003

8 Claims. (Cl. 66—157)

This invention relates to automatic stop mechanisms for knitting machines, especially spring needle machines. Its object is to increase the rapidity and certainty with which the power is automatically cut off from the knitting machine in the course of operation and stoppage effected upon the breakage or loss of one or more of the needles. The scope of the invention is best disclosed by describing three of the numerous forms in which it may be embodied.

One form with various refinements is shown in Figs. 1 to 6, inclusive, of the drawings. Fig. 1 shows the top plan view in operation, with the shoe held in position against the rotating needles by the spring-actuated plunger. Fig. 2 is the top plan view after the device has detected a broken or absent needle, engaged the shoe of its plunger in the gap and been rotated on its vertical shaft till the shoe is clear of the needles and the plunger free to advance under spring actuation to meet with its interior shoulder the electrically charged contact member within the housing, close the circuit, energize the electromagnet, actuate the trip and cut the power from the machine. Fig. 3 shows a side elevation of the device, including the complete electrical circuit and trip, the interior mechanism being disclosed by cutting away the side of the housing. Fig. 4 shows one form of the shoe, with details and mode of operation. Fig. 5 is a vertical cross section of the device cut on the line 5—5 of Fig. 3, and viewed from the side or end opposite the needles. Fig. 6 is another cross section viewed from the same position, but cut on the line 6—6 of Fig. 3. Fig. 7 shows a second form of the shoe for use with heavier, more widely spaced needles. Fig. 8 shows a side elevation and Fig. 9 a top plan view of another form of the device which is non-rotatable and makes its electrical connection directly by the advance of the shoe into any gap occurring in the rotating ring of needles, the shoe thereafter remounting the next incoming needle beyond the gap and continuing to ride as before. Fig. 10 is a side elevation of a non-rotatable form of the device which makes electrical connection by a lever instead of a plunger. Fig. 11 is the top plan view of the part thereof near the needles. Two methods of contact are shown, the trigger method which leaves the current running once the circuit has been closed for an instant, as in Fig. 8, and the split-second contact form as in Fig. 10, where the lever, having advanced into the gap and made the electrical contact, remounts the next incoming needle and breaks it. The two methods are interchangeable among the non-rotatable forms of the device.

This form of the device (Fig. 3) comprises a housing of the general shape of a flattened pear mounted on an upright supporting-shaft 2 firmly fixed in position at a proper distance from the knitting machine. Through the upper part of the housing 1 is a longitudinal horizontal boring in which the cylindrical plunger 3 travels. Figs. 3 and 6 show a pin 4 fixed in the housing 1 and riding in a longitudinal groove in the upper circumference of plunger 3, which serves to prevent the plunger from rotating on its axis. The plunger 3 travels under the tension of a coiled spring 7, the tension being adjusted by a screw 8 threaded into the boring behind the plunger 3. Toward the needle or inner end for a part of its length the plunger 3 is reduced in diameter and threaded to receive the female thread of a collar 9 which extends inwardly from the plunger and at its own inner or needle end is horizontally notched to receive the flat shoe 10, which is pivoted in the notch upon the vertical screw 11 passing through the forked end of the collar 9. The collar 9 with its shoe 10 in position can be screwed back and forth on the threads of the plunger 3 into the desired position and locked there by lock nut 12.

When the device is in operative position the shoe 10 is held in contact with the rotating ring of needles by the plunger 3 under the tension of the spring 7, the plunger having a hollow space cut into its lower side in which the electrically charged contact screw 13 stands, clear of either shoulder 14 and 15 which on either side terminate the hollow space, so that unless the plunger advances no electrical contact is made, and the circuit is open. Beneath the head of the contact screw 13 is an insulating washer, and beneath that the screw 13 is threaded into a cylinder 16 of hard rubber or other insulating material, which in turn screws by an exterior male thread into the housing 1 from below. The electrical connection of the contact screw 13 is made at its lower end by a brass washer and nut. The full electrical circuit is shown in Fig. 3. The housing 1 is grounded or in circuit, but so long as the plunger 3 is restrained by the needles against the shoe from advancing under the tension of the coiled spring 7 far enough to bring the shoulder 14 of the plunger into contact with the charged screw 13 the circuit is open. When the plunger is free of the needles and can advance till its shoulder 14 contacts the screw 13 the circuit is closed and the source of electricity 17 energizes the electromagnet 18 and moves the trip lever 19,

which cuts the power from the knitting machine and permits it to come to a standstill.

