Dec. 31, 1935. R. G. TURNER 2,026,148

WEFT DETECTOR ACTUATED BY DIRECT LIGHT

Filed April 26, 1934

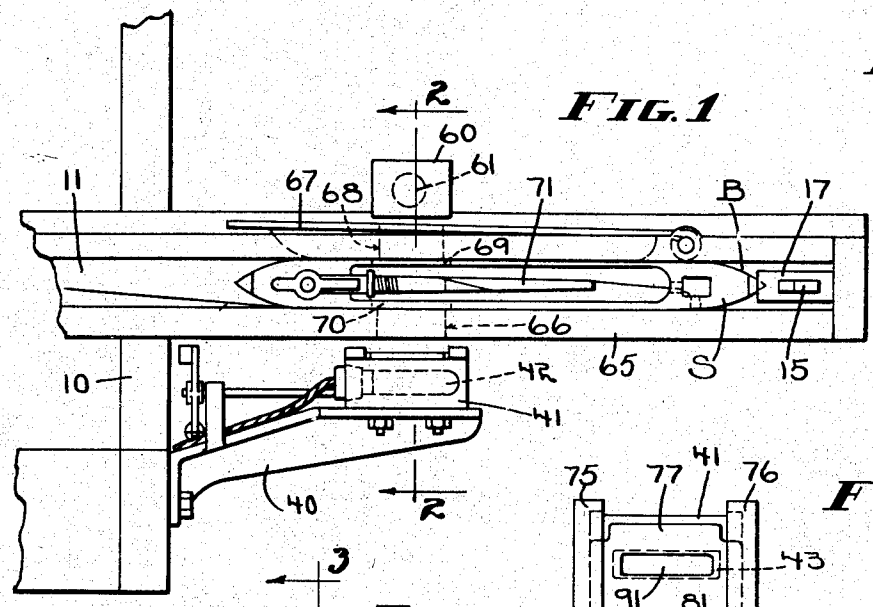


FIG. 1

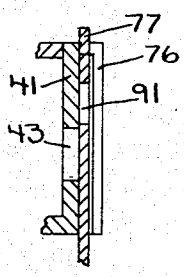


FIG. 4

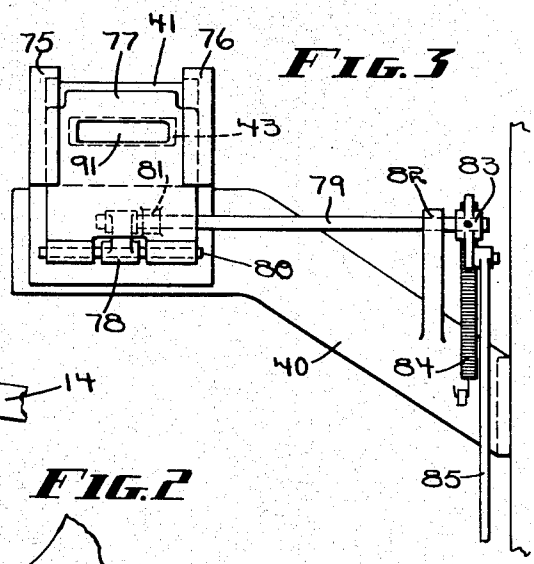


FIG. 3

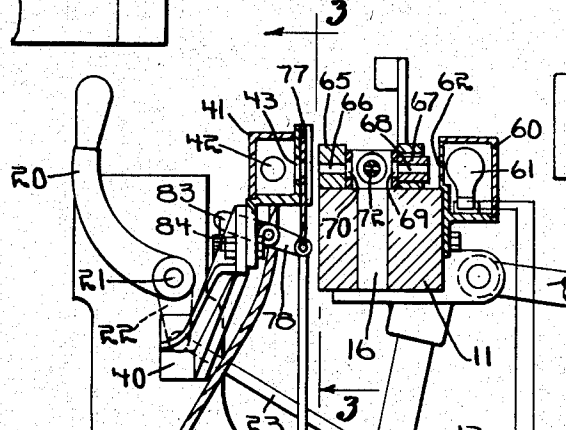


FIG. 2

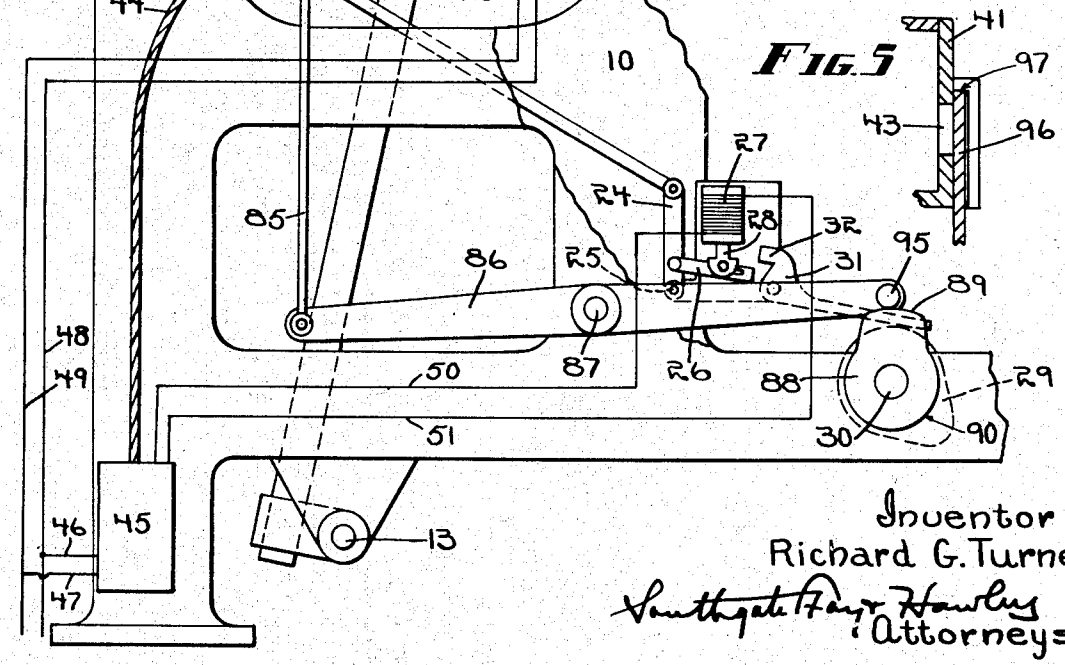


FIG. 5

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WEFT DETECTOR ACTUATED BY DIRECT LIGHT

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17 Claims. (Cl. 139—273)

This invention relates to improvements in weft detectors for looms and it is the general object of the invention to provide a detector which will avoid contact with the yarn and operate preferably by a beam of light which is normally rendered inoperative by presence of weft, but which upon substantial depletion of weft is allowed to shine directly upon a light sensitive detector element.

In my co-pending application Serial No. 720,739 I have set forth a weft detector of the general type described herein and so arranged that the detecting element is responsive to change of illumination and arranged when this alteration occurs to bring about a change in loom operation. In that application the change in illumination is effected by reflected light. It is an important object of my present invention to employ shuttles and bobbins so constructed that a source of light which would normally tend to shine directly upon the sensitive element at the time of detection is prevented from doing so by weft presence. When the weft reaches a given minimum it will no longer be able to obstruct the passage of light and the detector cell, whatever its form, will be energized by a ray of light falling directly upon it. In this way I avoid any variation in the intensity of the actuating beam which might result from using a number of bobbins or the like, each with its own reflecting surface.

Every alternate beat of the loom the shuttle box at the detecting end of the loom will be empty and a false indication might thereby be given. In order to avoid this result I provide means for preventing a ray of light from being able to fall on the light sensitive element when the shuttle box is empty. I may provide a shutter or the like which interrupts the beam of light when it would otherwise pass through an empty shuttle box to excite the detector. As a particular means of accomplishing this result, I may use a cam or the like having a complete revolution in two picks of the loom and operatively related to an opaque shield which allows light to pass toward the detector only at such times as actuation of the detector is desired.

My present invention can be used with bobbins which are provided with a slot to transmit light where means are provided to position the bobbin so that the slot is always able to transmit light, or a special form of bobbin may be used so constructed that it will transmit light regardless of its angular position with respect to the shuttle. In either instance the bobbin can be constructed to transmit a comparatively small amount of light inasmuch as the detector is to be actuated only by direct rays and color of the yarn being detected will not have any appreciable effect upon the light which reaches the detector. In this respect my present invention differs from that set forth in the aforesaid application. In the arrangement set forth herein presence of yarn casts a shadow upon the detector element and depletion of the weft by the weaving operation removes the shadow to permit actuation of the detector.

