Aug. 15, 1939. E. J. BUELL ET AL 2,169,756

LOOM STOPPING DEVICE

Filed March 11, 1936 3 Sheets-Sheet 1

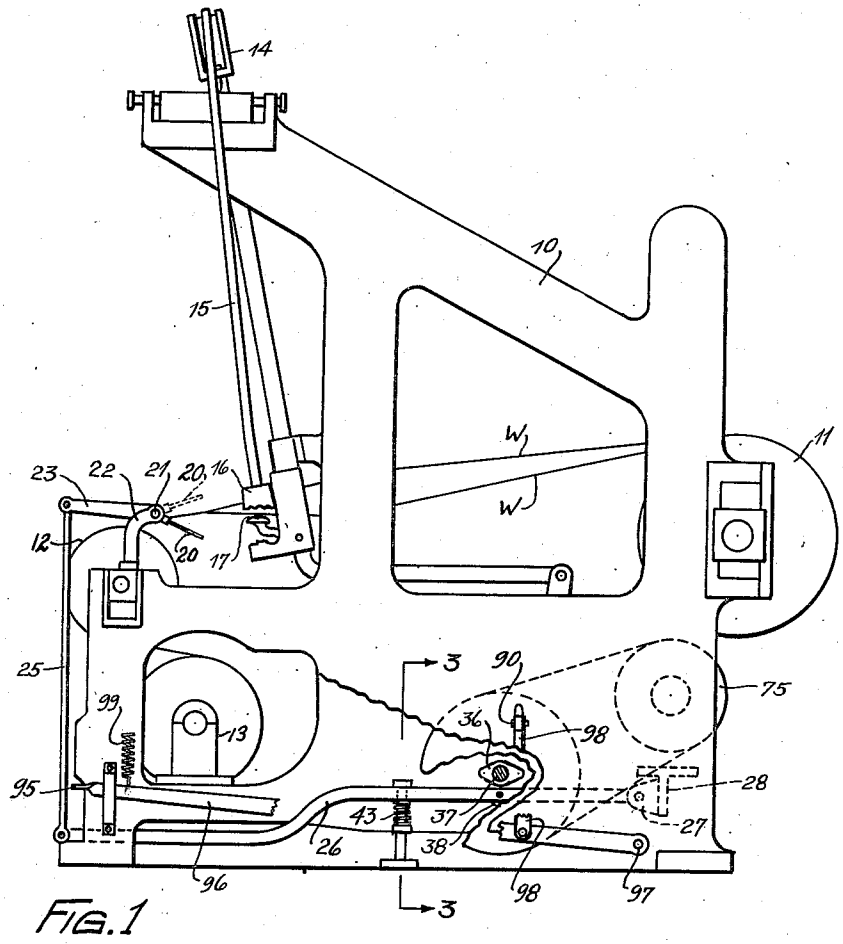


FIG. 1

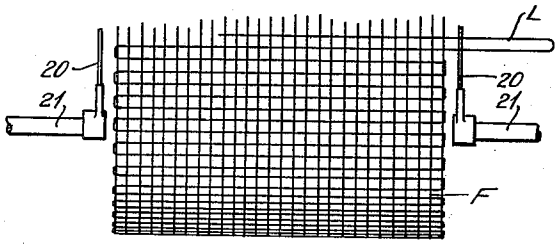


FIG. 2

