May 8, 1956 R. B. TAYLOR, SR., ET AL 2,744,545

FILLING DETECTION FOR WEAVING MACHINE

Filed Feb. 11, 1953 4 Sheets-Sheet 1

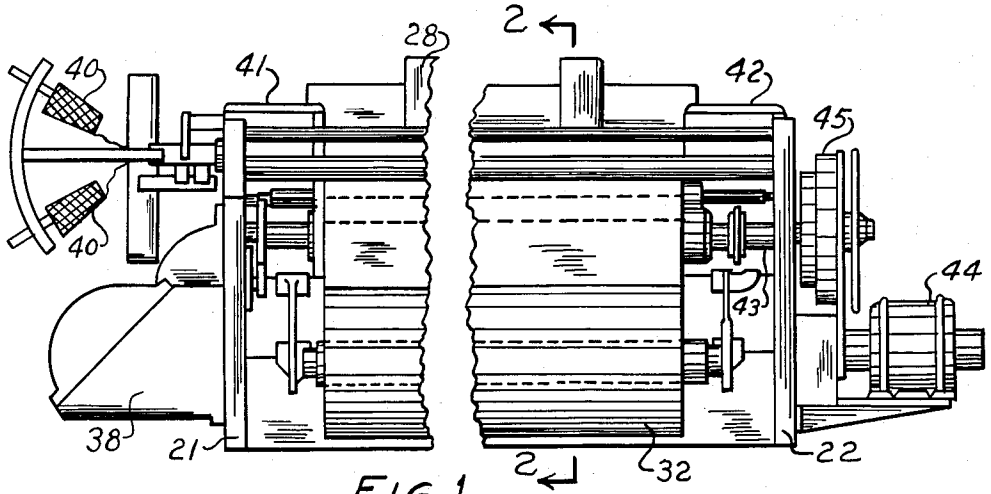


FIG. 1

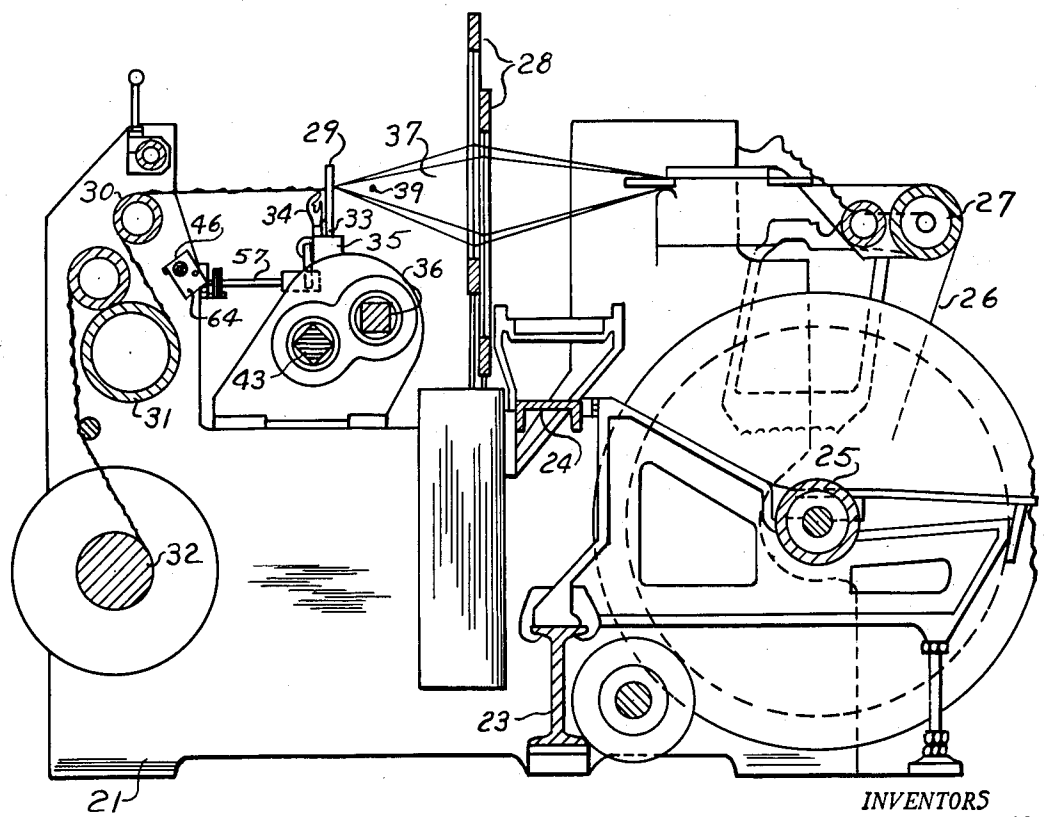


FIG. 2

INVENTORS
ROBERT WHEWELL, JR.
& RALPH B. TAYLOR, SR.
BY
RICHEY, WATTS, EDGERTON & McNENNY
Frederic B. Schramm
ATTORNEYS

May 8, 1956 R. B. TAYLOR, SR., ET AL 2,744,545

FILLING DETECTION FOR WEAVING MACHINE

Filed Feb. 11, 1953 4 Sheets-Sheet 2

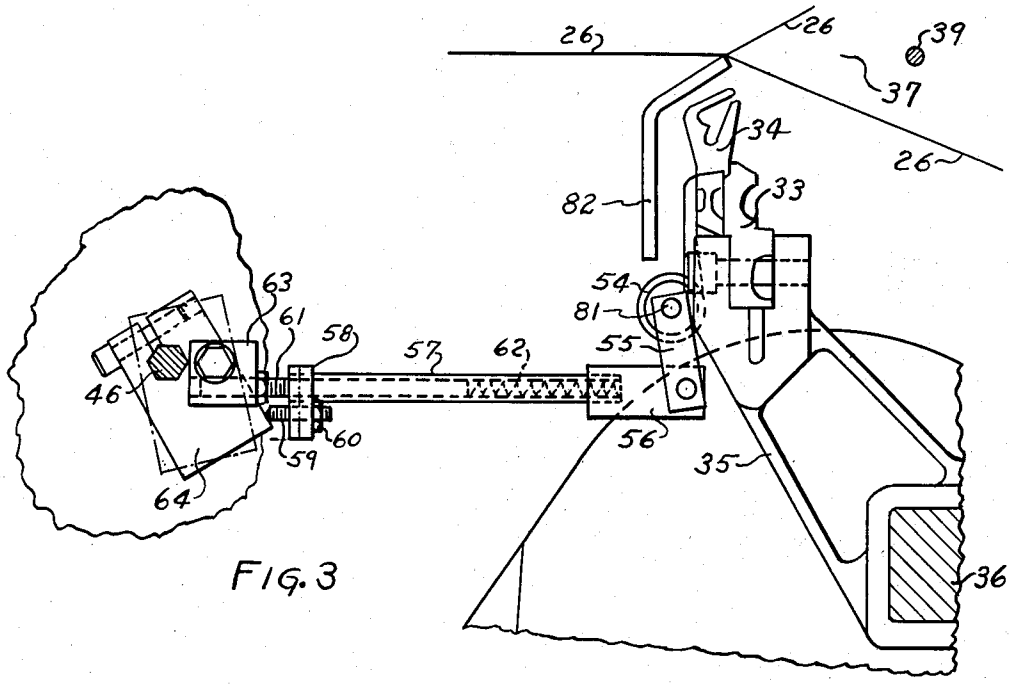


FIG. 3

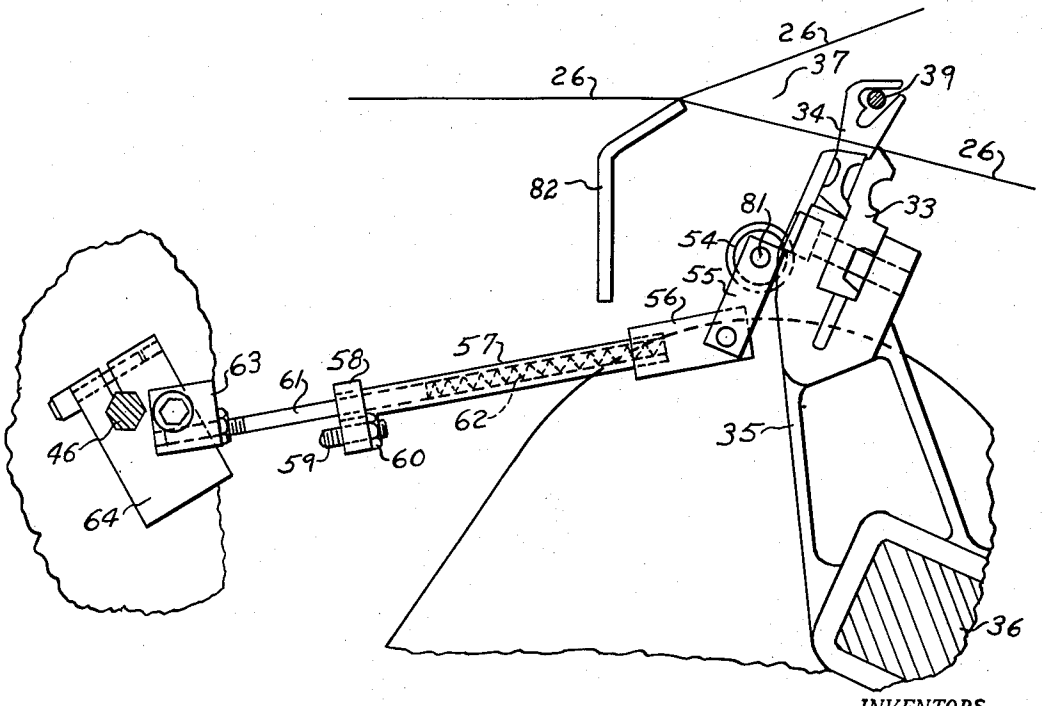


FIG. 4

INVENTORS
ROBERT WHEWELL, JR.
& RALPH B. TAYLOR, SR.
BY
RICHEY, WATTS, EDGERTON & McNENNY
Fredric B. Schramm
ATTORNEYS

May 8, 1956 R. B. TAYLOR, SR., ET AL 2,744,545

FILLING DETECTION FOR WEAVING MACHINE

Filed Feb. 11, 1953 4 Sheets-Sheet 3

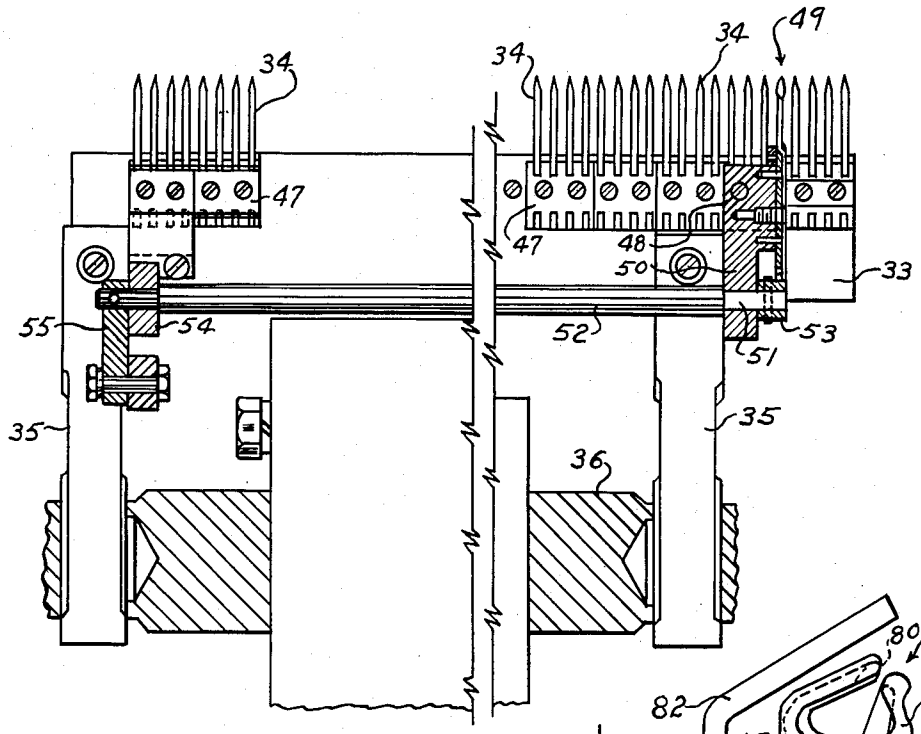


FIG. 5

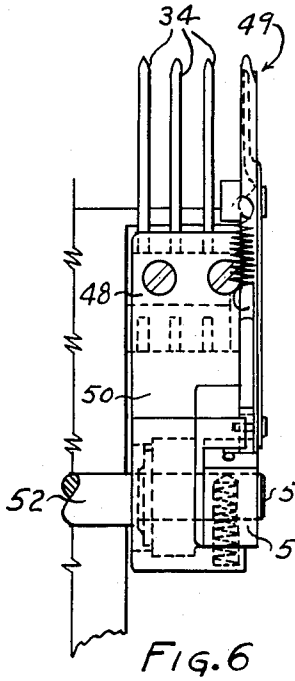


FIG. 6