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 drawing, wherein a convenient embodiment of my invention is set forth,

Fig. 1 is a plan view of an end of a loom showing the lay and associated detector parts,

Fig. 2 is a vertical section on line 2—2 of Fig. 1 showing a loom controlling mechanism,

Fig. 3 is a detail rear elevation taken along line 3—3 of Fig. 2,

Fig. 4 is a detail diagrammatic view of a part of Fig. 2, but showing a different position, and

Fig. 5 is a view of a slightly different shutter plate.

Referring to the drawing, I have shown a loom 10 having a lay 11 mounted on swords one of which is designated at 12 in Fig. 2. The lay rocks on a rocker shaft 13 and is driven back and forth by a shaft not shown attached to connectors 14.

By means not shown the picker stick 15 is propelled inwardly in slot 16 of the lay to drive the shuttle S out of the box B to the opposite side of the loom. As shown herein this picking operation may occur on alternate beats of the loom, the shuttle box B containing no shuttle on the intervening picks when the picker stick is idle. The picker 17 may be of the usual type either secured to or moving with the picker stick.

In Fig. 2 I show a shipper handle 20 on shaft 21 and having a lower arm 22 connected to rod 23. The latter is connected to an upright lever 24 on a fixed pivot 25 and a link 26 is attached to the lever. An electro-magnetic control device, such as solenoid 27, has a core 28 connected to the link 26. A cam 29 on bottom shaft 30 rocks a knock-off lever 31 having a knock-off finger 32 in timed relation with the loom and as shown herein on alternate beats of the lay.

When the loom is running the shipper handle will be pulled forward or to the left as viewed in

Fig. 2, the effect of which will be to move rod 23 to the right, thereby placing the lever 24 in its right hand position. When the solenoid is deenergized the knock-off finger 32 will pass above the adjacent edge of the link 26 and the cam and cam lever will have no connection with the shipping mechanism. When the solenoid is energized, however, the core 28 is raised to lift the link 26 into the path of the finger 32 and the subsequent rocking stroke of the lever 31 will push the link to the left as viewed in Fig. 2 and effect rocking of the shipper handle in a clockwise direction. The particular knock-off shown herein forms no part of my present invention and may be substantially the same as shown in prior patent to Payne No. 1,873,465, to which reference may be had for a further understanding of the details of structure and operation of the knock-off mechanism controlled through the electro-magnet. It is sufficient for the purpose of the present invention to note that energization of the solenoid 27 results in a change in loom operation, in this instance, loom stoppage.

The matter thus far described of itself forms no part of my present invention and may be of the usual construction.

In carrying my present invention into effect I secure to the loom frame a stand 40 to which is secured a housing 41 in which is located a photo-electric cell or tube 42 sensitive to a change in illumination. As shown more particularly in Fig. 2 the housing is closed on all sides except the rear in which there is located a port or slot 43 so positioned that light entering will fall on the photo-electric tube.

A cable 44 containing electric connections extends between the tube and a relay mechanism shown generally herein at 45. The relay mechanism is fed by wires 46 and 47 tapped in from feed wires 48 and 49, respectively, and there lead from the relay other wires 50 and 51 which are connected as shown in Fig. 2 to the solenoid 27.

The details of connection between the photo-electric tube, the relay, the solenoid and certain other electrical apparatus considered desirable in this form of electric apparatus may be the same as shown in the aforementioned application Serial No. 720,739. These connections of themselves form no part of my present invention and it is thought sufficient for the purposes of present description that when a change occurs in the illumination of the photo-electric tube, the mechanism designated generally at 45 will operate to send current through wires 50 and 51 to energize the solenoid 27.

Secured to the back of the lay is another housing 60 containing an electric lamp 61 which may be fed by wires 48 and 49. The housing 60 may if desired be closed on all sides but has in the front thereof a slot 62 which may be as shown in Fig. 2 at substantially the same height as slot 43, although this relation is not essential.

The shuttle box B has a box front 65 with a slot 66 while the binder 67 for the shuttle is provided with a slot 68. The shuttle S may have front and back slots 69 and 70, respectively, while the bobbin 71 may have a slot 72. The bobbin may be formed and held in the shuttle as set forth in my prior Patent No. 1,611,394 and the parts are so disposed that when the shuttle is boxed the slots 43, 62, 66, 68 and 72 are all so related that if the bobbin be empty of weft, light can pass from the lamp 61 to the photo-electric tube 42. If desired, a bobbin as shown in Patent No. 1,612,081 may be used, in which case light will be able to pass through the bobbin regardless of its angular position relatively to the shuttle.