To prevent the housing from creeping or rotating on its upright shaft 2 slightly away from its proper position under the torque of the needles, a tumbler 20 is provided which travels in a boring in the housing 1 beneath and parallel to the boring which carries the plunger 3. The tumbler 20 in normal operation rests in its boring under tension of a coiled spring 21 adjusted by a screw 22, the conical head of th tumbler resting in a socket 23, ordinarily conical, sunk in the periphery of the stationary supporting shaft 2. The resistance of the coiled spring 21 tends to hold the head of the tumbler 20 in position in the socket 23 and prevents rotation or creeping of the housing 1 under the normal torque of the needles, as they rub against the shoe in rotation, but when the shoe advances and catches in a gap in the line of needles, the resulting extraordinary torque forces the tumbler-head out of its socket against the resistance of the spring 21, and rotates the entire device.

Fig. 5 shows a view from the end or side of the device opposite the needles of a cross section of the device made at the line 5—5 of Fig. 3, vertically bisecting the supporting shaft 2. The upper portion of the shaft entering into the housing 1 is cut down in diameter so as to make a shoulder which for convenience is ordinarily enlarged, and upon which the housing rests at 24. Just below the top of the shaft 2 an annular groove 25 is cut in its periphery, making a track in which a retaining screw 26 can ride while holding the housing 1 in place on the supporting shaft 2. From the shoulder 24 of the shaft 2, just below the housing 1, a stud 27 extends out at right angles to the axis of the vertical shaft 2 and at right angles to the horizontal axis of the pear-shaped housing 1, but a short distance from the shaft 2 is bent vertically upward and serves as a butt or stop to limit the rotation of the housing 1 on the shaft 2.

Fig. 4 is a top plan view of one form of the shoe 10, suitable for the finer more closely spaced needles. An arc of the ring of needles is shown in position, rotating clockwise. The shoe is flat and lies horizontal in the socket or fork at the end of the collar 9, freely moving in a horizontal plane on the vertical pivot screw 11. The edge of the shoe 10 nearest the needles is cut back somewhat toward the central part, leaving a projection or heel on the left hand side where the rotating needles leave the shoe and another projection or toe on the right hand side where the rotating needles approach the shoe. The heel of the shoe rides three needles, or in other words is wider than the distance between the axes of alternate needles in position on the ring. The toe of the shoe, which meets the incoming needles, is less broad than the heel, being somewhat broader than the distance between the axes of adjacent needles but narrower than the distance between the circumferences of alternate needles. The shoe is so pivoted on the end of the plunger that an extension of the axial line of the thrust of the plunger passes through the cut-back on the edge of the shoe.

Fig. 7 shows another form 10*a* of the shoe for use with heavier more widely spaced needles. In this form the edge of the shoe toward the needles is straight, without cut-back. The outside corner angle of the toe which meets the incoming needles is less than ninety degrees, so as to enter the gap made by a broken needle sharply, but not so sharp as to catch or wedge against the needle. This shoe must be so pivoted on its screw 11*a* that an extension of the axial line of force or thrust of the plunger 3 through the collar 9*a* and the screw 11*a* must in normal operation with all needles present always lie between the middle and the departing needle, and never between the middle and the incoming needle until the latter has passed within the arc of the toe of the shoe 10*a*; that is to say the distance between an extension of the axial line of thrust of the plunger against the shoe and the toe or incoming edge of the shoe itself must never be less than the distance between the axes of two adjacent needles nor more than the distance between the circumferences of alternate needles. Preferably it should be a little less than the latter. This form of shoe catches the incoming needle beyond a break or gap a little more readily than the other form, but it produces a friction too heavy for fine needles. The obvious reason is that while smaller sizes of shoes can be substituted for use with finer needles, the mass and power of the plunger remain the same, and become the more disproportionate the smaller we make the shoe to conform to fine needles. The result is increased friction.