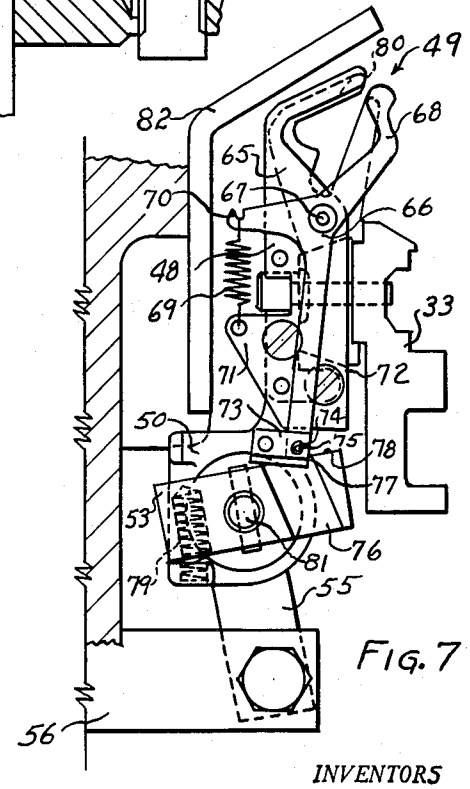


FIG. 7

INVENTORS
ROBERT WHEWELL, JR.
& RALPH B. TAYLOR, SR.
BY
RICHEY, WATTS, EDGERTON & McNENNY
Frederic B. Schramm
ATTORNEYS

May 8, 1956 R. B. TAYLOR, SR., ET AL 2,744,545

FILLING DETECTION FOR WEAVING MACHINE

Filed Feb. 11, 1953 4 Sheets-Sheet 4

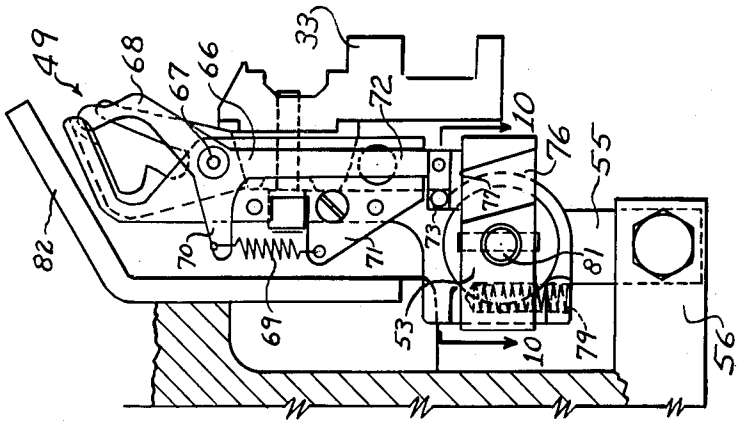


FIG. 9

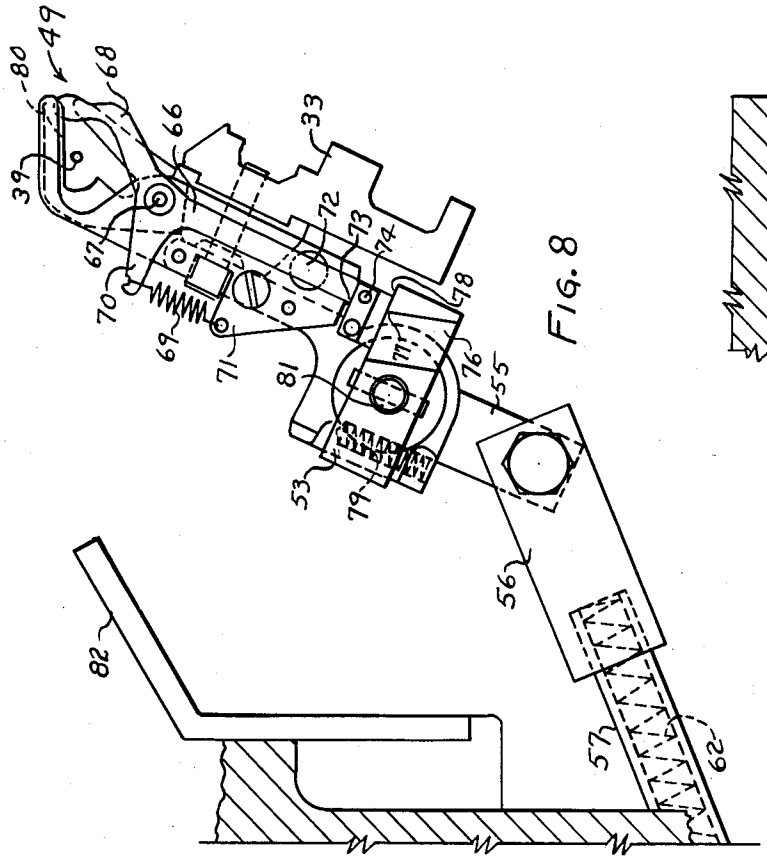


FIG. 8

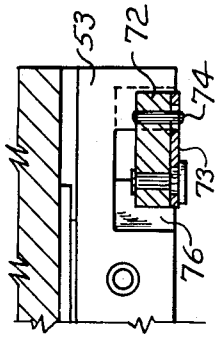


FIG. 10

INVENTORS
ROBERT WHEWELL, JR.
& RALPH B. TAYLOR, SR.
BY
RICHEY, WATTS, EDGERTON & McNENNY
Frederic B. Schramm
ATTORNEYS

United States Patent Office 2,744,545
Patented May 8, 1956

2,744,545

FILLING DETECTION FOR WEAVING MACHINE

Ralph B. Taylor, Sr., East Cleveland, and Robert Whewell, Jr., Garfield Heights, Ohio, assignors to The Warner & Swasey Company, Cleveland, Ohio, a corporation of Ohio

Application February 11, 1953, Serial No. 336,306

13 Claims. (Cl. 139—374)