As is common with certain types of looms the shuttle will be picked alternately from the two ends of the lay, which means that on every other beat of the lay the shuttle box B will be empty. Under these conditions the lamp, if continuously burning, would come near enough to the photo-electric tube to energize it and thereby give a false indication as the lay advanced. It is an important feature of my present invention to provide means for preventing a direct ray of light from passing from the lamp through the slots already mentioned except at those times when detection of weft is desired. I show herein one particular way of accomplishing this result, but I do not wish to be limited to such means.

The housing 41 is provided with a pair of guides 75 and 76 slotted to receive a thin shutter or opaque plate 77 which lies close to that part of the housing 41 in which the slot 43 is located. The lower end of the plate is connected to an arm 78 attached to a shaft 79. A pin 80 may be used to establish connection between the arm 78 and plate 77 as set forth more particularly in Fig. 3. The shaft 79 will be rocked in a bearing 81 associated with the housing 41 and in a second bearing 82 supported by the bracket 40. A small lever 83 is secured to the shaft 79 and has one arm connected to a spring 84 which, as shown in Figs. 2 and 3, acts normally to raise the plate 77. The other end of the lever 83 is connected to a rod 85 connected at its lower end to a lever 86 pivoted at 87 and positioned by a cam 88 having a high point 89 and a low dwell 90. The plate 77 may have a slot 91 through which light can pass, and a cam roll 95 on the lever engages the cam.

In operation, lamp 61 will be burning constantly and the lay will move back and forth, the shuttle being in box B on alternate beats. When the shuttle enters the box B during the forward movement of the lay the timing of the shaft 30 will be such that the cam 88 will place the riser or high point 89 under roll 95, thereby depressing the rod 85 so that the slot 91 comes into alignment with the other light transmitting slots already described. If under these conditions sufficient weft is present in the shuttle for continued weaving, it will block passage of light through the bobbin slot 72 and a shadow will be cast on the photo-electric cell 42. Under these conditions there will be no excitation of the tube or the relay and the loom will continue to run.

As the lay moves rearwardly after reaching its foremost position the picker stick will be operative to propel the shuttle to the opposite side of the loom, but before this happens the cam 88 will be turned far enough so that spring 84 will move the lever 86 in a clockwise direction as viewed in Fig. 2, operatively relating the lever to the low dwell 90. The effect of this motion is to raise the plate 77 to the position shown in Fig. 4, so that the opaque part thereof under the slot 91 will be in the path of the ray of light before the shuttle is picked. In this way a false indication, which might otherwise result when the path through the shuttle box was unobstructed due to shuttle picking, is obviated. During the subsequent beat-up of the lay when the shuttle is on the opposite side of the loom the dwell 90 will continue to control the lever 86, and slot 43 will be blocked to light.

When the shuttle again is picked into box B it may have its weft supply depleted, and after it

is boxed the riser 89 will depress the plate 77, whereupon light emanating from the lamp 61 will pass through slots 62, 86, 72, 70, 66, 91 and 43 falling onto the photo-electric tube and energizing the latter to excite the solenoid 27. Thereafter a change in loom operation will occur as already described.

If desired a modified form of plate 96 can be used the upper edge 97 of which will be above the slot 43 during the greater part of a two-pick cycle of the loom, the opaque part of the plate casting a shadow on the photo-electric cell when in raised position. This form of plate can be lowered so that light can pass over the top of it into the slot 43 to accomplish the result achieved when the parts previously described are in the position shown in Fig. 2.

From the foregoing it will be seen that I have provided a simple means for indicating weft exhaustion without physical contact of any of the detecting parts with the weft. This result is achieved as shown herein by placing a source of light and a photo-electric tube in such a relation to each other that when detecting is possible weft presence will cast a shadow on the tube, but if weft be absent, or substantially depleted, the light is transmitted through the weft carrier to excite the photo-electric element. It will also be seen that excitation of the photo-electric tube is prevented at all times except those when a shuttle is boxed and in a position to be detected. It will also be seen from Fig. 2 that when the parts are related for detection, the port or slot 43 is close to lay carried parts which do not transmit light except for the slot 66 and the possibility of extraneous light entering the housing 42 is thereby greatly reduced. If desired, the circuit can be adjusted so that the intensity of light from the lamp 61 passing through the slots will not be sufficient to excite the photo-electric tube until the lay is in the forward part of its stroke. This result can be accomplished because the intensity of the light varies inversely as the square of the distance between the lamp and the tube.

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 a loom, a photo-electric weft detector effective upon a change of illumination thereof to initiate a change in loom operation, and a source of light tending at the time of detection to shine directly upon the weft detector to change the illumination thereof and prevented from shining on said detector when sufficient weft for continued weaving is present.

