

[54] APPARATUS FOR GUIDING WEFT THREAD CARRIERS IN THE SHED OF A LOOM OF A PROGRESSIVE SHEDDING TYPE

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[56]

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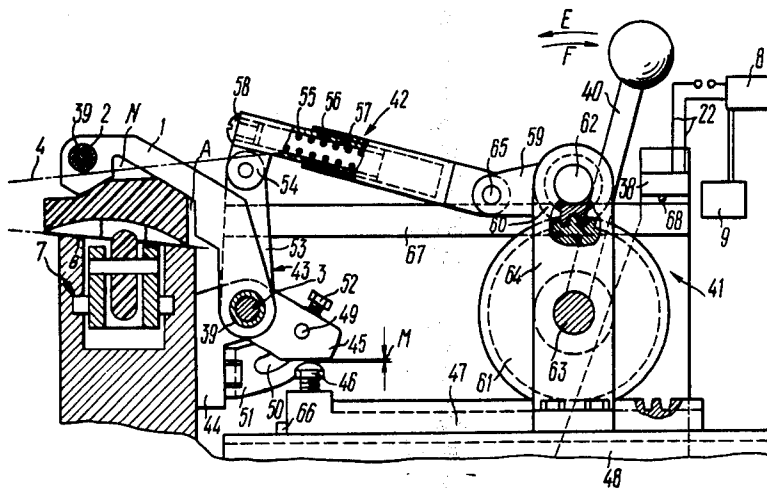
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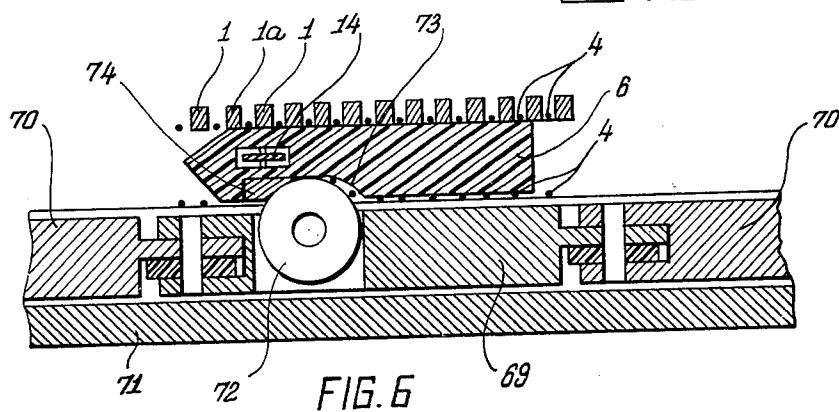
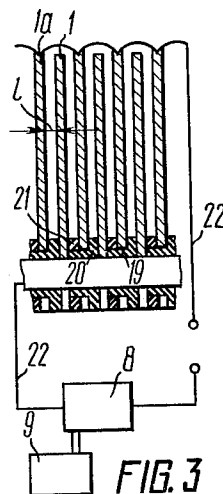
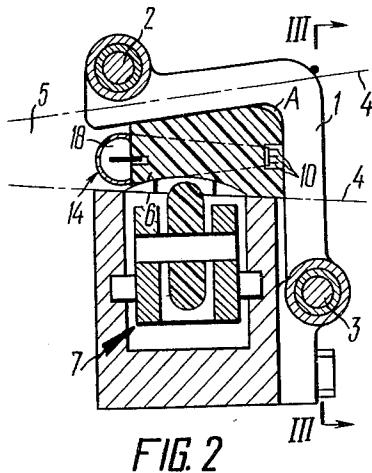
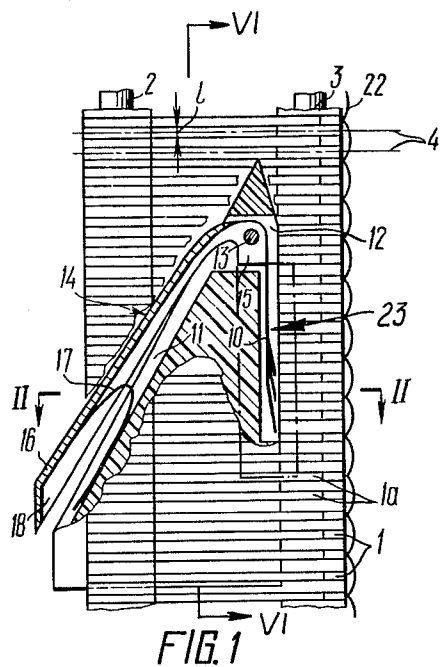
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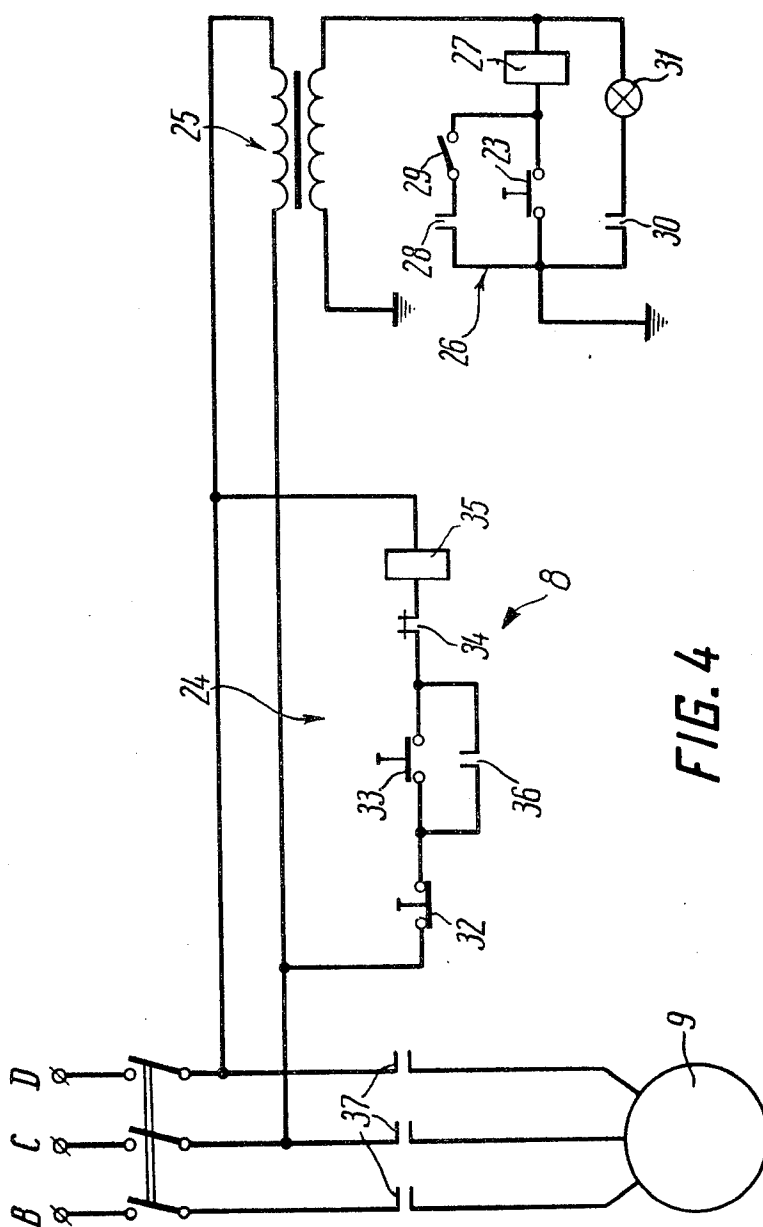
ABSTRACT

