Sept. 11, 1934. M. B. PENMAN ET AL 1,973,655

STOP MOTION FOR LOOMS

Filed March 17, 1934 6 Sheets-Sheet 1

Fig. 2.

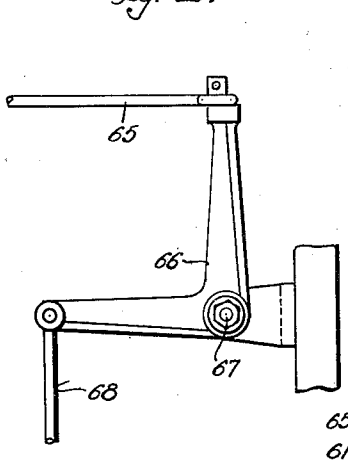


Fig. 1.

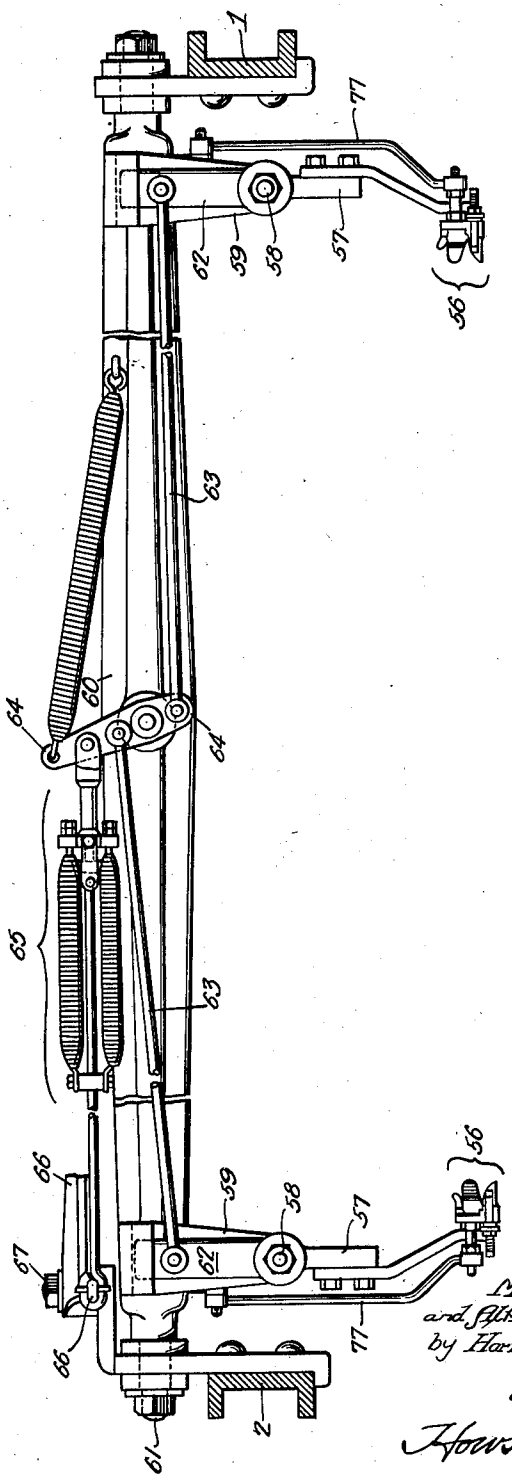
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Montgomery B. Penman
and Alfred F. McCallum deceased
by Harrisburg Trust Company
Executor.
by their Attorneys
Howson & Howson

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STOP MOTION FOR LOOMS

Filed March 17, 1934 6 Sheets-Sheet 2

Fig. 3.



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STOP MOTION FOR LOOMS

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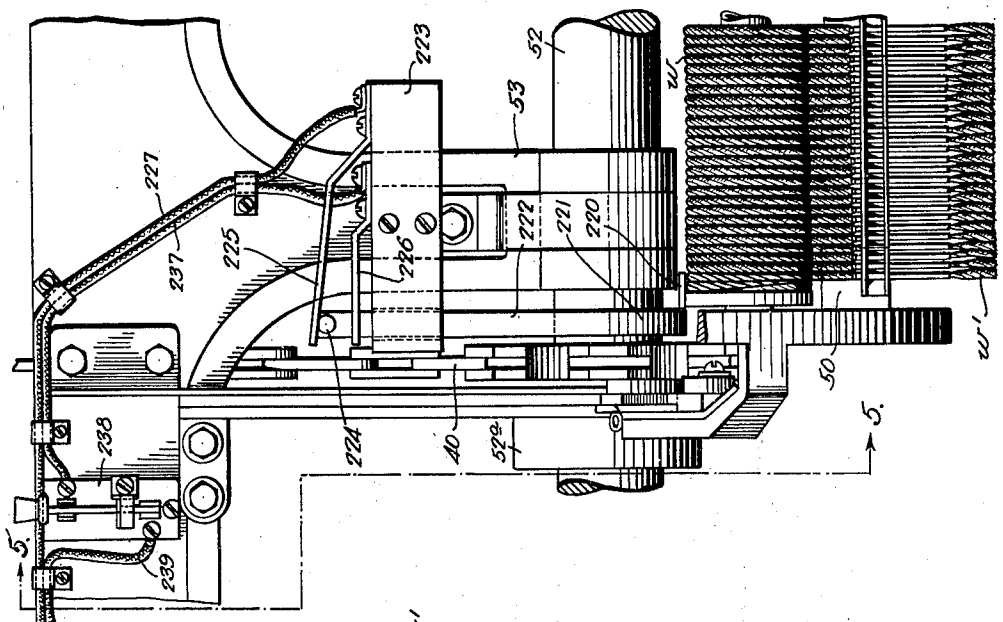


Fig. 4.

