Sept. 11, 1934. M. B. PENMAN ET AL 1,973,653

STOP MOTION FOR LOOMS

Original Filed March 9, 1933 3 Sheets-Sheet 1

Fig. 2.

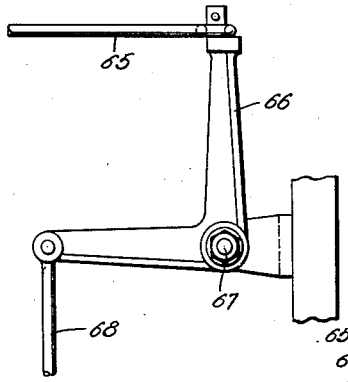



Fig. 1.




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Fig. 3.

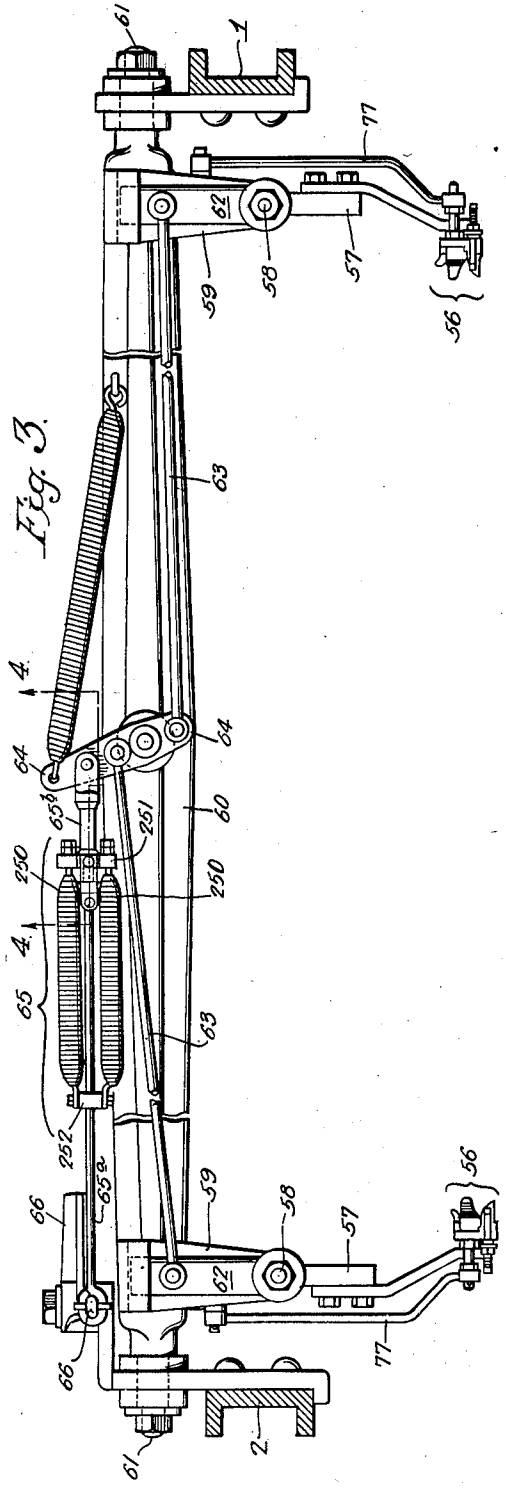
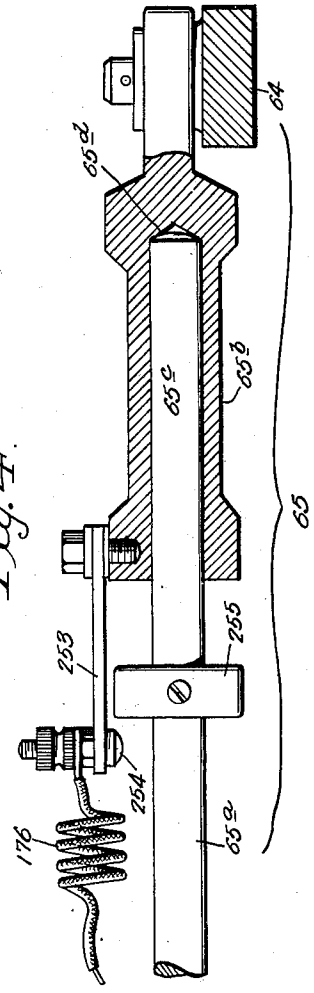



Fig. 4.