This invention relates to high speed weaving, particularly to safety arrangements for weaving machines of the gripper shuttle type and has for its principal object enabling perfect cloth to be woven.

In weaving machines of the gripper shuttle type, a new attachment of the weft thread is made to the shuttle each time before a shuttle is shot through the shed from the picking box to the receiving box. A plurality of shuttles is provided. Thus, there is a possibility of a shuttle being fired through the shed without a weft thread or of weft thread breakage; therefore an object of the invention is to provide a weft thread detector that will operate to halt the further operation of a weaving machine whenever weft thread breakage occurs or whenever a shuttle is fired through the shed without a weft thread.

Another object of the invention is to provide a weft thread detector of such configuration, that it can easily be rocked into and out of the shed by the lay bar.

A further object of the invention is to provide a weft thread detector of such configuration that it may be used as a shuttle guide during the time the shuttle is fired or shot through the shed.

Still another object of the invention is to accomplish detection of weft-thread failure and machine shut-down in response thereto accurately and reliably without disturbance of weft threads and requiring a minimum of force.

The invention is applicable to high speed weaving machines of the gripper shuttle type generally similar to the disclosures in such patents as Rossmann 2,099,627, Rusnov 2,538,630, Pfarrwaller 2,538,798, and the copending applications of Nicholas P. Darash, Serial No. 111,416, filed August 20, 1949, now Patent No. 2,654,396, Serial No. 204,867, filed June 8, 1951, now Patent No. 2,660,201, and Serial No. 228,858, filed May 29, 1951, now Patent No. 2,693,830.