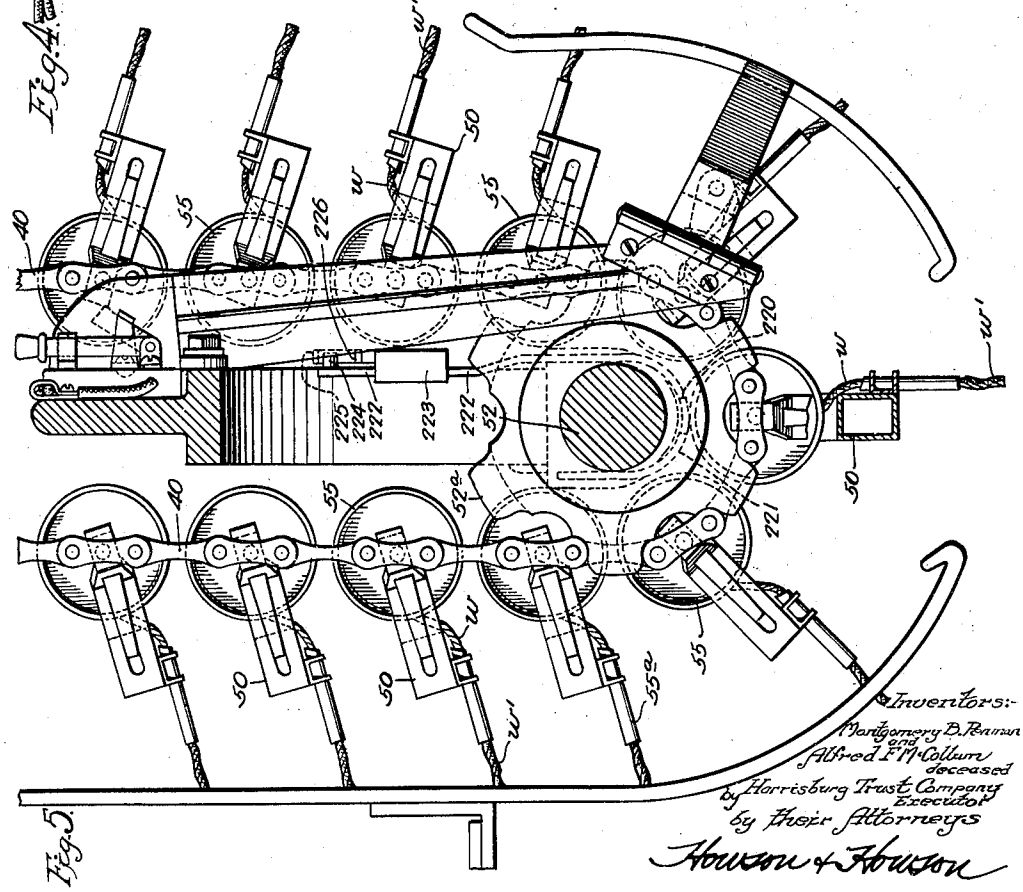


Fig. 5.

