April 5, 1932. O. V. PAYNE 1,852,059

ELECTRICAL WEFT DETECTOR HAVING DELAYED ACTION

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FIG. 1

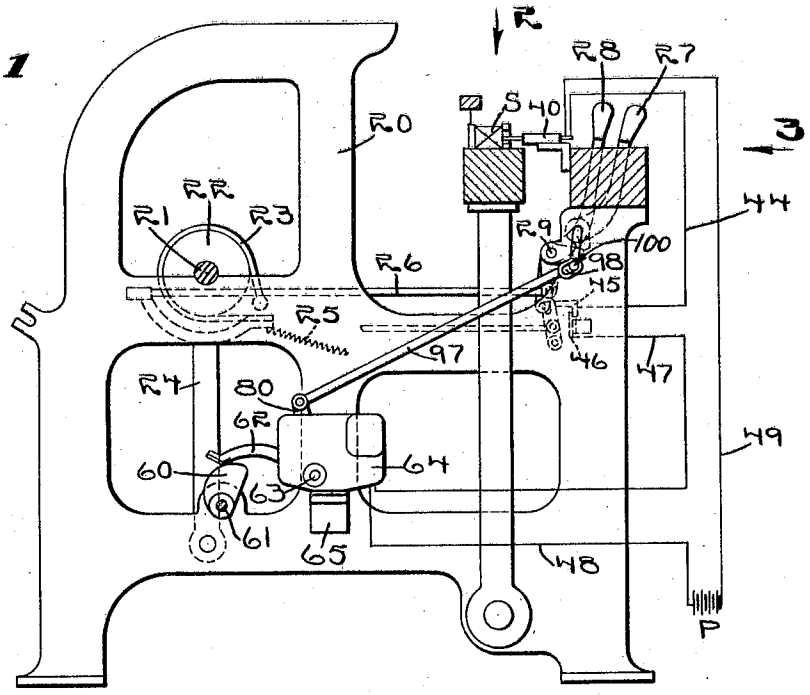
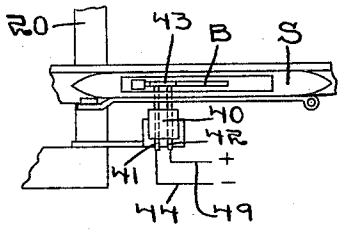