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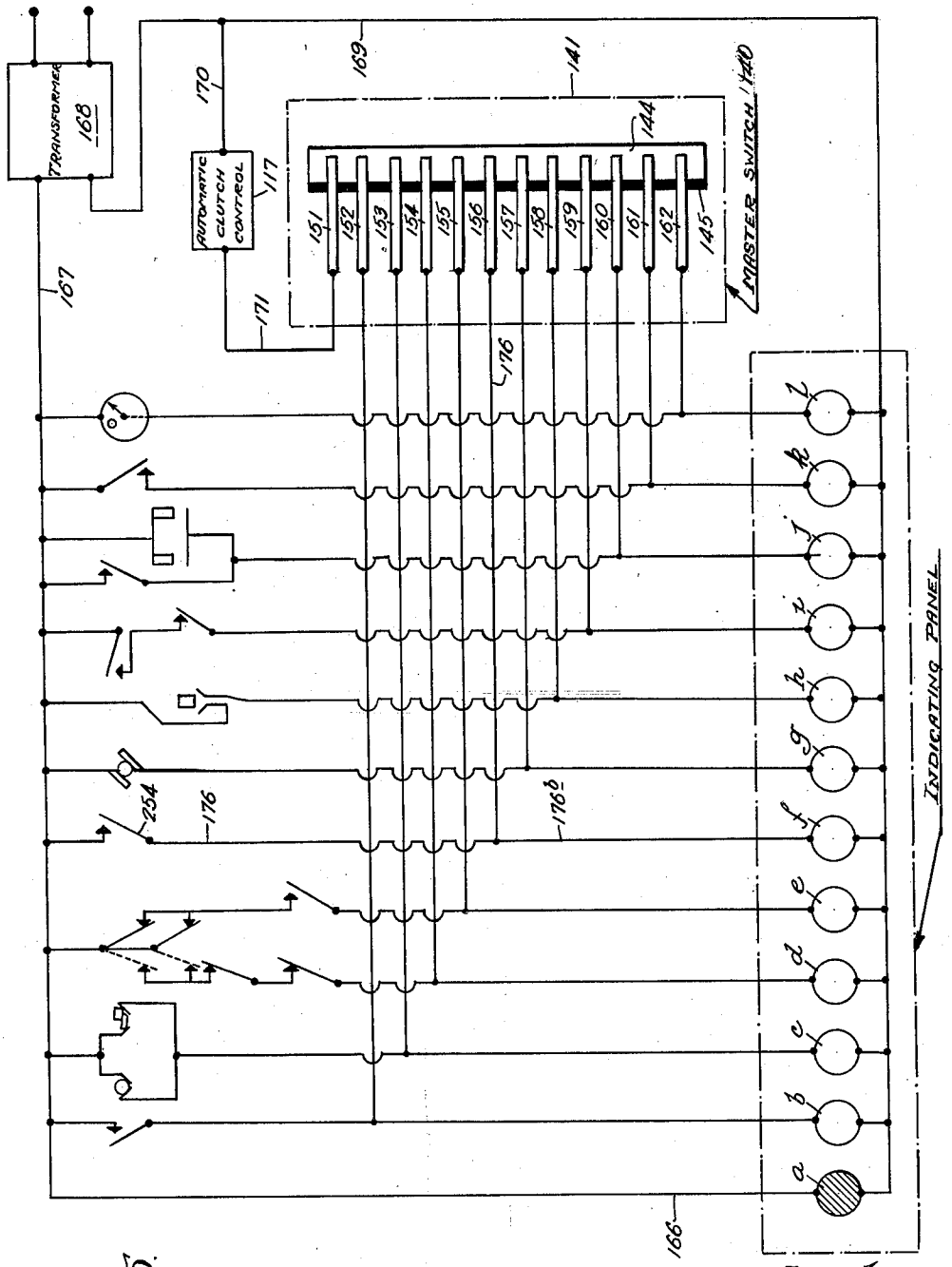



Fig. 5.

