Jan. 14, 1936. R. YEADON 2,027,459

CIRCULAR LOOM

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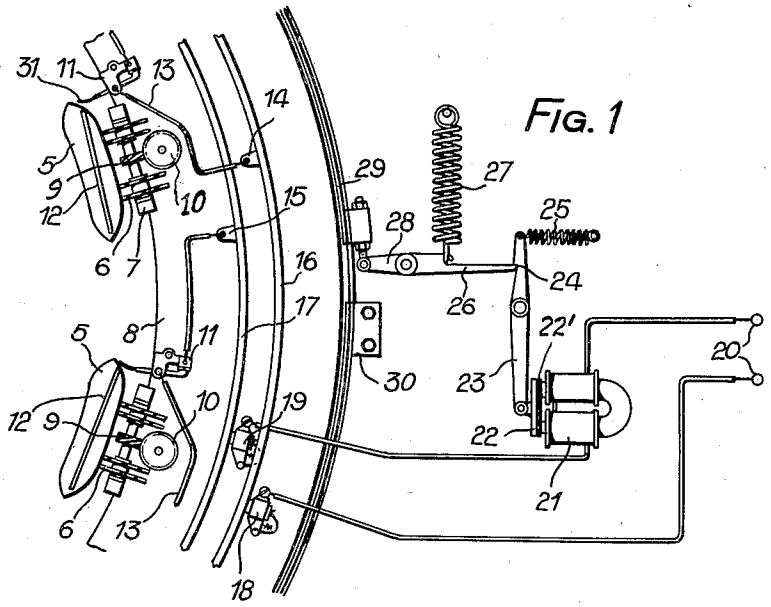


FIG. 1

FIG. 2

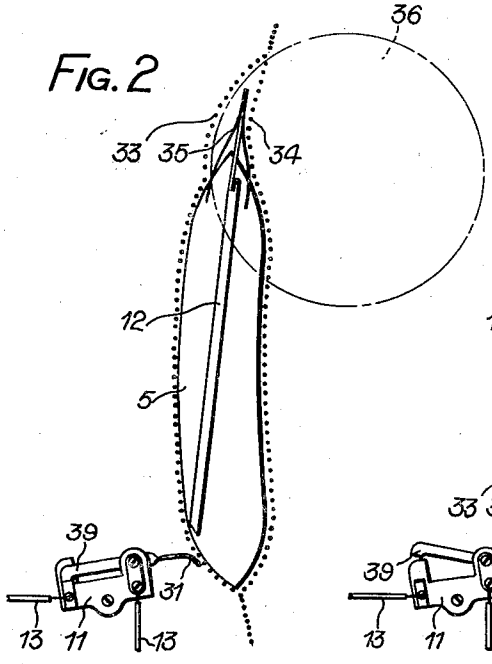
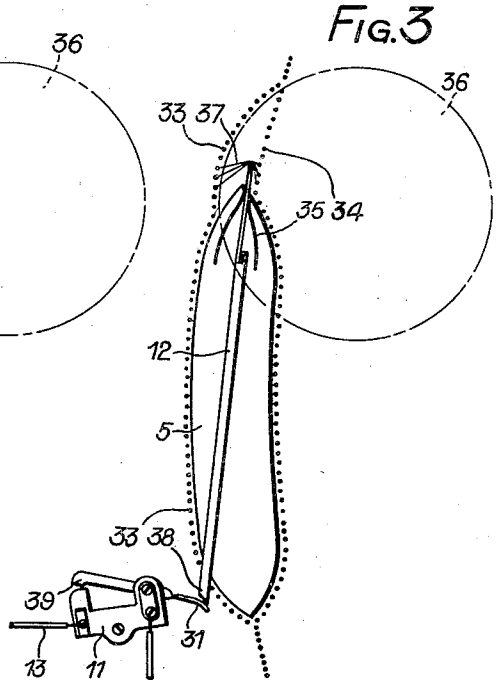