To operate this form of the device it is mounted on the supporting shaft fixed at a suitable distance from the needles. The extension of the plunger 3 fixing the distance from the stop motion device of the limited linear path of the shoe 10 is adjusted by turning the collar 9 on its threads and holding it in the place desired by the locknut 12. The tension of the coil spring 7 on the plunger 3 is adjusted by the screw 8. The tension of the coil spring 21 on the tumbler 20 is adjusted by the screw 22. In the operation of knitting, as seen from the drawings, Figs. 1 and 4, the ring of needles rotates clockwise, and the shoe rides them smoothly, each needle in turn passing under the toe of the shoe on the right and leaving the shoe at its heel on the left. When a gap in the ring resulting from the breakage or loss of a needle arrives at the shoe, and as soon as the last needle before the gap rotates beyond the axial line of thrust of the plunger, the spring pressure on the plunger, pivoting the heel of the shoe on the last needle, forces the toe into the gap, so that it engages the first needle beyond the gap as it approaches. This incoming needle, catching the toe of the shoe, rotates the shoe 10, plunger 3 and housing 1 with its contents on the shaft 2 as an axis, into a tangential position and clear of the ring of needles. When the shoe is so thrown clear of the ring all obstruction to the spring-actuated advance of the plunger 3 is removed, the plunger advances till its interior shoulder 14 engages the contact screw 13 and closes the circuit, permitting the current to energize the electromagnet 18, which actuates the trip 19 (Fig. 3) to cut off the power from the knitting machine. By the use of the pivot 11 in mounting the shoes 10 and 10*a* on the end of the plunger shaft 3 two advantages are obtained, one to enhance the speed with which the plunger 3 can thrust the toe of the shoe 10 forward into a gap to meet the incoming needle, and the other to enable the shoe to ride the rotating ring of needles more smoothly and with less friction. The principal advantage of providing that electrical contact shall be made and stoppage of the machine actuated only after the plunger and housing have been rotated away from the needles lies in the economy of dispensing with the necessity of fine adjustments between the

circuit-opening and circuit-closing positions of the plunger-shaft toward the contact member.

An alternative form of the device is shown in Figs. 8 and 9. This form is not rotatable and consequently calls for somewhat finer adjustment to the knitting machine than the form just described. The housing 1b is similar, and is mounted by means of its vertical shaft 2b on its support, but not rotatably, consequently the spring-actuated tumbler to govern rotation and stud to limit rotation found in the other form are dispensed with. It has a similar plunger 3b, with actuating spring 7b adjusted by a screw 8b. Revolution of the plunger 3 is prevented and the path of its linear movement limited by means of a screw 4b passing through the upper part of the housing 1b and with its inner end extending into the groove 24b cut linearly in the top of the shaft. There is the same collar 9b which is adjusted for position on the end of the plunger 3b by threads and a locknut as in the other form. The end of the plunger shaft 3b carries also by a solid fastening 11b a shoe 10b to ride the needles. The shoe, however is different in shape (Fig. 9). The edge or surface of the shoe or foot of the movable member on the incoming side is bevelled back so that the first incoming needle beyond the gap forces the shoe out again, to ride the needles till the gap makes another revolution. The width of the shoe, that is, its dimension tangentially to the ring of needles is more than the distance between axes of adjacent needles and less than the distance between circumferences of alternate needles. It is not operable to pivot the shoe in the non-rotating forms of the device. For contact a trigger 21b pivoted in the plunger 3b extends vertically down with its lower end bent away from the needles to make an elbow. The movement of the trigger from the vertical away from the needles is prevented by a cam or stud 23b on the plunger, the trigger being pressed against the cam by a leaf-spring 22b. A stud 16b extends downward from the housing and pivoted at its lower end is a lever 15b resting in normal operation horizontal under tension of the leaf-spring 20b, its end resting in the elbow of the trigger 21b. Directly above the outer end or counterarm of the lever 15b and in normal operation out of contact therewith is the electrically charged leaf-spring 14b fixed in position at the end of the stud extending down from the housing 1b by the screw 13b, and insulated therefrom by washers, but in circuit with the source of electricity and the electromagnet.