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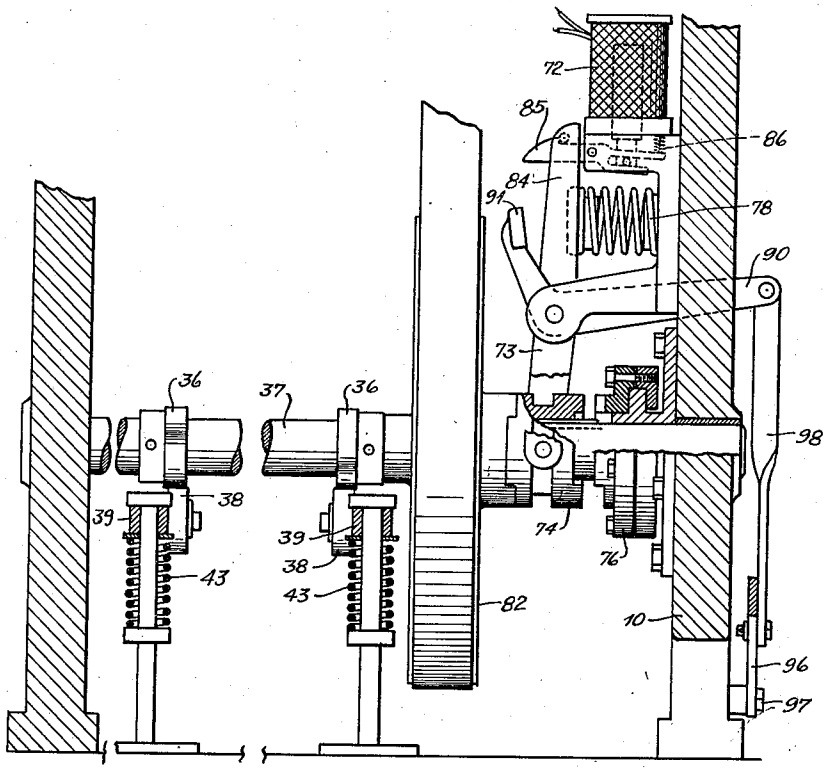


FIG. 3

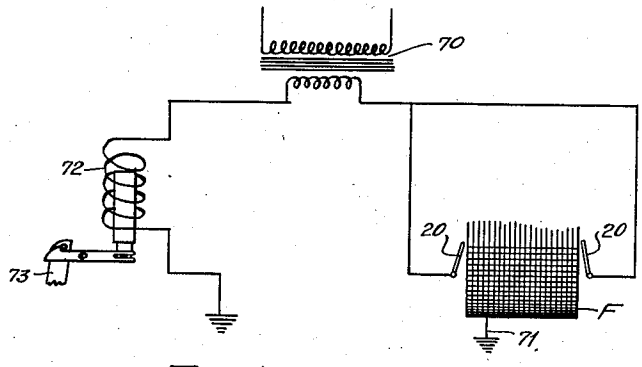


FIG. 4

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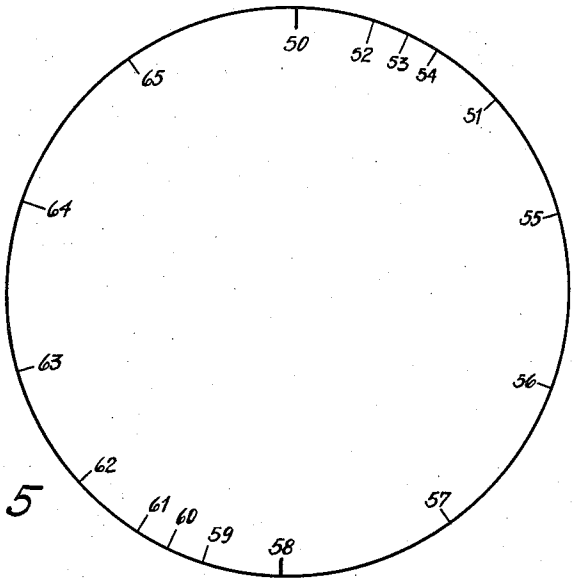