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# UNITED STATES PATENT OFFICE

1,973,653

## STOP MOTION FOR LOOMS

Montgomery B. Penman, Bloomsburg, and Alfred F. McCollum, deceased, late of Bloomsburg, Pa., by Harrisburg Trust Company, executor, Harrisburg, Pa., assignors to The Magee Carpet Co., Bloomsburg, Pa., a corporation of Pennsylvania

Original application March 9, 1933, Serial No. 660,166. Divided and this application March 15, 1934, Serial No. 715,698

4 Claims. (Cl. 139—336)

This invention relates to stop motions for looms, and particularly looms for weaving carpets of the "Axminster" type, wherein, for each transverse course of pile tufts included in a single repeat of the pattern to be woven into the fabric, a spool having a yarn wound thereon for each pile tuft of the course represented by the spool is provided; and wherein each spool is carried by a frame having a feed tube for each of the tuft yarns on the spool, each tube frame in turn being carried by a pair of endless chains which pass through circuitous paths and convey the tube frames successively to a predetermined position in the loom at which the newly positioned tube frame is removed from the carrier chains by a pair of grippers which are adapted to register with the opposite ends of the frame, the grippers being mounted at the outer ends of arms arranged to carry the frame to a position adjacent the warp in the loom or the fell of the fabric, for laying the tuft yarns of the spool in predetermined positions in the open warp shed, in order that the tufts may be tied into the fabric by filling or weft threads inserted in the open warp shed by a needle operable across the warp within the open shed, and to return the frame to its position on the carrier chains.

The present invention concerns the provision of means for detecting abnormal conditions arising during the weaving operations which heretofore have been responsible for considerable damage being done to the mechanisms of the loom and to the fabric and which are generally known to the trade as "smashes".

The present invention further concerns the incorporation with the detecting means above referred to of a system of signals, audible or visible, or a combination of both, by which the weaver may readily determine the location in the loom of the prevailing abnormal condition.

The present invention further concerns the incorporation, with the detecting mechanisms and the signalling system above referred to of an automatic mechanism common to all of the above noted detecting mechanisms and operable by any single one thereof for stopping the loom immediately upon detection of an abnormal condition, whereby the production of the above noted "smashes" is avoided.

The present application, a division of the parent application filed by the applicants in the present case, on March 9, 1933 and bearing Serial No. 660,166, particularly concerns the means for detecting improper registration between the tube frame and the grippers which normally remove the frames from the carrier chains as and for the purpose above noted.

The construction and operation of the detecting, signalling and stop-effecting mechanisms, forming the subject matter of the present application and the cooperation of this mechanism with the ordinary elements of a loom of the type noted insofar as the present case is concerned will be more fully disclosed hereinafter, reference being had to the accompanying drawings, of which:

Fig. 1 is a sectional elevation of sufficient of a loom of the type noted to show the mechanism for removing the tube frames from the carrier chains and for handling the tube frames in laying the tuft yarns in the open warp shed of the fabric;

Fig. 2 is a detail of a portion of the mechanism shown in Fig. 1;

Fig. 3 is a plan view of the tube frame handling mechanism shown in Fig. 1, showing mechanism for detecting improper registration of the frame grippers with the tube frame;

Fig. 4 is a sectional elevation taken on the line 4—4, Fig. 3, and showing, in detail, the switch for detecting said improper registration of the tube frame grippers with the tube frame located in the position to be removed from the carrier chains; and

Fig. 5 is a wiring diagram showing the manner of connecting the several detector switches, the master switch, the clutch-releasing mechanism and the signalling system with a source of electric energy.

The loom shown in the drawings for the purpose of illustrating the principles of the present invention is of the type generally known as a "Crompton and Knowles Axminster Loom" and as shown in Fig. 1 comprises the usual main side frames 1, which are integrally connected by the usual transverse frame members 3.

Extending laterally from the right side main frame 1 is a lateral extension frame which supports the driving motor (not shown) which rotates a main drive gear freely rotatable on a main drive shaft to which is fixed a constantly rotating member of the main clutch, the second member of which is splined to the shaft and provides a readily releasable driving connection between the motor and the main drive shaft. The main drive shaft through suitable gearing drives the main cam shaft 15 of the loom. The main cam shaft 15 is rotatably mounted in suitable bearings on the main side frames 1 and the said lateral extension frame. The loom is provided with the usual

breast beam 16 and oscillating lay 17 adjacent thereto.

Extending rearwardly from the main side frames 1 are supplemental side frames or racks which provide the necessary support for the carrier chains 40, 40 to which the tube frames 50, 50 are detachably secured.

