

March 4, 1952

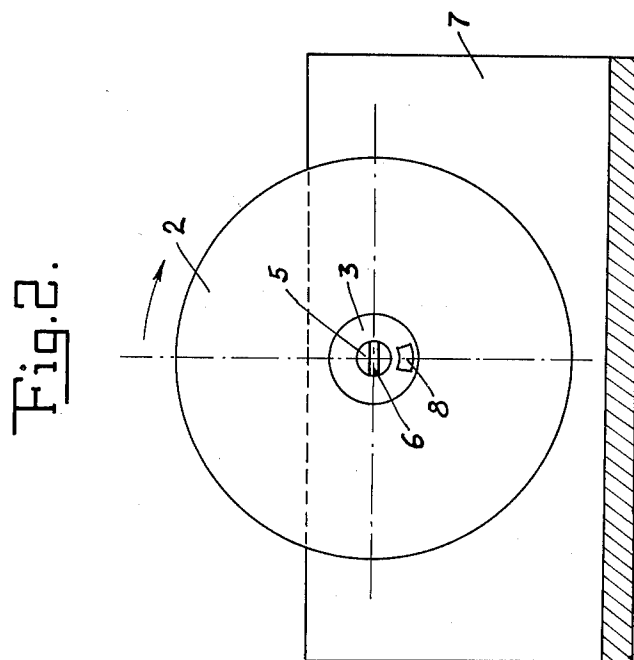
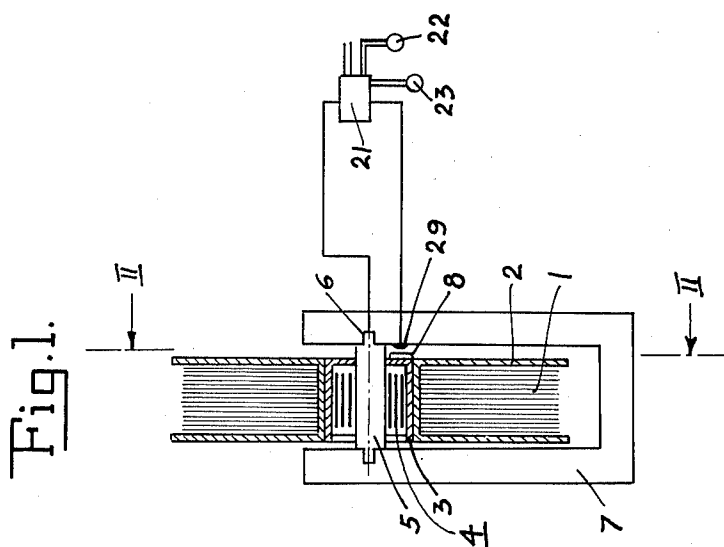
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SAFETY DEVICE FOR LOOMS

Filed April 27, 1948

3 Sheets-Sheet 1



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Fig. 1a.

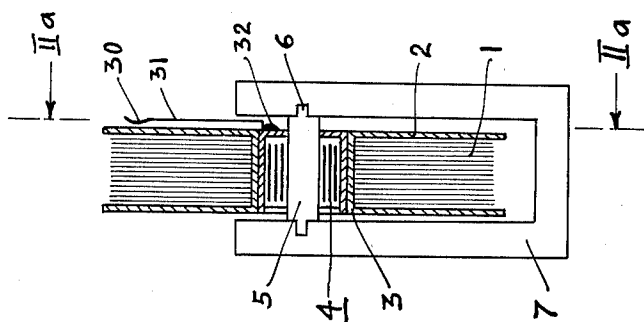
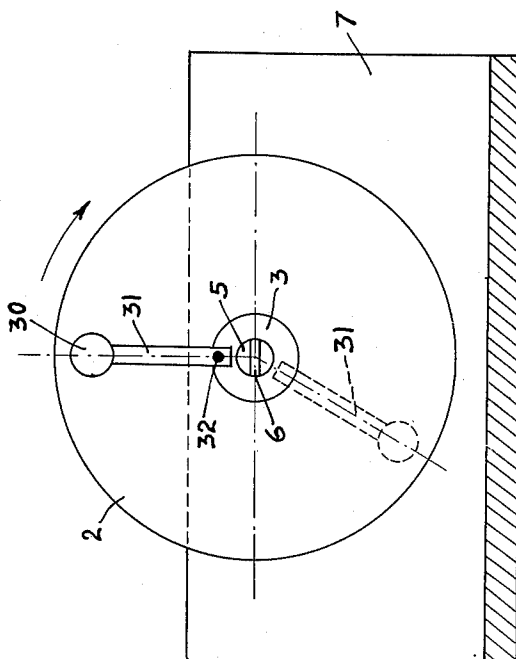


