March 9, 1948. L. M. ROGERS 2,437,406

LOOM STOP MOTION

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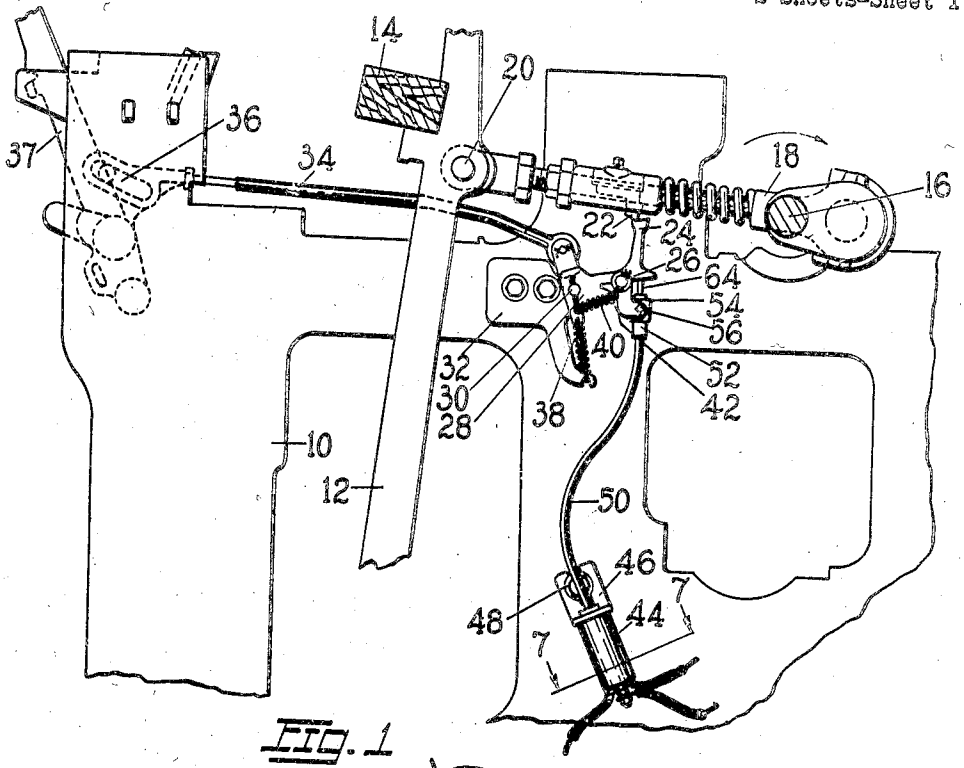


FIG. 1

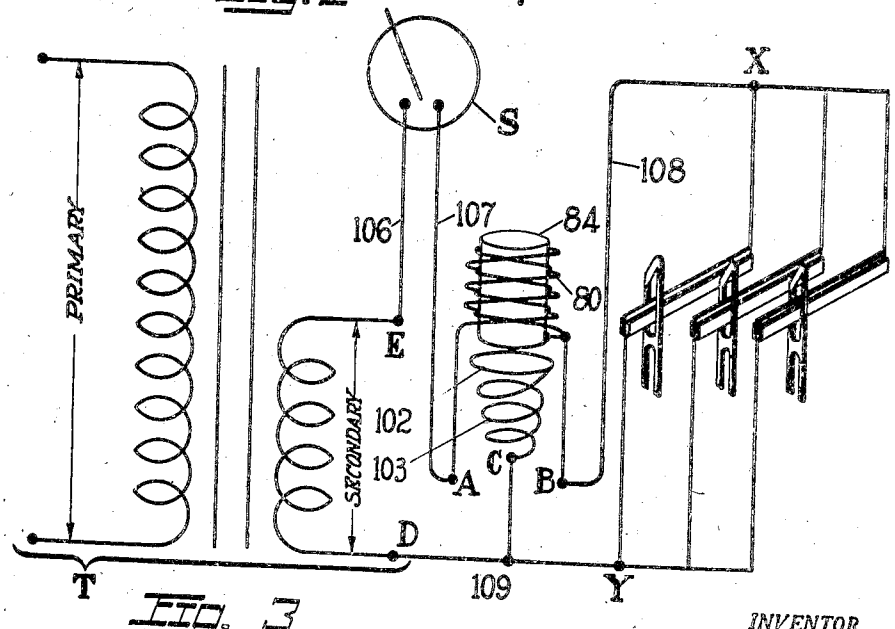


FIG. 3

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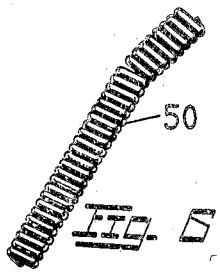