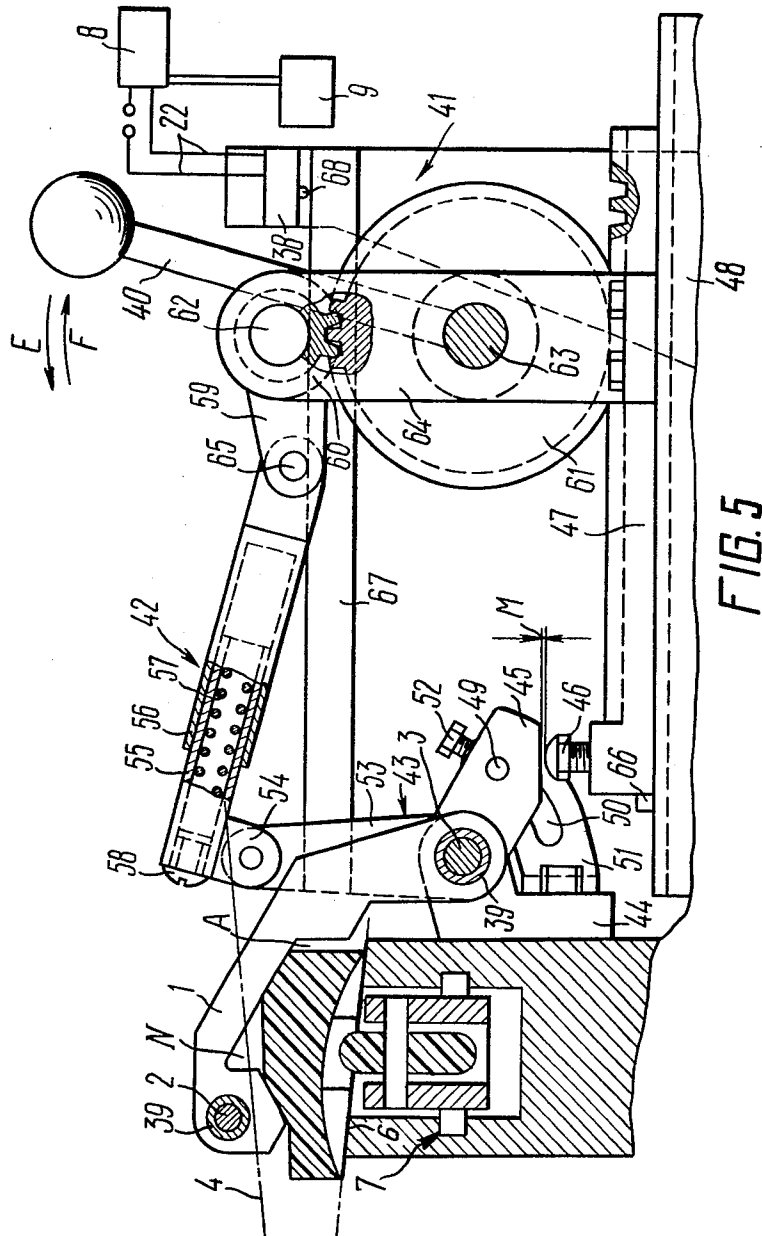
Apparatus intended for use in looms of a progressive shedding type, in which separate plates are mounted on common bars and spaced from one another to accommodate warp threads therebetween. The plates of the apparatus are electrically connected to the control circuit of the drive system of the loom, for de-energizing this drive as the weft carrier encounters an obstacle in the shed.

