INVENTOR:
ROBERT L. FOWLER

BY J. Russell Foster
ATTORNEY
This invention relates to an automatic web replenishing loom and more particularly to a filling detector mechanism for such a loom which incorporates a side slipping filling feeler.

In looms of the type having a reciprocating lay on which a shuttle supporting a filling carrying bobbin is traversed, a common practice is to utilize a filling detector mechanism which checks the amount of filling on the bobbin during each beat-up movement of the lay and which actuates a weft or bobbin replenishing operation when the absence of filling on the bobbin is detected.

A common type of filling detecting mechanism in use today for checking a bobbin incorporates a feeler of the side slipping type at the end of which engages the fill each time the bobbin is checked. In the absence of filling on the bobbin, the feeler slips sideways on the bare surface of the bobbin. This side slipping movement is transmitted through a connecting rod or lift wire to a pivoted lever supported on a filling feeler slide. The pivoting of the lever by the lift wire which occurs when the feeler slips, moves a portion of the lever into the path of a trip on a filling cam follower which is reciprocated during the beat-up movement of the lay by means of the filling motion cam on the main cam shaft. The Engagement of the lift lever with the follower trip pivots the slide actuating the bobbin or weft replenishing operation through a suitable mechanism.

The use of the lift wire and lever arrangement in filling detecting mechanisms in use today is characterized by many disadvantages. One problem frequently encountered is the tendency of such a mechanism to actuate the bobbin replenishing mechanism before the filling is exhausted or what might be called “a false change” as a result of loom vibrations and the like which permit the feeler to slip prematurely. Another commonly encountered problem with the lift wire arrangement is the tendency for the loom attendant to use the lift wire for manually actuating the bobbin replenishing operation when such is necessary which frequently results in bending of the lift wire and an attendant misalignment of the component parts.

Another disadvantage encountered in many types of presently employed filling detector mechanisms including those of the lift wire type is the difficulty of adjusting the component parts which are frequently large in number in order to insure that operation of the mechanism is proper and that proper interoperation of the parts is obtained. Generally, the lift is provided with a loop which can be manually bent for adjustment of its length which is at best subject to considerable human error. Furthermore, wear and vibration require that periodic adjustments be made on such present day feeler mechanisms adding to the costs of operating the loom as a result of the time and labor involved.

Accordingly, a primary object of this invention is to provide a new and improved filling detector mechanism which substantially reduces or eliminates false changes on an automatic web replenishing loom.

Another object of this invention is to provide a new and improved filling detector mechanism which incorporates a feeler of the side slipping type which eliminates virtually all lost motion between its component parts and in which all of the side slipping movement of the feeler is positively transmitted to the bobbin replenishing actuating mechanism.

A further object of this invention is to provide a new filling detector mechanism incorporating a side slipping feeler and a plunger in a filling feeler slide for locking the cam follower trip to the slide which may be assembled in a package unit with its component parts in an assembled relationship for installation on a loom in a simple and easy manner and which requires only a minimum of additional adjustment for proper operation.

Still another object of this invention is to provide a new filling detector mechanism which is simple and inexpensive in construction, which is virtually tamper-proof, which is self-compensating for wear and which is capable of prolonged use in a highly accurate manner without the need for periodic adjustment.

Other objects and advantages of the invention will become apparent from the following description taken in conjunction with the accompanying drawings.

In general, the objects of the invention and related objects are accomplished by the provision of a filling detecting mechanism which incorporates a side slipping filling feeler, a filling feeler slide for actuating a bobbin replenishing operation and a cam follower trip. A trip plunger is slidably mounted on the filling feeler slide and is movable from an unlocking position into a locking position in which it is engaged by the cam follower trip the movement of which moves the slide to actuate the bobbin replenishing operation. A Bowden cable having a wire core is supported between the trip plunger housing and a housing supported on the filling feeler guide. A feeler plunger is slidably mounted in the housing on the guide and has one end in engagement with the filling feeler. The wire core of the Bowden cable is connected at one end to the trip plunger and at the other end to the feeler plunger. A coil spring urges the trip plunger to the unlocking position and simultaneously stretches the Bowden cable wire core yieldingly urges the plunger into engagement with the filling feeler.

The novel features which are believed to be characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and method of operation may be best understood by reference to the following description taken in conjunction with the accompanying drawing in which:

FIGURE 1 is an isometric view of the filling detector mechanism of the invention;
FIGURE 2 is an enlarged sectional view taken substantially along line 2—2 of FIGURE 1 in the direction of the arrows; and
FIGURE 3 is an enlarged view taken in the direction of the arrow 3 of FIGURE 1.