FIG. 2



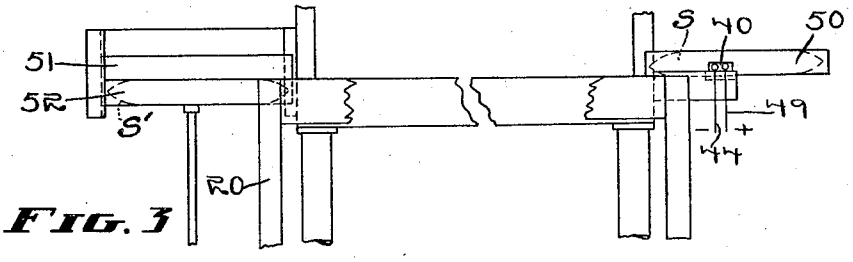


FIG. 3

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FIG. 4

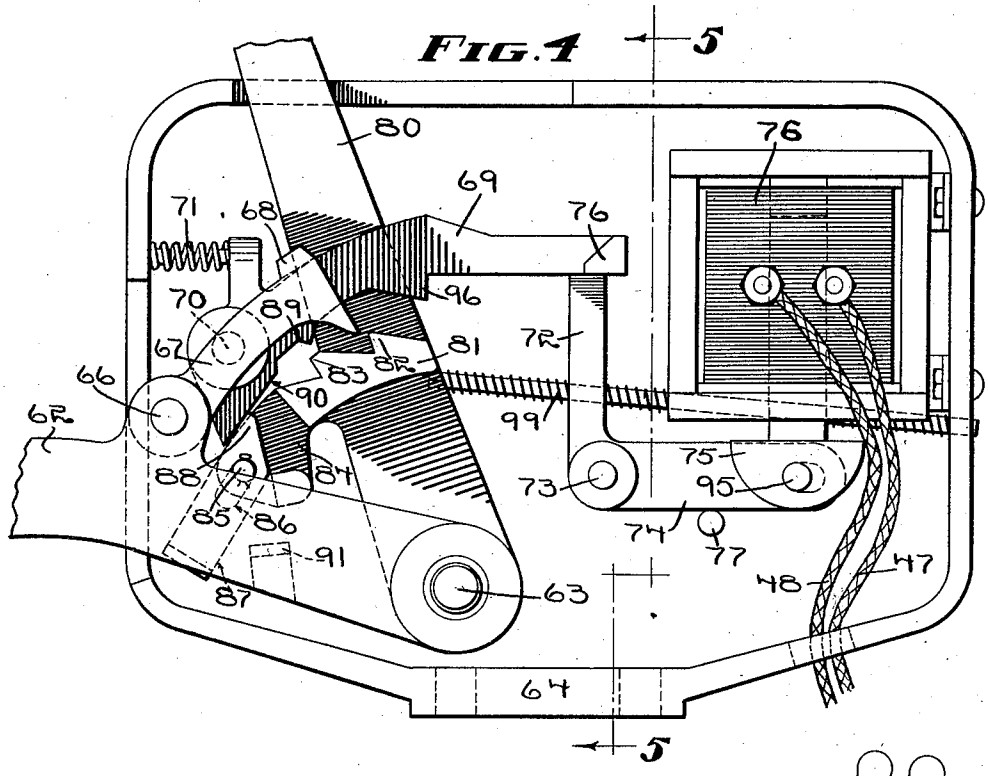
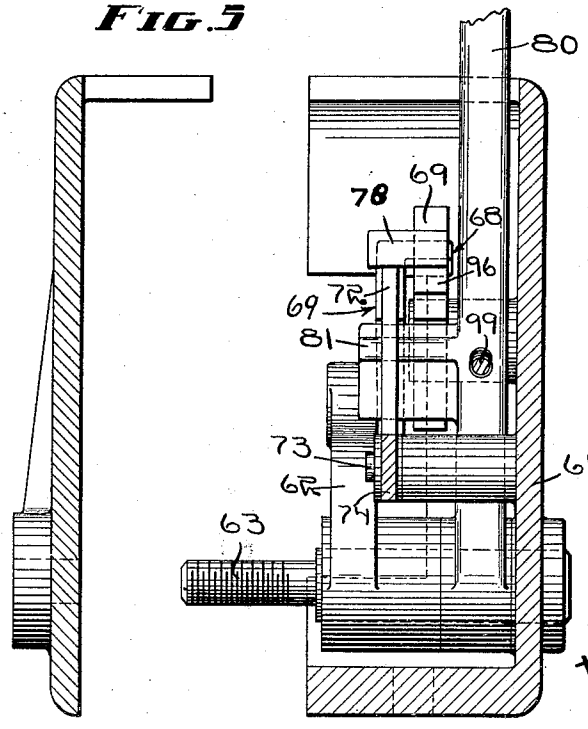


