Jan. 14, 1958 R. OPLETAL 2,819,737

WEFT STOP MOTION FOR WEAVING LOOMS

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Fig.1

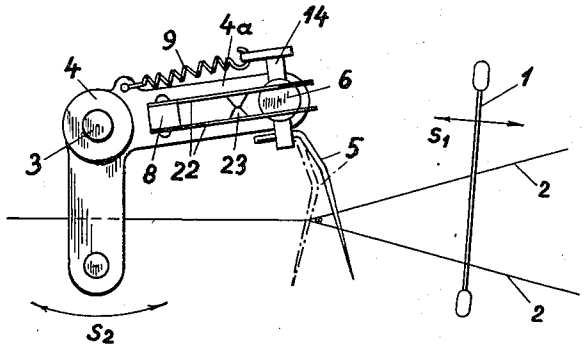

Fig.2

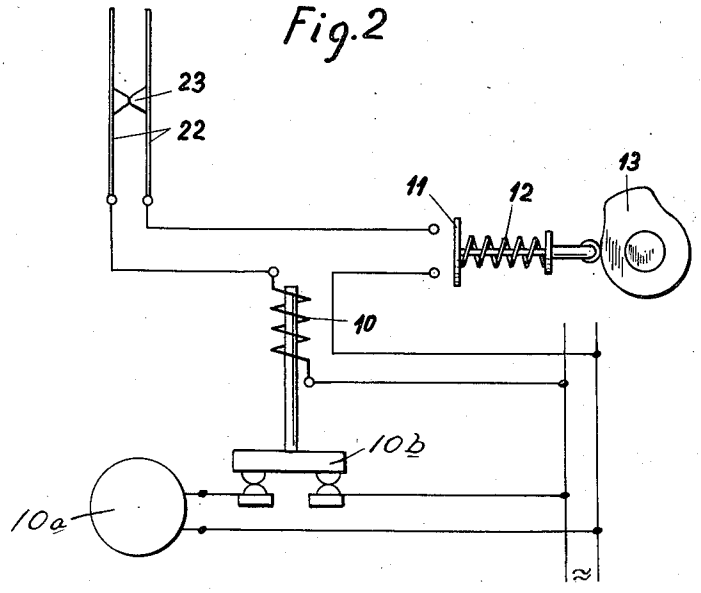

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Fig.3

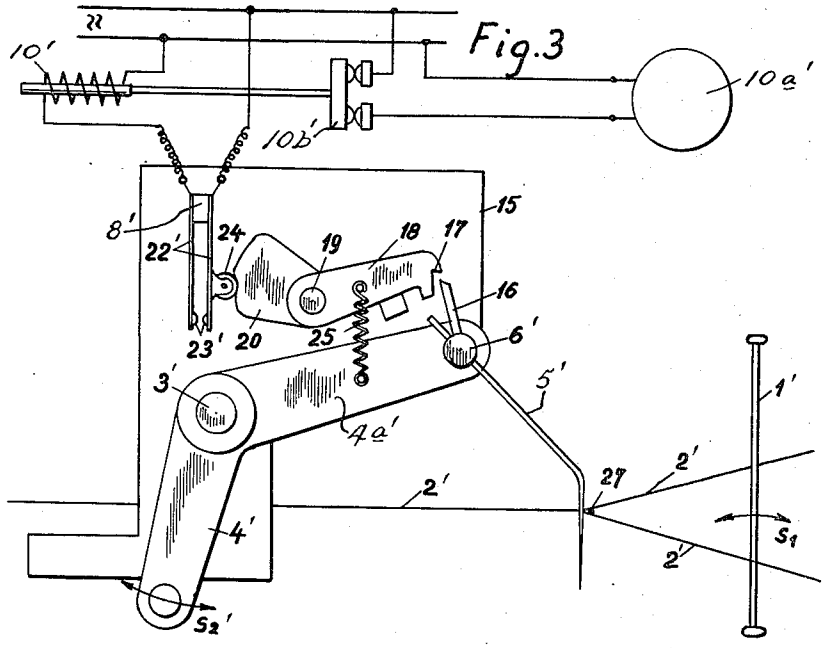


Fig.4

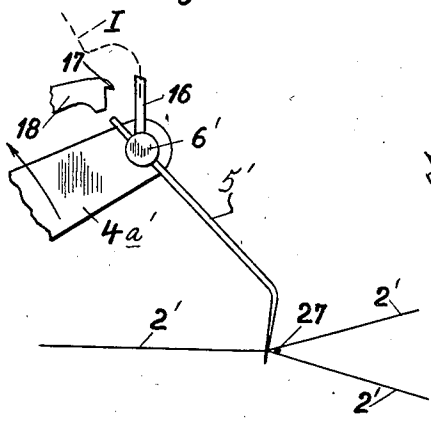
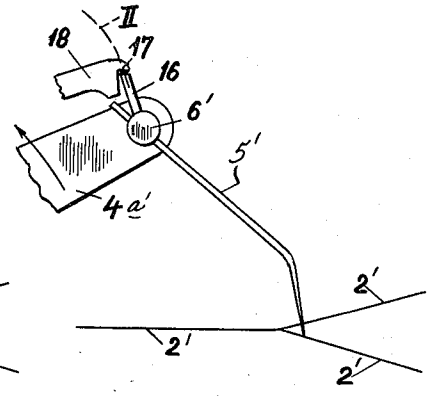


Fig.5



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WEFT STOP MOTION FOR WEAVING LOOMS

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6 Claims. (Cl. 139—370)

The present invention relates to improvements in a weft stop motion for weaving looms.

The hitherto known weft feelers, used in connection with weft stop motions of weaving looms, are usually designed to carry out a rocking movement in downward direction immediately after the insertion of the weft thread and to come to rest on the said thread so as not complete their travel. In case no weft thread has been inserted or if it has broken, the weft feeler sinks further down and emits an impulse to stop the weaving loom, for instance by closing an auxiliary current circuit.

Stop weft motions of the above type are not suitable for use in weaving looms in which the weft thread is inserted without tension, such as for instance pneumatic looms, in which the weft thread is picked through the shed by means of a nozzle.

The weft stop motions of the above mentioned design have, moreover, a relatively large weight and are not particularly suitable for high speed weaving looms.

The weft stop motion according to the present invention removes the above drawbacks: the gist of the invention resides in the fact that the weft feeler is mounted on a rockable support and, in turn, is swingable relative to the support so that, when the support is rocked to move the feeler against the fabric prior to the insertion of a new weft thread, the feeler penetrates with its tip between two neighbouring warp threads so as to rest with its free end against the weft thread which has been woven in last, and during its return movement out of the fabric the feeler is swung around its axis relative to the rocked support by the influence of the resistance of the new weft thread which in the meantime has been inserted and beaten up. If there is no new weft thread inserted or if the thread has broken no resistance is encountered and no swinging movement of the weft feeler relative to the rocked support is produced whereupon the driving motor of the weaving loom is stopped by a control solenoid which is energized by an electric circuit responding to the swinging or absence of swinging of the feeler relative to its rockable support.