FIG. 5

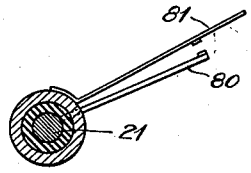


FIG. 6

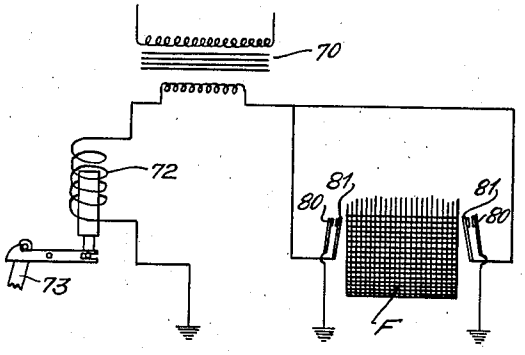


FIG. 7

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2,169,756

UNITED STATES PATENT OFFICE

2,169,756

LOOM STOPPING DEVICE

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Application March 11, 1936, Serial No. 68,186
In Canada March 11, 1935

12 Claims. (Cl. 139—370)

This invention relates to a device that is applicable to looms, such as are used in the manufacture of wire cloth belts, particularly looms of the fly-shuttle type. In such looms at each throw of the shuttle, there is formed a loop of wire which extends for a considerable distance beyond the edge of the cloth. The loop is present whenever the shuttle leaves the shuttle box. At such time, it has little or no support and therefore, has a tendency to catch on projecting parts of the machine and particularly upon the slay or batten. As a result, the slay delivers a blow in the usual manner, but on the return, it not only jerks the last shoot wire out of place, but also part of the preceding wire, thereby causing a serious defect in the fabric. Such defects at times are sufficiently great to necessitate scrapping of the belt.

An object of our invention is to make a device, which will automatically stop the loom before the slay can return after a snagged shoot wire has been driven into the cloth. In the preferred form of construction, the loom is stopped even before the snagged shoot can be driven into the work, although we have found that the actual driving of the shoot into the work is not serious. The damage to the cloth results upon the return movement of the slay.

An additional object of our invention is to provide a loom stopping device, which can readily be attached to existing looms, without necessitating extensive changes in the construction thereof.

Referring now to the drawings, Fig. 1 is a side elevation of a loom having our invention incorporated therein, certain parts of the loom being broken away to more clearly illustrate the internal construction thereof; Fig. 2 is a diagrammatic illustration showing the use of our invention; Fig. 3 is a sectional detail on an enlarged scale, the plane of the section being indicated by the lines 3—3 on Fig. 1; Fig. 4 is a diagram illustrating the electrical circuits; Fig. 5 is a diagram illustrating the timing of the various operations of the loom, and our improved stopping device; Fig. 6 is a sectional detail of a modified form of contact finger, and Fig. 7 is an electrical diagram illustrating the electrical circuits, as used with the contact finger shown in Fig. 6.

Our invention is shown in connection with a loom wherein 10 indicates the side frames, which support a warp-beam 11, a guide roll 12, and a cloth beam 13, in the usual way. Suitable gears and mechanism are provided between the warp beam and the cloth beam for advancing the warp threads W during the weaving operation, and for maintaining the necessary degree of tension thereon, to wind up the cloth F progressively, as it is woven. Such mechanism, however, forms no part of the present invention, and is therefore, not illustrated in detail.

The side frames pivotally support a batten frame 14, which carries picker arms 15, shuttle boxes 16 and shuttle race 17. Suitable mechanism is provided for imparting a quick movement to the lower ends of each picker staff, so that when such picker staff engages the shuttle, it will be shot across the race to the opposite shuttle box.

During the movement of the shuttle, wire is paid out therefrom so rapidly that it may lay in a large loop within the shed, thus requiring suitable take-up mechanism to tighten the shot before the batten is released.

Inasmuch as there is a considerable distance, depending upon the width of the fabric to be woven, between each shuttle box and the adjacent edge of the fabric, the loop has a tendency to catch upon any projecting part of the machine. Whenever the loop catches upon any part of the batten or upon any part of the loom, the shoot is driven into the work, but there is present an overhanging loop, which projects beyond the normal edge of the fabric. Such loop is shown diagrammatically, for example at L in Fig. 2.

