June 5, 1934. R. SPENDLOVE 1,961,400

PILE WIRE LOOM STOPPING MECHANISM

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Fig.1.

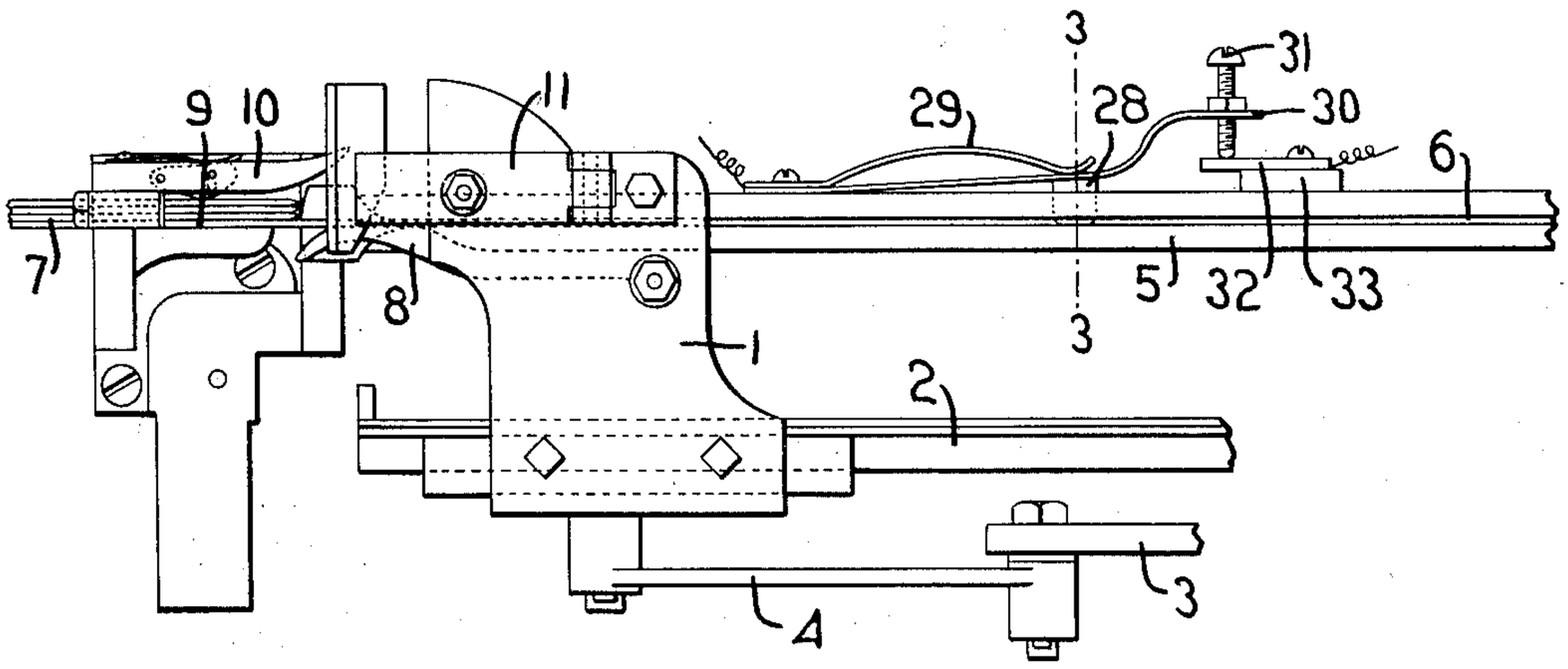

Fig.2.