FIG. 5



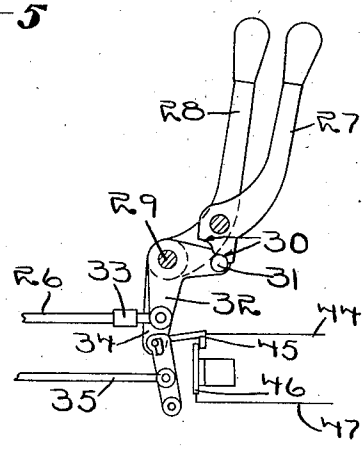


FIG. 6

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ELECTRICAL WEFT DETECTOR HAVING DELAYED ACTION

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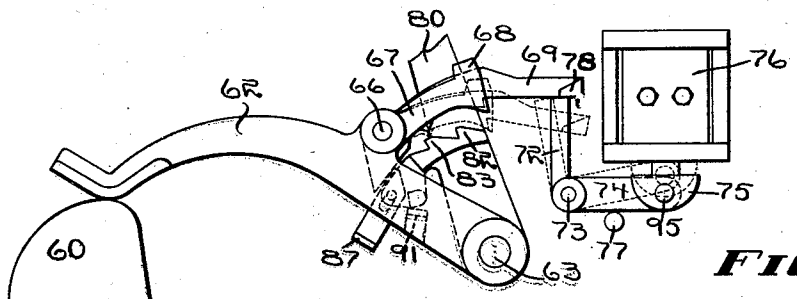

FIG. 7

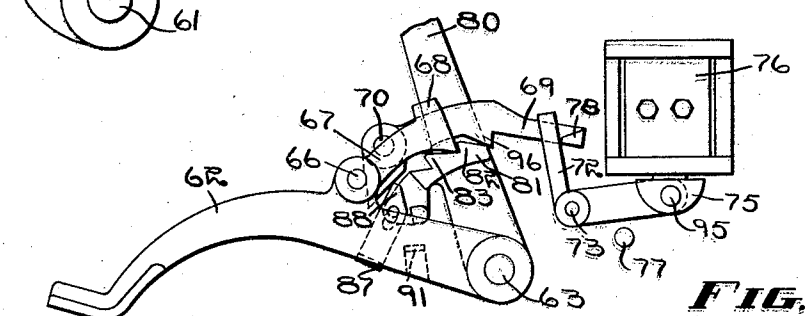

FIG. 8

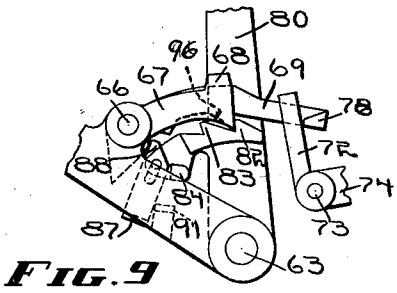

FIG. 9

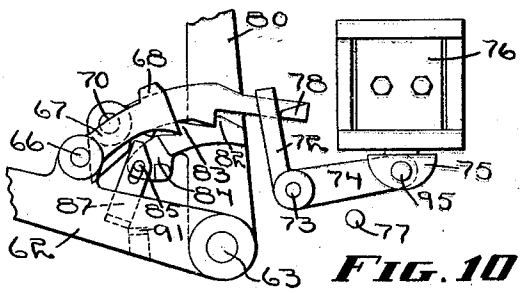

FIG. 10

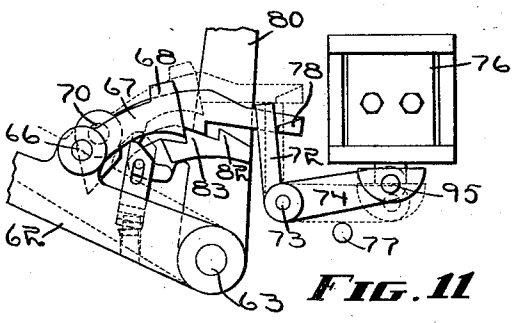

FIG. 11

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UNITED STATES PATENT OFFICE

OSCAR V. PAYNE, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO CROMPTON & KNOWLES LOOM WORKS, OF WORCESTER, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS

ELECTRICAL WEFT DETECTOR HAVING DELAYED ACTION

Application filed July 3, 1931. Serial No. 548,622.

This invention relates to improvements in weft detecting devices usable more particularly on shifting shuttle box looms and it is the general object of the invention to provide means whereby an interval of several picks may lapse between the operation of the weft detector and the final change in the operation of the loom, such as stopping.

In the weaving of certain fabrics a so-called two and two weave is employed which means that two picks of one shuttle are followed by two picks of another shuttle, and this sequence is repeated throughout the weaving of the fabric, the repeat consisting of four picks. In such looms it is desirable to have the shuttle in the plain box when the loom finally comes to rest to facilitate removal of the shuttle with subsequent hand replenishment. It is an important object of my present invention to provide a knock-off device which shall be started in operation by the closing of an electric circuit when weft is depleted in a shuttle occupying the plain box and to employ delay devices which will bring the loom to rest on the fourth succeeding pick, at which time the indicating shuttle will again be at the plain end of the loom.