The invention comprises certain novel features of construction, combination and arrangement of parts as will be hereinafter more fully described and claimed.

The accompanying drawings represent two examples of the weft stop motion according to the present invention, wherein

Fig. 1 is a diagrammatic representation of one embodiment of the invention,

Fig. 2 shows a part of the electric circuit and associated components of the embodiment of Fig. 1,

Fig. 3 shows a modified embodiment of the invention,

Fig. 4 shows the feeler of the embodiment of Fig. 3 in a position after the insertion of a new weft thread and

Fig. 5 shows the weft feeler of the embodiment of Fig. 3 in a position when no weft thread has been inserted.

Referring first to Figs. 1 and 2, the reference numeral 1 denotes a reed, adapted to carry out movement in the direction of the arrow *s*1 towards the fabric and back. At

one side of the loom a bell crank lever 4 is mounted for rocking movement on a pivot 3 and adapted to carry out movement as shown by the arrow *s*2, said bell crank lever carrying a weft feeler.

In the embodiment shown in Figs. 1 and 2 the weft feeler 5, made of wire, is rigidly mounted in a pin 14, which is adapted to rotate in a bolt 6 made of an electrically non-conductive material. The bolt 6 is mounted for rotation in the arm 4*a* of the bell crank lever 4. The arm 4*a* further carries two resilient contact strips 22 which are provided with contacts 23 protruding toward and normally engaging each other. The contact strips are secured at their left hand ends, as viewed in Fig. 1, to the arm 4*a* by means of a non-conductive spacing block 8. The right hand ends of the contact strips 22 rest against parallel flattened portions on the circumference of the bolt 6, so that upon rotation of the bolt from the illustrated position, the ends of the contact strips are removed or spaced from each other. Between a projection of the pin 14 and an eyelet on the bell crank lever 4 a spring 9 is mounted biassing the weft feeler 5 against the newly inserted weft thread.