Fig. 6

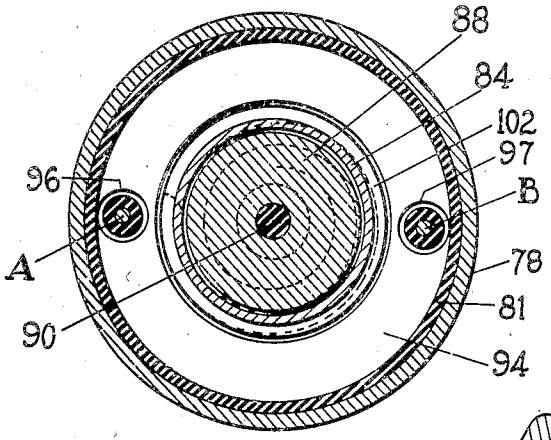


Fig. 7

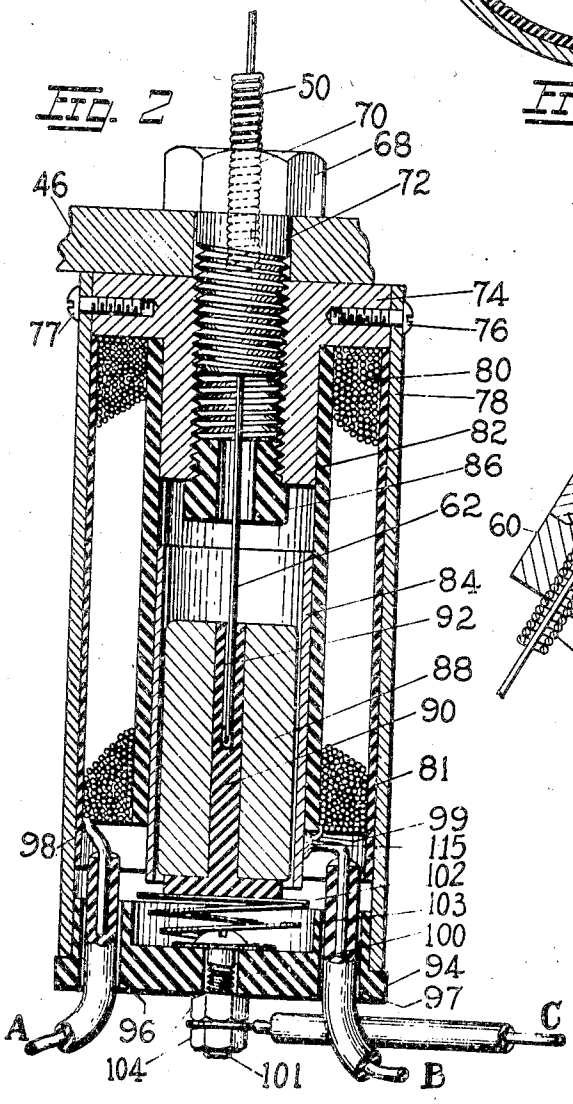


Fig. 2

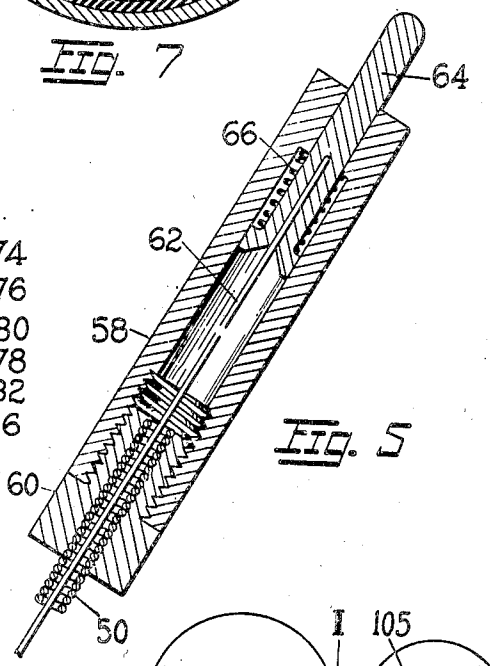


Fig. 5

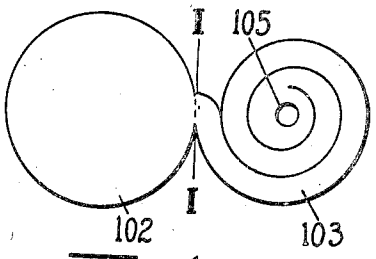


Fig. 4

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LOOM STOP MOTION

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8 Claims. (Cl. 139—353)

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This invention relates to stop motions for looms, and more particularly to electromechanically operated knock-off structures for looms employing electrical loom-condition detectors, such as electric warp-break detectors, electric weft detectors and electric harness motion detectors.