Fig. 2a.



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Fig. 3.

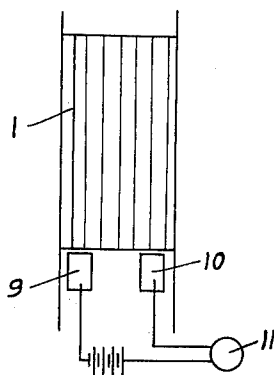
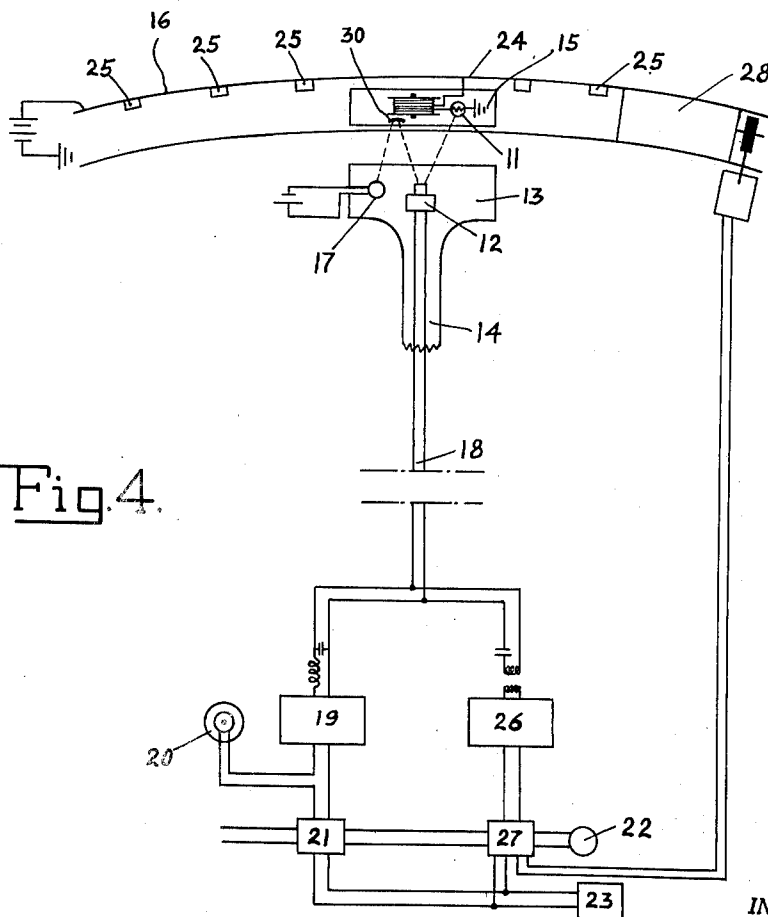


Fig. 4.



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UNITED STATES PATENT OFFICE

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SAFETY DEVICE FOR LOOMS

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In France May 12, 1947

8 Claims. (Cl. 139—353)

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The invention relates to safety devices applicable to looms in general and more particularly to looms of the type disclosed in patent application Serial No. 23,606 filed on April 27, 1948, now abandoned, by the same applicant and entitled "Circular Looms."