As shown in Fig. 2 the contact strips 22 are connected in series, in an auxiliary circuit, with a solenoid 10 which suitably controls the driving motor 10*a* of the weaving loom. For example, the solenoid 10 may be arranged to open a set of normally closed contacts 10*b*, when the solenoid is energized, and the contacts 10*b* may be interposed in the circuit energizing the motor 10*a*. A switch 11 is interposed in this auxiliary circuit, the switch remaining open as long as the spring 12 retains the same in open position, until the spring is counteracted by a rotary cam 13. The arrangement is such that the period of time during which the auxiliary circuit is broken by the rotation of the bolt 6 overlaps or covers the period of time during which the switch 11 is closed by the cam 13.

The device described above and shown in Figs. 1 and 2 operates as follows:

The bell crank-lever 4 receives a rocking motion indicated by the arrow *s*2 from the main shaft (not shown) of the weaving loom by the intermediary of a suitable gearing so that the tip of the weft feeler 5 on its downward movement penetrates between two neighbouring warp threads 2 prior to the insertion of a new weft thread and rests against the weft thread which has been woven in last. In the moment of the beat-up of the new weft thread the weft feeler 5 is in the position shown in Fig. 1 in dotted lines, the tip of the weft feeler being enclosed in the fabric.

The shape of the weft feeler is such that upon rocking movement of the lever 4 in counter clockwise direction, during which movement the reed proceeds to its rear position, the weft feeler is swung by the resistance of the new weft thread in clockwise direction around the axis of the bolt 6, the tip of the feeler being withdrawn out of the fabric.

The swinging movement of the feeler 5 also causes the bolt 6 to be angularly displaced so that its flattened portions move the right-hand ends of the contact strips 22 apart, interrupting the auxiliary current circuit. Shortly afterwards the positively driven cam 13, closes the switch 11 by counteracting the force of the spring 12, but such closure of the switch 11 has no effect on the driving motor of the weaving loom, because the current circuit of the solenoid 10 remains interrupted in consequence of the contacts 23 having been spaced from each other; the weaving loom operates therefore further without any interruption.

In case no weft thread has been inserted or if it has broken the weft feeler does not carry out the swinging movement relative to the rocked crank-lever or support 4 mentioned above and the contact 23 remains closed so that

when the cam 13 closes the switch 11, the solenoid 10 becomes energized and stops the weaving loom.

The pin 14 is mounted in the bolt 6 for rotation in order to enable the weft feeler 5 to move also in the direction of the weft thread so as to follow the lateral movements of the warp or of the fabric.

Figs. 3 to 5 show a modified embodiment of the weft stop motion according to the invention. Fig. 3 shows the general outlay of the device, while Fig. 4 the weft feeler in a position in which its tip is just about to be withdrawn from the fabric after insertion and beat-up of a new weft thread 27 and Fig. 5 shows the position assumed by the weft feeler if a new weft thread has not been inserted or if it has broken, i. e. when no resistance is offered to the withdrawing movement of the tip of the weft feeler from the fabric.

At one side of the weaving loom a bracket 15 is mounted, said bracket carrying a pivot 3'. A bell crank lever 4' is journalled on the pivot 3' and receives swinging movement indicated by the arrow *s2'* from the drive of the weaving loom, the swinging movement corresponding substantially to the movement *s1* of the reed 1. The longer arm of the lever 4' carries a bolt 6' mounted for rocking movement relative to the lever 4' about an axis parallel to the rocking axis of the lever or support, the bolt being retained in its normal position by a spring, not shown in the drawing. A weft feeler 5' penetrates through, and is secured in the bolt 6. A tongue 16 is further secured to the bolt 6', said tongue 16 being adapted to engage a notch 17 in a lever 18 during upward movement of the longer arm of the lever 4'. The lever 18 is secured to a pivot 19 mounted for rotation in the bracket 15. The pivot 19 also carries a cam lever 20 made of a non-conductive material.