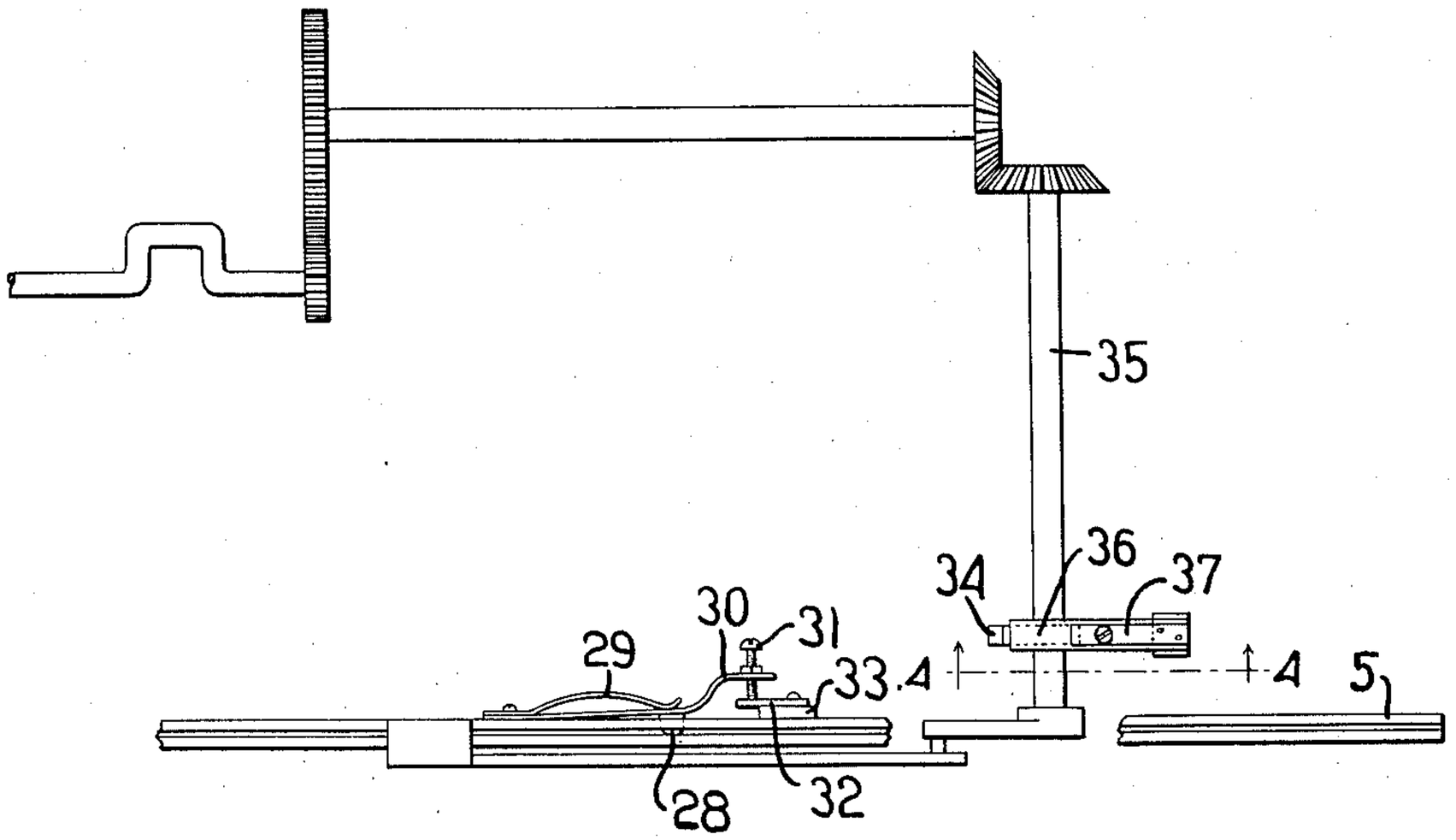

Fig.3.

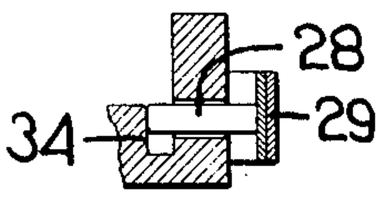

Fig.4.

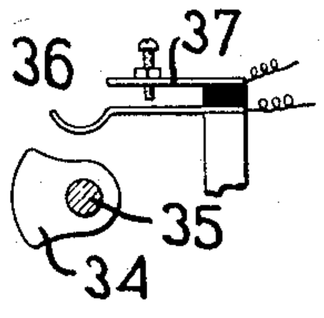

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Fig. 5.