Our invention includes the use of fingers, which are automatically moved, at each throw of the shuttle, in a vertical direction and in close proximity to each edge of the fabric. The fingers are adapted to engage any projecting loop of each shoot wire, and are further adapted upon such engagement to initiate the operation of suitable mechanism for stopping the loom. In one form of such mechanism, an electric current is caused to pass, upon engagement of the finger with the wire, through suitable electrical apparatus for disengaging a clutch, which normally connects the motor to the loom driving mechanism. Ordinarily, by utilizing a friction brake in conjunction with the clutch, the loom can be stopped before the batten is released. However, in high speed looms the momentum may result in a release of the batten, but in all such cases, the loom can nevertheless be stopped before the batten returns to its previous position.

An illustrative form of apparatus, which may be utilized for carrying out our invention, comprises fingers 20, which project from rock shafts 21, and which are disposed at opposite sides of the loom. Each rock shaft may be journalled in a bracket 22 on the associated side frame, and may carry an operating arm 23. Thus, whenever the lever is oscillated, the finger is likewise oscil-

lated and is caused to contact any part of the shoot wire, which projects improperly beyond the edge of the fabric. In one arrangement, as shown in Fig. 4, contact between the finger and wires closes an electric circuit and initiates the operation of mechanism which disengages the power shaft of the loom from the motor.

Each contact finger 20 is adapted to be actuated intermittently, in timed relationship to the throw of the shuttle, and to this end, the levers 23 are connected by links 25 to respective levers 26, which are pivotally mounted in suitable brackets 27 carried by a frame member 28 of the loom. To actuate the levers 26, we have shown, two double acting cams 36 drivingly carried by the loom power shaft 37, and which are adapted to engage respective rollers 38, one of which is carried by each operating lever 26. Suitable springs 43 normally act upon the cam actuated levers to retain them in the position shown in Fig. 1, wherein the associated fingers 20 are below the plane of the woven fabric. The springs 43 yieldingly resist the movement of the cam for the full degree of throw thereof, so as to move the fingers above the plane of the cloth into the dotted line position shown in Fig. 1.

There is a preferred time relationship between the shuttle movements and the operation of the contact fingers, and such relationship is illustrated in a time cycle diagram in Fig. 5, wherein the point 50 indicates the time at which the shuttle starts across the race from one of the boxes, which for illustration will be called the right-hand box. At point 51, the shuttle enters the opposite or left-hand box, but between such intervals, the right-hand finger is caused to move to its uppermost limit and then back to its lowermost limit; such points being illustrated in Fig. 5 at 52, 53 and 54, 53 being representative of the point of the highest travel of the finger. At 51, the batten starts downwardly, and at 55 it strikes the blow, which drives the shoot into the work. It then starts back and reaches its previous position at 56.

In the diagram illustrated, the batten is designed to deliver two blows to each shoot and accordingly, at 56, the batten is released for the second blow, which is delivered at 57, the batten being returned to its initial position at 58. At 58, the shuttle leaves the left-hand box, whereupon the cycle of operations is repeated, the contactor finger on the left hand side being operated at points 59, 60 and 61, the shuttle throw stopping, and the batten blow starting at 62. At 63, the first blow is delivered; at 64 the batten is at the top of its backward swing; at 65, the second blow is struck, and at 50, the batten has been returned to the top of the second swing. The diagram illustrated is typical of a six second cycle of operation.

As previously stated, if a shoot wire is improperly inserted, the contact finger completes an electric circuit through the fabric. To this end, we have shown a wiring diagram in Fig. 4, wherein a transformer 70 has a primary connected to the source of supply and the poles of the secondary connected to the fingers and ground respectively. The woven fabric is grounded, as at 71, and is adapted to cooperate with the fingers 20 for closing the secondary transformer circuit when either finger contacts an overhanging shootwire. When the circuit is thus closed, a solenoid 72 will be energized to initiate the operation of a clutch shifter 73, so as to disengage the power shaft 37 from driving connection with the motor (which is illustrated in general at 75).