The side chains 40, 40 are supported in and travel along an upper horizontal run and a series of short and long vertical runs which, together with the upper horizontal run, form the circuitous path traveled by carrier chains 40 and tube frames 50, whereby the said tube frames are conveyed successively to a position A located substantially above the fell $y$ of the fabric, at the rear edge of the extension 27 of the breast beam 16, see Fig. 1.

The carrier chains 40, 40 are advanced intermittently by the usual pawl and ratchet mechanism (not shown), which intermittently rotates a shaft 52 at the lower end of the front vertical run of the carrier chains, said shaft 52 being rotatably mounted in bearings carried by a transversely extending arch beam 54 which is secured at its opposite ends to the main side frame 1.

The heddle frames 25 are operated in the usual manner through a series of levers actuated by cams on the main shaft 15, to form open warp sheds composed of the warp ends $x$.

Carried by each of the tube frames 50 is the usual tuft yarn spool 55, on which the tuft yarns are wound, said tuft yarns passing from the spool 55 in the usual manner through the feed tubes 55$a$ carried by the tube frame 50 and from which the free ends $w^1$ of the tuft yarns extend.

As usual in this type of loom, each tube frame 50, as it is moved to position A, indexes or registers with a pair of jaws or grippers 56 which are disposed respectively at the opposite sides of the loom and which are carried on the outer ends of horizontally rockable arms 57, 57 which are rotatably mounted on vertical pivots 58, 58. The vertical pivots 58 of the gripper arms 57 are carried on the outer ends of vertically rockable arms 59, 59 which form parts of a transversely extending rocking frame 60. The rocking frame 60 is provided with trunnions 61, 61 which are rotatably mounted in bearings carried by the side frame 1.

Each of the gripper arms 57 is provided with an arm 62, said arms 62, 62 being connected at their outer ends by links 63, 63 with a lever 64 which is pivoted to the rocking frame 60 and connected by a link 65, see Fig. 3, to one arm of a bell-crank lever 66. The bell-crank lever 66, see Fig. 2, is pivoted at 67 to a bracket secured to the main frame of the loom. The second arm of the bell-crank 66 is connected by a link 68 to a lever 69 which is pivoted to the main frame of the loom and provided at its outer end with a cam follower 70 in operative engagement with a cam 71 secured to the main shaft 15 of the loom.

The rocking frame 60 is connected by a link 72 to the outer end of a lever 73 which is pivoted to the main frame of the loom and provided with a cam follower 74 in operative engagement with a cam 75 secured to the main shaft 15 of the loom.

The gripper jaws 56 are pivotally connected to the arms 57 and 76 and to each of the gripper jaws 56 is attached one end of a link 77, the opposite end of which is pivotally connected to a rocking lever 78 which in turn is connected by means of a link 79 to the outer end of a lever 80 which is pivoted at 81 to the lever 73. Intermediate its ends, the lever 80 is provided with a cam follower 82 in operative engagement with a cam 83 secured to the main shaft 15 of the loom.

As the shaft 15 rotates the cam 71 first rocks the gripper arms 57 about their pivots 58 to move the grippers inwardly in opposite directions into registry with the opposite ends of the tube frame 50 at position A, where the said grippers register with the tube frame and at the same time release the frame from the carrier chains 40, 40 in the usual manner, whereupon the cam 75 becomes effective and rocks the frame 60 about its pivots 61 to lower the grippers 56 and the tube frame 60 held thereby from the full line position, Fig. 1, to the broken line position in said figure, the cam 83 at the same time becoming effective to rock the grippers 56 and the tube frame 50 carried thereby about the pivots 76 whereby the projecting ends $w^1$ of the tuft yarns are laid in the open warp shed, substantially at the fell $y$ of the fabric.

While in this position a weft or filling thread is passed through the open warp shed in the usual manner by a filling needle which is inserted in the open warp shed by the usual rope drum actuated in the usual manner from the main shaft of the loom. The lay 17 is then rocked in the usual manner to beat the newly inserted filling thread and the engaged ends $w^1$ of the tuft yarns in the position at the fell $y$ of the fabric, after which the tufts formed by the said projecting ends $w^1$ of the tuft yarns are severed from the tuft yarns, adjacent the lower ends of the feed tubes 55$a$ through which the tuft yarns extend, the severing of the tufts from the tuft yarns being accomplished in the usual manner by the laterally reciprocating blade 87 and the co-operating laterally oscillating blade 88 operated in the usual manner in timed relation with the other elements of the loom.