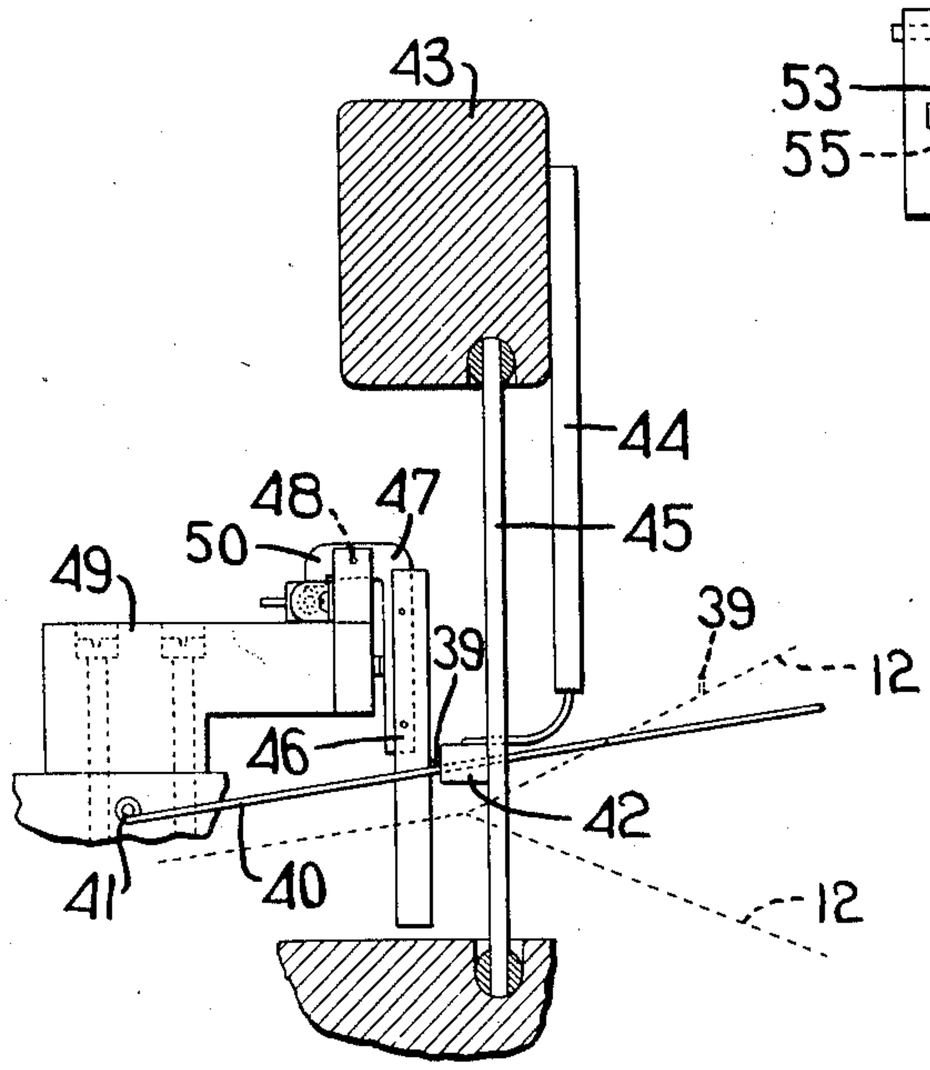


Fig. 6.

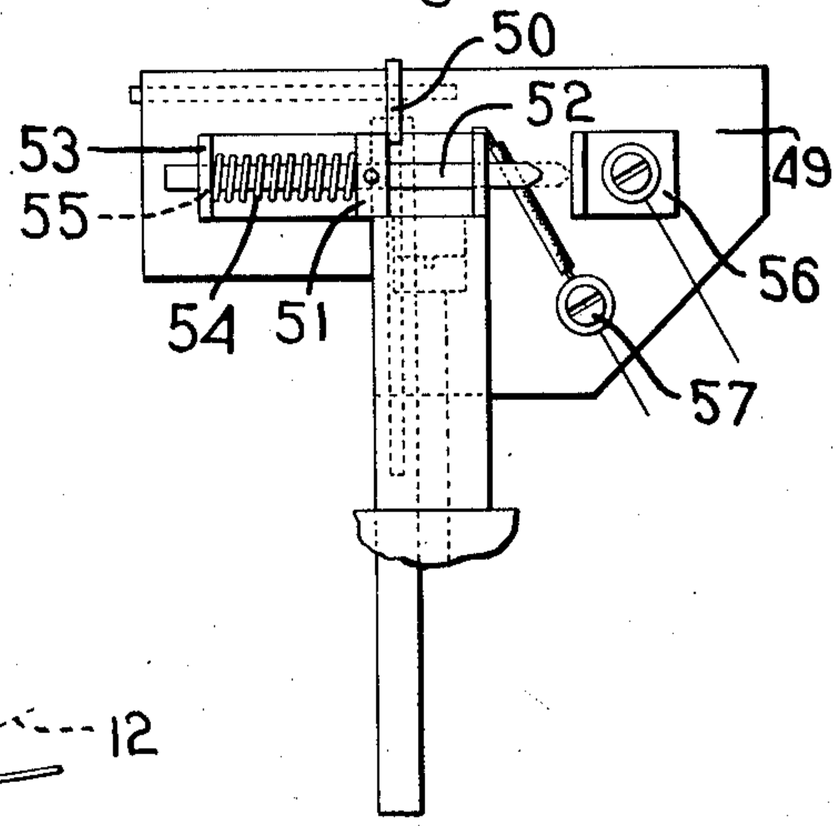


Fig. 7.

