Sept. 27, 1949. V. F. SEPAVICH 2,482,943

ELECTRIC FILLING STOP-MOTION FOR LOOMS

Filed June 15, 1948

FIG.1

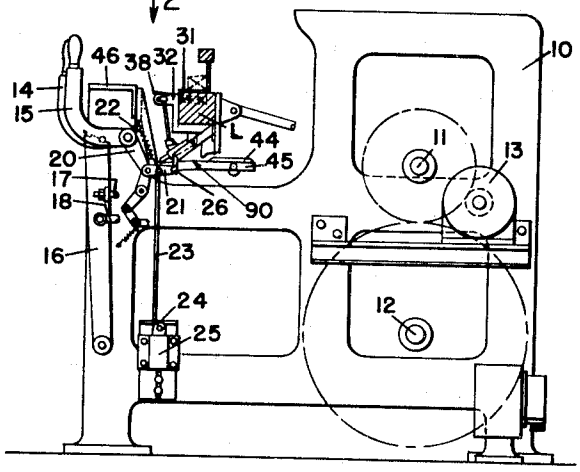
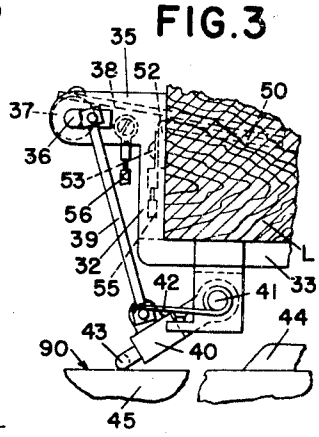


FIG.3



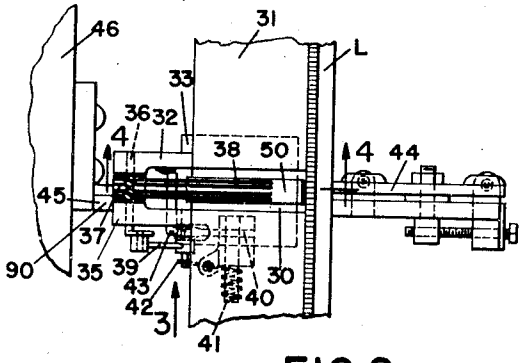


FIG.2

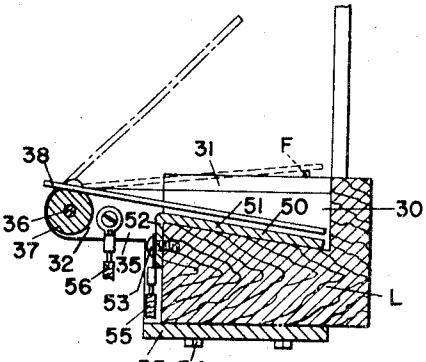


FIG.4

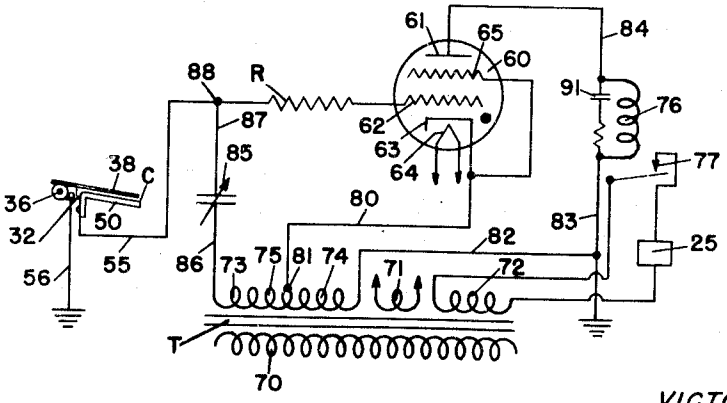


FIG.5

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ELECTRIC FILLING STOP MOTION FOR LOOMS

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10 Claims. (Cl. 139—376)

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This invention relates to improvements in filling stop motions for looms and it is the general object of the invention to provide a stop motion of this type which shall be sensitive and subject to a minimum of strain during operation.

Looms are ordinarily provided with some form of filling or weft stop motion to stop the loom if the thread of the shuttle becomes exhausted or broken. These motions are generally either of the side or center type. Each type includes some form of weft fork which moves against the weft or filling during a detecting period occurring during the forward beat of the lay. If the weft is present the fork is either moved away from stopping position, as in the case of a side stop motion, or is prevented from completing its motion to stopping position if the motion is of the center stop type. These motions or mechanisms are generally of the mechanical type and the several parts of the mechanism are subjected to some strain during a stopping operation, and are not always satisfactory for very fine weft.