Electromechanically operated knock-off structures for looms have been made in a variety of forms. Perhaps the most effective and widely used type is one in which a solenoid coil is employed, in circuit with a detector or circuit closer and power source, and arranged through its action on a ferromagnetic core to lift or otherwise move a link or lever system connected with a dagger or a knock-off.

The knock-off is arranged to be rocked or otherwise moved from a normal idle position into an active position in the path of a regularly-moving actuator. When thus moved and engaged by the actuator the knock-off is actuated to move loom stopping structure such as a shipper handle from operating to loom-stopping position. The above mentioned links or levers become badly worn at their joints or pivots due to vibration during operation of the loom, and also are likely to become deformed or maladjusted by a careless operator during cleaning of the loom. To allow for this wear and deformation of the parts of the linkage the solenoid coil and core have been designed to provide a relatively long working stroke of the core. Thus after the parts have become worn the slack in the linkage will be taken up and the core still will have an effective linkage-operating stroke. To produce the magnetomotive force necessary to move the core through a long working stroke a relatively large number of ampere turns was required in the solenoid coil. This in turn required employment of high voltage or heavy currents, or both, in the electrical circuits. An objection to either heavy currents or high voltages in such circuits is that arcing and burning of detector contacts results when detection of a fault occurs. In the case of electrical warp-break detectors the arcing is especially severe since due to drop-wire dancing or vibration, the electric circuit is closed and broken many times during the period elapsing between the first indication and final loom stopping. Each time the circuit is broken the energy stored in the inductive circuit of the solenoid tends to create an arc and to maintain the arc when established. The fact that the circuit is thus opened and closed many times compounds the trouble since with only an intermittent current flowing in the solenoid, a higher voltage and greater peak-current

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value must be employed to secure the necessary average value. Other objections to high voltages in the detector circuits are the fire and electrical shock hazards introduced by employment of such voltages.

Another objection to prior art loom stop motion solenoids and magnets is that they tend to become clogged with lint or grease and thus tend to become sluggish in operation or to fail to operate at all. To insure operation in spite of lint it has been the practice in some instances to employ a larger coil with a greater number of ampere-turns in its winding than would otherwise be necessary. While successful in insuring operation, that type of coil greatly compounded the evil of arcing at the detector contacts in an obvious manner.

Efforts have been made in the past to reduce the troubles incident to employment of link or lever mechanisms between the solenoid and the knock-off. For example, it has been proposed to employ a flexible wire connection, commonly referred to as a Bowden cable connection, in place of links or levers, whereby no lost motion is introduced between the solenoid core and the knock-off, and allowing a shorter travel of the solenoid core. It also has been proposed that a shunt or "holding" circuit be employed to shunt the detector or circuit closer and thus reduce the extent or likelihood of arcing at the detector contacts. However, these efforts have not been completely successful in overcoming the previously mentioned objections to prior art structures. Lint and grease accumulations still caused sluggish operation, and the shunt circuit structure employed allowed the shunt circuit contacts to drop open and "chatter" if alternating current power was employed to energize the stop motion circuit.

With the above considerations in mind it is an object of the present invention to provide an electromechanical loom stopping structure including a solenoid coil and core and shunt circuit means and which is immune to trouble caused by lint and grease and which can be used equally well with direct current power or with alternating current power. It is a second object of the invention to provide an electromechanical loom-stopping structure for a loom having a regularly-moving actuator and a normally idle knock-off movable into the path of the actuator, a solenoid and core, an encased member connecting the core and the knock-off, and shunt circuit contacts normally held apart by the core in idle position and movable into engagement upon only

slight movement of the core toward active or stop-initiating position. It is an additional object of the invention to provide an electromechanical loom stopping structure wherein the several moving parts of the stoppage-initiating structure are of light-weight construction, are not susceptible of easy disarrangement, are immune to trouble arising from lint and grease deposits, and require only low voltage-low current electric power for operation. Another object of the invention is to improve generally electromechanical loom stop motions.