Referring now to the drawing, there is shown in FIGURE 1 a filling detector mechanism designated generally by the numeral 10 constructed in accordance with the invention and preassembled as shown for installation in the conventional position on an automatic web replenishing loom. As generally illustrative of the invention, there is provided a feeler designated generally by the numeral 11 of the well known side slipping type supported in a housing or guide 12 suitably secured to the loom (not shown) by means such as a bracket 13. As is well known, the feeler 11 enters the shuttle box to check the bobbin carried by the shuttle during each beat-up movement of a reciprocating lay (not shown) and in the absence of filling on the bobbin, the feeler slips from the solid line to the dotted line position of FIGURE 2.

This side slipping movement of the feeler 11 is transmitted through novel connecting means as will be explained hereinafter to a trip plunger 14 carried by a filling feeler slide designated generally by the numeral 15
whereby the plunger 14 is moved from the solid line position to the dotted line position of FIGURE 2. In the dotted line position of FIGURE 2, the trip plunger 14 is engaged by the reciprocally movable cam follower trip designated generally by the numeral 16 which is reciprocated by means of a filling cam follower as the filling motion cam rides on the main cam shaft the parts of which have been omitted for simplicity. The engagement of the plunger by the trip 16 locks the trip to the slide 15 and rotates the slide 15 to actuate a bobbin replenishing operation through a suitable mechanism (not shown).

The filling feeler 11 and guide 12 are of the well-known construction with the feeler 11 of substantially L-shaped configuration and supported for side slipping movement from the solid line to the dotted line position of FIGURE 2. As shown in FIGURE 2, the feeler 11 includes a tip 17 having wound thereon coils of wire 18 for gripping the filling on the bobbin, a stem 19, an arm 21 having an end 22 engageable with a bearing surface 23 in the guide 12. A coil spring 24 is connected at one end to the feeder arm 21 and its other end to a post 26 in the feeder guide 12. The spring 24 urges the feeler to the inoperative solid line position of FIGURE 2 wherein the stem 19 engages a stop 27 in the guide.

As can be seen, the engagement of the tip 17 of the feeler 11 with a bobbin during the beat-up maneuver engages the filler detector mechanism 20 and the feeler 11 moves along the axis of the stem 19 and when the wire coils 18 engage filling on the bobbin, side slipping of the feeler is prevented when there is filling on the bobbin. In the absence of filling on the bobbin, the feeler tip 17 slides on the bare bobbin surface so that the feeder moves to the dotted line position of FIGURE 2 pivotally on its end 22 in the guide bearing 23 in the well-known manner.

The filling feeder slide 15 has an enlarged end 28 containing a slot 29 which accommodates a trip rod 31 carried by the cam follower trip 16. The trip rod 31, the forward end of which is provided with a groove 32, normally moves freely into and out of the slide slot 29 during the reciprocation of the cam follower trip. When the trip plunger 14 is moved into the dotted line position of FIGURE 2, the rod groove 32 engages the plunger and locks the cam follower trip 16 to the slide 15 whereby the slide is moved in the well-known manner to actuate a bobbin replenishing operation.

As specifically illustrative of the invention, the enlarged end 28 of the slide 15 is provided with a central bore 37 in which is suitably positioned as set screws 34, a tubular housing 36 having a central bore 37 threaded at one end at 38. The plunger 14 contains a head 39 and a centrally located inwardly facing recess 40 and is arranged to move slidably within the housing bore 37 between the solid line unlocking position of FIGURE 2 to the locking position indicated in FIGURE 2 by dotted lines. The forward end of the plunger 14 projects through an opening 41 in plunger housing 36. Urging means such as a coil spring 42 is positioned in the housing bore 37 around the plunger 14 and normally urges the plunger yieldingly into the solid line unlocking position of FIGURE 2.

The trip plunger recess 40 receives one end of the wire core 43 of a Bowden cable 44 which is secured at one end to the housing 36 by means of a nipple 45. The nipple 45 contains a threaded central bore 46 into which the end of the Bowden cable 44 is threaded. The nipple 45 also engages an externally threaded portion 47 which is threaded with the threaded portion 38 of the housing bore 37. The nipple 45 is preferably secured to the cable 44 by means such as a set screw 48 (FIGURE 1).

As shown best in FIGURE 2, the other end of the Bowden cable 44 is supported on the feeler guide 12 as shown in FIGURE 1 by means of a threaded connection with a threaded central bore 51 in a nipple 52 in a manner similar to that described above with reference to nipple 45. A set screw 59 is provided to secure the Bowden cable 44 to the nipple 52. The nipple 52 has an externally threaded portion 53 which is threadedly engaged with threaded portion 54 in the central bore 55 of a tubular housing 56 telescopically positioned within a support sleeve 57 suitably secured by welding or the like to the feeler guide 12. The tubular housing 56 is secured in the selected axial position within the support sleeve 57 by the set screw 59 as shown. The forward end of the plunger 59 projects through an opening 63 in the plunger housing 56 so as to engage the feeder stem 19 as shown.