In normal operation of this form of the device, as in the form just described, the spring 7b holds the shoe or end 10b of the plunger against the rotating ring of needles. When a gap due to the breakage or loss of a needle arrives at the shoe or foot of the plunger 3b the latter advances, the cam 23b on the plunger forces the trigger 21b out of engagement with the end of the lever 15b, the latter descends under the pressure of the leaf-spring 20b and the counterarm rises into contact with the electrically charged spring 14b, closing the circuit, energizing the electromagnet and actuating the trip. The shoe 10b meanwhile remounts the rotating needles beyond the gap, forced therefrom by the pressure of needles on its bevelled edge, or withdrawn in other manner.

Figs. 10 and 11 show a third form of the device, less expensive and elaborate in detail, but readily operable. To a support or housing 1c is pivoted at 2c a curved lever 3c instead of the plunger used in the other forms. Its upper end is threaded to carry the collar 9c having a slot in the inner end in which the shoe 10c is fixed by a vertical screw 11c. The collar 9c and shoe 10c are adjusted for position on the threaded end of the lever 1c and fixed by means of a locknut, as in other forms, so that the shoe 10c rests against and rides the rotating ring of needles in normal operation, the tension of the shoe 10c against the needles being governed by the spring 7c on the counterarm of lever 3c adjusted by the screw 8c. The contact member 14c consists of a screw of conducting material threaded through a plug of rubber or other non-conducting material itself threaded through the housing 1c and fixed with locknuts. The contact screw 14c is adjusted for position with relation to the contact end 13c of the lever 3c, and locked into position by a nut 16c which also serves to connect the screw 14c with the wiring 15c. The parts described, that is, the contact member 14c, wiring 15c, electromagnet, source of electricity, housing 1c and lever 13c are all in electric circuit save that it is broken by the separation of the lower lever-end 13c and the contact member 14c in normal operation.

When in normal operation a gap in the ring of needles arrives in rotation at the shoe 10c the latter is released to advance under the tension of the spring 7c, and the lower end 13c of the lever 3c closes against the contact member 14c, completing the circuit so that the current is made, energizes the electromagnet, actuates the trip and cuts off the power from the knitting machine. Fig. 11 shows a form of the shoe 10c available for use with all non-rotating forms of stop motion. Where the stop motion is not rotated clear of the needles when the shoe engages in the gap, it is necessary that the edge or side of the shoe meeting the incoming needles be shaped to a sufficiently obtuse angle to enable the shoe to remount the needles after the gap passes.

All non-rotating forms of the device can use interchangeably either the method of steady contact, by trigger as shown in Fig. 8, or the method of split-second contact, as shown in Fig. 10, or any modification of either. The use of the pivoted shoe at the end of the plunger or lever is a mechanical and commercial advantage, increasing speed and accuracy of operation and diminishing friction, but it is not indispensable to operation. The above described forms exemplify and illustrate the invention, but do not limit its scope, which extends to all forms of embodiment in which it is essential.

I claim:

1. In a stop mechanism for knitting machines, a suitable support, a movable member travelling thereon under spring actuation to and from the ring of needles and having in normal operation contact therewith, a source of electrical energy, an electromagnet, a trip actuatable thereby and a contact member in circuit with the source of electrical energy and cooperating with the movable member so that the latter may make the circuit depending on the position of the movable member with reference to the ring of needles, whereby, when the movable member advances into a gap or undue space in the ring of needles the electromagnet is energized and the trip actuated.