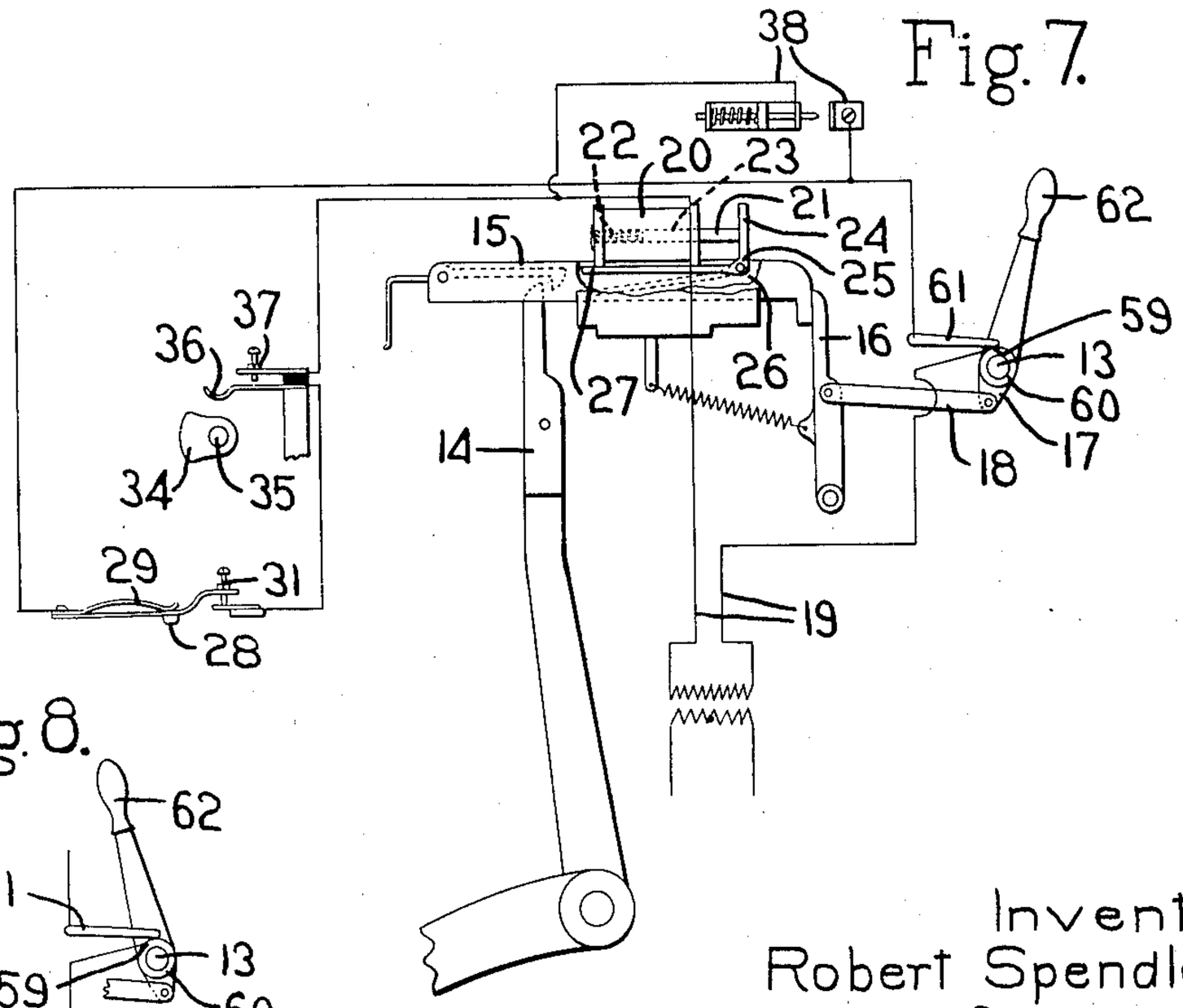
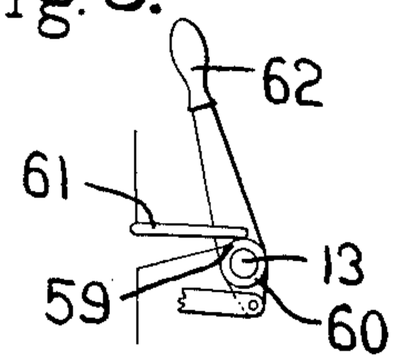


Fig. 8.



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PILE WIRE LOOM STOPPING MECHANISM

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Application July 29, 1931, Serial No. 553,718

16 Claims. (Cl. 139—336)

This invention relates to pile fabric looms and particularly to looms of this type in which the tufts of pile are formed by weaving pile wires into the fabric and withdrawing them therefrom.

It is particularly desirous in producing fabrics of this character to prevent the occurrence of irregularities in the weaving process for the reason that the product itself is costly relatively to manufacture, and furthermore considerable labor is involved in making a satisfactory repair upon the fabric if a defect becomes woven therein. It is important, therefore, that a defect due to a failure of the mechanism be detected immediately. It is the chief object of this invention to effect the stopping of the loom immediately upon failure of the pile wire mechanism to function properly.

A particular object of the invention is to cause the loom to stop when there has been a failure of the mechanism to withdraw properly a pile wire from the fabric as required in the operation of the loom.

A further object of the invention is to provide means for stopping the loom when the pile wire mechanism improperly inserts a pile wire as when the mechanism moves a pile wire across the shed of the loom but outside thereof instead of properly within the shed.

A further object of the invention is to provide electrical means to stop the loom upon the occurrence of any improper function of the pile wire mechanism including means acting to close a portion of the circuit of such electrical means during the withdrawing and inserting operations of the pile wire mechanism and opening that portion of the circuit during the remainder of the cycle of operations required in the weaving process.

