ELECTRIC STOP MECHANISM FOR KNITTING MACHINES AND THE LIKE

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My invention relates to devices used to actuate or control the stop mechanism of knitting machines and other similar apparatus upon breaking or knotting of the thread. Primarily, the invention has for its object to provide mechanism which will act quickly and surely so as to stop the machine before damage to the cloth occurs.

Further, the invention has for an object to provide means whereby the electric circuits to the stop actuating magnet of the knitting machine will be closed by direct contact of metal which will not readily corrode, thereby insuring operation of the device at all times under all conditions.

Further, it is an object of the invention to provide a primary circuit closer device controlled by the thread (which, if the thread breaks or knots, will close the circuit) which device is of such construction that it cannot be improperly threaded, or in other words, it is an object of my invention to provide such a device with means whereby the new loop of the thread must always be placed in proper position on the control lever before the circuit to the stopping machine will be opened to permit the machine to begin work again.

Further, it is an object to provide reliable stop mechanism for use on machines using light silk threads.

Further, the invention has for its object to provide a circuit closer having a duplex set of closing contacts, one including a gravity operated lever which, when the thread breaks, will fall and close the circuit, and the other including a spring-held lever which operates by a pull on the thread to close the circuit, the two levers being cooperatively associated.

Another object is to provide an improved tension adjustment device for the spring that holds the spring-held lever in the circuit open position so that danger of twisting and breaking the coil spring employed may be avoided.

Further, the invention has for its object to provide auxiliary circuit closers operating at different places along the thread from the bobbin to the place where the thread leaves the bobbin holder to pass to the knitting needles so as to insure an instantaneous stopping of the machine upon the breaking or knotting of the thread.

Again, it is an object to provide an auxiliary device to close the circuit if the thread breaks adjacent the bobbin, such device having combined with it an adjustable thread tensioning means (for silk machines especially) to keep the thread taut and eliminate knotting due to slack, as well as to hold the thread sufficiently taut under normal working conditions so as to prevent the primary circuit closer from operating in the event that the thread tends to slack due to normal fluctuations caused by the knitting machine.

Other objects will in part be obvious and in part be pointed out hereinafter.

To the attainment of the aforesaid objects and ends, my invention consists in the novel features of construction and in the combination, connection and arrangement of parts, hereinafter more fully described and then pointed out in the appended claims.

In the drawings:

Figure 1 is a diagrammatic elevation showing my invention in use.

Figure 2 is a side elevation with the cover plate removed, of the primary circuit closer unit, the parts being shown in full lines in the position they assume when new thread is in place, other positions, hereinafter referred to, being indicated in dotted lines.

Figure 3 is a vertical longitudinal section taken substantially on the line 3—3 of Figure 6.

Figure 4 is a detail perspective view of the spring-held lever.

Figure 5 is a detail perspective view of the gravity operated lever.

Figure 6 is a top plan view of the primary circuit closer unit.

Figure 7 is a central vertical longitudinal section of the second circuit closer unit.

Figure 8 is a front elevation of the same.

In the drawing in which like numerals of reference indicate like parts in all of the figures, 1 represents a bobbin stand which may be of any usual construction and contains the main shaft 2 that carries the upper annulus 3 as shown. To the annulus 3 is secured the primary circuit closer 6 constitu-
ing one of the essential improvements of this invention. The primary circuit closer includes a casing provided with a top horizontal ear 7 by means of which it can be secured to a support such as the element 3 for instance and there is also provided a lower ear 8 by which the device can be mounted. When mounted by the lower ear 8 it is mounted as indicated in Figures 1 and 2 of the drawing. When the primary circuit closer unit is mounted as shown in Figures 1 and 2 the upper annulus 3 is preferably provided with holes 4 for convenience in obtaining access to the tensioning screw 31 herein again referred to. It will be observed that the casing of the primary circuit closer is closed except for an opening 9 in the front wall through which operating levers project. The casing is provided with a removable cover 11 and carries a pivot bolt 10 which also serves to secure the cover in place.

An electric terminal 12 is supported on the casing and insulated from the same and carries a double contact finger leaf spring 13. This spring consists of a leaf slit lengthwise and bent to form two contact fingers 14 and 15 respectively. The finger 14 extends forward of the finger 15 as best shown in Figures 2 and 3 of the drawing.

Pivoted on the bolt 10 is what I hereinafter term a spring-held lever which is shown in detail in Figure 4 and comprises the parallel arms 16 connected at the front by a downwardly projecting loop 18 and having fulcrum ears or bearing loops 19 as shown. Projecting backwardly from the ears 19 the lever is bent to comprise a counterbalancing loop 21 and a tension spring attaching eye 20, the latter also serving as a contact heel to engage with the spring finger 14 at times as will hereinafter more clearly appear.