These devices comprise in essence electrical alarm devices coming into action on the breakage of the warp thread or weft thread, or the exhaustion or stoppage of the shuttle. They may also cause the automatic stoppage of the loom.

According to the invention use is made separately, or preferably in combination, of a system of electrical contacts and a photo-electric cell to energise a relay which actuates an alarm device or causes the stoppage of the loom.

For example, in the case of the warp or weft thread breaking, bobbins or spools with return springs are used and the backward movement of one of these spools if the thread breaks, causes the displacement of a mirror which in normal operation reflects a ray of light on to a photo-electric cell, or it may simply cause the opening or the closing of an electric circuit.

The "shuttle-empty" device comprises a feeler which, when the cop is empty, causes the extinction of a pilot lamp acting on a photo-electric cell.

Similarly, the stoppage of the shuttle causes the operation of a photo-electric cell, which in normal operation follows the shuttle. In every case the photo-electric cell acts on the loom controls and on an alarm device.

The invention is illustrated in the accompanying drawings which show by way of example safety devices applied to a circular loom of the type mentioned above, and therein

Figure 1 is a section through a spool filled with thread,

Figure 2 is a sectional view taken substantially along the line II—II of Figure 1 together with a diagrammatic illustration of a control circuit operated by the particular control device illustrated;

Figures 1a and 2a are views respectively similar to Figures 1 and 2 which illustrate a modified form of control device;

Figure 3 shows diagrammatically the operation of a feeler, and

Figure 4 indicates diagrammatically the manner of control from the shuttle under conditions of stopped shuttle, broken weft and exhausted cop.

Referring first to Figures 1 and 2, it will be seen that the warp or weft thread 1 is wound on a bobbin 2; the latter is mounted for rotation against friction on a sleeve 3, which serves as casing for a spiral spring 4. The spring 4 is anchored by its inner end to the shaft 5 and is fixed by its outer end to the sleeve 3. The shaft

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5 is held from rotation by two flat parts 6, which engage grooves provided in the flanges or other support 7 of the spool.

In the case of a warp bobbin, for example, as shown in Figures 1 and 2, a brush 8 is mounted on the sleeve 3, which normally wipes a contact 29 fixed to the support 7. In the case of a weft cop, for example, as shown in Figures 1a and 2a, the brush 8 and contact 29 are omitted and are replaced by a mirror 30 mounted at the end of an arm 31, which in turn is fixed to the sleeve 3 by a screw 32.

Operation is as follows: The thread 1 in unwinding drives the spool 2 in the direction of the arrow shown in Figure 2. In consequence of the friction the sleeve 3 is driven in this direction through an angle limited by the tension of the spring 4. In the case of a warp thread the brush 8 then comes on to the contact 29 and completes an electric circuit, for instance through the spring 4 and the shaft 5, this circuit being operable to control a relay in a manner to be described. In the case of a weft thread the mirror 30, which was hidden by the flange 7 of the shuttle in the dotted position of Figure 2, takes up the operational position shown in full lines on the same figure and reflects towards a photo-electric cell 12 rays coming from a suitably placed lamp 17 (see Figure 4). In either case the spring 4 remains tensioned so long as the thread unwinds normally.

If now the thread breaks, the spring 4 is relieved and returns the bobbin; in the case of a warp thread the connection is broken between the brush 8 and the contact 29 and the electric circuit is opened. The loom is thereby stopped, and at the same time an alarm device comes into operation, as will be explained later in connection with Figure 4. In the case of a weft thread the mirror 30 is shifted behind the flange 7, and the cell 12 no longer being energised acts on a relay to cause stoppage of the loom as will be seen later.

Of course, in the case of a warp thread the arrangement could be reversed, the electric circuit being closed only on breakage of the thread, and similarly in the case of a weft thread the mirror 30 could be normally hidden and only appear to energise the cell 12 when the thread breaks.