3 Claims, 6 Drawing Figures









APPARATUS FOR GUIDING WEFT THREAD CARRIERS IN THE SHED OF A LOOM OF A PROGRESSIVE SHEDDING TYPE

The present invention relates to looms of a progressive shedding type, and more particularly to apparatus for guiding weft thread carriers in the shed of such looms.

At present, there are known apparatus for guiding weft thread carriers in the shed of a loom of a progressive shedding type, comprising separate plates encircling the weft thread carrier and mounted on common bars, the plates being spaced apart to accommodate warp threads therebetween.

In these known apparatus, the weft thread carrier continuously moves along these plates and, upon having encountered an obstacle, e.g., a faulty warp, it continues its motion and either breaks both the warp and weft threads or passes below or above these threads, thus adversely affecting the weaving pattern, in which way the quality of the cloth being woven is impaired. To avoid this, the operation of the loom should be permanently supervised, which reduces the number of looms operable by a single weaver, and, consequently, steps up the cost of the cloth.

The present invention has for its aim to provide an apparatus for guiding weft thread carriers in the shed of a loom of the progressive shedding type, which, in addition to its basic function of indexing and guiding the carrier in the shed formed by warp threads, should also serve as the means for disengaging the drive of the loom upon the weft thread carriers having encountered an obstacle in the shed.