The above objects and others that will hereinafter become apparent are attained by the invention, one preferred embodiment of which is disclosed in the following description considered with the companion drawings. In the drawings:

Fig. 1 is a view from within the loom of certain parts of the loom structure with devices according to the invention applied in operating position;

Fig. 2 is an enlarged longitudinal sectional view through an electromotor according to the invention, with associated structure;

Fig. 3 is a schematic circuit diagram of the electrical apparatus of the stop motion;

Fig. 4 is a view of a shunt circuit contact and spring according to the invention, in flat condition, on approximately the same scale as Fig. 2;

Figs. 5 and 6 are views illustrating details of the power transmitting means interconnecting the electromotor means and the knock-off of the loom; and

Fig. 7 is a view in section taken along and in the direction indicated by line 7—7 of Fig. 1, considerably enlarged.

Referring to the drawings there is shown in Fig. 1 a left-hand loomside 10, and a left-hand lay sword 12 upon which is mounted one end of a lay beam 14. Supported for rotation in bearings not shown is a crankshaft 16 to which is pivotally connected a multiple-piece pitman 18. The pitman is connected at its left-hand (forward) end to the lay sword 12 as by means of a pin 20. Mounted on the pitman and extending laterally thereof is a bunter 22 arranged to engage a knock-off 24 when the latter is raised into the position shown in Fig. 1 by means to be later described. The knock-off has an integral pivot 26 by which it is pivotally mounted on a lever 28 which in turn is pivotally mounted as by a pin 30 on a bracket 32 fixed on the loomside 10. Lever 28 is pivotally connected to a knock-off rod 34 which is connected at pin-and-slot connection 36 to a shipper handle 37. Shipper handle 37 is connected by means (not shown) to loom clutch and brake means (not shown) for controlling starting and stopping of the loom. When the shipper handle is moved to the right as viewed in Fig. 1, loom stoppage occurs, and opposite movement is effected to start the loom. Lever 28 is normally held in idle or loom-running position by a spring 38 attached to its lower extremity and extending under tension to a hook formed on the lower end of bracket 32. Knock-off 24 is normally held in idle position out of the path of bunter 22 by a spring 40 secured at one end to a cotter pin 42 secured in the end of pivot 26 and at its other end to lever 28.

When knock-off 24 is moved to the position indicated in Fig. 1 it is engaged by the downwardly and forwardly moving bunter 22, as shown in that figure. As the bunter continues its movement, knock-off 24 moves downwardly, causing lever 28 to rock about pin 30 and draw knock-off rod 34 rearwardly, whereby shipper handle 38 is moved and loom-stoppage effected. At a certain point in its downward and forward movement bunter 22 slips off knock-off 24, whereupon springs 38 and 40 restore members 24, 28 and 34 to normal idle positions.

The enumerated structures hereinabove described are conventional and they and their operation are well understood by those skilled in the art. Per se they are not of the present invention and are shown and described solely as aids in understanding the invention.

In attaining the objects of the invention there is provided a novel electromechanical structure including electromotor means 44 (Fig. 1) secured to the loomside 10 by means of a bracket 46 and bolt 48, and power transmitting means including a flexible Bowden cable sheath 50 of spirally formed wire secured at its lower end to the electromotor and at its other end to an anchorage 52. The electromotor means and appurtenant structure is arranged, as will hereinafter appear, to receive an electrical indication of necessity for loom stoppage from an electrical loom-condition detector, to retain the indication, and to translate the indication into an actuation of the power transmitting means which in turn is arranged to move knock-off 24 from idle to loom-stopping position. The anchorage 52 is received within the bore of a cylindrical foot 54 formed as a part of lever 28, and is therein held in adjusted position by a set screw 56. Referring to Figs. 5 and 6, the anchorage comprises a cylinder 58 having a reduced internal diameter at its upper end, and a threaded plug 60 turned into the threaded lower end of the cylinder. Plug 60 is formed with a threaded bore into which is turned one end of sheath 50. Prior to being turned into plug 60 the sheath is distorted sufficiently to produce a permanently set kink or bend therein near the end, as illustrated in Fig. 6. Upon turning the kinked portion of the sheath into the plug it is found that the distortion is removed, that is, the sheath is straightened, but the tendency for the permanently set distortion to assert itself causes the sheath to be tightly set within the plug. This not only permits doing away with a set screw to lock the sheath, but also allows ready adjustment of the sheath in relation to the anchorage. The Bowden cable core, in the form of a rod 62, extends from the sheath inside the cylinder and includes a head or plunger 64 which may be formed integrally with the rod or separately and then attached to the rod. In either event the plunger acts as a termination of the power transmitting Bowden cable core. The plunger is provided with a return spring 66 whose tendency is to return the plunger wholly into the cylinder. The arrangement of the anchorage and plunger with respect to lever 28 and knock-off 24 is such that the knock-off rests in idle position on the upper end of the cylinder and is raised to active or knock-off position by movement of the plunger outwardly of the cylinder in response to upward movement of the Bowden cable core.