It is another object of my invention to provide a regularly moving actuator which cooperates with a shield normally rendering the actuator ineffective so long as an electro-magnet or solenoid is unenergized but effective upon energization of the solenoid to render the actuator operative to give a knocking-off element progressive movements at two-pick intervals. In this connection I provide a lost motion connection between the progressively moving knocking-off member and the shipping mechanism so that the last part only of the movement of said member operates to stop the loom.

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 claims.

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

Fig. 1 is a vertical central section through a loom having my invention applied thereto, the electric circuit being shown diagrammatically,

Figs. 2 and 3 are diagrammatic views taken in the direction of arrows 2 and 3, respectively, of Fig. 1,

Fig. 4 is an enlarged side elevation of the delay mechanism with the cover removed,

Fig. 5 is a vertical section on line 5—5 of Fig. 4,

Fig. 6 is a diagrammatic view of the shipper handle connections, and

Figs. 7 to 11 are diagrammatic views showing the mechanism in different positions.

The loom frame 20 supports a top shaft 21 to which is secured a friction drum 22 cooperating with the flexible brake band 23. One end of the latter is anchored while the other end is connected to a brake lever 24 urged by a spring 25 to apply the brake band to the drum, but held normally in rearward position by means of a connector 26 cooperating with a brake handle 27. As shown more clearly in Fig. 6 the brake handle has notches 30 which cooperate with a roller 31 on a bell crank lever 32 to move the connector 26 from operative to inoperative position.

A shipper handle 28 is secured to the shipper shaft 29 to control the loom in the usual way by hand operation. When the brake handle 27 is knocked off to apply the brake a stop 33 will strike the lower part 34 of the shipper handle to throw off the power through the connection 35.

The weft detector 40 comprises a pair of oppositely charged fingers 41 and 42, respectively, which are adapted to have electrical connection with each other through a metallic ferrule 43 on the bobbin B in the shuttle S when the latter is on the plain side of the loom at the right as shown in Fig. 3 and the weft is substantially exhausted. Wire 44 leads to a movable switch element 45 which normally contacts with a second contact element 46 mounted on the loomside. Another wire 47 extends from the element 46 to a solenoid to be described, the other side of the latter being connected by a wire 48 to a source of power P, see Fig. 1.

Wire 49 connects the other side of the battery with detector finger 42. Reference to Fig. 3 will show a plain box 50 on the right hand side of the loom and a gang of two shifting shuttle boxes 51 and 52, respectively, which are reciprocated in well-known manner, box 51 being active for two picks only and then moving out of action to bring box 52 into action for two picks only, after which box 51 will return to action, this sequence continuing throughout the operation of the loom.

The matter more particularly forming a part of my invention comprises a cam 60 mounted on the bottom shaft 61 of the loom and having engagement with an actuator lever 62 pivoted on a stud 63 carried by a casing 64. The latter may be secured in any manner to the loom, as on a platform 65. The lever 62 has pivoted thereto as at 66 an actuator pawl 67 having a finger 68 extending over a shield 69, see Fig. 5. The latter is mounted on a fixed pivot 70 and has connection with a compression spring 71 which tends to rotate the latter in a clockwise direction as viewed in Fig. 4. Such motion is limited by a latch arm 72 pivoted at 73 to the casing. A second latch arm 74 rigid with the first has operative connection with a solenoid core 75 adapted to be drawn upwardly by solenoid 76 whenever the latter is energized. The latch arm 72 is out of vertical alignment with the main portion of the shield 69 but normally lies under an offset arm 76 on the shield. A stop 77 for the arm 74 insures proper holding engagement between the arms 72 and 76.