These and other objects are attained in an apparatus for guiding weft thread carriers in the shed of a loom of a progressive shedding type, comprising a drive system including an electric control circuit, the apparatus having a plurality of individual plates embracing a moving weft thread carrier, the plates being mounted on common bars and being spaced from one another to accommodate warp threads therebetween, in which apparatus, according to the present invention, the plates are electrically connected to the control circuit of the drive system of the loom, said carrier being adapted, upon having encountered an obstacle, to cooperate with said plates to break said electric control circuit of the drive of the loom and thus to stop the loom.

The provision of an electric connection between the plates and the control circuit of the drive system of the loom enables the weft thread carrier to be used as a means for monitoring the process of shedding, as well as makes it possible to use the herein disclosed apparatus as a means for disengaging the drive of the loom, since the plates of the apparatus are in permanent contact with the weft thread carrier during the entire period of the travel of the carrier in the loom, whereby disengagement of the drive system of the loom can be effected under the action of any one of a plurality of the carriers at any given moment.

According to one embodiment of the present invention, the electric connection of the plates to the control circuit of the drive system is effected by one of the common bars and at least every second plate being connected into this control circuit, the plates being mounted on these common bars by means of insulating bushes, whereas the weft thread carrier is provided with movable electric contacts protruding from the car-

rier upon the latter having encountered an obstacle in the shed, to engage the plates and in this way to break the control circuit of the drive system.

In this embodiment, in accordance with the invention, the weft thread carrier is provided with a groove accommodating a pivotable arm having one end portion thereof carrying the above-mentioned electric contacts, the other end portion of the arm being made thicker and biased toward the weft thread carrier, so that said end portion with the electric contacts is normally sunk within the groove, while the thicker end portion projects from the groove to be engaged by an obstacle in the shed, in which way the arm is pivoted to project its end portion with the electric contacts from the groove, for the contacts to engage the plates.

According to an alternative embodiment of the present invention, the electric connection is effected by means of open contacts mounted adjacent to the plates and connected into the control circuit of the drive system, the apparatus being mounted in the loom for rotation about the axis of one of said common bars upon the weft thread carrier having encountered an obstacle in the shed, in which way said open electric contacts become closed, and the control circuit of the drive system is broken.

The above embodiments of the electric connection make it possible to prevent faults in the weaving pattern in a simple and effective way, since should any obstacle appear in the shed, the loom is automatically stopped until the cause is eliminated. This allows for preventing the production of a cloth with a faulty weave resulting from the weft thread carrier having passed either above the obstacle or below it. Furthermore, the eventuality of warp and weft thread abrupton is substantially reduced.

Thus, disengagement of the drive of the loom by the apparatus for guiding the weft thread carriers the very moment any of these carriers has encountered an obstacle in the loom prevents abrupton of warp and weft threads, as well as faulty weave. Furthermore, it permits of increasing the number of looms operable by a single weaver and to step up their productivity.

The present invention will be further described with reference to embodiments thereof in conjunction with the accompanying drawings, wherein:

FIG. 1 is a schematic plan view of an apparatus embodying the invention, together with the weft thread carrier (of which only a part is shown);

FIG. 2 is a sectional view along line II—II of FIG. 1; FIG. 3 is a sectional view along line III—III of FIG. 2, with the control circuit of the drive system of the loom;

FIG. 4 is a schematic diagram of the electric control circuit of the drive of the loom;

FIG. 5 is a partly sectional view of a second embodiment of the apparatus for guiding weft thread carriers, with the electric control circuit of the loom.

Referring now in particular to the appended drawings, the apparatus for guiding weft thread carriers in the shed of a loom of a progressive shedding type comprises individual plates 1 (FIGS. 1 and 2) mounted on common bars 2 and 3. The plates 1 are separated by a distance I along the bars 2 and 3 (FIG. 1), to accommodate therebetween warp threads 4 from which a shed 5 (FIG. 2) is formed, the weft thread carrier 6 being movable in this shed.