It is an important object of the present invention to provide a filling stop motion effective to stop the loom upon breakage of weft, but wherein the parts of the motion which do the actual detecting are subjected to little or no mechanical strain.

Filling stop motions of the electrical type have been proposed heretofore, but they have generally been unsatisfactory in operation because of the necessity for closing an electric contact upon failure of weft. The motion, either of the side or center type, is in such position that it is likely to accumulate lint and for this reason the contacts are not good enough to control an electric circuit. Furthermore, where there is any likelihood of sparking, as is the case when a contact is made by a fork and an electrode, there is likelihood of fire. Also, the forks are delicately balanced and are not able for that reason to make a good contact.

It is a further object of the present invention to provide an electric filling stop motion of the kind which will not require actual closure of an electric switch by the weft fork. This result can be effected by use of an electronic circuit with a grid control dependent merely upon movement of the filling fork to a position close to a metallic body. The fork and the metallic body in effect are parts of an electric condenser which is normally of such low capacitance as to permit the detecting circuit to maintain the grid in a condition which will prevent firing of the electronic tube, but when the weft fork due to absence of the filling moves close

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to the metallic plate or the like it effects a substantial increase in the capacitance of the condenser the effect of which is to alter the grid in such manner as to allow electric current to flow through the electronic tube to effect loom stoppage.

With these and other objects in view which will appear as the description proceeds, my invention resides in the combination and arrangement of parts hereinafter described and set forth.

In the accompanying drawings, wherein a convenient embodiment of my invention is set forth,

Fig. 1 is a side elevation partly in section of a loom having the invention applied thereto,

Fig. 2 is an enlarged plan view looking in the direction of arrow 2, Fig. 1,

Fig. 3 is a side elevation on an enlarged scale looking in the direction of arrow 3, Fig. 2, the lay being in section,

Fig. 4 is an enlarged vertical section on line 4—4 of Fig. 2, and

Fig. 5 is a diagram showing a form of electric circuit which can be used with the invention.

Referring particularly to Fig. 1, the loom frame 10 has top and bottom shafts 11 and 12, respectively, driven by an electric motor 13. Brake and shipper handles 14 and 15 control a shipper lever 16 which by means of rods 17 and 18 control the driving and stopping mechanism of the loom. This mechanism is not shown herein but may be of any well-known form such that when the handles 14 or 15 are pulled forwardly, or to the left in Fig. 1, power from the motor is applied to the shafts of the loom and the brake is in non-braking position. When the loom is to be stopped the handles 14 and 15 are moved rearwardly, or to the right as viewed in Fig. 1, to effect a change in the position of lever 16 the result of which is to move the clutch to non-driving position and apply the brake.

Control for the handles 14 and 15 as shown herein includes a depending arm 20 on one or the other of the handles 14 or 15, preferably the former, to which is pivoted a stopping latch 21 normally held in raised non-stopping position by a spring 22 but movable down to stopping position by means of a rod 23 connected to the core 24 of a solenoid 25. The latter is ordinarily deenergized so that the spring 22 holds the latch above the path of a dagger 26 on the lay L. If, however, the solenoid is energized it draws the latch 21 down into the path of the dagger and the latter upon forward movement of the lay moves the latch and arm 20 forwardly to effect right hand rotation of the handles 14 and 15,

Fig. 1, to stop the loom. This particular stopping mechanism may be the same as that shown in patent to Darwin No. 2,263,983.

In order to illustrate the invention it has been applied to a center stop motion, but it is to be understood that the invention is not necessarily limited in its use to a stop motion of this type. The lay L is formed with a well 30 which may be of usual form and in the usual location, and the lay may have secured to the top thereof a thin strip of material constituting a shuttle race 31. A bracket 32 having a base 33 secured as at 34 to the bottom of the lay has a forward extension 35 carrying a pivot pin or shaft 36. This shaft has mounted thereon a barrel 37 to which are secured several tines 38 constituting the weft fork of the center stop motion. The barrel is operatively connected to a rod 39 extending downwardly to a lever 40 pivoted as at 41 to a part of the bracket 32. A wire spring 42 extending around the stud 41 has a forward extension operatively connected either to the lower end of rod 39 or the lever 40 and tends normally to hold the latter down. A finger 43 extends forwardly from the lever 40 for cooperation with a cam 44 secured to a bracket 45 extending rearwardly from the breast beam 46 of the loom.