Referring to Fig. 2, the electromotor means comprises a headed and threaded plug 68 which has a threaded longitudinal bore 70 into which is turned the lower end of sheath 50. The lower end of sheath 50 may be kinked in the same manner as the upper end, thus providing for secure fastening of the sheath to plug 68. Plug 68 extends through a hole 72 in bracket 46 and is turned into the threaded bore of a casing head 74.

Thus the plug performs the plural functions of attaching the head to the bracket and of forming a seal and an anchorage for sheath 50. Head 74 is preferably of ferromagnetic material and has attached to it by suitable means such screws 76, 77, a hollow casing barrel 78 which may be of round or square or other cross-section to conform to the peripheral shape of head 74. Nested within the casing barrel below head 74 is a solenoid coil 80 insulated from the barrel by insulation 81 and having a bore in which is fitted a sleeve 82 of electrical insulation which is held in place by tight engagement with a depending portion of head 74. Tightly fitted within the lower end of insulating sleeve 82 and extending outwardly thereof is a non-magnetic metallic sleeve 84 which acts as a guide for the solenoid core and performs other functions as shall hereinafter be explained. Within the lower end of the threaded bore of head 74 there may optionally be provided a core stop 86 of non-metallic material which may be secured in place by being turned into the lower end of the bore of head 74. Stop 86 may optionally also be formed to act as a guide for wire 62. Slidably fitted within sleeve 84 is an armature or core including a ferromagnetic body 88 of such cross-sectional dimensions as to slide easily within yet be accurately guided by the sleeve. Body 88 is formed with a longitudinally extending axial bore into which is driven to a tight fit a headed plug 90 of suitable electrical insulation such as hard rubber. The plug forms a part of the core and performs a plurality of functions as will presently be explained. The head of the plug is preferably made nearly as wide as the end of body 88 for a reason to appear hereinafter. The shank of the plug is provided with a small bore 92 extending axially thereinto from the end opposite the head, as indicated in Fig. 2. Into the latter bore is pressed the doubled end of rod 62, which is thereby releasably but firmly attached to the solenoid core for movement thereby. The end of casing barrel 78 opposite head 74 is covered by a head 94 of suitable electrical insulation, which head preferably extends partly within the casing and is held therein by a tight frictional fit or may optionally be attached thereto by screws in the same manner as is head 74. Head 94 (Figs. 2 and 7), is provided with two holes 96, 97, through which two leads, A and B, extend to the solenoid coil ends at 98, 99, respectively. The head 94 is also provided with a centrally located hole 100 through which a shunt circuit terminal screw 101 is fitted. Held in position on the inner face of head 94 is an integral shunt contact and spring device comprising a contact 102 and a spring 103 which may conveniently be formed from a single stamping of suitable sheet material, as shown in Fig. 4. The stamping is formed preferably of Phosphor bronze or a copper-beryllium alloy, and is provided with a hole 105 for screw 101. After insertion of the screw, contact 102 is folded over spring 103 by bending along line I—I in Fig. 4 and the convolutions or turns of the spring are stretched beyond the elastic limit of the material to form a spiral spring as indicated in Fig. 2. Contact 102 is formed of dimensions slightly greater than the cross-section of metallic sleeve 84, and as indicated in Fig. 2, is arranged when assembled with spring 103 on head 94, to contact sleeve 84 when permitted to do so by the solenoid core. It will be noted that the head of plug 90 insulates the metallic core body 88 from contact 102. Attached to screw 101 as by nuts 104 is a shunt circuit lead C (Fig. 2) which is connected to the