22 is the bearing body of the gravity actuated lever, the body 22 being fulcrummed on the pivot bolt 10 and carries the contact finger 23 which cooperates with the spring finger 15 to close the circuit at times.

The gravity actuated lever also includes the forwardly projecting actuated part 24 that projects through the opening 9, (as does also the porcelain cover portion 17 of the parallel arms 16 of the spring held lever) and projects between the parallel arms 16 as best shown in Figures 2, 3 and 6 of the drawing.

The projecting portion 24 of the gravity actuated lever may be made of steel or other suitable material and is secured in the body 22 by looping it therein as indicated at 25 in the drawing.

The lever portion 24 is bent to provide a thread holding loop 26, a lifting inclined 27 and a front finger 28, the latter projecting beyond the loop 18 and adapted to rest in that loop at times as will be more clear later.

29 is a coiled tension spring, one end of which is hooked in the eye 20 and the other end is connected to an adjusting bar 30 which slides up and down in the housing 6 and is adjusted by means of an adjusting screw 31 that can be operated by a screw driver through the hole 4 when it is necessary to adjust the tension of the spring.

As far as described it will be seen that when the parts are positioned as shown in full lines in Figure 2, no thread being present, the gravity actuated lever will maintain contact between its member 23 and the contact finger 15 and thereby close the electric circuit to the stop mechanism's magnet 58 hereinafter again referred to. The spring 29, however, maintains the circuit open between the spring-held lever's contact heel 20 and the spring contact 14 so as to maintain the circuit open at that place. In order to open the circuit between the contact 13 and the contact finger 23 the thread 48 is passed under the finger 28 and over the parallel arms 16, thus lifting the gravity actuated lever toward the position shown in dotted lines in Figure 2 until the thread is in place when that lever will drop to the position shown in full lines in Figure 3. When the parts are in this position the circuit will be open between both contact fingers 14 and 15 and the two levers, Figure 3 being the normal operating position of these parts. Should, however, the thread break there will be nothing to sustain the gravity actuated lever in the full line position shown in Figure 3 with the result that it will fall to the position shown in full lines in Figure 2, close the circuit at 15 and energize the stop magnet 58 to operate the stopping lever 57, through the circuit connections 66, 61 and battery 59.

If the thread is in the position shown in Figures 1 and 5 and a knot comes along, since the knot cannot pass the eye 47, therefore the spring-held lever will be moved from the full line position shown in Figure 2 to the dotted line position shown in that figure, thereby closing the circuit between the heel 20 and the contact finger 14, as well as close the circuit between the contact finger 23 and the spring contact finger 15 and allowing the thread to slip off of the spring-held lever and thereby cause its release, the knitting machine being stopped, however, by the electric action before damage to the cloth or thread can occur.

In order more fully to protect the cloth against damage as well as to assist the primary circuit closer in performing its function properly under all conditions and especially when light silk thread is being used, I provide a second circuit closer 32 which is mounted on the intermediate support 5 adjacent to the bobbin 49. This second circuit closer, which is illustrated in detail in Figures 7 and 8, comprises a support 33 which is secured by suitable means 34 to the inter-
mediate support 5, there being a porcelain bushed thread-passing eye 47 provided in the base of the support 33 as best shown in Figure 7.

There is also provided as a part of the second circuit closer a contact box 35 in which is fulcrumed a gravity actuated lever 39, the latter having a contact loop arm 40 to engage with the springy fixed contact 38 that is mounted in the contact box and suitably insulated therefrom as at 37. The contact box 35 is secured to the support 33 by a screw 36 as shown.

The lever 39 is bent to carry one or more eyes 41 through which the thread is passed. These eyes are adapted to be projected forwardly through openings 42 in the front of the support and held in that position by the thread when the machine is operating under normal working conditions.

In addition to providing the lower means of mounting the support 33 it may also be provided with an upper mounting ear 43 as it may sometimes be found more convenient to mount by means of the ear 43 than by the base of the support.

Mounted on the front of the support 33 is an adjustable thread tensioning device 44 of the construction usually found on sewing machines and the like. As the construction of this device is well known a detail description thereof is thought to be unnecessary.

The gravity actuated lever 39 is provided with overbalancing arms 45 and 46 whereby, when the thread is not passing through the eyes, the lever will be moved back by gravity to the full line position shown in Figure 7 and thereby close the electric circuit between the elements 40 and 38 to operate the magnet 59 via the circuit wires 62, 63 and battery 59 as indicated in Figure 1.