A knock-off member 80 is pivotally mounted on the stud 63 and is provided with a ratchet 81 having two teeth 82 and 83, respectively, which under certain conditions are engaged by pawl 67. A depending arm 84 of the member 80 carries a stud 85 which extends through a slot 86 formed in dog 87. The latter has a knock-off tip 88 which is positioned for engagement with a lifting notch or shoulder 89 on the shield. A guide surface 90 normally engages the dog to direct the movements of the same toward the shoulder 89 when the member 80 is being moved toward knocking-off position. A lifting lug 91 is positioned to engage the bottom of the dog 87 during the latter part of the operation of the mechanism for the purpose of resetting the shield.

Under normal conditions the cam 60 is set so as to raise the actuator lever 62 whenever a shuttle is picked from the drop box end of the loom, the action of the cam being such that the lever returns sometime during the succeeding two picks so as to be effective again to lift the lever when the other shuttle is to be picked from the drop box end of the loom.

In operation, it may be assumed that one of the shuttles S for box 51 is on the plain end of the loom in box 50 and has electrically connected the fingers 41 and 42 so that current flows through the circuit shown in Fig. 1 and previously described. The effect of current flowing in the circuit will be to energize the solenoid 76 and the latter, acting through a lifting pin 95, carried by the core 75, will rock the arms 72 and 74 from the full line position to the dotted line position shown in Fig. 7. This action may take place while the actuator lever is descending on cam 60. The spring 71 will thereupon act to lower the shield 69 until the latter assumes the position shown in dotted lines in Fig. 7. The supporting finger 68, not being sustained by the shield, permits the pawl 67 to fall to the dotted line position shown in Fig. 7.

Shortly after this action has taken place the depleted shuttle will be picked from the plain to the box end of the loom, the actuator lever continuing its downward movement until it assumes the position shown in Fig. 8. Continued operation of the loom will result in a shifting of the boxes so that the lower box 52 and shuttle S′ become active. As soon as this shuttle has been completely picked from the lower box the cam 60 will give the actuator lever 62 a quick upward movement the effect of which will be to cause pawl 67 to engage tooth 82 and move the knock-off member 80 to the position shown in Fig. 9. The shield has a tooth 96 which engages tooth 82 to hold the latter and the member 80 in its new position. As the actuator lever continues its upward movement the shuttle S′ will travel toward the plain side of the loom. When the lay again reaches top center shuttle S′ will be picked to the box side of the loom with the actuator lever descending to the position shown in Fig. 10.

When shuttle S′ arrives at the box end the boxes will again shift and the empty shuttle which gave the previous indication will again become active. Immediately after the picking of this shuttle S is complete the cam will give the actuator lever another upward movement the effect of which will be to cause pawl 67 to engage tooth 83. Continued upward movement of the lever 62 will move the knock-off lever 80 from the position shown in Fig. 10 to that shown in full lines in Fig. 11.

This last movement on the part of the member 80 results in an endwise thrust of rod 97 which is pivotally connected to the upper end of the knock-off member 80. A lost motion slot 98 in the rod 97 prevents the first movement of the member 80 from rocking the shipper shaft. The shipper shaft 29 has an offset 100 passing through slot 98 so that as rod 97 moves to the right in Fig. 1 the shipper shaft and handle will be rocked in a left hand direction to effect loom stoppage. As previously described the brake band 23 will engage the drum to bring the loom to rest preferably before the lay reaches front center.

During the latter part of the upward movement last described on the part of the lever 62 the dog 87 enters the notch 89 and the point 88 thereof comes into lifting engagement with shield 69. The notch is so designed that the dog may pivot about stud 85 after tip 88 rises above surface 90, thereby letting the bottom of the dog move over the lifting lug 91 of the actuated lever 62. The last part of the upward movement of the latter will lift the dog and shift the shield from the full line to the dotted line position shown in Fig. 11. As soon as the arm 76 rises above the top of arm 72 the latter will return to the position shown in Fig. 4 by reason of the weight of the core 75 and also the latch arm 74.