The other end of the Bowden cable wire core 43 is received within the plunger recess 62 and the parts including the plungers 14, 59, the coil spring 42 and the wire core 43 are so assembled that the urging of the trip plunger 14 by the coil spring 42 into the unlocking solid line position of FIGURE 2 simultaneously urges the plunger 59 into engagement with the feeler 11 through the Bowden cable wire core 43.

As can be seen in FIGURE 2, the component parts described above may be assembled prior to positioning the filling detector mechanism in correspondence with the bobbin terminal in the loom. The coil spring 42 maintains the Bowden cable wire core 43 within the recesses 40, 62 of the plungers 14, 59 respectively and simultaneously urges the trip plunger 14 into the unlocking position and the feeder plunger 59 against the feeder stem 19 which in turn is urged against the guide stop 27. Thus, premature side slipping movement of the feeler tip 17 caused by vibrations in the loom and the like is prevented due to the spring force pressing against the feeder stem 19.

In accordance with the novel construction of the invention, when the filling is on the periodically checked bobbin is exhausted, the slipping of the feeler tip 17 on the bare bobbin surface permits the feeler 11 to move to the dotted line position of FIGURE 2. As a result of the engagement of the end of feeder plunger 59 with the feeder stem 19, this movement of the feeler 11 moves the plunger plunger to the right as viewed in FIGURE 2 within the housing bore 55 transmitting this motion through the wire core 43 of the Bowden cable 44 to the trip plunger 14 against the urging force of coil spring 42 moving the plunger 14 to the locking position of FIGURE 3. When urged by means such as the coil spring 42 of FIGURE 3, the forward end 32 of the cam follower trip rod 31 entering the slide slot 29 during the beat-up movement of the lay, engages the extended plunger 14 and the slide 15 moves to actuate a bobbin replenishing operation through a suitable well-known mechanism. When a filled bobbin is positioned in the shuttle, the feeler 11 moves back into and is retained in the solid line position of FIGURE 2 by the filling on the bobbin as explained above. The component parts of the mechanism of the invention also return to the solid line position of FIGURE 2.

A manual actuation of the bobbin replenishment operation may be simply accomplished by means of a push rod 66 mounted for vertically reciprocating movement in the filling feeler slide 28 as shown in FIGURE 3. The rod 66 is provided with a cap 67 on its upper end and an enlargement 68 on its lower end suitably formed for engaging with a threaded portion 31 of the feeder plunger 31. The lower portion of the rod 66 extends within the slide slot 29 and the rod is spring loaded upwardly by means of a coil spring 69 into the position of FIGURE 3. When the push rod 66 is manually depressed, the rod enlargement 68 is moved into the path of the reciprocally moving trip rod 31 so that the rod end 32 engages the enlargement 68 for manually locking the follower trip 16 to the slide 15 resulting in the bobbin replenishing operation as described above.
The novel features of this invention can be readily appreciated when considering such factors as the wear on the end of the feeler plunger 59 due to its contact with the feeler stem 19 which in presently employed detector mechanism results in a need for periodic adjustment. In the mechanism of the invention, this wear is constantly taken up and compensated for as a result of the urging action of the spring 42 which constantly maintains the plunger 59 against the feeler stem 19. There is no lost motion in the mechanism of the invention; as all of the side-slipping motion of the feeler 11 is transmitted instantaneously without play to the trip plunger 14 to produce an actuation in the replenishing operation. Adjustment of the mechanism of the invention may be accomplished in a simple manner and periodic adjustments are not required due to the simple construction of the invention and the wear-compensating features. Of great advantage in the invention is the elimination of false changes common to presently employed weft detecting mechanisms and the need for constant adjustment common to the lift wire type of mechanism is eliminated. As a result of the novel construction of the invention, only two initial adjustments are required when positioning the detecting mechanism 10 on a loom. In the dotted line position shown in FIGURE 2, the feeler tip 17 should have approximately a \( \frac{1}{8} \) inch clearance with the surface of a bare bobbin in the front center position of the lay. Also, it will generally be necessary to adjust the follower trip roll 51 so that its end groove 52 will properly engage the follower plunger 14 in the locking position. In addition, the component parts are relatively free from interference by the machine attendant.