50 Designates a thread guide and part of a tensioning device, one part of which is constituted by an arm 54 coiled around a drum 63 as a spring 55, and having its other end provided with an eye 52 through which the thread may be passed. This arm or lever 54 has its drum 52 mounted on a suitable support 51 sustained on the intermediate support 5 and cooperates with a fixed contact 50 mounted on the shaft 2 when the thread breaks in passing from the bobbin stand to the machine's needles.

It will be seen, by reference to Figure 1, that the springy arm 54 serves as a slack take-up to the thread under normal working conditions, and if the thread breaks between the guide 50 and the needles it functions as a circuit closing element in cooperation with the contact 56 which is insulated from the grounded support to close the circuit to the magnet 58 via wires 64 and 65 and battery 59 and operate the lever 57 of the stop mechanism to stop the machine.

It will be seen from the foregoing that the slack take-up arm 54 constitutes a tensioning device, which, in cooperation with the adjustable tension 44, enables just the right amount of tension to be put upon the thread 45 to keep the gravity actuated lever of the primary circuit closer from forcing the thread down between the parallel arms 16 thereof.

By providing the several places for closing the circuit to stop mechanism's magnet, I insure an instantaneous stopping of the machine regardless of whether the thread breaks close to the bobbin or at some point in its travel between the bobbin and the needles of the knitting machine.

Furthermore adequate provision is made in case the thread knots to close the circuit and stop the machine before the knotted portion of the thread can reach the cloth and spoil it. This also gives ample time, in case a thread breaks, for the attendant to tie the thread again and if the bobbin gives out to put a new bobbin in place and tie its thread onto the end of the preceding thread before the end of the preceding thread can reach the cloth.

I might also call attention to the fact that the electrical contacts of the primary circuit closer and those of the secondary circuit closer are what may be termed wiping contacts, i.e., they rub on one another and thus keep the contacting surfaces clean, thereby insuring good electrical connections at all times.

From the foregoing description, taken in connection with the accompanying drawing, it is thought that the complete construction, operation and advantages of my invention will be clear to those skilled in the art to which it appertains.

What I claim is:

1. In stop mechanism under control of a travelling thread the combination with an electric circuit including an operating magnet and a source of electric energy to actuate the stop device of a machine, a bobbin stand, a primary circuit closer unit mounted on said stand and including circuit closing contacts normally held open by the unbroken thread and including means to close the contacts upon breaking or knotting of the thread, a second circuit closer unit located between said primary unit and the bobbin and adjacent to the bobbin to close the circuit upon breaking of the thread adjacent the bobbin and upon passage of the end of the thread from the bobbin.