It is to be understood that the knocking-off is completed sometime prior to the arrival of the depleted shuttle in the plain box so that a repeated indication cannot be given. The latch will therefore be free to move under the arm 76 to support the shield 69. As soon as the shield 69 is raised the holding tooth 96 and also the actuator pawl 67 will be moved out of engagement with the ratchet 81 and the latter together with the member 80 will be restored to the position shown in Fig. 4 by a spring plunger 99. During movement of the lever 80 to the left the lifting point or tip 88 of the dog will engage the shield so that the lower end thereof will be swung to the left to clear the lifting lug 91. Subsequently, the lever 62 will drop as the cam 60 continues to rotate to give further clearance of the dog to enable the same to return to the position shown in Fig. 4.

In order that the circuit may be broken during the time that the loom is stopped the contacts 45 and 46 are so arranged that when the shipper handle and brake move to a position corresponding to loom stoppage these contacts will be separated.

From the foregoing it will be seen that I have provided an electrically operated device which will act to delay the stopping of the loom a predetermined number of picks after indication of weft exhaustion is given. In the case set forth a 2 x 1 loom has been described as weaving two picks with one shuttle and then two picks with the other shuttle, the detecting being done at the plain end and the delay acting through several picks and operating to stop the loom when the indicating shuttle is again on the plain side of the loom. It will also be seen that the lifting dog acts to reset the device and is raised during the first part of the resetting operation by the knock-off member 80 and then when positioned over the lifting lever 91 is given an additional lifting movement independently of the ratchet 81 to raise the shield 69 above the latch arm 72.

Having thus described my invention it will be seen that changes and modifications may be made therein by those skilled in the art without departing from the spirit and scope of the invention and I do not wish to be limited to the details herein disclosed, but what I claim is:

1. In apparatus to bring about a change in the operation of a loom operating with a single and two shifting shuttle boxes and having two shuttles which are alternately active each for two picks, an electrical weft detector to indicate substantial exhaustion in either shuttle when active and in the single shuttle box, an electro-magnetic device having its magnetic field changed by action of the detector when the latter indicates weft exhaustion, loom controlling means, a regularly moving actuator held out of action normally, a delay device to be operatively related to the actuator subsequent to indication of weft exhaustion, and a controller for the actuator normally holding the same out of operative relation with respect to the delay mechanism and movable by the electro-magnetic device to effect operative relation between the actuator and the delayed device, said actuator and delay device being effective cooperatively when the exhausted shuttle is again in the plain box to bring about a change in the operation of the loom.

2. In apparatus to bring about a change in the operation of a loom operating with a single and two shifting shuttle boxes and having two shuttles which are alternately active each for two picks, an electrical weft detector to indicate substantial exhaustion in either shuttle when active and in the single shuttle box, an electro-magnetic device having its magnetic field changed by action of the detector when the latter indicates weft exhaustion, loom stopping means, a regularly moving actuator, a progressively movable ratchet delay device positioned for cooperation with the actuator, and a controller for the latter the position of which is determined by the electro-magnetic device, the latter acting when its magnetic field is changed to move the controller and thereby effect operative relation between the actuator and the ratchet delay device, said actuator and delay device effective cooperatively when the exhausted shuttle is again in the plain box to coact with the loom stopping means to stop the loom.

3. In apparatus to bring about a change in the operation of a loom operating with a single and two shifting shuttle boxes and having two shuttles which are alternately active each for two picks, an electrical weft detector to indicate substantial exhaustion in either shuttle when active and in the single shuttle box, an electro-magnetic device having its magnetic field changed by action of the detector when the latter indicates weft exhaustion, a regularly moving actuator, a pawl therefor, a ratchet delay mechanism, a shield for the pawl holding the latter normally out

of relation with respect to the ratchet delay mechanism, and means under control of the electro-magnetic device to effect such movement of the shield as will cause operative relation between the pawl and the ratchet device, the delay mechanism being effective to cause loom stoppage through the actuator when the exhausted shuttle is again in the plain shuttle box.