A preferred embodiment of the invention comprises essentially a loom stopping mechanism which is associated desirably with the control handle upon the loom. To obtain the required power to actuate the knock-off mechanism of the loom, means are provided to present an abutment into the path of the usual weft hammer of the loom which engages the abutment and causes the usual filling fork slide to move in the proper direction to actuate the knock-off mechanism thus stopping the loom.

A convenient method for detecting a failure of the pile wire mechanism to perform in the manner required by the operation of the loom is to employ electro-mechanical apparatus which acts in conjunction with a knock-off mechanism to stop the loom.

During the withdrawing and inserting operations of the pile wire mechanism, a pile wire is received in a supporting member extending laterally from the side of the loom and having a groove therein in which the wire is received. In the normal function of the pile wire mechanism there is a certain portion of its cycle at which there must always be a pile wire present within the slot in the pile wire supporting means or the pile wire bar as it is commonly known to those familiar with the art. The present invention provides means for detecting an improper absence of a pile wire within the groove in the pile wire bar.

For a detecting means at this point in the apparatus the present invention employs desirably an electric switching device which is held in open circuit position by the presence of a pile wire in the groove within the pile wire bar. Since there are times during a cycle of operation of the mechanism when a pile wire is properly absent from the groove in the pile wire bar, means are provided for automatically opening the circuit at another point during that period when a pile wire is properly absent from the groove. Such means desirably may be a circuit interrupting device operated in proper timed relation to the operation of the loom to maintain the circuit open at the required time during the withdrawing and inserting operations.

The pile wire mechanism will sometimes fail to properly insert a pile wire in the shed in which case the pile wire is projected across the loom exteriorly of the shed. When such a condition exists and the loom continues to run, a defect is woven into the fabric. Furthermore, such a failure of the mechanism is liable to cause serious damage to the pile threads or to the reed. The present invention provides means to stop the loom upon such a failure of the mechanism. A convenient and effective method of accomplishing this result is to provide an electro-mechanical means which includes a detecting mechanism inserted in an electric circuit which is connected in parallel relation to the previously described circuit. The detecting mechanism is actuated by the presence of a pile wire outside of the shed, and employs the movement of the lay to actuate a latch which functions to release an electric contact which closes the electric circuit and causes stopping of the loom through the action of the knock-off mechanism.

In the drawings:

Fig. 1 is a plan view of a portion of the mecha-

nism employed for withdrawing and inserting pile wires and includes the detecting device employed to stop the loom upon failure of the pile wire mechanism properly to withdraw a pile wire.

Fig. 2 is a diagrammatic illustration of the method of driving the pile wire mechanism and illustrates a circuit interrupting mechanism which acts to time the action of the loom stopping devices.

Fig. 3 is a section on line 3—3 Fig. 1.

Fig. 4 is a section on line 4—4 Fig. 2.

Fig. 5 is a transverse sectional view through the lay illustrating in side elevation the detecting mechanism which acts to stop the loom when a pile wire is wrongfully inserted on top of the shed instead of within the shed.

Fig. 6 is an end elevation of the mechanism shown in Fig. 5 looking toward the left.

Fig. 7 is a diagrammatic illustration of the electric circuits and the automatic loom stopping mechanism which actuates the knock-off mechanism to stop the loom.

Fig. 8 is a detail view of a circuit breaking device upon the starting rod of the loom in its open position which occurs when the loom is stopped.

The principles of the invention may be practiced in any suitable manner. A particular embodiment of the invention is shown herein in which only those elements which are directly related to the invention are illustrated and described. The remaining elements of the loom are or may be of the usual design well known to those skilled in the art. The pile wire mechanism is of the usual type having a carriage 1 which is slidably mounted upon its supporting bar 2 and is oscillated thereon by means of the well known mechanism including a crank, not shown, which is operated from a moving part of the loom and an oscillating lever 3 which is connected to the carriage 1 and imparts the motion of the lever 3 thereto by means of a connecting link 4. A pile wire bar 5 is disposed at the side of the loom extending transversely therefrom and in parallel relation to the supporting bar 2 and has therein a groove 6 in which is received a pile wire during the withdrawing and inserting operation of the mechanism. The pile wire bar 5 is positioned with its groove 6 in alignment with a pile wire 7 which is the forwardmost wire of a group of four similar wires which are used in rotation to form the loops in the pile fabric. The usual mechanism is employed to shift the carriage 1 and the pile wire bar 5 into proper position to permit the pile wire to be again inserted into the shed after it has been withdrawn. The shifting mechanism is not shown since it is of usual construction.

The carriage 1 is provided with a latch 8 which engages the usual opening in the body portion of the head 9 of the pile wire 7 and draws the pile wire 7 out of the magazine 10 in which the heads of the four pile wires are received. Upon further outward movement of the carriage 1 a latch 11 pivoted upon the carriage engages the upper edge of the head 9 and continues to draw the pile wire 7 into the groove 6 in the pile wire bar. The pile wire bar 5 is then shifted rearwardly and upon the inward stroke of the carriage 1 the pile wire is forced into the shed 12 of the loom. This sequence of operations is followed throughout the weaving process. The mechanism above described is usual in this type of loom and forms no part of the present invention.