2. In stop mechanism under control of a travelling thread the combination with an electric circuit including an operating magnet and a source of electric energy to actuate the stop device of a machine, a bobbin stand, a primary circuit closer unit mounted on said stand and including circuit closing contacts normally held open by the unbroken thread and including means to close the contacts upon breaking or knotting of the thread, a second circuit closer unit located between said.
primary unit and the bobbin and adjacent to
the bobbin to close the circuit upon breaking
of the thread adjacent the bobbin and upon
passage of the end of the thread from the bob-
bin, and a third circuit closer unit mounted
on the bobbin stand and associated with the
thread where it passes from the bobbin stand
in order to close the circuit upon breakage of
the thread on leaving the stand.
3. In stop mechanism under control of a
travelling thread the combination with an
electric circuit including an operating magnet
and a source of electric energy to actuate the
stop device of a machine; a bobbin stand, a
primary circuit closer unit mounted on said
stand and including circuit closing contacts
normally held open by the unbroken thread
and including means to close the contacts
upon breaking or knotting of the thread, an
adjustable tensioning means associated with
the thread before it passes to said circuit
closer unit and a yieldable tensioning means
associated with the thread after it passes said
circuit closer unit.
4. In stop mechanism under control of a
travelling thread the combination with an
electric circuit including an operating magnet
and a source of electric energy to actuate the
stop device of a machine; a bobbin stand, a
primary circuit closer unit mounted on said
stand and including circuit closing contacts
normally held open by the unbroken thread
and including means to close the contacts
upon breaking or knotting of the thread, an
combined yieldable tensioning means and
circuit closer unit associated with the thread
after it leaves said primary circuit closer unit.
5. In stop mechanism under control of a
travelling thread the combination with an
electric circuit including an operating magnet
and a source of electric energy to actuate the
stop device of a machine; a bobbin stand, a
primary circuit closer unit mounted on said
stand and including circuit closing contacts
normally held open by the unbroken thread
and including means to close the contacts upon
breaking or knotting of the thread, an
adjustable tensioning means associated with
the thread before it passes to said circuit closer
unit and a yieldable tensioning means associa-
ted with the thread after it passes said
circuit closer unit, and means adjacent said
adjustable tensioning means to close the cir-
cuit upon breaking of the thread.
6. In stop mechanism under control of a
travelling thread wherein is provided an elec-
tric circuit including an operating magnet
and a source of electric energy to actuate the
stop device of a machine; a bobbin stand, a
primary circuit closer unit mounted on said
stand and including circuit closing contacts
normally held open by the unbroken thread
and including means to close the contacts
upon breaking or knotting of the thread, an
adjustable tensioning and circuit closer unit
associated with the thread between the bobbin
and said primary circuit closer unit and com-
prising a support, a tension adjusting de-
vice on the support, said support having at
least one opening, a lever with at least one
thread-passing eye associated with said open-
ing and adapted to move back through said
opening by gravity, said last named lever
having a contact member, and a stationary
contact member associated with said lever's
contact member and mounted on said sup-
port for the purposes specified, all being
arranged whereby the adjustable tensioning
and circuit closer unit will maintain sufficient
tension normally on the thread to hold the
primary circuit closer open.
7. In stop mechanism under the control
of a travelling thread, a circuit closer unit
comprising a housing, a fixed leaf spring con-
tact member insulated from and mounted
in said housing, a circuit terminal therefor,
said spring having two contact arms, a spring-
held lever fulcrumed in said housing and
comprising two substantially parallel arms
extending to the outside of said housing and
having a contact heel to engage one of the
arms of said leaf spring at times, an adjust-
able spring tension for said spring-held lever,
a gravity actuated lever also fulcrumed in
said housing and having a contact arm to
generate at times with the other leaf spring
arm and having an operating arm extending
to the outside of said housing in association
with the parallel arms of said spring-held
lever, said operating arm extending between
said parallel arms, said parallel arms having
a stop loop with which said operating arm
may engage when no thread is present.
8. In stop mechanism under the control
of a travelling thread, a circuit closer unit
comprising a housing, a fixed leaf spring con-
tact member insulated from and mounted
in said housing, a circuit terminal therefor,
said spring having two contact arms, a spring-
held lever fulcrumed in said housing, and
comprising two substantially parallel arms
extending to the outside of said housing and
having a contact heel to engage one of the
arms of said leaf spring at times, an adjust-
able spring tension for said spring-held lever,
a gravity actuated lever also fulcrumed in
said housing and having a contact arm to
generate at times with the other leaf spring
arm and having an operating arm extending
to the outside of said housing in association
with the parallel arms of said spring-held
lever, said operating arm extending between
said parallel arms, said parallel arms having
a stop loop with which said operating arm
may engage when no thread is present, said
operating arm having a finger end projected
beyond said parallel arms.
9. In stop mechanism for knitting machines
and the like, a circuit closer comprising a
plate having at least one opening and hav-
ing a forwardly projecting portion at the bottom with a thread-passing eye and having a rearwardly projecting portion at the top for mounting purposes, a box having its front open and secured to the back of said plate, the plate serving as a closure for the opening of said box, a lever having bearing portions and a heel, said box having edge notches constituting bearings for said bearing portions, the heel of said lever being located within said box, said lever having at least one thread-passing eye adapted to be projected through said opening of said plate, an insulated contact spring within said box cooperating with said heel, said lever being so weighted that it will fall by gravity backwards to withdraw its thread-passing eye through said opening from the front to the back of said plate substantially as shown and described.

10. In stop mechanism, a circuit closer comprising a plate having its upper end bent rearwardly to provide a securing ear and having its lower end extending forwardly and rearwardly, the rearwardly extending portion serving as a securing means and the forwardly extending portion having an eye for the passage of a thread, said plate having at least one opening in its wall, a box having one open side, said box being secured to the back of said plate, said plate serving as a closure for the box, a contact finger mounted in and insulated from the box, a wire lever having bearing portions and a loop or heel, the latter being located in the box, said box having bearing notches in its front edge for said bearing portions, said wire lever extending upwardly above said box and having at least one thread-passing eye associated with said opening in said plate and counterbalanced to move by gravity toward the back of said plate to bring its heel into contact with said insulated contact, said wire lever adapted to be moved to project its thread-passing eye through said opening in said plate whereby a thread may be passed along the front of said plate through said thread-passing eye for the purposes described.

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