The operation of the shuttle-empty device shown in Figure 3 is very simple. The thread 1 is wound on a bobbin, and if it is a metallic thread it closes an electric circuit in which the current enters by a brush 9 and leaves by a brush 10, the combination of these two brushes constituting a feeler, which remains continuously in contact with the thread.

The layer of thread between the two brushes normally ensures the passage of current. In the brush circuit there is inserted a pilot lamp 11,

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which is arranged to energise the photo-electric cell 12 as shown schematically in Figure 4.

But as soon as only a few turns of thread remain on the centre of the bobbin and have lost contact with one of the brushes, say 9, the current is interrupted in the circuit and the lamp 11 is extinguished. The photo-electric cell, being no longer energised, actuates through a relay as above an alarm device or the control members of the loom, or both.

If the thread being woven is not conductive, the arrangement is reversed: the contact of the feeler with the empty metallic cop closes the circuit. In this case the lighting up of the lamp energises a photo-electric cell; alternatively contact with the empty bobbin may close the circuit of an electromagnet, which breaks the circuit of the lamp 11 and thus extinguishes this lamp.

In the case of a circular loom, the photo-electric cell is carried by a horizontal arm mounted on a vertical shaft and follows the rotary movement of the shuttle. It may for instance be mounted direct on the electromagnet which drives the shuttle in the above-mentioned patent specification.

Figure 4 shows diagrammatically safety devices operating by photo-electric cells in the case of breakage of the weft thread, stoppage of the shuttle or exhaustion of the thread carried thereby.

The photo-electric cell 12 is carried by the electromagnet 13, which, mounted on a rotary horizontal arm 14, drives the shuttle by magnetic attraction on a circular track 16. It is energised continuously by light from a lamp 17 likewise carried on the electromagnet 13, the light being normally deflected by the mirror 30, which is carried by the shuttle.

The current coming from the cell 12 is passed by the circuit 18 to an amplifier 19 and from there through the warp stop motion 20 to a relay 21 controlling the energizing circuit of the motor or motors 22 driving the loom. In addition, the relay 21 controls an alarm device 23. When the modified control shown in Figures 1 and 2 is to be used, the control relay may be connected directly in the circuit of the contacts 8 and 29 as indicated.

In this case it has been assumed that the warp stop motion permits current to pass normally and only interrupts it if a warp thread should break. This device can as stated comprise merely electric contacts in series passing through each bobbin of thread, or the device may include as for the shuttle a photo-electric cell device for each bobbin. The former solution is clearly the simpler.

It results from what has been stated above, that if the weft thread breaks, or if the shuttle stops, the mirror 30 will no longer reflect the light from the lamp 17 on to the cell 12. Current will cease to pass in the circuit 18 and the relay 19, which will cause the operation of the relay 21 and the stoppage of the loom at the same time as the alarm device 23 is set into action. Relay 21 will be operated in a similar manner when contacts 8 and 29 are moved out of engagement.

On the other hand the cell 12 is energised by modulated light by the lamp 11, which is carried by the shuttle. The lamp 11 is modulated in a simple manner by having it fed by means of a brush 24 passing over contacts 25, which are arranged along the length of the track 16. An energizing circuit for the lamp 11 is completed each

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time one of the contacts 25 is engaged by the brush 24. As the shuttle moves, the brush 24 passes from one contact to the next and provides intermittent illumination at rapid frequency. The lamp 11 remains in operation so long as the cop carries a quantity of thread sufficient for at least two picks.

The modulated current passing from the cell 12 through the circuit 18 and following the modulations of the lamp 11 is passed to an amplifier 26 and from there to a relay 27. This relay controls the energizing circuit of the motors 22 or the alarm 23 in a manner similar to the relay 21 as explained above. Again, it may set into motion an automatic device 28 for renewing the empty cop, for example of the type described in the above-mentioned patent specification.