In carrying out the invention in a preferred form thereof, a weft detector comprising a fixed and a movable finger is employed in place of one of the shuttle guides of a weaving machine having shuttle guides of the type shown in the patent to Moessinger 2,316,703, which are fixed to the lay bar. The movable finger of the weft detector has a catch fixed to the end thereof which cooperates with a rockable lever which is telescopically connected to a plate fixed to the master stop shaft of the weaving machine in such a manner that when the movable finger of the weft thread detector is not moved about its pivot by a weft thread due to the absence or breakage of the weft thread as lay bar is retracted from the shed, the catch on the end of the finger locks against the rockable lever and increases the movement of said lever, thereby operating the master stop shaft to stop the operation of the weaving machine.

Other and further objects, features, and advantages of the invention will be apparent to those skilled in the art to which the invention pertains from the following detailed description of the present preferred embodiment described with reference to the accompanying drawings in

which similar reference characters represent corresponding parts throughout the several views and in which:

Fig. 1 is a front view of a weaving machine of the gripper shuttle type;

Fig. 2 is a cross section of the weaving machine shown in Fig. 1 and taken along lines 2—2 thereof;

Fig. 3 is an enlarged view of part of Fig. 2 showing the lay bar in its "out of shed" or beat up position;

Fig. 4 is a view similar to Fig. 3, but with the lay bar shown in its "in shed" or shuttle firing position;

Fig. 5 is a front view of the lay bar partly in section and partly in elevation;

Fig. 6 is an enlarged view of a portion of the lay bar shown in Fig. 5 and showing the weft detector;

Fig. 7 is an enlarged view of the weft detector shown in its normal "out of shed" position;

Fig. 8 is a view similar to Fig. 7, but with the weft detector shown in its "in shed" position;

Fig. 9 is a view similar to Figs. 7 and 8, but with the weft detector shown in its tripped position;

Fig. 10 is a view of the rocking lever taken along lines 10—10 of Fig. 9.

Referring to the drawings, the weaving machine comprises a supporting frame including a pair of side plates 21 and 22 secured to reinforcing members 23 and 24. The side plates 21 and 22 support a warp beam 25 upon which are wound warp threads 26. Said warp threads 26 pass over the whip roll 27, through heddles 28, through a reed 29 and now as part of the woven cloth over a roll 30, around a take up roll 31 and onto a cloth beam 32. The reed 29 is fastened to a lay bar 33 which also has shuttle guides 34 fastened thereto. The lay bar 33 is fastened to an arm 35 (see Figs. 2 and 3). The arm 35 is carried by a lay bar shaft 36, the motion of which is such that the reed and shuttle guides enter the shed during the firing of the shuttle and then leave the shed after the shuttle is fired, as is well known in the art.

The action of the heddles 28 forms the shed 37. Said heddles are actuated by a shedding mechanism 38 (Fig. 1). Shuttles carry the weft thread 39 from a weft thread supply 40 through the shed 37. Said shuttles carry the weft thread and are shot through the shed from a picking mechanism 41 to a receiving mechanism 42. Said shuttle picking, guiding, and receiving mechanism are of the general type illustrated in Patents Nos. 2,160,338, 2,160,339, 2,316,703, 2,420,380 to Moessinger and 2,099,627 to Rossmann. An adjustable sheet metal guard 82 may be provided which extends the width of the machine and provides support for the cloth.

All the motions of the weaving machine derive their source of power from a main drive shaft 43 which is driven by V belts by a motor 44 through a hollow drum 45 carried by the main drive shaft 43. The hollow drum 45 has concealed therein automatic clutch and brake means in order to facilitate rapid stoppage of the operating parts of the weaving machine in case of weft or warp thread failure or the failure of some operative part of the weaving machine. The automatic clutch and brake is of the type illustrated and described in the copending patent applications of Nicholas P. Darash, Serial No. 111,416, filed August 20, 1949, now Patent No. 2,654,397, and Serial No. 266,703, filed January 16, 1952. Said clutch and brake are actuated by the rocking movement of a master stop rod 46 as fully explained in said copending applications.

As viewed in Fig. 5, the lay bar 33 has fixed thereto a plurality of shuttle guide holders 47 which hold the shuttle guides 34 in spaced and aligned relationship to each other and to the lay bar 33 in order to form a guideway for the shutle as it is fired through the shed.

In the group of said shuttle guide holders 47 there is a unit 48 of modified construction which supports three

shuttle guides 34 and a weft detector 49 hereinafter described. The shuttle guide holder 48 has a downwardly projecting portion 50 which forms a bearing for the reduced end 51 of a detector shaft 52. A rockable lever 53, hereinafter described, is pinned to the reduced portion 51 of the shaft 52. The opposite end of the detector shaft 52 is carried in a bearing block 54 fixed on the lay bar 33 and has pinned thereto a lever 55. The lever 55 is pivotly connected to a trip rod end 56 which has fixed thereto a tube 57 (Figs. 3 and 4) which carries at its opposite end a block 58. Threaded into and projecting from the block 58 is a set screw 59 which is prevented from rotating by means of a jam nut 60. The tube 57 telescopically supports a rod 61, and interposed between one end thereof and the trip rod end 56 within the tube 57 is a compression spring 62. The other end of the rod 61 is threadedly secured to a pivot block 63, which is pivotly connected to a trip block 64, which is secured to the master stop rod 46. The set screw 59 is adjusted in the block 58 so that the end of the set screw 59 contacts the edge of the trip block 64 when the weaving machine is in its stopped or at rest condition.