The loom stopping mechanism employed in the invention is rendered active by the closing of an electric circuit. The stopping mechanism acts upon the usual starting rod 13 of the loom and receives its motion from the weft hammer 14 which acts through the usual filling fork slide 15 which engages a lever 16 pivotally upon a fixed point on the loom. The lever 16 is connected to a short arm 17 extending downwardly from the starting rod 13 by means of a link 18.

During the normal operation of the loom the weft hammer oscillates freely. When, however, a failure of the pile wire mechanism to function properly occurs the electric circuit 19 is energized. In the circuit 19 is a solenoid 20 having an armature 21 slidably mounted axially therein. The armature 21 of the solenoid 20 is acted upon by a spring 22 which is situated in the aperture 23 in which the armature is received. The spring 22 acts to move the armature 21 outwardly and causes it to assume a position partially out of the influence of the field of the solenoid with its outer end abutting an arm 24 of a bell crank lever 25 which is pivoted upon the filling fork slide 15 at 26. The other arm 27 of the bell crank lever is held normally in a horizontal position with its outer end out of the path of the weft hammer 14 by means of the spring 22. When a failure of the pile wire mechanism to function properly occurs, the electric circuit 19 is closed thus energizing the solenoid 20 which immediately draws the armature 21 inwardly which releases the bell crank lever 25, the arm 27 of which drops downwardly into the path of the weft hammer. Upon the next succeeding stroke of the weft hammer the arm 27 is engaged thereby and by reason of the connection of the bell crank lever with the filling fork slide causing the slide to move toward the right in Fig. 7 which motion acts through the lever 16 and the link 18 to rotate the starting rod 13 thus stopping the loom. While a particular form of stopping mechanism has been described any suitable mechanism may be employed however.

As previously pointed out in the normal operation of the pile wire mechanism, a pile wire is always present during a certain portion of its cycle of operation in the groove 6 of the pile wire bar 5. If, however, the pile wire mechanism fails to withdraw a pile wire when required by the normal operation thereof, there will be an improper absence of a pile wire in the groove 6.

The present invention provides a novel means of detecting the abnormal absence of a pile wire from the groove 6. The detecting mechanism comprises a finger 28 which is movable within an aperture formed in one of the walls of the groove 6. The finger 28 is forced yieldingly into the groove 6 by means of a leaf spring 29 secured at one end to the bar 5 and pressing with its free end upon an electric contact member 30. This member 30 carries the finger 28 and is secured rigidly at one end by the same means which secures the fixed end of the spring 29 and lies beneath the spring and is acted upon thereby. At the free end of the contact member 30 is located an adjusting screw 31. The lower end of the screw 31 is positioned to contact with an electrically-conductive plate 32 which is secured to and electrically insulated

from the bar 5 by means of a block of insulation 33.

The screw 31 is so adjusted that when no pile wire is present in the groove 6, there will be an electric contact established between the screw 31 on the contact member 30 and the plate 32, at which time the finger 28 will be forced inwardly by the spring 29 until it engages the wall 34 of the groove 6. When, however, a pile wire is present in the groove 6, the finger 28 will be forced outwardly moving the contact member 30 into a position to separate the screw 31 from the plate 32 thereby opening the circuit.

It is evident that there are certain periods in the cycle of operation of the pile wire mechanism when the pile wire is absent properly from the groove 6. Since at these periods the contact between the screw 31 and the plate 32 will be established to close the circuit 19, some means must be provided to maintain the circuit open at another point during such periods. This is provided for by means of an automatic circuit interrupting device which comprises a rotating cam 34 mounted upon a shaft 35 which is driven in proper timed relation to the weaving cycle to open the circuit at the required time. The shaft 35 desirably may be the shaft used to reciprocate the carriage 1. Situated in the path of the cam 34 is a flexible contact member 36 which when engaged by the cam makes an electric contact with a fixed contact plate 37 mounted at any suitable point upon the loom. The members 36 and 37 are connected in series in the circuit 19 and function normally to interrupt the circuit, and when acted upon by the cam 34 act to complete the circuit. The cam 34 is so timed that it will close the circuit only during the period when a pile wire should be present in the groove 6 of the bar 5. When there is an improper absence of a pile wire from the groove 6 an electric contact is established at both points entirely completing the circuit through the solenoid 20 which renders active the stopping mechanism.

The pile wire mechanism may fail not only to withdraw a pile wire at the proper time, but it may fail after withdrawing a wire to properly reinsert the wire. Means are provided also by the invention to cause the stopping of the loom upon failure of the mechanism to function properly in this respect.