The plates 1 are L-shaped and define a passage A through which the weft thread carrier 6 moves. The plates 1 embrace this weft thread carrier 6, as is shown in FIG. 2, while from below the weft thread carrier is supported by a means 7 propelling the carrier along the passage A, e.g., a chain conveyor.

In accordance with the present invention, the plates 1 of the apparatus are electrically connected to an electric control circuit 8 (FIG. 3) of the drive system of the loom, including a motor 9, the weft thread carrier 6 being adapted, upon having encountered an obstacle in the shed, to cooperate with the plates 1 to break the control circuit 8 of the drive system and to de-energize the latter.

The drive system of the loom actuates all the major mechanisms of the loom such as the means 7 (FIG. 2) for propelling the weft thread carriers 6 in the shed, the beat-up motion, the device for winding the weft thread onto the spool of the weft thread carrier, the shedding motion, the warp threads feeding motion and the cloth take-up mechanism, the selvage-forming mechanism (these motions and mechanisms are not shown in the appended drawings, for the sake of clarity).

To stop instantaneously the means 7 (FIG. 2) of the loom, the control circuit 8 (FIG. 3) also incorporates an electrically operated brake which is not disclosed here since it is generally known per se.

In accordance with one embodiment of the present invention, the electric connection between the plates 1 and the control circuit 8 of the drive system is effected by this control circuit including one of common bars 3 contacting plates 1, and plates 1a which is insulated from bar 3 and plates 1 is located in a spaced manner from a plate 1. Every thread carrier 6 (FIG. 1) is provided with movable electric contacts 10 that are received within the weft thread carrier 6 and protrude therefrom the moment the carrier engages an obstacle in the shed, whereby the contacts engage the plates 1a and thus break the control circuit 8.

The weft thread carrier 6 is provided with grooves 11 and 12. The groove 12 receives an arm 14 pivotable about an axle 13. One end 15 of this double-ended arm 14 pivots on the axle 13 and has the contacts 10 attached thereto, while the other end 16 of the arm is made thicker. The thickness of this opposite end 16 of the arm 14 increases toward its extremity opposite to the contacts 10, to be engaged by an obstacle that cannot be overcome by mere spreading apart of the warp threads 4 by the carrier 6 engaging this obstacle, e.g., intertwined warp threads.

The end 16 of the arm 14 is loaded by a coiled spring 17 so that the other end 15 thereof with the electric contacts 10 is sunk within the groove 12, while the thicker end 16 protrudes from the carrier to be engaged by an obstacle in the shed, in which case the arm 14 pivots on the axle 13, and its end 15 with the contacts 10 comes out of the groove 12 for the contacts to engage the plates 1. One end of the spring 17 is fixed in the groove 11 of the carrier 6, while the opposite end thereof is received by a notch 18 provided in the thicker end 16 of the arm 14. The electric contacts 10 are in the form of a plurality of thin wires of different length, slightly bent toward the plates 1 to provide for a more reliable contact therewith for contact with, at least, two adjacent plates.

Every other plate 1 is secured to the bars 2 and 3 (FIG. 3), so that direct electric contact is established

therebetween to ensure the flow of an electric current there through. The rest of the plates labelled here as 1a, are mounted by means of insulating bushes 19 that insulate them electrically from the bars 2 and 3. These insulating bushes may be made from organic glass. To effect the insulation of the plates 1a, each bush 19 has a flange 20 at one end thereof, the thickness of this flange equalling the distance l between the plates 1 and 1a, while an insulating washer 21, e.g., also made from organic glass, is fitted on the opposite end of the bush 19. When the plates 1 and 1a are assembled on the bars 2 and 3, they are secured at the opposite ends of the bars with nuts (not shown).

It is also possible to connect the plates 1 into the control circuit 8 of the drive system by groups of two, three or more plates, in which case the length of the insulating bushes 19 should be increased accordingly.

The plates 1a are connected one to another and to the control circuit 8, just like the bar 3 is connected to the control circuit 8, by means of wires 22, thus forming normally open contacts 23 (FIG. 4), process contacts.