Thus, it will be seen that when the lay bar 33 is rocked toward the shed 37 (as shown in Fig. 4) and the shuttle guides 34 enter the shed 37, the rod 61 will telescopically slide out of the tube 57, and the compression spring 62 will assume its free length. Since the pivot block 63 is then free to pivot on the trip block 64, no action will be imparted to the trip block 64. When the lay bar 33 is rocked away from the shed 37, as shown in Fig. 3, and the shuttle guides 34 leave the shed 37, the rod 61 will slide into the tube 57 and compress the spring 62. When the lay bar 33 has reached the end of its outward movement from the shed 37, the set screw 59 in the block 58 will just contact the edge of the trip block 64. In this outermost position, the spring 62 will be compressed, but will not actuate the rod 61 since the pivot point of the pivot block 63 and the center of the master stop rod 46 lie in the same plane, and the compressed energy of the spring 62 can not rock the trip block 63 about its center.

As viewed in Fig. 7, the weft detector 49 consists of a fixed finger 65 secured to the shuttle guide holder 48 and a movable three armed detector finger 66 pivoted about a pin 67 secured to the fixed finger 65. The detector finger 66 has an upwardly extending detector arm 68, which is urged toward the upper portion of the fixed finger 65 by a tension spring 69 acting between a horizontally extending arm 70 of the detector finger 66 and an ear 71 on the fixed finger 65. There is a downwardly extending arm 72 of the detector finger 66 which has a catch 73 pivotly mounted thereon. The catch 73 is limited in its movement by a pin 74 mounted on the arm 72 which cooperates with an opening 75 in the catch 73. The catch 73 cooperates with and fits into an oblique slot 76 milled into the face of the rocker lever 53. The oblique slot 76 forms a knife edge 77 with the top 78 of the rocker lever 53. The opposite end of the rocker lever 53 is cored to receive a compression spring 79, the other end of which is fixed to the lower portion 50 of the shuttle guide holder 48. The compression spring 79 tends to turn the rocker lever 53 and the shaft 52 in a clockwise direction, however the energy of the compression spring 79 is overcome by the energy of the compression spring 62 in the tube 57.

When the lay bar 33 is rocked from its rest or "out of shed" position as shown in Figs. 3 and 7, to its "inshed" position, as shown in Figs. 4 and 8, the rod 61 slides out of the tube 57 and the compression spring 62 assumes its free length. When the energy of the compression spring 79 overcomes the diminishing energy of the compression spring 62, it rotates the rocker lever 53 and the shaft 52 in a clockwise direction. When this occurs, the catch 73 clears the knife edge 77, and the catch moves out of the oblique slot 76 onto the top portion 78 of the rocker lever 53. This movement occurs because the moment that the catch 73 clears the knife edge 77, the tension spring 69 rotates the detector finger 66 about its pivot 67 until the tip of the upper portion 68 of the detector finger 66 registers with a slot 80 in the fixed detector finger 65.

When the lay bar 33 reaches the end of its movement toward the shed 37, the shuttle guides 34 and the weft detector 49 have passed between the warp threads 26 and are now in the shed 37. At this time a shuttle carrying a weft thread 39 is shot through the shuttle guides within the shed 37, and a weft thread 39 is laid in the shed 37. Weft thread grippers now grip the ends of the weft thread, as is well known in the art and as shown in the following patents: 1,948,051 issued to Rossman, 2,519,274 issued to Moessinger, and 2,602,472 issued to Pfarrwaller.

The lay bar 33 now starts its "out of shed" movement to return to the rest position shown in Figs. 3 and 7. As the shuttle guides 34 and the weft detector 49 are withdrawn from the shed 37, the weft-thread 39 contacts the upper arm 68 of the detector finger 66 and pivots it around its pivot 67 and against the action of the tension spring 69. The top of the upper arm 68 moves out of the slot 80 in the fixed finger 65 and forms an opening between the fixed finger 65 and the upper arm 68 of the movable detector finger 66 so that the weft thread 39 can pass between said fingers and said fingers can be removed from the shed 37. As the lay bar 33 is moving out of the shed 37, the compression spring 62 within the tube 57 is being compressed and overcomes the energy of the spring 79 and tends to rock the rocker arm 53 counterclockwise, as viewed in Fig. 8. As the movable detector finger 66 is pivoted about its pivot 67, the catch 73 on the lower arm 72 slides off the top 78 of the rocker arm 53 past the knife edge 77 and into the oblique slot 76 in the rocker arm 53, and the entire mechanism returns to the rest position shown in Figs. 3 and 7.