FIG. 3



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FIG. 4

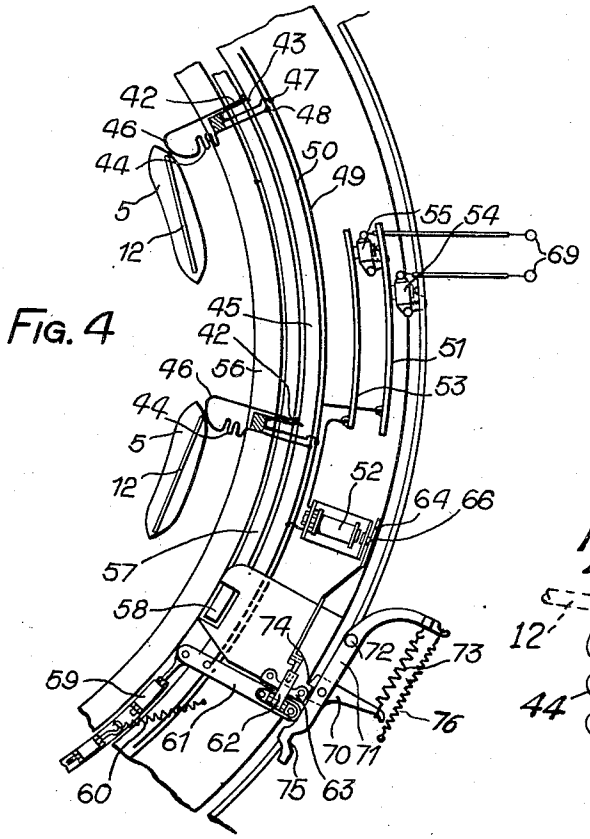


FIG. 6.

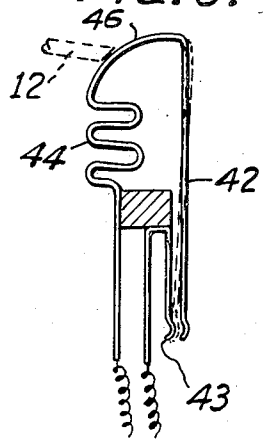
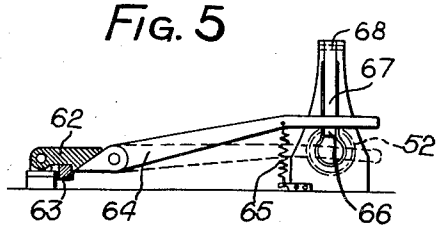


FIG. 5



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CIRCULAR LOOM

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Application August 8, 1934, Serial No. 738,892
In Great Britain August 31, 1933

10 Claims. (Cl. 139—13)

This invention is particularly concerned with the improvement of means such as those described in U. S. application S. No. 655,560 filed 7th February, 1933, (British Pat. No. 396,757) for bringing to an end relative circular motion between the shuttle or shuttles of a circular loom and the warps on jamming or breakage of the warps, or, as described in U. S. applications S. Nos. 672,379 filed 22nd May, 1933 and 726,932 filed 22nd May, 1934, in the event of weft breakage, so as to avoid damage which would arise if the movement were allowed to continue.

According to the invention means are provided which comprise latch mechanism adapted on release to stop weaving by bringing to an end relative motion between the shuttle or shuttles and the warp threads, electrically controlled latch releasing means, and an electric circuit including the latch releasing means and contacts adapteded to operate on breakage or jamming of the warp threads, or on breaking or absence of the weft thread, so as to control the circuit and thereby the latch releasing means.

The release of the latch mechanism may serve to put into operation clutch means, the frictional action of which brings to an end rotation of one part of the loom with respect to another. Thus, a normally stationary part of the loom may be connected to a rotating part for both to rotate together, or a normally rotating part may be brought to rest. Convenient and compact forms of clutch mechanism are described in detail in U. S. applications S. Nos. 655,560 and 706,321 filed 12th January, 1934.

The provision of an electric circuit enables the detection of breakage or jamming of the warp threads, or of breakage or absence of weft thread to be followed substantially immediately by cessation of weaving, and prevents damage arising from continuation of the weaving operation with broken warp or weft threads. Again, the provision of electrical control allows of great sensitivity of the thread detecting means, and the simplicity of connection between the detection and stopping means reduces the number of moving parts in the stop mechanism to a minimum.

The electric circuit employed for the purposes of the present invention may either be a closed circuit adapted to be opened in order to stop the loom, or vice versa. Of the two, the closed circuit is preferable, since it is better adapted to act rapidly.