The broad principles of the invention contemplate the use of any suitable means for stopping the loom upon such a failure of the mechanism to insert properly a pile wire into the shed. A desirable form is shown herein which consists of a detecting mechanism which functions to close an electric circuit 38 which is parallel to the circuit 19 and functions when closed to render operative the loom stopping means. When the pile wire mechanism fails to insert a pile wire into the shed, it is invariably thrown upwardly into a position on top of the upper portion of the shed. The detecting mechanism utilizes this abnormal position of the wire to cause stoppage of the loom. When a pile wire is thrown across the upper surface of the shed such, for instance, as that indicated in dotted lines at 39 in Fig. 5, the succeeding forward stroke of the lay will carry the wire with it into a position adjacent the fell of the fabric being woven. In order to guide this forward bodily movement of the pile wire into a predetermined position, a support 40 is provided therefor which is pivoted at one end to a fixed part of the loom as at 41, and is supported in a substantially horizontal position by means of a guiding member 42 which is supported from any suitable point on the lay such as the hand rail 43 by means of a bracket 44. The support 40 is positioned closely adjacent one side of the selvage of the goods. As the lay moves forward and backward the support 40 travels through the guide member 42. The forward edge of the guide member 42 is situated in a plane a short distance in front of the plane of the reed 45. When a pile wire has been thrown improperly across the top of the shed, it will be engaged immediately by the guide member 42 and carried forward along the upper surface of the support 40 to a position where it engages an arm 46 of a latch member 47 pivoted at 48 upon a fixed bracket 49 mounted on a stationary portion of the loom.

The engagement of the pile wire with the arm 46 causes the latch member 47 to rock about its pivot point 48 and causes an arm 50 upon the latch member 47 to release its engagement with a collar 51 upon an electric contact member 52. The contact member 52 is mounted in a manner to permit longitudinal movement thereof within a supporting frame 53 which in turn is fixed to the bracket 49. An expansion spring 54 is interposed between the collar 51 and the outwardly extending supporting journal 55 of the frame 53, and acts to move the contact member 52 toward the right in Fig. 6. An electric contact 56 is fixed upon the bracket 49 in the path of the contact member 52. When the arm 50 of the latch member releases its engagement with the collar 51, the contact member is forced into engagement with the contact 56 by the action of the spring 54.

The bracket 49 desirably is constructed of insulating material such as hard fibre, and an electrical connection 57 is established with the frame 53 which is itself of electrically conductive material. One terminal of the circuit 38 is connected to the contact member 56 while the other terminal is connected to the contact member 52 through the electrical connection 57. Through the medium of the above described detecting means, therefore after a pile wire has been thrown improperly across the upper surface of the shed, the succeeding forward stroke of the lay functions to close the circuit 38 rendering active the loom stopping mechanism to stop the loom before a defect in the weave is woven into the fabric or before any possible damage occurs to the mechanism.

After stoppage of the loom, it is desirable to open the electric circuit leading to the solenoid 20. If this were not done, an unnecessary waste of power would result with a possible overheating of the electrical elements involved in the device. The present invention includes automatic means to open the circuit immediately upon the stopping of the loom. The main circuit 19 is established through a contact member 59 inserted in a collar 60 of insulating material upon the starting rod 13 which is in contact with an electrical conductor 61 when the starting lever 62 is in the position shown in Fig. 7. When, however, the loom has been stopped for any purpose, the starting lever 62 and starting rod 13 carrying the collar 60 are moved into the position shown in Fig. 8, at which time the contact member 59 is moved out of engagement with the electrical conductor 61 thereby opening the circuit 19.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is:

1. In a pile fabric loom, a pile wire mechanism operable to insert and withdraw a pile wire in timed relation to the weaving cycle, loom stopping means, and means for actuating said loom stopping means rendered active either when the pile wire mechanism fails properly to withdraw a pile wire or when the pile wire mechanism during its inserting movement projects a pile wire exteriorly of the shed.

2. In a pile fabric loom, pile wire mechanism to insert and withdraw a pile wire in timed relation to the weaving cycle, means for stopping the loom, an electric circuit, means for closing said circuit either when the pile wire mechanism fails properly to withdraw a pile wire or when the pile wire mechanism during its inserting movement projects a pile wire exteriorly of the shed and means in said circuit operable to actuate said loom stopping means when said circuit is closed.

3. In a pile fabric loom, means for inserting and withdrawing pile wires in timed relation to the weaving cycle, loom stopping means, means to receive and support a pile wire during the withdrawing and inserting operations, means upon said support operable when there is an improper absence of a pile wire upon said support to actuate said loom stopping means and means operable to actuate the loom stopping means when the pile wire mechanism, during its inserting movement, projects a pile wire exteriorly of the shed.

4. In a pile fabric loom, a pile wire mechanism operable to insert and withdraw a pile wire in timed relation to the weaving cycle, loom stopping means, an electric circuit capable of interruption at two points, means at one point operable in timed relation to the pile wire mechanism to close a portion of said circuit during the withdrawing and inserting operations and to open the circuit at other times, a normally open circuited means at the other point operable to complete the circuit either when the pile wire mechanism fails properly to withdraw a pile wire or when said mechanism during its inserting movement projects a pile wire exteriorly of the shed and means in the circuit operable when the circuit is closed to actuate said loom stopping means.