The links and levers just described are then rocked in reverse order to return the tube frame to its place on the carrier chains 40, 40 at the station A.

The above general description and operation of the elements of a loom of the type noted will suffice for a clear understanding of the utility and operation of the mechanism of the stop motion forming the subject of the present invention.

One cause for the expensive "smashes", above referred to, is frequently attributed to a failure of the grippers to register properly with the tube frame in the registry position.

The present invention concerns the provision of a suitable detector for the condition above mentioned, which necessitates long periods of idleness of the loom while making repairs.

The detecting mechanism above noted is provided with a switch which is connected in electric circuit with an automatic clutch release unit by which immediate stopping of the loom is effected upon detection of the condition noted above. Also included in the electric circuit is a signal by which the weaver may readily determine the location of the trouble or existence of the condition which caused the stopping of the loom, the electric circuit being under control of a master switch which is actuated by, in the present instance, the main clutch lever of the loom.

This master switch 140, see Fig. 5, comprises a casing 141 which is secured in fixed position to the frame of the loom. Mounted within the casing 141 is a base plate composed of insulating

material. Secured to the base plate is a pair of bearings in which is rotatably mounted, in the present instance, a round metallic bar or shaft 144 which forms the main rotatable contact of the master switch. Between the bearings one side of the bar 144 is cut away to provide a seat for a semicircular insulating block 145. The switch bar 144 is provided with an extension which passes through an opening formed in the side of the casing and of such a diameter as not to contact with the extension of the said switch bar.

Secured to the extension outside of the casing is a lever composed of fiber or other insulating material. The outer end of the lever is connected by a link to an arm of the clutch lever.

Secured to the base block is an insulating strip to which is secured a series of electrical contacts 151 to 162 inclusive, the free ends of said contacts bearing normally, while the loom is running, on the metallic portion of the switch bar 144.

As shown in Fig. 5, the contact 151 is connected by a conductor 171 to one side of the coil of the automatic clutch release unit 117, the opposite side of said coil being connected by a conductor 170 to one side 169 of a main electric circuit, in the present instance a circuit connected to the secondary winding of a suitable transformer 168. The second side 167 of the secondary circuit coming from the transformer 168 is preferably grounded on the frame of the loom, for purposes hereinafter noted, whereby all the metallic elements of the loom not otherwise insulated form the one side 167 of the secondary circuit of the transformer.

At such time as the automatic clutch release 117 is operated to release the main clutch of the loom the clutch lever rocks the switch bar 144 about its axis thereby bringing the insulating block 145 into contact with each and all of the electric contacts 151 to 162 of the master switch 140.

The side 169 of the secondary circuit of the transformer 168 is connected to one side of each of a series of signal devices, which for purposes of illustration are hereinafter referred to as lights *a* to *l* inclusive, as illustrated in Fig. 5. The second side of the signal or pilot light *a* is connected by a conductor 166 directly to the frame of the machine, forming the second side 167 of the circuit, whereby the light *a*, which is preferably colored, for example green, burns constantly, indicating to the weaver that current is flowing through the secondary circuit of the transformer to the various detector mechanisms.

In event of the grippers 56 failing to register properly with the opposite ends respectively of the tube frame 50 disposed at position A, which will cause the grippers 56 to be held apart to a greater extent than they would normally be when registering properly with a tube frame, the detector and switch shown in Figs. 3 and 4 will then become effective.

The bell-crank lever 66 receives a constant rocking motion at the proper time for closing the jaws 56, 56 on the tube frame and the link 65, which connects the bell-crank lever 66 with the jaw-operating lever 64, for the purpose of the present invention is made in two parts, namely, 65*a* and 65*b*, as illustrated in Fig. 4, the end 65*c* of the portion 65*a* of said link being slidably mounted in a bore 65*d* formed in the head element 65*b* of said link, whereby a telescoping connection between the two sections of the link is provided.

The extreme end of the section 65*a* is held in contact with the extreme inner end of the bore 65*d* of the head 65*b*, by springs 250, having one end secured to a lateral projection 251 of the head 65*b* and the opposite end secured to a collar 252 on the section 65*a* of said link.

Secured to the head 65*b* and projecting longitudinally of the section 65*a* of said link 65 is an insulating bar 253, on the outer end of which is secured a contact element 254 which is connected by the conductor 176 with the contact element 156 of the master switch 140, and through a conductor 176*b* to the signal light *f*.