The clutch shifter 73 is preferably operated by a relatively heavy spring 78 which is arranged to force the shipper collar 74, which is splined to the power shaft 37 out of engagement with the driving pulley 82 and into engagement with a friction brake mechanism. As shown, the spring 78 is supported by a stationary part of the loom frame and is arranged to coact with an arm 84 of the shipper lever 73.

The action of the spring 81 is normally restrained by a latch 85 which is normally held in engagement with the arm 84 by a comparatively light spring 86, but which is drawn out of engagement by the energization of the solenoid 72 consequent upon the contact of either finger 20 with a distended loop. Thus, it will be seen that when the wire is out of position, the loom will be automatically stopped, thereby enabling the repositioning of the wire, after which, the loom may again be set in operation.

We have arranged the clutch shifter arm 73 so that it may be manually shifted by the operator, after the distended loop of wire has been drawn taut. As shown in Figs. 1 and 3, a bell crank 90 is pivoted to the frame and is provided with a surface 91 arranged to engage the shipper lever 73 to rock such lever about its pivot to reengage the clutch. As the shipper lever is so rocked it is reengaged by the latch 85. At the forward end of the machine there is provided a pedal 95 which is carried by a lever 96 pivoted to the loom frame at 97 and connected to the bell crank 90 by a suitable link 98. Hence the depression of the pedal 95 against the action of a spring 99 sets the loom in operation.

In the event that fabric is being woven with non-conducting weft material, we may construct the contact finger in the manner illustrated in Fig. 6 in which each finger has two sections, one indicated at 80 as being rigid, and the other at 81, as being flexible, and the two being insulated from each other, but connected at opposite polarities to the source of electric current. Thus, when the flexible section encounters a weft thread, it is moved into contact with the rigid finger to complete the circuit, which initiates the movement of the clutch disengaging mechanism, as illustrated in Fig. 7.

Our invention has constituted an important advance in the art of weaving woven fabric, for it has satisfactorily eliminated a very expensive defect in Fourdrinier wires. The invention is applicable, of course, for use in the weaving of any woven product although it has been used primarily in the weaving of Fourdrinier wires. It is to be understood, however, that the mechanism shown may assume various mechanical forms, and still be within the spirit of our invention.

We claim:

1. In a loom of the fly-shuttle type having a batten associated therewith, means for actuating the batten after each throw of the shuttle, an oscillating finger disposed on each side of the woven fabric and means for operating the fingers in timed relationship to each throw of the shuttle so as to contact an improperly laid weft thread, an electric circuit adapted to be closed upon engagement of the finger with such thread and mechanism controlled by the closing of said circuit for stopping the batten.

2. In a loom of the fly-shuttle type having a batten, the combination of means for operating

the batten in predetermined timed relationship to each throw of the shuttle, a movable member for contacting an improperly laid shoot wire, means for operating said member in timed relationship to each alternate throw of the shuttle and prior to each successive alternate operation of the batten, an electric circuit adapted and arranged to be closed whenever said member engages an improperly laid weft thread, and means in said circuit for disengaging the batten from the operating means therefor.

3. In a loom of the fly-shuttle type, the combination of an electrical contactor that is disposed adjacent one side of the woven fabric, means for actuating the contactor in a predetermined timed relationship to the throw of the shuttle, said contactor operating to close an electric circuit through the strand supplied by the shuttle whenever it is laid improperly in the shed, and mechanism also in said circuit and initiated upon closing of the same for stopping the loom.

4. In a loom of the fly-shuttle type, having a batten and operating means therefor; in combination with a member that is movably supported on the loom at one side of the woven fabric, and normally held below the plane of the latter; mechanism operable while the shuttle is in motion for passing the member across the plane of the woven fabric to contact an improperly protruding loop on a shoot wire, and means rendered active by said member only upon the presence of such protruding loop to stop the batten-operating means before the weaving of the shoot wire into the fabric is completed.