If however, no weft thread 39 is present or the weft thread 39 is broken in the shed 37 and the lay bar 33 starts its "out of shed" movement, there will be no force exerted against the upper arm 68 of the movable detector finger 66, and it will not be pivoted about its pivot 67 with the result that the spring 69 will keep the catch 73 upon the top surface 78 of the rocker arm 53 with the result that the catch 73 will not enter the oblique slot 76, but will rest upon the top portion 78 of the rocker arm 53 and impart an additional movement of about 15 degrees in the clockwise direction to the rocker arm 53 as is shown in Fig. 9. With the configuration of parts illustrated but very minute force is required for the operation of the weft detector and the operation takes place without significant disturbance in any way of the weft threads whether coarse or fine cloth is being woven.

This additional 15 degrees movement of the rocker arm 53 will be imparted to the shaft 52 and also to the lever 55 moving the trip rod end 56 and the tube further to the left, as viewed in Fig. 3 causing the set screw 59 not only to touch the trip block 64, but to move said trip block to the dot dash position shown in Fig. 3, and thereby to rotate the master stop rod 46 and stop the action of the weaving machine as hereinbefore explained. It will be observed that the length of the stop motion linkage measured from the pivot point 81 of the rocking lever 53 to the edge of the trip block 64 engaged by the set screw 59 is greater when the detector fingers 65 and 66 are closed and the rocking lever 53 is blocked by the catch 73 than when the fingers are open and the catch 73 is free to enter the slot 76.

Thus, it will be seen that the weft detector described and illustrated will upon the absence or the failure of a weft thread, halt the action of the weaving machine before the next pick takes place and thus insure the weaving of more nearly uniform cloth.

While we have shown and described a preferred em-

bodiment of the invention, we do not wish to be confined to the precise details illustrated; but desire to cover all modifications coming within the spirit and scope of our invention as set forth in the claims.

What we claim is:

1. In a weaving machine of the gripper shuttle type having a lay carrying shuttle guides moving into the shed for shuttle picking, and moving out during the beat-up motion of the lay, a weft thread detector comprising a stationary finger and a pivoted movable finger adapted to be mounted among the shuttle guides, the pivoted finger having a detector arm spaced from the stationary finger but with a tip extending toward the stationary finger to form therewith an additional shuttle guide, a transversely extending arm and a downwardly extending arm, the stationary finger being slotted to receive the tip end of the detector arm of the movable finger, a resilient device secured to the transverse arm of the pivoted finger for biasing the pivoted finger to the closed position with the detector arm of the pivoted finger engaged in the slot in the stationary finger, a catch secured pivotally to the lower end of the downwardly extending arm of the said pivoted finger, a rockable lever having a slot adapted to cooperate with said catch and a telescoping stop motion rod pivoted at one end to the stop motion lever, the rockable lever being joined to the stop motion lever at its other end, the stop motion rod having resilient means for resisting compression of the rod and the stop motion rod being adapted to actuate mechanism for stopping operation of the weaving machine upon longitudinal motion beyond a predetermined distance, the rockable lever being provided with resilient means for causing rotation thereof in opposition to the resilient means opposing compression of the stop motion rod but weaker than the latter so as to be overcome thereby when the stop motion rod is compressed, the stop motion rod being so mounted in relation to the lay as to be compressed and moved toward the stopping position of the stop motion mechanism when the lay is in the out of shed position, whereby the presence of a weft thread within the shuttle guides as the shuttle guides are retracted from the shed causes the deflection of the pivoted finger of the weft thread detector to form a gap for release of the weft thread, such movement being against the force of the resilient means of the pivoted finger, deflecting the lower arm thereof to the position wherein its catch is free to enter the slot in the rockable lever, permitting the latter to give, whereby the stop arm rod is not moved far enough longitudinally to effect stop motion, but in the event of weft thread failure, the failure of the pivoted finger to be deflected as the weft detector is retracted from the shed causes the downwardly extending arm of the pivoted finger to remain in a position blocking rotation of the rockable lever, thus causing increased longitudinal motion of the stop arm rod during the beat-up motion of the lay and thereby causing the weaving machine to be shutdown in response to weft thread failure.

2. In a weaving machine of the type having a lay bar movable away from the shed during the beat-up motion and into the shed during the shuttle picking operation and having a stop motion shaft with a trip block secured thereto for causing stoppage of the weaving machine upon motion beyond a predetermined limit of the trip block, a weft thread detector comprising in combination a pair of fingers (adapted to enter the shed as the lay bar returns from the beat-up position), one of said fingers being movable relative to the other and the fingers having a closed position adapted to receive the weft thread as the shuttle is projected through the shed and having an open position permitting the weft thread to clear the fingers through a gap formed between the tips thereof in their open position as the fingers are retracted from the shed during the beat-up motion

of the lay bar, the movable finger being pivoted, having means resiliently biasing it to the closed position and having an arm carrying a catch, a rockable lever having an axis of rotation and having a slot adapted to cooperate with said catch for permitting the rockable lever to rotate in a direction in which the catch is received within the slot when the fingers are in the open position but preventing movement of the catch into the slot and blocking rotation of the rockable lever when the fingers are in the closed position, said rockable lever having means for resiliently biasing it toward the position in which the slot tends to receive the said catch, and a linkage between the rockable lever and the trip block of the stop motion which is longer measured from the rockable lever rotation axis when the rockable lever is in the position blocked by the said catch than when it is in the position receiving the catch, whereby beat up motion of the lay bar actuates the stop motion trip block when there has been a weft thread failure leaving the movable finger in the closed position, said linkage being shortened when the presence of weft thread has caused opening of the fingers permitting the catch to be received in the slot in the rocking lever.