When the loom employs a plurality of shuttles, each shuttle may be provided with means for detecting warp breakage or jamming, and with means for detecting weft breakage or absence, while contacts connected in an electric circuit may be so positioned as to be operated by movement of the thread detectors. The warp thread detectors may be of the type described in U. S. application S. No. 655,561 filed 7th February, 1933, the slidable plunger rod described therein serving to operate contacts placed in suitable relation to the rod, while the weft thread detectors may be of the type described in U. S. applications S. Nos. 672,379 or 726,932. The apparatus according to the invention may be used in looms in which the warps rotate while the shuttles are maintained stationary within the shed, or in looms in which the shuttles or the shuttles and the warps rotate.

By way of example, some forms of apparatus according to the invention will now be described in greater detail with reference to the accompanying drawings, in which

Figure 1 is a diagrammatic plan view of a section of a loom according to the present invention;

Figures 2 and 3 show a detail of the detecting mechanism employed in the apparatus shown in Figure 1;

Figure 4 is a view, similar to Figure 1, of a different form of apparatus according to the invention; and

Figures 5 and 6 show details of Figure 4.

In Figure 1 the shuttles 5 are caused to rotate while the warp threads (not shown) are stationary. The shuttles 5 are driven by means of vane wheels 6 mounted in bearings 7 secured to a rotating circular plate 8, the vane wheels 6 being driven by means of gears 9 and 10.

In connection with each of the shuttles 5, an electric switch 11 is provided, adapted to be operated by means of a horizontal sliding rod 12 carried by the shuttles, in a manner to be described hereafter. The several switches 11 are connected in series round the loom by means of suitably insulated wires 13, the ends of the series being connected at 14, 15 to a pair of slip rings 16, 17. Stationary carbon brushes 18, 19 are provided which make contact with the slip rings 16, 17, the brush 18 being connected to a source of supply of electric current 20, while the brush 19 is connected to an electromagnet 21 which in turn is connected to the source of supply 20.

The switches 11 are normally in a closed position so that there is a closed circuit from the source of supply 20 through the electromagnet 21 and the slip ring 17, through all the switches 11 in series and back through the slip ring 16 to

the source of supply 20 again. Current is therefore constantly flowing through the electromagnet 21, whereby the electromagnet is caused to attract and hold an armature 22 mounted on the end of a lever 23. The other end of the lever 23 is in the form of a catch 24 and is loaded by means of a spring 25. The catch 24 holds the end of a lever 26 loaded by means of a spring 27, the other end 28 of the lever 26 being connected to the end of a brake band 29 surrounding the outside of the rotating ring 8. The other end of the brake band is anchored at 30.

On jamming of the warp threads, whether by reason of the breakage of one or more warp threads or for any other cause, the rod 12 carried by the shuttle encountering the jam is pushed back and acts upon the tail 31 of the corresponding switch 11. The switches 11 are very light in operation, and easily opened by the touch of the rod 12. The opening of any one of the switches 11 breaks the electric circuit and causes the electromagnet 21 to be de-energized, so that the armature 22 is released. A small piece of non-magnetic sheet material 22' may be placed between the armature 22 and the electromagnet 21, in order to minimize any time lag due to residual magnetism. On release of the armature 22 the catch 24 is allowed to fly back under the action of the spring 25, releasing the lever 26 so that the spring 27, acting through the lever 26, applies the brake band 29 firmly to the outside of the rotating ring 8. In this manner, the brake band 29 is applied almost instantaneously and the shuttles are brought rapidly to rest. The drive of the loom may then be disconnected, and examination of the switches 11 shows immediately where the warp jam has occurred.

The manner in which the sliding rod 12 is operated is shown in Figures 2 and 3. The shuttle 5 is provided with a warp feeler 35 which precedes the shuttle and enters the warp shed before the body of the shuttle 5. The warp shed is initially formed by means of a shedding wheel 36 which opens the warp threads 33, 34 slightly, after which the shuttle pushes its way between the warp threads and itself completes the shedding operation. The normal operation of the loom in the manner described above is illustrated in Figure 2. In Figure 3 the warp threads 33, 34 are shown to be jammed at 37, as a result of which the warp feeler 35, on encountering the obstruction, is pushed back and, being connected to the rod 12, pushes the rod 12 back also. The rear end 38 of the rod 12 is thus pushed through the warp threads 33 and strikes the tail 31 of the switch 11, so that the contacts 39 of the switch 11 are opened. In this manner, the current which maintains the armature 22 in contact with the electromagnet 21 and prevents the brake band 29 from being applied, is broken.