2. In a stop mechanism for knitting machines, a suitable base, a support rotatably mounted

thereon, a movable member travelling on the support under spring actuation to and from the ring of needles and having in normal operation contact therewith, a source of electrical energy, an electromagnet, a trip actuatable thereby, and a contact member in circuit with the source of electrical energy and cooperating with the movable member so that when the latter advances into a gap or undue space occurring in the rotating ring of needles and by the resulting torque is rotated clear thereof and free to meet the contact member the electromagnet is energized and the trip actuated; means for preventing rotation or tangential displacement of the movable member during normal operation.

3. In a stop mechanism for knitting machines, a suitable support, a movable member travelling thereon under spring actuation to and from the ring of needles and having in normal operation contact therewith, a source of electrical energy, an electromagnet, a trip actuatable thereby, a contact member in circuit with the source of electrical energy, means for effecting the cooperation of the contact member with the movable member so that the latter may make the circuit depending on the position of the movable member with reference to the ring of needles, whereby, when the movable member advances into a gap or undue space in the ring of needles the electromagnet is energized and the trip actuated; means for adjusting the movable member to the ring of needles; means for withdrawing the movable member from the gap or undue space in the rotating ring of needles after circuit is made.

4. In a stop mechanism for knitting machines, a suitable support, a lever pivoted thereto and moving under spring actuation to and from the ring of needles and having in normal operation contact therewith, means for adjusting the position of the lever with reference to the needles, a contact member in circuit with the source of electrical energy, means for effecting the cooperation of the contact member with the lever so that the latter may make the circuit depending on the position of the lever with reference to the ring of needles, whereby, when the lever advances into a gap or undue space in the ring of needles the electromagnet is energized and the trip actuated; means of withdrawing the lever from the gap after the circuit is made.

5. In a stop mechanism for knitting machines, a suitable support, a movable member travelling thereon under spring actuation to and from the ring of needles, a shoe pivoted on the movable member and having in normal operation contact with the ring of needles, a source of electrical energy, an electromagnet, a trip actuatable thereby and a contact member in circuit with the source of electrical energy and cooperating with the movable member so that the latter may make the circuit depending on the position of the movable member with reference to the ring of needles, whereby, when the shoe advances into a gap or undue space in the ring of needles the electromagnet is energized and the trip actuated.

6. In a stop mechanism for knitting machines, a suitable base, a support rotatably mounted thereon, a movable member traveling on the support under spring actuation to and from the ring of needles, a shoe pivoted on the movable member and having in normal operation contact with the ring of needles, a source of electrical energy, an electromagnet, a trip actuatable thereby, and a contact member in circuit with the source of electrical energy and cooperating with the movable member so that the latter may make the circuit depending on its position with reference to the ring of needles, whereby, when the shoe advances into a gap or undue space occurring in the rotating ring of needles and by the resulting torque the movable member is rotated clear thereof and free to meet the contact member the electromagnet is energized and the trip actuated; means of preventing rotation or tangential displacement of the movable member during normal operation.

7. In a stop mechanism for knitting machines, a shoe the edge or surface of which lying in normal operative position next the rotating ring of needles is cut back in its central portion to leave on the side where the rotating needles approach the shoe a portion or toe with an acute outer angle next the needles and a dimension tangential to the ring of needles greater than the distance between the axes of adjacent needles and less than the distance between the circumferences of alternate needles, and on the side where the rotating ring of needles leaves the shoe a portion or heel having a tangential dimension sufficient to ride at least two or more needles at all times; means for pivoting the shoe on the movable member of the stop mechanism to play in the plane of the ring of needles.

8. In a stop mechanism for knitting machines, the combination of a member movable under spring actuation radially to the ring of needles in operative position and in the plane thereof with a shoe pivoted on such movable member so as to lie in the plane of and adjacent to the ring of needles, having the corner thereof on the side of the incoming needles in rotation shaped to an acute angle and being of such dimensions and so pivoted on the movable member that the line of spring-actuated thrust thereof passes, in normal operation when all needles are present in unbroken sequence, between the middle and departing needle and never between the middle and incoming needle until the latter has passed within the arc of the nearest corner of the shoe on its pivot, and the distance from said axial line of thrust to the toe or incoming corner of the shoe is greater than the distance between the axes of adjacent needles and less than the distance between the circumferences of alternate needles.

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