The control circuit 8 of the drive of the loom is a generally known electric circuit switching on and off the drive, i.e., starting and stopping of the loom, the motor 9 being connected to three-phase A.C. mains B, C, D. Connected in parallel with two phases C and D of these mains is a circuit 24 for de-energizing the drive and a step-down transformer 25, connected to the secondary winding whereof is a circuit 26 for switching the drive off.

The circuit 26 includes the normally open contacts 23 connected in series with a relay 27 whose n.o. contacts 28 are connected, together with a manually operable switch 29, in parallel with the contacts 23.

Connected in parallel with the contacts 23 and the relay 27 are series-connected normally open contacts 30 of the relay 27 and a pilot lamp 31.

The circuit 24 for switching off the drive comprises series-connected, normally closed contacts of the "STOP" push-button, n.o. contacts 33 of the "START" push-button, normally closed contacts 34 of the relay 27 and a relay 35 for de-energizing the drive.

Connected in parallel with the contacts 33 of the "START" push-button are n.o. interlocking contacts 36 of the relay 35.

The electric motor 9 is connected to the three-phase mains B, C, D via respective n.o. contacts 37 of the relay 35.

The step-down transformer 25 supplies to the circuit 26 and, consequently, to the plates 1a and the bars 3 with the plates 1 an electric current of about 12 V, which is harmless to a man.

The apparatus of the present invention operates as follows.

With the "START" button depressed, the contacts 33 make, and an electric current flows through the de-energizing circuit 24, the relay 35 operates, whereby the interlocking contacts 36 make, same as the contacts 37 in the B, C, D mains. When the contacts 33 of the "START" push-button re-open, the electric current continues through the circuit 24, and the motor 9 transmits rotation to the mechanisms and motions of the loom.

Consequently, the means 7 (FIG. 2) acts upon the bottom portion of the weft thread carrier 6, propelling the latter through the carrier-guiding channel A in the

shed 5. When encountering an obstacle in the shed 5, the carrier 6 tries to spread the warp threads 4 apart and thus to unblock the passage. If this fails, the obstacle is engaged by the arm 14 (FIG. 1), whereby the arm 14 compresses the spring 17 and is pivoted about the axle 13 so that the end 15 of the arm with the electric contacts 10 comes out of the groove 12, the contacts engaging the plates 1 and 1a, thus closing the circuit 26, i.e., closing the contacts 23 (FIG. 4) in the circuit 26. The current now flows through the circuit 26 which results in the relay 27 closing its interlocking contacts 28 and 30 and breaking its contacts 34 in the drive de-energizing circuit 24.

Then the pilot lamp 31 in the control circuit 26 comes on, and, upon the process contacts 23 having opened, the control circuit is still energized. As the contacts 34 open, the de-energizing circuit 24 is broken, and the contacts 37 in the mains B, C open the motor 9 being de-energized, whereby all the mechanisms and motions of the loom are stopped.

As the obstacle in the shed 5 is removed, the spring 17 acting on the end 16 of the arm 14 turns the arm 14 together with the contacts 10, whereby the latter are disengaged from the plates 1 and 1a and sink once again in the groove 12, and the thicker end 16 protrudes again from the carrier 6.

The switch 29 is manually operated to break the circuit of the interlocking contact 28 in the de-energizing control circuit 26. Thus, the latter circuit is broken, and the contacts 28, 30, 34 of the relay 27 return to their initial position. Now the drive of the loom may be energized by depressing the "START" push-button.

Alternatively, the electric connection of the plates 1 to the drive control circuit 8 is effected in a different manner. According to this embodiment, mounted adjacent to the plates 1 are normally open electric contacts, e.g., those of a limit switch 38 (FIG. 5), which are electrically connected to the drive control circuit 8, while the entire apparatus for guiding the weft thread carriers in the shed of a loom of a progressive shedding type is mounted in the loom rotatably about the geometric axis of one of the two common support bars, e.g., that of the bar 3, under the action of the weft thread carrier 6 on the plates 1 of the apparatus, upon the carrier having encountered an obstacle in the shed.