5. In combination, a loom having a driven power shaft; a motor; driving connections between said shaft and motor, including a clutch; a batten operatively connected to the driven power shaft; a cam on said driven power shaft; a lever actuated intermittently by the cam; a rock shaft; means for operatively connecting the rock shaft to said lever; a finger fast with said rock shaft, and disposed adjacent one edge of the woven fabric; means for normally holding the finger below the plane of the woven fabric; and means for severing the drive between said motor and driven power shaft, by throwing out said clutch, whenever said finger detects by contact a loop on a weft thread improperly protruding beyond the normal edge of the woven fabric, to thereby stop the batten before the weaving of the weft thread into the work is completed.

6. In a loom, the combination of a power shaft; a batten operatively connected to the shaft and driven thereby; a cam carried by the shaft; a lever actuated by the cam; a finger disposed at one side of the woven fabric; mechanism operatively connecting the finger and lever so as to oscillate the finger intermittently during the operation of the loom; and means including a clutch operable to sever the connection between said shaft and batten whenever said finger contacts a loop left improperly protruding from the normal edge of the woven fabric to thereby stop the batten.

7. In a loom, the combination of an electric circuit; a controller therein; means adapted and arranged to engage the loop of an improperly laid shoot wire for actuating the controller; actuating means drivingly connected with the loom for causing such engagement of the first named means with such loop at a predetermined period of operation of the loom, and mechanism operable upon actuation of the controller for stopping the loom.

8. In a loom of the fly-shuttle type, the combination of a contactor, and cam means for operating the contactor in time relationship with the throw of the shuttle, an electric circuit of which the woven fabric forms a part, said contactor being actuated by said cam means and operative upon engagement with an improperly laid shoot wire for closing the electric circuit, and means in the circuit actuated upon closing of the same, for stopping the loom.

9. In a loom having a series of warp threads forming a shed for the passage of a weft thread therethrough, the combination of a shuttle, a batten for striking a blow to each weft thread after it has been laid in the shed by the shuttle, mechanism for contacting a loop on a weft thread improperly projecting beyond the normal edge of the woven fabric, said mechanism comprising an intermittently operated finger, and means rendered active by said finger consequent upon engagement of said finger with such protruding loop to stop the batten.

10. In a loom having a shuttle and shuttle boxes with means for moving the shuttle from one box to the other, the combination of stop fingers positioned outside the normal edges of the woven fabric, and means carried by the loom to oscillate said fingers in timed relation with the throw of the shuttle, driving means for the loom, and mechanism including an electric circuit which is closed to stop the loom driving means only when one of the fingers contacts a loop on a weft thread left improperly projecting beyond the normal edge of the woven fabric.

11. In a loom of the fly-shuttle type, having a power shaft, the combination of a pivotally mounted batten, means to drive the batten comprising mechanism for operatively connecting said batten with the power shaft, an oscillating finger located outside the normal edge of the woven fabric, means for oscillating the finger in timed relationship with the throw of the shuttle, means to stop the movement of said power shaft, and mechanism controlled by the finger to actuate said last-named means only whenever such finger contacts a loop of a weft thread left improperly protruding beyond the normal edge of the woven fabric and in the path of oscillation of said finger, whereby the stopping of the power shaft in turn prevents further movement of the batten from driving the improperly laid weft thread into the fabric.

12. In a loom, the combination of a batten, means for operating the batten, a fly-shuttle, and means for stopping the batten, mechanism having controller means therefor located outside one edge of the fabric as normally formed on the loom, said controller means being movable upon each reciprocation of the shuttle, substantially into the plane of such fabric for detecting a protruding loop of a weft thread, and means for moving the controller means whereby said mechanism is made operative by engagement of the controller means with an improperly protruding loop to actuate the stopping means.

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