4. In stopping mechanism for a loom having plain and drop boxes and an electric feeler, an electro-magnetic device to be actuated when the feeler indicates exhaustion of weft with an exhausted shuttle in the plain box, an actuator having regular movements, a ratchet delay device to be operatively connected to the actuator, and a pawl on the actuator normally held out of relation with respect to the ratchet device, actuation of the electro-magnetic device at the time of exhaustion of weft effecting cooperation between the pawl and the ratchet device to effect loom stoppage when the exhausted shuttle is again in the plain shuttle box.

5. In stopping mechanism for a loom having an electric feeler, an electro-magnetic device to be actuated when the feeler indicates exhaustion of weft, an actuator having regular movements, a pawl moving with and movable with respect to the actuator, a ratchet delay device, a shield normally holding the pawl out of relation with respect to the ratchet device, and a release for the shield under control of the electro-magnetic device and movable when the latter is actuated at weft exhaustion to effect operative relation between the pawl and the ratchet device, the latter acting during the fourth pick subsequent to exhaustion indication to stop the loom.

6. In stopping mechanism for a loom having an electric feeler, an electro-magnetic device to be actuated when the feeler indicates exhaustion of weft, an actuator having regular movements, a pawl moving with and movable with respect to the actuator, a ratchet delay device, a shield normally holding the pawl out of relation with respect to the ratchet device, a release for the shield under control of the electro-magnetic device and movable when the latter is actuated at weft exhaustion to effect operative relation between the pawl and the ratchet device, the latter acting during the fourth pick subsequent to exhaustion indication to stop the loom, and means moving with the ratchet to reset the shield.

7. In stopping mechanism for a loom having an electric feeler, an electro-magnetic device to be actuated when the feeler indicates exhaustion of weft, an actuator having a regular movement every second beat of the loom, a pawl pivoted thereto and moving therewith, a knock-off device, a ratchet moving with the knock-off device and adapted for coaction with the pawl, a shield normally holding the pawl out of relation with respect to the ratchet, and a latch for the shield under control of the electro-magnetic device and holding the latch in normal position, actuator of the electro-magnetic device moving the latch to release the shield and the latter moving to effect operative relation between the pawl and the ratchet, the knock-off device being movable by the ratchet and during the second movement of the actuator thereafter to effect loom stoppage.

8. In stopping mechanism for a loom having an electric feeler, an electro-magnetic device to be actuated when the feeler indicates exhaustion of weft, an actuator having a regular movement every second beat of the loom, a pawl pivoted thereto and moving therewith, a knock-off device, a ratchet moving with the knock-off device and adapted for coaction with the pawl, a shield normally holding the pawl out of relation with respect to the ratchet, a latch for the shield under control of the electro-magnetic device and holding the shield in normal position, actuation of the electro-magnetic device moving the latch to release the shield and the latter moving to effect operative relation between the pawl and the ratchet, the knock-off device being movable by the ratchet and during the second movement of the actuator thereafter to effect loom stoppage, and a resetting device moving with the ratchet to restore the shield to normal position at the time the knock-off member effects loom stoppage.

9. In stopping mechanism for a loom having an electric feeler, an electro-magnetic device to be actuated when the feeler indicates exhaustion of weft, an actuator having a regular movement every second beat of the loom, a pawl pivoted thereto and moving therewith, a knock-off device, a ratchet moving with the knock-off device and adapted for coaction with the pawl, a shield normally holding the pawl out of relation with respect to the ratchet, a latch for the shield under control of the electro-magnetic device and holding the latch in normal position, actuation of the electro-magnetic device moving the latch to release the shield and the latter moving to effect operative relation between the pawl and the ratchet, the knock-off device being movable by the ratchet during the second movement of the actuator thereafter to effect loom stoppage, and a resetting device moving with the ratchet to restore the shield to normal position at the time the knock-off members effects loom stoppage, said resetting device deriving its shield moving force from the actuator.