While there has been described what at present is considered to be the preferred embodiment of the invention, it will be understood by those skilled in the art that various changes and modifications may be made therein without departing from the invention and therefore it is the aim of the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

Having thus described the invention, what is claimed is:

1. In a filling detecting mechanism incorporating a side slipping filling feeler for checking the filling on a bobbin, a filling feeler slide for actuating a bobbin replenishing operation and a reciprocally moveable cam follower trip, the combination of, a slidably mounted trip plunger supported on said filling feeler slide movable from an unlocking location into a locking position for locking said slide to said slide for simultaneous movement of said trip and said slide to actuate a bobbin replenishing operation, connecting means including a Bobsten cam engageable at one end with said filling feeler and at its other end with said trip plunger for transmitting the side slipping movement of said filling feeler to said trip plunger, means engageable with said trip plunger for normally urging said trip plunger into said unlocking position and for simultaneously maintaining said one end of said connections means in engagement with said filling feeler, said filling feeler arranged to slip sideways in the absence of filling on the checked plunger from an inactive position with said trip plunger in said unlocking position into an operative position to move said trip plunger against said urging means through said connecting means into said slide locking position.

2. In a filling detecting mechanism incorporating a side slipping filling feeler for checking the filling on a bobbin, a guide for said filling feeler, a filling feeler slide for actuating a bobbin replenishing operation and a reciprocally moveable cam follower trip, the combination of, a tubular trip plunger housing mounted on said filling feeler slide, a trip plunger guidedly mounted in said trip plunger housing on said slide for sliding movement between an unlocking position and a locking position for locking said trip to said slide for simultaneous movement of said trip and said slide to actuate a bobbin replenishing operation, a tubular feeler plunger housing mounted on said filling feeler guide, a filling feeler plunger guidedly mounted in said feeler plunger housing on said guide for sliding movement and having one end engageable with said filling feeler, a Bowden cable connected at opposite ends to said trip plunger housing and said feeler plunger housing, said Bowden cable having a wire core removably connected at opposite ends to said trip plunger slide and said feeler plunger means in said trip plunger housing for yieldingly urging said trip plunger into said unlocking position and simultaneously yieldingly urging said feeler plunger through said wire core into engagement with said filling feeler, said filling feeler arranged to slip sideways in the absence of filling on the checked bobbin from an inactive position with said trip plunger in said unlocking position into an operative position to move said trip plunger against said urging means through said feeler plunger and said core into said slide locking position.

3. In a filling detecting mechanism incorporating a side slipping filling feeler for checking the filling on a bobbin, a trip plunger guidably mounted in said trip plunger housing on said slide for sliding movement between an unlocking position and a locking position for locking said trip to said slide for simultaneous movement of said trip and said slide to actuate a bobbin replenishing operation and a reciprocally moveable cam follower trip, the combination of, a tubular trip plunger housing mounted on said filling feeler slide, a trip plunger guidably mounted in said trip plunger housing on said slide for sliding movement between an unlocking position and a locking position for locking said trip to said slide for simultaneous movement of said trip and said slide to actuate a bobbin replenishing operation, a recess in the inner end of said feeler plunger, a nipple having a threaded central bore and an externally threaded portion threadedly engaged within one end of said trip plunger housing, a support sleeve mounted on said filling feeler guide, a tubular feeler plunger housing mounted in telescoping relationship within said support sleeve, means for securing said tubular feeler plunger housing in a selected axial position on said filling feeler slide, a trip plunger guidably mounted in the feeler plunger housing positioned in said support sleeve for sliding movement and having one end engageable with said filling feeler, a recess in the inner end of said feeler plunger, a nipple having a threaded central bore and an externally threaded portion threadedly engaged within one end of said feeler plunger housing, a Bowden cable threadedly connected at opposite ends within the threaded central bores of said nipples, said Bowden cable having a wire core having opposite ends inserted within said trip plunger and said feeler plunger recesses, a coil spring in said trip plunger housing for normally urging said trip plunger yieldingly into said unlocking position and simultaneously urging said feeler plunger through said wire core into engagement with said filling feeler, said filling feeler arranged to slip sideways in the absence of filling on the checked bobbin from an inactive position with said trip plunger in said unlocking position into an operative position to move said trip plunger against said coil spring through said feeler plunger and said core into said slide locking position.

References Cited in the file of this patent

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Patentee</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,222,994</td>
<td>Rhodes</td>
<td>Apr. 17, 1917</td>
</tr>
<tr>
<td>1,290,108</td>
<td>Davis</td>
<td>Jan. 7, 1919</td>
</tr>
<tr>
<td>1,308,193</td>
<td>Rhoads</td>
<td>July 1, 1919</td>
</tr>
<tr>
<td>1,593,426</td>
<td>Brown</td>
<td>July 20, 1926</td>
</tr>
<tr>
<td>1,817,164</td>
<td>Nelson</td>
<td>Aug. 4, 1931</td>
</tr>
<tr>
<td>2,556,136</td>
<td>Donoghue</td>
<td>June 5, 1951</td>
</tr>
<tr>
<td>3,062,243</td>
<td>Lee et al.</td>
<td>Nov. 6, 1962</td>
</tr>
</tbody>
</table>