principal electric circuit in a manner to be presently described. Lead B is connected to end 99 of the solenoid coil 80 and also to sleeve 84 as by soldering at 115. The preferred arrangement of head 94, spring 103, contact 102, core 88 including plug 90, sleeve 84, and other appurtenant parts is such as is indicated in Fig. 2 which shows the parts in idle position with the solenoid coil de-energized. The arrangement is such that spring 103 is partly compressed by and supports the weight of the core including plug 90 which thus keeps contact 102 out of engagement with the electrically conductive sleeve 84. At the same time spring 103 is in condition to aid the magnetomotive force produced upon energization of the solenoid coil, in raising the core to active position near or against stop 86.

Referring to Fig. 3 there is shown a schematic circuit diagram of electrical circuits in which are connected the solenoid coil and shunt circuit means of the invention. Power is supplied to the apparatus through a conventional step-down transformer T having a primary as indicated which may be connected to one phase of the loom driving motor power supply (not shown), the transformer also comprising a core and a secondary as indicated. The voltage ratio of the two transformer windings is dependent upon the voltage to be applied to the primary, and may be such as to produce a voltage in the range from two to ten volts at the secondary terminals. The secondary terminals are connected to the circuits at D and E. It is evident that if a low voltage direct-current source of power is employed a transformer is unnecessary, the source being in that event connected to the circuits at D and E. From one terminal of the secondary a lead 106 extends to a first terminal of a switch S provided to allow disabling of the circuits. From the other terminal of switch S a lead 107 extends to lead A of the solenoid coil. From lead B of the solenoid coil a lead 108 extends to one terminal X of a loom-condition detector (here shown as an electrical warp break detector). From the other terminal Y of the detector a lead 109 extends to terminal D of the transformer secondary. Thus the transformer secondary, switch S, coil 80 and the detector are connected in series relationship. If now the detector closes this series circuit the coil is energized and the core will be drawn toward the interior of the coil. This movement of the core is aided by spring 103 to the point where contact 102 engages sleeve 84, since spring 103 has been held in compressed or stressed status by the core. The fact that spring 103 aids in moving the core enables fewer ampere-turns to be used in the coil since the lowest number of lines of magnetic flux per ampere turn, hence the least effective magnetomotive force, is produced when the core is most distant from the center of the coil, and it is at that time and position that the spring is most highly stressed. In effect, the spring acts to move a portion of the weight of the core while the magnetomotive force produced by the coil acts to move the remaining portion. As the core moves to a position in which core body 88 is fully within the coil the magnetomotive force required to maintain the movement decreases, and the number of lines of force produced per ampere turn is greatly increased. This occurs as the force exerted by spring 103 diminishes. When the core has moved but a part of the way into the interior of the coil, contact 102 engages sleeve 84. This results in the establishment of a shunt circuit across the detector, which has two advantages in

the present invention. First, establishment of the shunt cuts out or at least practically short circuits the relatively high resistance comprised in lead 108 and the detector. This allows an increase in current flow through the coil whereby the magnetomoti e force acting on body 88 is increased just at the time spring 103 no longer aids in moving the solenoid core. Second, the shunt circuit as arranged according to the invention positively precludes disruption of current flow through circuit-opening at the detector. In view of the nature of contact 102 and sleeve 84 an excellent electrical connection is made over a relatively large area of those two elements, insuring positive and low-resistance contact. Additionally it should be noted that since the core continues to move away from contact 102 after the latter engages sleeve 84, chattering or oscillatory movement of the core due to employment of alternating current power, or due to other cause, will have no effect upon the efficacy of the shunt contact and cannot cause arcing at the detector. It should also be noted that since the coil and core are completely enclosed, the parts cannot readily be disarranged or deformed by loom-cleaning operations and are quite immune to troubles caused by accumulations of lint and grease. The several features described enable the electromotor to be designed to operate very satisfactorily for an indefinitely long period of time without any attention or adjustment, and to operate at a much lower voltage and current rating than is usual with loom stopping devices. The reduced voltage and current rating results in substantial elimination of arcing at the detector, and in greatly lessened electric shock and fire hazards.