It will be seen also that the warp stop device mentioned above in circuit between the amplifier 19 and the circuit breaker 21 causes the stoppage of the loom in the event of the breakage of a warp thread, without the necessity of a special control being provided for this purpose.

It is also possible to provide a feeler similar to the shuttle-empty feeler for each bobbin of warp thread, this feeler actuating an alarm device or causing the stoppage of the loom as in the case of the breakage of a warp thread.

Although the stoppage devices described above are shown and described as being applied to a circular loom, it should be understood that the invention extends broadly to the application of the principle to any loom. For instance, in the case of an ordinary loom the warp stop motion device can be applied without modification. For checking the operation of the shuttle it would be possible in this case to provide a photo-electric cell mounted in a suitable manner to follow the shuttle.

It should also be understood that other practical combinations can be devised of electric contacts and photo-electric cells for the same purpose without departing from the essence of the invention.

Finally, the lamps 11 and 17 can be replaced by suitable transmitters and the photo-electric cell by a corresponding receiver, the control and operation of the loom being then effected according to the "radar" principle.

I claim:

1. A safety device for a loom to come into action on the breakage of a thread, comprising a spool on which the supply of thread is wound, a bush upon which the spool can rotate with friction, a spindle supporting the bush for free rotation, means for holding the spindle against rotation, a spiral spring connecting the spindle and the bush to permit limited rotation of the bush against spring tension, a relay, and means for causing the relay to be actuated when the spring is relieved of tension.

2. A safety device in accordance with claim 1 wherein said means comprise a brush contact on the bush, a stationary contact for engagement by said brush contact, and an electric circuit including the contact and brush for actuating said relay.

3. A safety device in accordance with claim 1 having a source of light, a photo-electric cell operatively associated with the relay to cause the actuation of the said relay when deprived of illumination, and a mirror mounted on the bush to reflect light from the source on to the photo-electric cell when there is a predetermined tension in the spring.

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4. A safety device for a circular loom having a shuttle actuated by a driving member in a non-positive manner, the device comprising a source of light and a photo-electric cell on the driving member, a mirror on the shuttle located to reflect light from the source on to the photo-electric cell in normal operation, and a relay becoming operative on the failure of current from the photo-electric cell, the cell being deprived of light when the mirror is displaced due to the shuttle losing touch with its driving member.

5. A safety device as claimed in claim 1, wherein there is a frame supporting the spindle, and wherein said means comprises a brush contact on the bush, a stationary contact on the frame, said stationary contact being located to normally engage with the brush contact when the spring is tensioned by movement of the bush relative to the spindle, and an electric circuit for actuating the relay when said brush and stationary contact move out of engagement.

6. A safety device for a circular loom having a shuttle actuated by a rotary arm in a non-positive manner, a source of light and a photo-electric cell on the rotary arm, a mirror on the shuttle located to reflect light from the said source onto the cell only in normal operation, a d. c. amplifier connected to the photo-electric cell, a control relay connected to said amplifier for actuation thereby, and means responsive to operation of the relay for stopping the operation of the loom.

7. A safety device for a circular loom having a shuttle driven from a rotary arm in a non-positive manner comprising a photo-electric cell on the rotary arm, a lamp on the shuttle located to illuminate the photo-electric cell only

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in normal operation, a thread spool on the shuttle, circuit means for intermittently energizing said lamp including a set of contacts spaced around the path of the shuttle, and a brush on the shuttle to pass over said contacts in rapid succession, and means for rendering said circuit means inoperative in response to exhaustion of the thread on said spool, a control relay, means electrically connecting said relay to said cell for actuation thereby, and means operated by said relay for controlling the operation of the loom.

8. A safety device as claimed in claim 7 wherein the said means for rendering the circuit means operative in response to exhaustion of thread on the spool includes two brushes in circuit with the lamp, and means by which the conductive condition of the part of the circuit between said two brushes on the spool is changed when the thread supply is nearly exhausted.

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