As the apparatus is rotated in the above fashion, the plates 1 make the through lever 67 described below close, breaking the drive control circuit 8 which is similar to the circuit described above in connection with the previous embodiment, with reference to FIG. 4, the open contacts 38 being connected to the de-energizing control circuit 26 in lieu of the normally open process contacts 23.

With the carrier guiding apparatus illustrated in FIG. 5 being rotatably mounted in the loom, the plates 1 thereof are rigidly secured to the bars 2 and 3, with spacers 39 interposed therebetween to maintain the distance 1 between the plates for the passage of warp threads.

Manual rotation of the apparatus is effected with a handle 40 associated with a retaining mechanism 41, a spring member 42 and bell cranks 43.

The bell cranks 43 are rigidly attached to the ends of the bar 3 that extends through openings in brackets 44 which are arranged at spaced points across the weaving width of the loom to provide for greater rigidity of the device.

Positioned under an arm 45 of the bell crank 43 is an abutment 46 limiting the angle of rotation of the apparatus under the action of the carrier 6, as the latter encounters an obstacle in the shed 5.

The abutment 46 is in the form of a bolt with a semi-spherical head, supported by a movable toothed rack 47. The toothed rack 47 is slidable to the left and to the right in a guide 48, as the apparatus is manually swung into an open position and returned to its initial working position. The abutment bolt 46 may be turned in or out of the rack 47 to adjust the angle of rotation of the apparatus under the action of the carrier 6.

For the plates 1 of the apparatus to engage reliably the weft thread carriers 6, as the latter move through the channel A, there is provided a pin 49 mounted on the arm 45 of the bell crank 43 and movable in an arcuate slot 50 provided in a bracket 51. There is also provided a screw 52 threaded into the free end of the bracket 51 and having its end extending into the upper part of the slot 50, for cooperation with the pin 49 at normal operation of the loom. By turning the screw 52 in and out it is possible to adjust the extreme position of the apparatus and thus to ensure reliable engagement of the plates 1 with the carriers 6, i.e., to ensure that the carriers are reliably guided in the channel A.

The opposite arm 53 of the bell crank 43 is pivotably connected by means of a pivot axis 54 to the spring number 42 pressing the plates 1 to their extreme position and setting a definite force which precludes the loom's cutting off while normal movement of the carrier.

The spring member 42 includes a pair of telescopically arranged sleeves 55 and 56 receiving a coiled compression spring 57. The spring 57 is directly received in the sleeve 55. When the apparatus is manually rotated, the sleeve 55 is moved into the sleeve 56 compressing the spring 57. The force rotating the apparatus can be regulated by means of an adjustment screw 58 threaded into the bottom of the sleeve 55.

The other sleeve 56 is pivotably connected to the retaining mechanism 41, i.e., to the mechanism retaining the apparatus in its working position whereat the plates 1 engage the carriers.

The retaining mechanism 41 is connected to the spring member 42 through a crank 59, the rotation whereof results in the spring 57 being either compressed or released.

The retaining mechanism 41 includes a pair of meshing gears 60 and 61, the gear 61 also meshing with the toothed rack 47. The gears 60 and 61 have their respective shafts 62 and 63 journaled in a support 64, the shaft 63 carrying the handle 40, while the shaft 62 carries the above crank 59. With the handle 40 being turned in the direction indicated by the arrow line E, a pivot axle 65 interconnecting the crank 59 with the sleeve 56 is raised, and the rotation of the meshing gears 60 and 61 results in the toothed rack being moved to the right, whereby the entire carrier guiding apparatus is turned about the geometric axis of the bar 3.

With the handle 40 being rotated in the direction indicated by the arrow line F, the rack 47 is moved to the left against the abutment 46, and the pivot axle 65 of the crank 59 is lowered, the spring 57 being compressed between the bottoms of the sleeves 55 and 56, the effort of the compressed spring being transmitted through the meshing gears 60 and 61 to press the rack

47 against the abutment 66, i.e., the apparatus for guiding the carriers is positively retained in the position where the plates 1 reliably engage the carriers 6.

To de-energize the drive of the loom, the arm 53 of the bell crank 43 carries a cantilever arm 67 of which the free end underlies the limit switch 38 electrically connected by wires 22, as it has been already described, to the drive control circuit 8.