In Figure 4 a section is shown of a loom in which the shuttles are maintained stationary, being connected to a stationary ring 45 by means such as those described with reference to the rotating ring 8 in Figure 1. A switch 46 is provided in connection with each of the shuttles 5, the switch 46 in this case being normally open. The switch 46 is formed of a U-shaped strip of metal which may easily be sprung so that its end 42 contacts with a point 43, closing the switch. The metal strip is rendered more flexible by being bent into a wave form at 44. The switch 46 is shown more clearly on a larger scale in Figure 6.

Each switch 46 is connected at 47 and 48 to two wires 49 and 50 carried by the stationary ring 45, so that the switches in this case are connected in parallel instead of in series as in Figure 1. The wire 49 is connected to a slip ring section 51, while the wire 50 is connected to an electromagnet 52, the other end of which is connected to a second slip ring section 53. The slip ring sections 51, 53 are connected by means of carbon brushes 54, 55 to a source of supply 69 of electric current. The whole of the electric mechanism described above, that is the switches 46, wires 49, 50, slip ring sections 51, 53 and electromagnet 52, is mounted on the stationary ring 45.

A rotating ring 56 which rotates with the warp threads is provided inside the stationary ring 45, and a brake band 57, secured at one end 58 to the stationary ring 45, surrounds the rotating ring 56. The other end 59 of the brake band 57 is secured to a spring 60 attached to the stationary ring 45, the spring 60 being prevented from pulling the brake band 57 in contact with the rotating ring 56 by means of a lever 61 held in position by a latch 62.

The mechanism controlling the lever 61 is shown more clearly in Figure 5. The latch 62 is caught over a bar 63, and is capable of being released by the dropping of a lever 64 under the action of a spring 65. The lever 64, however, is held up by means of a projection 66 on the armature 67 of the electromagnet 52, the armature 67 being pivoted at 68. The stationary ring 45 is held in position by means of a latch 70 which is pivotally connected to a lever 71 mounted at 72 on a stationary part of the machine. Springs 73 and 76 are provided to keep the latch 70 in contact with a projection 74 on the ring 45, the spring 76 being secured at one end to the lever 71 and at the other end to a stationary part of the machine. The free end 75 of the lever 71 is so shaped as to be engaged by the end of the lever 61 and pushed outwardly by it so as to free the latch 70 from the projection 74.

On breakage or jamming of the warp threads, the rod 12 on the shuttle 5 which encounters the obstruction, is pushed back in the manner described with reference to Figures 2 and 3, and causes contact to be made at the corresponding switch 45. This closes the electric circuit through the electromagnet 52 and causes the armature 67 to be attracted. The lever 64 is thus released and pushes the latch 62 clear of the bar 63, allowing the lever 61 to move under the action of the spring 60. The movement of the lever 61 acts on the end 75 of the lever 71 and causes the latch 70 to be disengaged from the projection 74 so that the ring 45 is free to rotate. At the same time, the movement of the lever 61 permits the spring 60 to apply the brake band 57 to the rotating ring 56 so that the stationary ring 45 is caused to rotate with the ring 56, and relative motion between the shuttles and the warp threads is brought to an end. The drive of the loom may then be disconnected at leisure.

The provision of the slip ring sections 51, 53 allows relative motion to take place between the ring 45 on which they are mounted and the stationary carbon brushes 54, 55, and facilitates the adjustment of the loom on re-starting.

It will be noted that both in Figure 1 and in Figure 4, the contact points 39, and 42, 43 of the switches 11, 46 respectively are disposed at some distance from the warp threads, so that any sparking which may occur at these contacts is not

liable to burn the warp threads and so damage the fabric being woven.

In the case of weft breakage, the weft detector device described in U. S. application S. No. 726,932 may be provided on each shuttle 5, which device, on release (on breakage or absence of weft thread) causes a jamming of the warp threads and serves to operate the rod 12 of the next succeeding shuttle, and accordingly the electromagnet 21 or 52, and latch releasing means. If desired, the pivoted weft feeler device described in U. S. application S. No. 672,379 may be used the penetration of the warp threads by the pivoted member serving to operate the rod 12 and accordingly the electromagnet 21 or 52, and latch releasing means.