5. In a pile fabric loom, means for inserting and withdrawing pile wires, means to support and guide a wire during the withdrawing and inserting operation, and means normally held inactive by the pile wire when properly present at a given point in its travel upon said support and guide and operable whenever the pile wire is improperly absent to stop the loom.

6. In a pile fabric loom, means for inserting and withdrawing pile wires in timed relation to the weaving cycle, a supporting member having a groove therein to receive a pile wire during the withdrawing and inserting operations and automatic means normally held inactive when a pile wire is properly in said groove and operable whenever the pile wire is improperly absent to stop the loom.

7. In a pile fabric loom, means for inserting and withdrawing pile wires in timed relation to the weaving cycle, a pile wire bar having a groove therein for receiving a pile wire during the inserting and withdrawing operations, means yieldingly forced transversely across said groove in the path of a pile wire and normally held in inactive position by a pile wire properly within the groove and acting upon any improper absence of a pile wire to stop the loom.

8. In a pile fabric loom, means for inserting and withdrawing pile wires, a pile wire bar to receive a pile wire during the withdrawing and inserting operations, electrically-controlled loom stopping means having a controlling switch upon said pile wire bar held in open circuit position by a pile wire properly within the pile wire bar and operable upon an improper absence of a pile wire to close said circuit and actuate said loom stopping means.

9. In a pile fabric loom, pile wire actuating mechanism for inserting and withdrawing pile wires, a pile wire bar to receive a pile wire during the withdrawing and inserting operations, an electric circuit having two points of interruption, means at one point of interruption actuated in timed relation to the pile wire mechanism to close partially the circuit while a pile wire is being withdrawn and inserted into the fabric, means at the other point of interruption normally interrupting the circuit when the wire is properly present in the pile wire bar and operable when there is an improper absence of a pile wire in the pile wire bar completely to close said electric circuit and means in said circuit acting when the circuit is closed to stop the loom.

10. In a pile wire loom, means for inserting and withdrawing pile wires, a pile wire bar having a groove therein to receive a pile wire during the inserting and withdrawing operations, loom stopping means, an electric circuit, means on said bar operable to close said circuit whenever a wire is improperly absent from a given point in said groove and means actuated by said circuit when closed to operate said loom stopping means.

11. In a pile wire loom, pile wire actuating mechanism for inserting and withdrawing a pile wire, a pile wire bar having a groove therein to receive the pile wire during the inserting and withdrawing operations, loom stopping means, an electric circuit capable of interruption at two points, a circuit interrupting device acting in timed relation to the pile wire mechanism to close partially said electric circuit during the inserting and withdrawing operations, a second circuit interrupting device situated on said pile wire bar operable completely to close said electric circuit upon an improper absence of a pile wire in said groove and means actuated by said circuit when closed to operate the loom stopping means.

12. In a pile fabric loom, pile wire actuating mechanism for inserting and withdrawing pile wires in timed relation to the weaving cycle and automatic electrically-operated means operable to stop the loom when said pile wire mechanism during its inserting movement projects a pile wire exteriorly of the shed.

13. In a pile fabric loom, a lay and means for actuating the lay, pile wire actuating mechanism for inserting and withdrawing pile wires in proper timed relation to the weaving cycle, an electric circuit, means normally interrupting said circuit actuated by the forward movement of the lay with a pile wire mispositioned exteriorly of the shed to close said circuit and means actuated by said circuit when closed to operate said loom stopping means.

14. In a pile fabric loom, having a lay and

means for actuating the lay, pile wire actuating mechanism for inserting and withdrawing pile wires in timed relation to the weaving cycle, loom stopping means, a latch pivoted on the loom frame, normally maintaining inactive said loom stopping means and an abutment on the lay operable on the forward movement thereof to engage and move a pile wire when mispositioned exteriorly of the shed into engagement with said latch and render active said loom stopping means.

15. In a pile fabric loom, having a lay and means for actuating the lay, a pile wire actuating mechanism for inserting and withdrawing pile wires in timed relation to the weaving cycle, loom stopping means and an electric circuit, a latch operated switch mounted on the loom frame acting normally to interrupt said circuit, an abutment on the lay operable upon the forward movement thereof to move a pile wire, when mispositioned exteriorly of the shed, into engagement with the latch upon said switch to close said circuit and means in said circuit operable when the circuit is closed to actuate said loom stopping means.

16. In a pile fabric loom, having a lay and means for actuating the lay, pile wire actuating mechanism for inserting and withdrawing pile wires in timed relation to the weaving cycle, loom stopping means, a latch pivoted on the loom frame normally maintaining inactive said loom stopping means, an abutment on the lay operable on the forward movement thereof to engage and move a pile wire when mispositioned exteriorly of the shed, into engagement with the latch and render active said loom stopping means and a guide member secured on the loom frame at one end and slidably supported by the lay in position to receive and guide the pile wire during its forward movement out of contact with the shed and into engagement with the latch.

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