10. In stopping mechanism for a loom having an electric feeler, an electro-magnetic device to be actuated when the feeler indicates exhaustion of weft, a pivoted actuator lever having an operative stroke on alternate beats

of the loom, a pawl pivoted to and moving with the actuator lever, a knock-off lever moving pivotally around the axis of the actuator lever, a ratchet on the knock-off lever, a shield normally holding the pawl out of relation with respect to the ratchet, and a latch for the shield under control of the electro-magnetic device, the latter when actuated at weft exhaustion moving the latch to release the shield and the latter thereafter moving to effect operative relation between the pawl and ratchet, the latter having two teeth the second of which when in engagement with the pawl is effective to bring about loom stoppage through the knock-off member.

11. In stopping mechanism for a loom having an electric feeler, an electro-magnetic device to be actuated when the feeler indicates exhaustion of weft, a pivoted actuator lever having an operative stroke on alternate beats of the loom, a pawl pivoted to and moving with the actuator lever, a knock-off lever moving pivotally around the axis of the actuator lever, a ratchet on the knock-off lever, a shield normally holding the pawl out of relation with respect to the ratchet, and a latch for the shield under control of the electro-magnetic device, the latter when actuated at weft exhaustion moving the latch to release the shield and the latter thereafter moving to effect operative relation between the pawl and ratchet, the latter having two teeth the second of which when in engagement with the pawl is effective to bring about loom stoppage through the knock-off member, said shield having a hold pawl to coact with the ratchet.

12. In stopping mechanism for a loom having an electric feeler, an electro-magnetic device to be actuated when the feeler indicates exhaustion of weft, a pivoted actuator lever having an operative stroke on alternate beats of the loom, a pawl pivoted to and moving with the actuator lever, a knock-off lever moving pivotally around the axis of the actuator lever, a ratchet on the knock-off lever, a shield normally holding the pawl out of relation with respect to the ratchet, a latch for the shield under control of the electro-magnetic device, the latter when actuated at weft exhaustion moving the latch to release the shield and the latter thereafter moving to effect operative relation between the pawl and ratchet, the ratchet having two teeth the second of which when in engagement with the pawl is effective to bring about loom stoppage through the knock-off member, said shield having a hold pawl to co-act with the ratchet, and a resetting device effective at the time of loom stoppage to move the shield and the pawl thereon out of holding relation with respect to the ratchet to assist in resetting of the knock-off lever.

13. In stopping mechanism for a loom having an electric feeler, an electro-magnetic device to be actuated when the feeler indicates exhaustion of weft, a pivoted actuator lever having an operative stroke on alternate beats of the loom, a pawl pivoted to and moving with the actuator lever, a knock-off lever moving pivotally around the axis of the actuator lever, a ratchet on the knock-off lever, a shield normally holding the pawl out of relation with respect to the ratchet, a latch for the shield under control of the electro-magnetic device, the latter when actuated at weft exhaustion moving the latch to release the shield and the latter thereafter moving to effect operative relation between the pawl and the ratchet, the ratchet having two teeth the second of which when in engagement with the pawl is effective to bring about loom stoppage through the knock-off member, said shield having a hold pawl to co-act with the ratchet, and a resetting device effective at the time of loom stoppage to move the shield and the pawl thereon out of holding relation with respect to the ratchet to assist in resetting of the knock-off lever, the resetting device deriving its force from the actuator lever on the second working stroke thereof following indication of weft exhaustion.

14. In stopping mechanism for a loom having plain and drop boxes and an electric feeler, an electro-magnetic device to be actuated when the feeler indicates exhaustion of weft with an exhausted shuttle in the plain box, an actuator having regular movements, a ratchet delay device to be operatively connected to the actuator, a driving pawl on the actuator, a combined shield and hold pawl to hold the driving pawl normally out of relation with respect to the ratchet device, actuation of the electro-magnetic device effective to move the combined shield and hold pawl to cause engagement between the driving pawl and the ratchet and holding relation between the ratchet and hold pawl, the ratchet device to effect loom stoppage when the exhausted shuttle is again in the plain box.

In testimony whereof I have hereunto affixed my signature.

OSCAR V. PAYNE.