2. In a loom, a weft detector effective upon a change of illumination thereof to initiate a change in loom operation, a source of light positioned to shine directly upon and change the illumination of the detector at the time of weft detection, and a weft supply to prevent the source of light from changing the illumination of the detector when sufficient weft for continued weaving is present.

3. In a loom, a weft detector effective upon a change of illumination thereof to initiate a change in loom operation, a source of light, and a shuttle containing a supply of weft and so formed as to define a passage for light from the source to the detector, presence of sufficient weft for continued weaving preventing transmission of light through the shuttle from the source to the detector.

4. In a loom, a weft detector effective upon a change of illumination thereof to initiate a change in loom operation, a source of light, a weft carrier between the source of light and weft detector effective when sufficient weft for continued weaving is present to cast a shadow upon the detector and effective when insufficient weft is present to define a passage for light from the source to the detector to change the illumination of the detector.

5. In a loom, a weft detector effective upon a change of illumination thereof to initiate a change in loom operation, a source of light, a shuttle, a weft carrier in the shuttle, the carrier and shuttle being located between the source of light and the detector, sufficient weft for continued weaving casting a shadow upon and causing no substantial change in illumination of the detector, and said carrier and shuttle being so formed as to define a passage for light when insufficient weft is present from the source to the detector to change the illumination of the latter.

6. In a loom, a weft detector effective upon a change of illumination thereof to initiate a change in loom operation, a source of light tending to change the illumination of the detector, and means to place a sufficient supply of weft for continued weaving in position to cast a shadow upon and prevent change of illumination of the detector.

7. In a loom, a photo-electric weft detector effective when the illumination thereof is changed to initiate a change in loom operation, a source of light, and a weft supply to be located between the source of light and the detector at the time of weft detection.

8. In a loom, a substantially stationary weft detector effective upon a change of illumination thereof to initiate a change in loom operation, a source of light movable toward and from the detector, and means to interpose a weft supply between the source of light and the detector to prevent light from falling on the detector when sufficient weft is present and permit light to fall on the detector when insufficient weft is present.

9. In a light actuated weft detector, a stationary element effective upon a change of illumination to initiate a change in loom operation, a movable source of light, and means to interpose a supply of weft between the source of light and the element at the time of detection.

10. In a loom operating with a weft supply, a weft detector effective upon a change of illumination thereof to initiate a change in loom operation, a source of light movable toward and from the weft detector, and effective when approaching the detector and when the weft supply is substantially exhausted to change the illumination of the detector.

11. In a loom, a weft detector effective upon a change of illumination thereof to initiate a change in loom operation, a source of light tending normally to change the illumination of the detector, a lay, a shuttle to be in detecting position on alternate beats only of the lay, and means operative on the intervening beats of the lay to prevent the source of light from changing the illumination of the detector.

12. In a loom, a weft detector effective upon a change of illumination thereof to initiate a change in loom operation, a shuttle to be in detecting position on alternate beats of the loom, a source of light normally positioned to effect a change of illumination of the detector, and means to prevent the source from changing the illumination of the

detector on the intermediate non-detecting beats of the loom.

13. In a loom, a shuttle to be in detecting position on alternate beats only of the loom, a weft detector effective when the illumination thereof is changed to initiate a change in loom operation, a source of light positioned to change the illumination of the detector, and means effective on the non-detecting intervening beats of the loom to prevent the source from changing the illumination of the detector.

14. In a loom, a weft detector effective upon a change of illumination thereof to initiate a change in loom operation, a supply of weft to be in detecting position on alternate beats only of the loom, a source of light, and means to render said source of light incapable of changing the illumination of the detector except when the weft supply is in detecting position.

15. In a loom, a lay, a weft detector effective when subjected to a change of illumination to initiate a change in loom operation, a source of light moving with the lay, and means by virtue of which substantial exhaustion of weft causes the light from the source to fall on and change the illumination of the detector.

16. In a loom, a lay, a weft detector on the lay effective when subjected to a change of illumination to initiate a change in loom operation, a source of light on the lay, and means by virtue of which substantial exhaustion of weft causes light from the source to fall on and change the illumination of the detector.

17. In a loom, a weft detector effective upon a change of illumination thereof to initiate a change in loom operation, a lay, a weft carrier with a weft supply on the lay, a source of light moving with the lay and tending normally to change the illumination of the detector and prevented from doing so by a sufficient supply of weft.

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