If for any reason the jaws 56 fails to move to their regular gripping position the lever 64 is stopped in its swinging about its pivot by such jamming of the jaws 56. The jamming of the jaws 56, 56 arrests the longitudinal movement of the section 65*b* of the link 65, the section 65*a* of said link, however, continues to move, by reason of the uniform rocking motion of the bell-crank lever 66, and such relative movement between the sections 65*a* and 65*b* of the link 65 causes the collar 255 on the section 65*a* to engage the contact element 254, whereby the circuit through the conductor 176 and master switch 140 is closed, which effects operation of the automatic clutch release unit 117 for immediately stopping the loom, the signal light *f* at the same time indicating the source of the trouble.

Upon referring to the electric diagram shown in Fig. 5, it will be obvious that when current is caused to flow through the conductor 176, such current will flow through the contact element 156 of the master switch 140 to which the conductor is connected. The current will then flow through the metallic portion 144 of the rotary contact element of the master switch 140 into the contact 151 of said master switch and through the coils of the automatic clutch release unit 117 which will remain energized as long as the particular detector circuit remains closed. Incidently the current will flow through all of the contacts 152 to 162 of the master switch 140, by reason of their engagement with the rotary contact element 144, which will cause all of the signal lights *b* to *l* to be lighted.

In order to cut out the signal lights that are not desired, leaving lighted only that signal light which is indicating the source of the trouble, and to affect deenergization of the coils of the automatic clutch release unit 117 the rotary switch element 144—145 is rotated, immediately upon release of the clutch, to bring the insulating portion 145 of said rotary switch element into contact with all the contacts 151 to 162 inclusive, whereby the coils of the unit 117 are deenergized and the current is shut off from all of the signal lights, excepting the one included in the circuit of the detector which has been operated to stop the loom, such light remaining lit as long as the detector switch connected in series therewith, across the sides 167 and 169 of the secondary circuit of the transformer 168, remains closed.

Correction of the trouble which has caused the stopping of the loom, and the opening of the detector switch which indicated such trouble, again clears the circuit for subsequent operation of the loom, the loom again being started by manually moving the clutch shift rod for engagement with the unit 117.

While a pilot light *a* is shown in Fig. 5 to indicate the presence of electric energy in the circuits including the detector switches, this light is not necessary to the functioning of the stop

motion as a whole and may be eliminated when not desired.

We claim:

1. In a stop motion for looms comprising a yarn spool supporting frame disposed at a predetermined station in the loom the combination of means adapted to register with said frame for removal of said frame from said station, an electrically operable stop-effecting device and means in circuit with said stop-effecting device and operable by said frame-removing means for stopping the loom upon improper registration of the removing means with said frame.

2. In a stop motion for looms comprising a yarn spool supporting frame disposed at a predetermined station in the loom, means adapted to register with and grip said frame for removal of said frame from said station, means for effecting said removal including a longitudinally operable link having one end connected to a positively actuating portion of the loom and its opposite end operatively connected to said gripping means, an electrically operable stop-effecting device, and a switch in circuit with said device and operable by said link for stopping the loom upon improper registration of the gripping means with said frame.

3. In a stop motion for looms comprising a yarn spool supporting frame disposed at a predetermined station on said loom, means adapted to register with and grip said frame for removal of the frame from said station, means for effecting said gripping including a link having one end rigidly connected to a positively operating part of the loom mechanism and its opposite end telescopically connected to said gripping means, and a switch associated with said telescopically connected end of said link for stopping said loom upon relative longitudinal movement between the opposite ends of the link produced by improper registration of the gripping means with said frame.

4. In a stop motion for looms comprising a yarn spool supporting frame disposed at a predetermined station on said loom, means adapted to register with and grip said frame for removal of the frame from said station, means for effecting said gripping including a link having one end rigidly connected to a positively operating part of the loom mechanism, a head operatively connected to said gripping means and in which the opposite end of said link is slidably mounted, means for limiting movement of the one end of the link in one direction relative to said head, resilient means normally maintaining said link in contact with said limiting means and a switch having relatively movable portions respectively carried by said link and said head for effecting stopping of the loom upon relative longitudinal movement between said head and said link by which said switch parts are moved relatively to effect said stopping.

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