As may be evident from Figs. 1, 2 and 5, when the solenoid core is moved inwardly in response to energization of the solenoid coil, rod 62 is moved through sheath 50 and plunger 64 is pressed outwardly of anchorage 52 and spring 66 is compressed. As plunger 64 moves outwardly it raises knock-off 24 into active position for engagement by bunter 22. It is evident that once the shunt circuit has been closed, action or behavior of the detector is immaterial. Due to the aid extended by spring 103 in moving the core and due to the relatively short movement of the core required before engagement of contact 102 and sleeve 84, the shunt circuit is established and is effective in an extremely short period of time. If desired, switch S may be mechanically linked in any suitable manner with shipper handle 37 so when the shipper handle is moved to loom-running position the switch will be closed, and vice versa. This will insure interruption of current flow through the solenoid coil while the loom is not operating. Such interconnection of switch and shipper handle is conventional practice and forms no part of the present invention.

It may be pointed out that in those applications of the invention wherein the solenoid coil cannot conveniently be arranged with its axis vertical or only moderately inclined, spring 66 necessarily will be stronger than in the latter cases, to cause return of the core and rod 62 after deenergization of the coil. In either case, the constants and characteristics of springs 66 and 103 are so related that spring 103 will be slightly compressed and contact 102 spaced from sleeve 84 when the solenoid coil is deenergized. The preferred arrangement is with the coil axis vertical or nearly so, so the full benefits of the described construction may be realized. Fig. 1 illustrates the electromotor in a position deemed to be of maximum tilt from the vertical consistent with substantially optimum operation. Sleeve 84, while acting as a conductor or contact, also acts as an anti-friction guide for the solenoid core, keeping the latter member from scarifying sleeve 82. It should be noted that the power-transmitting means interconnecting the electromotor and the knock-off is such as to yield under forces accidentally or otherwise applied thereto during loom-cleaning operations, thereafter readily reassuming proper position automatically; and that it is immune to any adverse effects from accumulations of grease and lint which heretofore have caused much trouble and annoyance. The entire electro-mechanical structure is in fact capable of easy and long continued operation when covered with grease and lint.

Having fully disclosed a preferred embodiment of the invention it is evident that changes and modifications will occur to those skilled in the art, and what I claim and wish to secure by Letters Patent of the United States is:

1. In a loom stop motion having a source of electric energy, an electric loom-condition detector, a regularly moving actuator, and a normally idle knock-off movable into the path of the actuator to initiate loom stoppage, in combination therewith: electromechanical means to move the knock-off into the path of the actuator, said means comprising electromotor means and mechanical power transmitting means connected to and arranged for actuation by said electromotor means; said electromotor means including a generally upright hollow cylindrical casing having ends the upper one of which is provided with a headed and threaded plug having a centrally located threaded opening, a solenoid coil fitted within the casing with its bore generally upright, a non-magnetic electrically conductive sleeve electrically connected to one end of said coil and arranged partly within the coil bore and extending outwardly from the lower end thereof, a solenoid core including a cylindrical solenoid core body slidably fitted within the sleeve and provided with an axially extending bore and electrical insulation on the lower end of the core body and within the bore thereof, a shunt circuit including contact means comprising a compressible spring and contact in the lower end of said casing and normally compressed by said core body and insulation and arranged to rise into electrical contact with said sleeve to close the shunt circuit when released by upward movement of the core body incident to energization of said coil; said power transmitting means comprising rod means passing through said opening and secured at one of its ends within said core body bore and positioned at its other end to actuate said knock-off, and means including an anchorage and a flexible spiral wire sheath kinked near each end surrounding and guiding said rod means and with its lower kinked end tightly fitted within said opening and with its upper kinked end in the anchorage, said anchorage positioning said rod means for cooperation with said knock-off; and electrical circuit means including connectors connecting said electric energy source, said detector, and said solenoid coil in a series electrical circuit and said shunt circuit in shunt relation to said detector.

2. In a loom stop motion having an electric thread-condition detector, a movable knock-off, and a source of electric energy, in combination therewith: electromechanical means to move the knock-off; and electric circuit means; said electromechanical means comprising mechanical

power transmitting means and electromotor means; said electromotor means comprising a hollow casing having ends the upper one of which is provided with a threaded opening, a generally vertically arranged solenoid coil within the casing, a non-magnetic electrically conductive sleeve electrically connected with said coil and fitting partly within and extending out of the solenoid coil at the lower end thereof, a solenoid core including a tubular magnetic core body mounted for upward movement in said sleeve in response to energization of the solenoid coil and electrical insulation covering the lower end of the core body and extending within the bore thereof, and shunt circuit means including a spring contact normally held by said core in open circuit condition and arranged to electrically contact said sleeve to close the shunt circuit when the core is raised incident to energization of said coil; said mechanical power transmitting means comprising rod means one end of which is connected by said insulation to said core body and which extends out of said casing through said opening and to said knock-off for movement of the latter upon upward movement of the core, and a flexible spiral wire sheath threaded into said threaded opening and sheathing a portion of said rod means to guide the same; said electric circuit means including connectors connecting said source, said detector and said solenoid coil in a series circuit and said shunt contact means and sleeve in shunt relationship with said detector.