3. In a weaving machine having a lay and a stop motion member adapted to stop operation of the machine when moving a predetermined distance, a weft failure detector system comprising in combination linkage between the lay and the stop motion member having one end secured to the lay movable therewith, said linkage being variable in length, having a shorter length such that motion of the lay does not move the stop motion member sufficiently for actuation and a greater length such that lay motion does move the stop motion member sufficiently for actuation, a weft thread feeler having two positions, one responsive to absence of the weft thread and the other responsive to presence of the weft thread with an operative connection to the said linkage actuated by the feeler in the former position to lengthen said stop motion linkage for stopping operation of the weaving machine with motion of the lay.

4. In a weaving machine having a lay carrying a plurality of shuttle guides, one of which comprises relatively movable fingers, the others comprising relatively fixed fingers, a weft thread detector comprising the shuttle guide with relatively movable fingers, each of the fingers having a tip and the fingers having alternative relative positions in one of which the tips are opened to form a gap for release of weft thread during beat-up motion of the lay as the shuttle guides are retracted from the shed and in the second of which alternative relative positions the finger tips are closed with no gap whereby retraction of the shuttle guides when weft thread is present causes opening of the said gap and relative movement of the detector fingers for release of the weft thread, and a mechanism responsive to failure of such fingers to move to the open gap position during beat-up motion of the lay to stop operation of the weaving machine.

5. In a weaving machine of the type having shuttle guides, each comprising fixed fingers forming a partial enclosure to guide shuttles and a gap between tips of fingers for permitting retraction of the guide during beat-up and release of the weft thread through such gap, a weft thread detector adapted to be mounted among the fixed-finger shuttle guides, said detector comprising a fixed finger and a movable finger of such configuration and movable to such positions as to form an enclosure when the movable finger is in one position and a partial enclosure with a weft releasing gap between finger tips when the movable finger is in the other position, and mechanism responsive to the location of the movable finger in the closed position during retraction to indicate weft failure.

6. Apparatus as in claim 5 wherein the movable finger is resiliently biased to the closed position and carries a

catch, and a rockable member cooperating with said catch is provided which is so formed so as to be locked by such catch when the movable finger remains in closed position during retraction of the shuttle guides to produce a weft failure indication.

7. Apparatus as in claim 6 in which mechanism for stopping the weaving machine is provided which is actuated by the rockable member only when it is in locked position during guide retraction.

8. Apparatus as in claim 7 wherein the machine stopping mechanism comprises a telescoping connecting rod connected at one end to the rockable member and having a conventional weaving machine stop motion member connected to the other end.

9. Apparatus as in claim 8 wherein the telescoping rod is resiliently compressible, with a force opposing compression so selected so as to transmit sufficient force to the stop motion member for actuation only when the rockable member is in locked position during guide retraction.

10. Apparatus as in claim 9 wherein the rockable member is resiliently biased to the locked position by a force weaker than the force opposing compression of the telescoping rod whereby the rocking member yields and prevents sufficient force transmission through the telescoping rod for stop motion actuation unless the said catch is in locking position.

11. A weaving machine of the type having shuttle guides movable into the shed for shuttle picking and retractable from the shed during beat-up motion, a weft thread detector comprising one of said shuttle guides formed with relatively movable fingers having tips, the fingers having two relative positions, in one of which a gap is opened between the tips for release of weft thread during shuttle guide retraction and in the other of which the tips close the gap so that relative motion of the fingers from the closed gap to the open gap position takes place during shuttle guide retraction when a weft thread is present for indication of such presence and failure of relative motion from the closed gap to the open gap position is indicative of weft thread failure.

12. Apparatus as in claim 11 wherein means are provided for resiliently biasing the detector to the closed gap position, stop motion is provided and stop motion arresting means are provided responsive to relative movement of the fingers.

13. In a weaving machine of the type having a lay movable between a shuttle picking position, and a beat-up position retracted from the shed, a weft thread detector system comprising the combination of a pivoted weft thread feeler movable with the lay into the shed during the shuttle picking position and retractable therefrom during the beat-up motion, a rockable lever movable with the lay, a catch actuated by the detector feeler and cooperating with the rockable member for locking it in operative position when the feeler remains undeflected during beat-up motion and for releasing the catch when the feeler strikes weft thread and is deflected thereby during beat-up motion, and a weaving machine stopping mechanism actuated during beat-up motion when the rockable member is locked in the operative position.

References Cited in the file of this patent

UNITED STATES PATENTS

2,383,931	Brown	Sept. 4, 1945
2,427,725	Hoeber	Sept. 23, 1947

FOREIGN PATENTS

105,599	Germany	Sept. 6, 1899
396,334	Germany	May 30, 1924
312,080	Great Britain	Feb. 20, 1930