A prismatic block 8' of electrically non-conductive material is mounted on the bracket 15, said block carrying two resilient contact strips 22' provided with contacts 23'. One of the contact strips carries a rotatably mounted roller 24 engageable by the cam lever 20. A spring 25 is arranged between the bracket 15 and the lever 18 and urges the latter to rock in the clockwise direction to the position shown on Fig. 3.

Suitable conductors connect the contact strips 22' with the conductors supplying the driving motor 10'*a* of the weaving loom and a solenoid 10' is connected in the circuit and, when energized, opens the normally closed contacts 10'*b* which are in series with the motor.

The weft stop motion just described and represented in Figs. 3 to 5 operates as follows:

During downward movement of the free end of the longer arm 4'*a* of the lever 4' the tip of the weft feeler 5' penetrates between two neighbouring warp threads 2' and rests against the weft thread which has been woven in last. In the moment of the beat-up of the next weft thread 27, the weft feeler 5' is in the position shown in Fig. 3. The tip of the weft feeler is thus enclosed in the fabric. During the rocked return-movement of the bell crank lever 4' in counter-clockwise direction the resistance of the new weft thread 27, which in the meantime has been inserted, imparts a swinging movement to the weft feeler 5' in clockwise direction around the axis of the bolt 6', the tip of the feeler being withdrawn from the fabric. Fig. 4 shows the device in the moment in which the tip of the weft feeler is just about to be withdrawn from the fabric as described above.

During further rocking movement of the bell crank lever 4' the tip of the tongue 16 travels along the path I, shown in Fig. 4 in dotted lines and does not engage the notch 17 of the lever 18. The contacts 23' remain therefore in the position shown in Fig. 3 in which they are spaced from each other; the solenoid receives no current so that the weaving loom operates without interruption.

If, however, the weft feeler 5' is withdrawn from the fabric without a new weft thread having been inserted or in the event that the weft thread has broken, the feeler does not carry out any swinging movement relative to the rocked lever 4', because there is no resistance causing such movement and the tongue 16 remains in its position relative to the lever 4' as shown in Fig. 5. During further rocking movement of the lever 4' in counter-clockwise direction the tip of the tongue 16 engages the notch 17 of the lever 18 and tilts the latter along the path II shown in dotted lines in Fig. 5. The cam 20 displaces the roller 24 to the left closing the contacts 23' so that the solenoid 10' is energised to open the contacts 10'*b* and the weaving loom brought to a stop.

The difference in operation of the two embodiments described resides therein that in normal operation, i. e. when the weft thread has been properly inserted, the contact strips 22 in the embodiment according to Figs. 1 and 2 are acauated during each correct pick, whereas in the embodiment according to Figs. 3 to 5 the contacts are actuated only in the case of a failure in consequence of the weft thread not being inserted or having broken so that the contact strips 22' and contacts 23' are subject to a far smaller strain.

A further advantage of the embodiment according to Figs. 3 to 5, as compared with the embodiment according to Figs. 1 and 2 is that, for operating the switch means, a smaller force is required and there is less danger that by the considerable resistance caused by a newly inserted weft thread bearing against the tip of the weft feeler and by the corresponding reaction, the thread could be drawn out of the fabric.

The arrangement according to Figs. 3 to 5 is further advantageous because the current circuit causing the switching off of the driving motor remains closed during a longer part of the operative cycle of the weaving loom, so that this arrangement is particularly suitable for high speed weaving looms, and finally because the switching device is very simple, owing to the elimination of the auxiliary circuit with the switch 11 and cam 13 which are included in the embodiment of Figs. 1 and 2.

I claim:

1. In a weaving loom having driving means therefor and a reciprocated reed for beating up the successive weft threads woven with the warp threads; a weft stop motion comprising a rockable support, a weft feeler of relatively small mass, means mounting said feeler on said support and permitting movement of said feeler relative to said support, said support being rocked in one direction, prior to the insertion of a new weft thread, to cause said feeler to penetrate between adjacent warp threads and to come to rest against the last beaten up weft thread previously woven with the warp threads, said support being rocked in the opposite direction, after the reciprocating movement of the reed for beating up a new weft thread in back of the penetrating feeler, to withdraw said feeler from between the adjacent warp threads so that, when a new weft thread has been normally inserted, the new weft thread acts against said feeler to cause movement of the latter relative to said support during withdrawal of the feeler and, when a failure has occurred in the insertion of the new weft thread, said feeler is free to be withdrawn from between the warp threads while remaining immobile relative to said support, and means responsive to the movement of said feeler relative to said support to halt the operation of the driving means for the loom when said support rocks in said opposite direction to withdraw said feeler and the latter remains immobile relative to said support during its withdrawal.