What I claim and desire to secure by Letters Patent is:—

1. In a circular loom, latch mechanism adapted on release to stop weaving by bringing to an end relative circular motion between the weft inserting means and the warp threads, an electric circuit, electrical latch releasing means included in and actuated by said circuit, means adapted to detect jamming of the warp threads, and contacts in said circuit adapted to be operated on actuation of said detecting means so as to actuate the latch releasing means through said circuit.

2. In a circular loom, latch mechanism adapted on release to stop weaving by bringing to an end relative circular motion between the weft inserting means and the warp threads, an electric circuit, electrical latch releasing means included in and actuated on breakage of said circuit, means adapted to detect jamming of the warp threads, and contacts in said circuit adapted to be opened on actuation of said detecting means so as to actuate the latch releasing means by breakage of said circuit.

3. In a circular loom, latch mechanism adapted on release to stop weaving by bringing to an end relative circular motion between the weft inserting means and the warp threads, an electric circuit, electrical latch releasing means included in and actuated on closing of said circuit, means adapted to detect jamming of the warp threads, and contacts in said circuit adapted to be closed on actuation of said detecting means so as to actuate the latch releasing means by closing said circuit.

4. In a circular loom comprising stationary warps and rotating shuttles, latch mechanism adapted on release to stop the rotation of such shuttles, an electric circuit, electrical latch releasing means included in and actuated by said circuit, detector means carried by each of said shuttles, and contacts in said circuit adapted to be operated by said detector means so as to actuate the latch releasing means through said circuit.

5. In a circular loom comprising stationary shuttles and rotating warps, latch mechanism adapted on release to set the shuttles in rotation with the warps, an electric circuit, electrical latch releasing means included in and actuated by said circuit, detector means carried by each of said shuttles, and contacts in said circuit adapted to be operated by said detector means so as to actuate the latch releasing means through said circuit.

6. In a circular loom, latch mechanism adapted on release to stop weaving by bringing to an end relative motion between the shuttles and the warp threads, an electromagnet adapted to hold such latch mechanism against release, an electric circuit including said electromagnet, detector means carried by each of said shuttles, and closed contacts in said circuit adapted to be opened by said detector means so as to break said circuit, de-energize said electromagnet, and release said latch mechanism.

7. In a circular loom, latch mechanism adapted on release to stop weaving by bringing to an end relative motion between the shuttles and the warp threads, an electric circuit, electrical latch releasing means included in and actuated by said circuit, detector means carried by each of said shuttles inside the warp threads and adapted to act through the warp threads, and contacts in said circuit outside the warp threads adapted to be operated by said detector means so as to actuate the latch releasing means through said circuit.

8. In a circular loom, latch mechanism adapted on release to stop weaving by bringing to an end relative motion between the shuttles and the warp threads, an electric circuit, electrical latch releasing means included in and actuated by said circuit, a rod carried by each of said shuttles inside the warp threads, detector means carried by each shuttle and adapted to cause said rod to penetrate the warp threads, and contacts in said circuit outside the warp threads adapted to be operated by said rod so as to actuate the latch releasing means through said circuit.

9. In a circular loom comprising stationary warps and rotating shuttles, latch mechanism adapted on release to stop weaving by bringing to an end relative motion between the shuttles and the warp threads, an electro-magnet adapted to hold such mechanism against release, an electric circuit including said electro-magnet, detector means carried by each of said shuttles and closed contacts in series in said circuit adapted to be opened by said detector means so as to break said circuit, de-energize said electro-magnet and release said latch mechanism.

10. In a circular loom comprising stationary warps and rotating shuttles, latch mechanism adapted on release to stop weaving by bringing to an end relative motion between the shuttles and the warp threads, an electro-magnet adapted to hold such mechanism against release, a series of closed contacts, a slip ring at each end of said series, said slip rings being adapted to rotate with the shuttles, brushes engaging said slip rings and connecting said electro-magnet in series with said contacts, said detector means carried by each of said shuttles, said detector means being adapted to open said contacts so as to break the circuit through said contacts and said electro-magnet and release said latch mechanism.

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