3. An electromechanical loom-stopping structure including a normally idle mechanical loom-stopping linkage, a regularly moving actuator for actuating said linkage, and electromechanical means for causing interaction of the actuator and loom-stopping linkage and comprising in combination therewith: a mechanical power transmitting element arranged to move a part of said linkage; electromotor means for operating said element; a source of electric power for the electromotor means; an electric loom-condition detector; and electric circuit means interconnecting said source, detector and electromotor means in series electrical relation upon indication given by said detector; said electromotor means comprising an electromagnet coil, first and second shunt circuit contacts, means including spring means urging said second shunt contact into engagement with said first shunt contact and to electrically interconnect them in shunt relation across said detector, and an armature for said coil; said armature engaging said power transmitting element and being moved from normally idle to active position by and upon energization of said coil and in idle position holding said second contact out of engagement with said first contact and being moved away from said second contact during initial stages of its movement to active position.

4. Electromechanical loom-stopping structure comprising a normally idle knock-off movable from an idle to a knock-off position; a normally deenergized solenoid coil; a loom-condition detector including an electric circuit closer; a source of electric power; a first shunt circuit contact; a second shunt circuit contact biassed to tend to engage said first contact; electric circuit means connecting said solenoid coil, said source and said circuit closer in a series circuit and said first and second contacts in shunt relationship with said circuit closer; a normally idle solenoid core normally holding said second contact out of engagement with said first contact and moved from idle

to active position out of holding relation with said second contact upon energization of said solenoid coil; and means interconnecting said core and said knock-off for movement of the latter by force derived from the former.

5. In a loom stop motion comprising a regularly moving actuator and a normally idle knock-off movable into the path of the actuator, solenoid coil and core means, a flexible power transmitting means comprising a rod and a spiral wire sheath surrounding said rod, said rod being positioned between said core and said knock-off and arranged for movement of the latter incident to movement of the core, and an interiorly threaded tubular anchorage for said sheath, said sheath having a permanently set distortion near an end thereof and having said distorted portion threaded into said anchorage, whereby said sheath is securely and adjustably held in said anchorage.

6. An electromechanical loom stopping mechanism for a loom having a source of electric energy, a regularly moving actuator, a normally idle knock-off movable into the path of the actuator, and thread-condition detecting means including an electric circuit closer, comprising in combination therewith: a casing having a threaded opening, a solenoid coil and a movable solenoid core within the casing, rod means secured in the core and extending through said opening to said knock-off, a spiral wire sheath for the flexible rod means fitted at one end into said opening and having a permanently set deformation adjacent the other end, an interiorly threaded tubular anchorage for said sheath threadably receiving said deformation, said rod means acting to transmit motion and power from said core through said sheath and anchorage to move said knock-off, and electric circuit means connecting said circuit closer, said source, and said solenoid coil in current conducting relation to cause energization of the solenoid coil and movement of the core for moving the knock-off into the path of the actuator.

7. An electromechanical loom stopping structure including a regularly moving actuator and a normally idle knock-off movable to active position in the path of the actuator in initiate loom stoppage, electromechanical means for moving the knock-off from idle to active position and including electromotor means and mechanical power transmitting means interconnecting the electromotor means and the knock-off for movement of the latter; said electromotor means including: a solenoid coil, first and second shunt circuit contacts normally relatively biased toward interengagement, and a solenoid core normally maintaining said second contact out of engagement with said first contact and moved entirely away from said second contact upon and by energization of said solenoid coil.

8. A unitary encased electromechanical loom-stoppage initiating structure comprising: electromotor means including a coil, an armature, and a casing enclosing said coil and armature and having an opening; mechanical power transmitting means comprising rod means engaging said armature for transmitting power therefrom and extending through said opening, said power transmitting means also including a sheath secured in and closing said opening and surrounding that portion of the rod means exterior to said casing.

LEONARD M. ROGERS.

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