As the lay swings back and forth between its front and back center positions the finger 43 moves over the stationary cam 44 and bracket 45 to effect upward movement of the fork or tines 38 when the lay is in the rear part of its reciprocation. As the lay advances the fork descends during a detecting period under action of spring 42 to determine the presence or absence of weft. If weft is present as indicated at F in Fig. 4 the fork as it descends from the dot and dash line position will be arrested in the dotted line non-stopping position of Fig. 4. If, however, the weft is absent due to breakage or exhaustion, the tines 38 will continue into the well and assume the full line stopping position shown in Fig. 4.

The matter thus far described may be similar to constructions heretofore used in center stop motions for looms and of itself forms no part of the invention. It should also be understood that the particular form of knock-off mechanism for the handles 14 and 15 need not necessarily be that shown herein and set forth more fully in the aforesaid Darwin patent, since other forms of stopping mechanism controlled by a solenoid and suitable for the purpose can be used.

In carrying the invention into effect a metallic plate 50 formed as shown in Figs. 2 and 4 is secured to the lay below the weft fork. A top flat section 51 of the plate lies in the bottom of well 30 and a forward down-turned end 52 affords means for attaching the plate to the lay as at 53. The plate is insulated from the weft fork and other metallic parts of the loom, and as shown in Fig. 4 this result is attained by having it secured directly to the wood beam of the lay. If the invention is applied to looms equipped with metallic lay beams some means must be provided to insulate the plate 50 from the metallic lay. A wire 55 is in direct electrical contact with the plate 50, and the tines 38 of the filling fork are electrically connected to another wire 56 which is grounded. This grounding may be effected by attaching the wire 56 to the bracket 32 and relying upon the metallic parts of the bracket and barrel 37 for establishing conductivity from the tines to the ground.

The electric circuit shown in Fig. 5 includes a gas filled electronic power tube 60 having a plate 61, a control grid 62, and a cathode 63. The tube also has the usual filament 64 and may if desired have a shield grid 65 electrically connected to the cathode 63. A transformer designated generally at T has a primary winding 70 supplied by power either from a lighting circuit or a power circuit, and has also a secondary winding 71 for the filament 64, another secondary winding 72 for the solenoid 25, and a center tap secondary 73 having right and left halves or windings 74 and 75, respectively, as shown in Fig. 5. An electro-magnetic device, such as a relay 76, controls a normally open switch 77 in a circuit including secondary winding 72 and the solenoid 25.

When current is able to pass through the electronic tube 60 current will flow from the plate 61 through the tube to cathode 63, over wire 80 to the center tap 81 of winding 73, through winding 74 and wire 82 to wire 83, and thence through the relay 76 and back to the plate by wire 84. Current flowing in this operating circuit will cause a change in the magnetic field of relay 76 and effect closure of the switch 77 to effect energization of the solenoid 25 and downward movement of the stopping latch 21 into the path of the lay carried dagger 26. Loom stoppage is thereupon effected as the lay moves forwardly as set forth more particularly in the aforesaid Darwin patent.

The grid 62 is controlled by a detecting circuit including a resistance R, a variable condenser 85, and a loom controlled condenser designated generally at C. This latter condenser is of the variable type and comprises the tines 38 and the plate 50. The resistance R may have a high value, such as 10 megohms, and the variable condenser 85 may be of very low capacity having a range, for instance, from 50 to 100 micro-microfarads. Condenser 85 need not be variable, but when of that type adjustments of the detecting circuit can be more easily made.

The condenser 85 is connected by wire 86 to the left end of winding 75 of the secondary 73, and a wire 87 leading from the condenser 85 to the resistance R has a junction 88 to which the wire 55 of the plate 50 is electrically connected.

It will be understood that relative movement of fork tines 38 and plate 50 causes condenser C to be of variable capacitance depending upon the distance between the tines 38 and the plate. If the tines are relatively far from the plate, such as shown in dot and dash, or dotted lines in Fig. 4, the capacity of condenser C is too small to have any material effect on the detecting circuit including the grid, and normal non-stopping conditions will prevail enabling the grid to be in such electric condition that it will prevent firing of the tube 60. These are the conditions which exist on forward beats of the lay when weft F is present.

When, however, the weft is broken and the tines 38, move into the well 30 to a stopping position in close proximity to the plate 50 the capacitance of the condenser C increases and in doing so effects such an alteration of the detecting circuit and the grid as will permit current to flow through the tube 60 with resultant energization of the relay 76.

While the condenser C has been shown as comprising tines of a filling fork and a flat metallic plate, the invention is not necessarily limited to a condenser formed in this manner, and it will be sufficient if the two parts of the

condenser C are so formed that when they are in close proximity to each other they have such a capacity as will alter the electric condition of the grid **62**.