At normal operation of the loom, this end of the cantilever arm 67 permanently engages the push-button 68 of the limit switch 38, whereby the contacts of the latter are open.

With the handle 40 being turned in the direction indicated by the arrow line E, the gear 61 moves the toothed rack 47 together with the abutment 46 to the right, making space for rotation of the arm 45 of the bell crank 43, and as the herein disclosed carrier guiding apparatus is swung open, the gear 61 further rotating the gear 60 together with the crank 59 clockwise. The pivot axle 65 entrained by the crank 59 is lifted, whereby the sleeves 55 and 56 are moved apart in a telescoping motion, and the spring 57 is relieved. Now the spring 57 opposes no longer the rotation of the apparatus, and the latter may be swung open manually. To return the apparatus to its working position, the handle 40 is turned in the direction indicated by the arrow line F, and the above sequence is reversed. Finally, the force of the compressed spring 57 retains the herein disclosed apparatus for guiding weft thread carriers in its working position.

Upon having encountered an obstacle in the shed 5, the weft thread carrier 6 tries to overcome this obstacle and, consequently, applies a certain force to the plates 1 of the apparatus. Should this force be sufficient to overcome the opposition of the spring 57, the apparatus would be rotated together with the bar 3 in the brackets 44, the bell crank 43 and the cantilever arm 65 being also rotated. The latter releases the push-button of the limit switch 38, and the contacts of the latter close, whereby the drive control circuit 8 becomes broken in the manner described hereinabove, and the drive of the loom is stopped. The rotation of the apparatus under the effort exerted by the carrier 6 is limited by the clearance M between the arm 45 of the bell crank 43 and the head of the abutment 46.

Upon the loom having been stopped, the apparatus for guiding the weft thread carriers may be rotated manually, if this is required, in the manner described hereinabove, for the obstacle that had caused the stoppage of the loom to be removed.

What is claimed is:

1. Apparatus for guiding weft thread carriers in the shed of a loom of a progressive shedding type, includ-

ing a drive and a control circuit of the drive, the apparatus comprising plates embracing said weft thread carrier for guiding it in said shed; bars on which said plates are mounted in spaced relationship for the passage of warp threads therebetween, said plates being electrically connected to said control circuit of said drive, said weft thread carrier being adapted upon having encountered an obstacle in said shed to cooperate with said plates to break said electric control circuit of said drive and thus to de-energize said drive, said electric control circuit of said drive including one of said plate-supporting bars and at least every other said plate, said plates being mounted on said bars by means of insulating bushings, said weft thread carrier having movable electric contacts adapted to protrude therefrom upon said weft thread carrier having encountered an obstacle in said shed and to engage said plates, whereby said electric control circuit of said drive is broken.

2. Apparatus as claimed in claim 1, wherein said weft thread carrier has a groove accommodating a pivotable arm, one end of said arm carrying said electric contacts and the other end of said arm being thicker and pressed by a spring against said carrier so that said end with said electric contacts is normally held within said groove and said thicker end protrudes from said carrier to be engaged by an obstacle in said shed, such engagement resulting in said arm being pivoted and said end with said electric contacts coming out of said groove to engage said electric contacts.

3. Apparatus for guiding weft thread carriers in the shed of a loom of a progressive shedding type, including a drive and a control circuit of the drive, the apparatus comprising plates embracing said weft thread carrier for guiding it in said shed; bars on which said plates are mounted in spaced relationship for the passage of warp threads therebetween, said plates being electrically connected to said control circuit of said drive, said weft thread carrier being adapted upon having encountered an obstacle in said shed to cooperate with said plates to break said electric control circuit of said drive and thus to de-energize said drive, including normally open electric contacts positioned adjacent to said plates, said normally open contacts being connected into said control circuit of said drive, said apparatus being mounted in said loom for rotation about the axis of one of said bars under the action of said weft thread carrier exerted upon said plates, as said weft thread carrier encounters an obstacle in said shed, such rotation resulting in said normally open electric contacts being closed, and said control circuit of said drive being broken.

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