2. In a weaving loom having driving means therefor and a reciprocated reed for beating up successive weft threads woven together with warp threads; a weft stop motion comprising a support rockable about an axis extending laterally with respect to the loom, a weft feeler of relatively small mass mounted on said rockable support and swingable relative to the latter about an axis parallel to the rocking axis of the support, said support being rocked in one direction, prior to the insertion of a new

weft thread, to cause said feeler to penetrate between adjacent warp threads and to come to rest against the last beaten up warp thread previously woven with the warp threads, said support being rocked in the opposite direction, after the reciprocating movement of the reed for beating up a new weft thread in back of the penetrating feeler, to withdraw said feeler from between the adjacent warp threads along a path in which a new weft thread would be interposed, so that, when a new weft thread has been normally inserted, the new weft thread acts against said feeler to cause swinging of the latter relative to said support during withdrawal of said feeler and, when a failure has occurred in the insertion of the new weft thread, said feeler is free to be withdrawn along said path while remaining immobile relative to said rockable support, and control means responsive to swinging of said feeler relative to said support to halt the operation of the driving means for the loom when said support rocks in said opposite direction to withdraw said feeler and the latter remains immobile relative to said support during its withdrawal.

3. In a weaving loom having driving means therefor and a reciprocated reed for beating up successive weft threads woven together with warp threads; a weft stop motion as in claim 2; wherein said feeler is swingably mounted on said rockable support by means including a bolt member rotatable in said support with the axis of said bolt member extending parallel to said rocking axis, said bolt member having diametrically opposed flat surface portions; and wherein said control means includes an electrical control circuit, a pair of normally closed electric contacts interposed in said control circuit and normally engaging against opposite sides of said bolt member at said flat surface portions so that said electric contacts are opened by said bolt member when the latter turns relative to said support in response to swinging of said feeler relative to the support, a normally open auxiliary switch in series with said normally closed contacts in said control circuit and periodically closed during rocking of said support in said opposite direction so that said electric control circuit is completed only when said normally closed contacts remain closed during rocking of said support in said opposite direction by virtue of said feeler remaining immobile relative to said support in response to the occurrence of a failure in the insertion of a new weft thread, and means for halting operation of the drive means of the loom in response to completion of said electric control circuit.

4. In a weaving loom having driving means therefor and a reciprocated reed for beating up successive weft threads woven together with warp threads; a weft stop motion as in claim 2; wherein said feeler mounted on said support by means including a bolt member rotatable in said support with the axis of said bolt member corresponding to the axis of swinging of said feeler relative to said support, and means attaching said bolt member and feeler and permitting angular displacement of the latter relative to the bolt member about an axis at right angles to said swinging axis so that said feeler can move relative to said bolt member for accommodating lateral movements of adjacent warp threads between which the feeler penetrates.

5. In a weaving loom having driving means therefor and a reciprocated reed for beating up successive weft threads woven together with warp threads; a weft stop motion as in claim 2, wherein said control means includes normally inoperative means operative to halt the driving means of the loom, a control assembly for said normally inoperative means having a control member movable between a normal position, corresponding to the inoperative condition of said normally inoperative means, and a displaced position in which said normally inoperative means is caused to operate, thereby to halt the driving means, and an actuating member carried by said rockable support and swingable with said feeler relative to the latter, said actuating member being engageable with said control member to displace the latter to said displaced position when said support rocks in said opposite direction and said feeler remains immobile relative to said support, and said actuating member swinging relative to said support to clear said control member and leave the latter in said normal position when, during rocking said support in said opposite direction, said feeler is caused to swing relative to said support by the action of a normally inserted new weft thread against the feeler being withdrawn from between adjacent warp threads.

6. In a weaving loom having driving means therefor and a reciprocated reed for beating up successive weft threads woven together with warp threads; a weft stop motion as in claim 5; wherein said normally inoperative means includes an electric circuit having normally open contacts interposed therein, a solenoid adapted to be energized by said electric circuit upon closing of said contacts and operative, when energized, to halt operation of the driving means of the loom, and cam means movable with said control member and effective to close said normally open contacts upon movement of said control member to said displaced position.

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