The condenser C is normally discharged and when the tines and plate **50** are in the position shown at the left of Fig. 5 the condenser should preferably have a capacitance approximating that of condenser **85**, or larger. Under normal conditions the condenser **85** will be charged with its negative side connected to the grid and in this way it maintains the grid in such electric condition as will prevent firing of the tube **60**. When the condenser C is as shown in Fig. 5 it has a sufficient capacitance to serve as a reservoir to receive the inactive electrons of condenser **85** which normally maintains the grid negative. This exchange of electrons from condenser **85** to condenser C, thereby effecting discharge of condenser **85**, is believed to be the electric change incident to weft breakage which alters the electric condition of the grid. It will be seen that this change is effected without establishing a metallic contact between the tines and plate **50** or any equivalent of the latter which may be used. The low position of the tines **38** shown in Fig. 4 is determined by engagement of the finger **43** with the bracket **45**. The latter will have an upper surface **90** along which finger **43** moves to the left, Fig. 3, as the lay advances.

After the condenser **85** has been discharged to permit firing of the tube **60** it will gradually regain its normal charge during a recovery interval, but this interval will be prolonged by the high resistance R and during the recovery period the tube is able to fire. A condenser **91** can if desired be connected in parallel with the relay **76** to be charged when the tube fires and plate **61** is positive and then discharge through the relay when the plate is negative. For the purposes of the invention the relay **76** may be considered as an electromagnetic device which when energized effects loom stoppage.

The metallic tines **38** of the weft fork may be four in number, approximately 4" long, somewhat less than $\frac{1}{8}$" wide, and between $\frac{1}{64}$" and $\frac{1}{32}$" in thickness. The plate **50** may be so formed that the upper flat part **51** thereof is $2\frac{1}{2}$" long and from $\frac{3}{4}$" to 1" wide, and other proportions may be substantially the same as those set forth in Fig. 4. The tines will be spaced so that they cover the greater part of the width of the plate as suggested in Fig. 2. When the fork is in stopping position it is very close to plate **50**, but need not touch the plate. While these particular dimensions are given as an instance of proportions for condensers C which will operate, the invention is not necessarily limited to tines and a plate of the size set forth herein.

It should be mentioned that if the weft fork should touch plate **50** condenser would be directly grounded and the electric condition of the grid would be altered as already described. There is such likelihood of lint, etc., collecting in well **30**, however, that a contact between the fork and plate **50** cannot be relied upon, and for this reason the capacitance of condenser C is preferably relied upon to discharge condenser **85**.

From the foregoing it will be seen that the invention sets forth a simple means by which the filling fork of a filling stop motion is made as part of a condenser normally ineffective to alter the electric condition of the grid when weft is present, but when weft is absent the parts of condenser C move to increase its capacitance

the effect of which is to change the electric condition of the grid to permit the tube to fire. It will be seen that the change in the detecting circuit effected by the condenser C is brought about without metallic contact of the tines and the plate **50**, but such contact will not be objectionable should it occur.

Having thus described the invention it will be seen that changes and modifications of the foregoing specific disclosure may be made without departing from the spirit and scope of the invention.

What is claimed as new is:

1. In electric weft stop means for a loom wherein the presence or absence of weft is determined during a detecting period, weft thread detecting means comprising a condenser having one degree of capacitance when weft is present and having a different degree of capacitance when weft is absent during the detecting period, and loom controlling electric circuit means controlled by said condenser and effecting loom stoppage when said condenser has said different value.

2. In electric weft stop means for a loom, and wherein presence or absence of weft is determined during a detecting period, an electromagnetic device effective when energized to cause loom stoppage, an electric condenser including a weft fork controlled by the weft and having a given capacitance when weft is present and having a different capacitance when weft is absent during the detecting period, and electric circuit means including an electronic tube and a grid therefor controlled by said condenser and effective to energize said device only when the condenser has said different capacitance during the detecting period.

3. In electric weft stop means for a loom having a lay and wherein presence or absence of weft is determined during a detecting period, a weft detecting fork, metallic member on the lay, said fork and metallic member forming an electric condenser, said fork when engaging a weft thread during the detecting period being at a given distance from said metallic member and the condenser having one value of capacitance, said weft fork being at a less distance from said metallic member and said condenser having a greater value of capacitance when weft is absent during the detecting period, and loom controlling electric circuit means including an electronic tube having a grid controlled by the condenser effective to stop the loom if said fork is at said less distance from the metallic member to cause said condenser to have said greater value of capacitance during the detecting period.

4. In electric weft stop means for a loom wherein the presence or absence of weft is determined during a detecting period, electric circuit means including an electronic tube effecting loom stoppage when electric current can flow through the tube, a control grid for the tube normally preventing electric current from flowing through the tube, and a condenser including two relatively movable parts the position of one of which relatively to the other part is controlled by the weft during the detecting period, said one part being close to the other part during the detecting period when weft is absent but being spaced farther from said other part when weft is present, and electric means controlled by said condenser changing the electric condition of the grid to permit electric current to flow through the tube when said one part due to absence of the weft

moves to a position close to the other part during the detecting period.

5. In electric weft stop means for a loom wherein presence or absence of weft is determined during a detecting period, loom controlling electric circuit means including an electronic tube having a grid effective normally to permit continued running of the loom due to the fact that the grid normally prevents flow of electric current through the tube, said electric circuit means effecting loom stoppage when electric current can flow through the tube, an electric condenser the capacitance of which attains a given value when weft is absent during the detecting period but attains a less value when weft is present during the detecting period, and electric means including said condenser controlling and altering the grid electrically to enable the electric circuit means to effect loom stoppage when said condenser due to absence of weft attains a capacitance of said given value.

6. Weft stop means for a loom having a lay, stopping means including an electromagnetic device effective when a change occurs in the magnetic field thereof to cause the means to stop the loom, an operating electric circuit for said device including an electronic tube and causing said change in the magnetic field when electric current can flow through said tube, a control grid in said tube the normal electric condition of which is effective to prevent flow of electric current through the tube, and detecting electric circuit means controlling said grid including a weft fork and a metallic member on the lay insulated electrically from said fork effective when the presence of weft keeps the fork spaced a given distance from said member to maintain said electric condition of the grid to enable the latter to prevent flow of electric current through said tube, said detecting circuit means when the fork moves to a position at less distance from said member than said given distance due to absence of weft effective to change the electric condition of said grid to enable electric current to flow through said tube.

7. In a center weft stop motion for a loom having a lay and wherein presence or absence of weft is determined during a detecting period, a weft fork pivoted to the lay, a metallic member mounted on the lay insulated from the fork, said fork descending during a weft detecting period and being supported by the weft at a given distance from said member if the weft is present but moving to a position of less distance than said given distance from said member if weft is absent, said fork and member forming part of an electric condenser, and loom controlling electric circuit means controlled by the condenser and effective to stop the loom when said fork moves to said position of less distance from said member.

8. In electric center stop means for a loom having a lay and wherein presence or absence of weft is determined during a detecting period, a weft detecting fork pivoted on the lay and supported at a given level when weft is present during the detecting period and falling to a lower level when weft is absent during the detecting period, a metallic member on the lay below the fork and together with the latter forming an electric condenser having a relatively low capacitance when the fork is at said given level and having a higher capacitance when the fork falls to said lower level, and loom controlling electric circuit means controlled by the condenser and effective when the latter has said higher capacitance to stop the loom.

9. In electric weft stop means for a loom having a lay and wherein presence or absence of weft is determined during a detecting period, a metallic member fixed with respect to the lay, a second metallic member comprising a weft fork pivoted with respect to the lay and electrically insulated from the first member, said second member when weft is present during the detecting period being in such position that the electric capacitance of said two members is relatively low, and said second member when weft is absent during the detecting period being in a different position such that the electric capacitance of said members is relatively high, an electromagnetic device effective when energized to cause loom stoppage, electric circuit means including an electronic tube and a grid effective when electric current can flow through the tube to energize the device, and detecting electric circuit means controlling the grid and including said first and second members, the grid normally being in an electric condition to prevent flow of current through the tube when the electric capacitance of said members is relatively low but being in an electric condition to permit current to flow through the tube when the electric capacitance of said members is relatively high.

10. In electric weft stop means for a loom having a lay wherein presence or absence of weft is determined during a detecting period, a variable electric condenser on the lay comprising a metallic member on the lay and a weft fork electrically insulated from said member movably mounted with respect to the lay and held in non-stopping position when weft is present during the detecting period but being in stopping position when weft is absent during the detecting period, the electric capacitance of said condenser having one value when the fork is in said non-stopping position and having a different value when the fork is in stopping position, an electromagnetic device effective when energized to cause loom stoppage, and electric circuit means including said device and an electronic tube having a grid under control of said condenser, said grid normally preventing flow of electric current through the tube and circuit means when the fork is in non-stopping position during the detecting period and effective to permit current to flow through the tube and said circuit to energize said device when the fork is in stopping position during the detecting period.

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The following references are of record in the file of this patent:

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