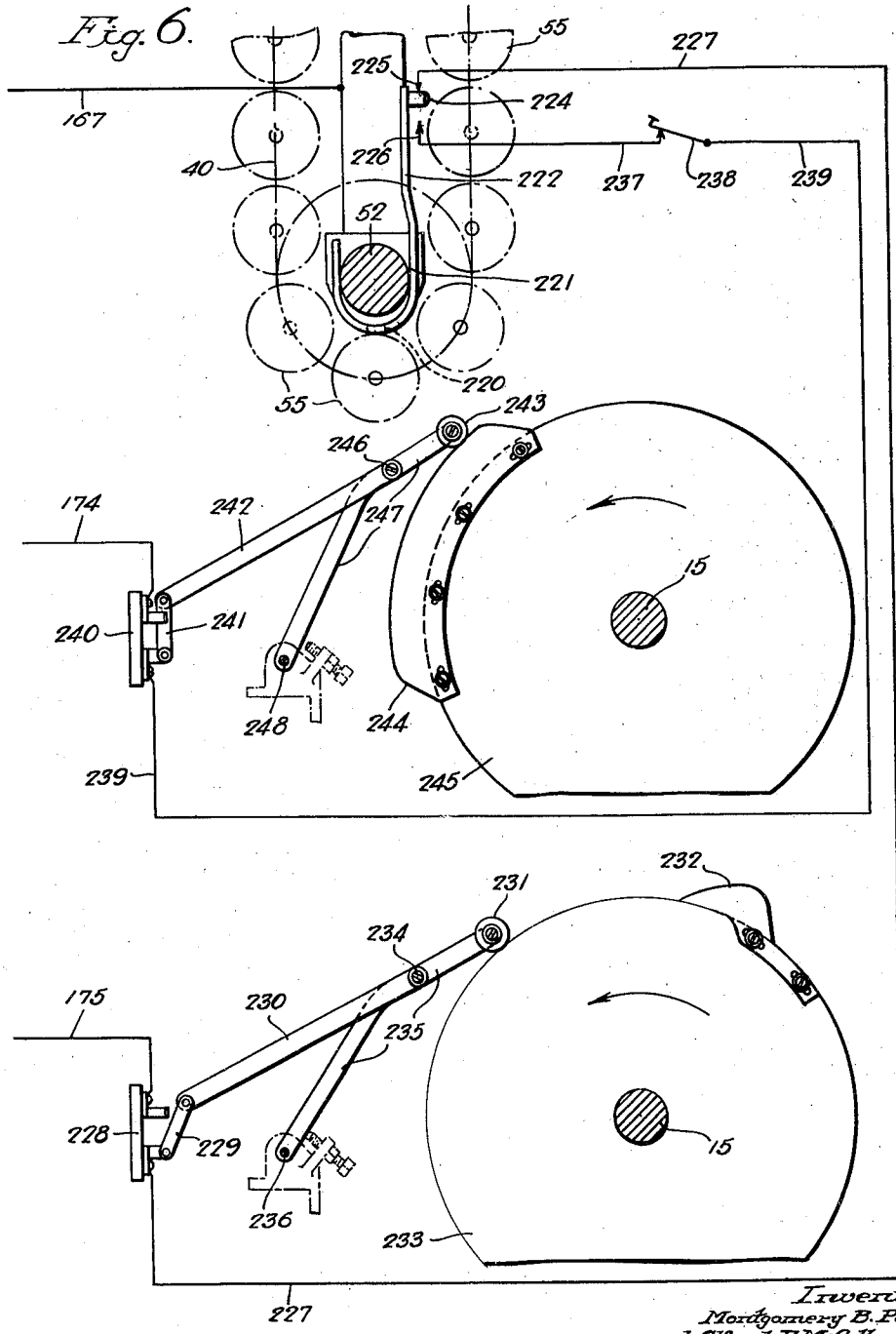
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STOP MOTION FOR LOOMS

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Fig. 6.



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STOP MOTION FOR LOOMS

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Fig. 7.

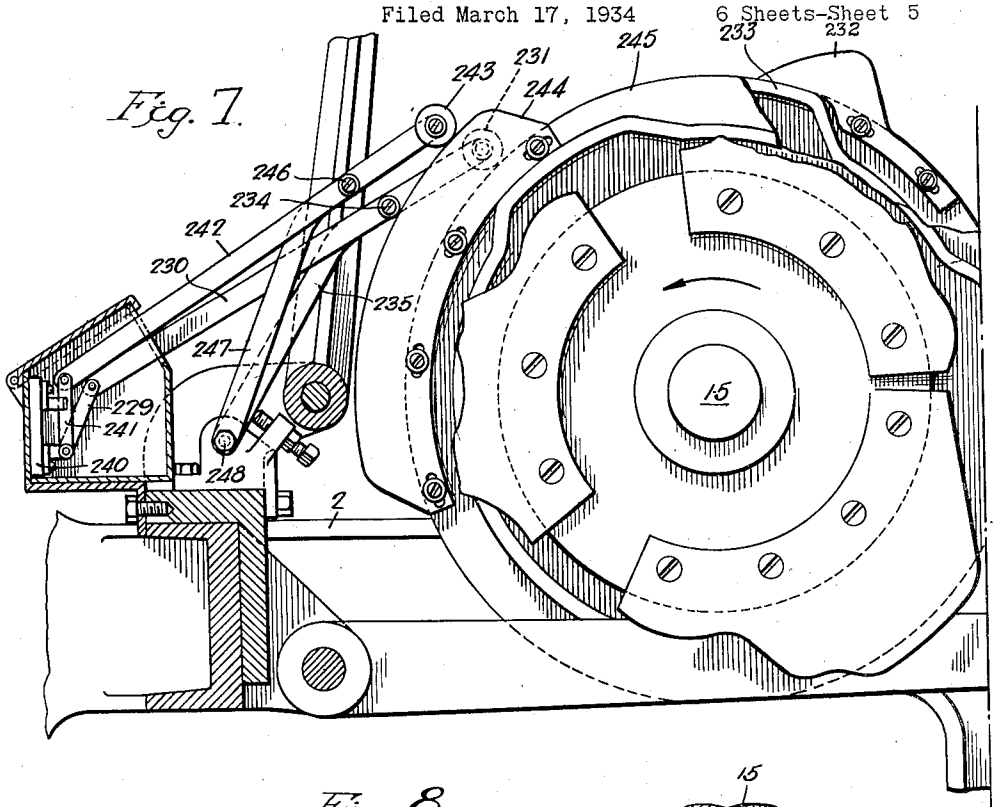
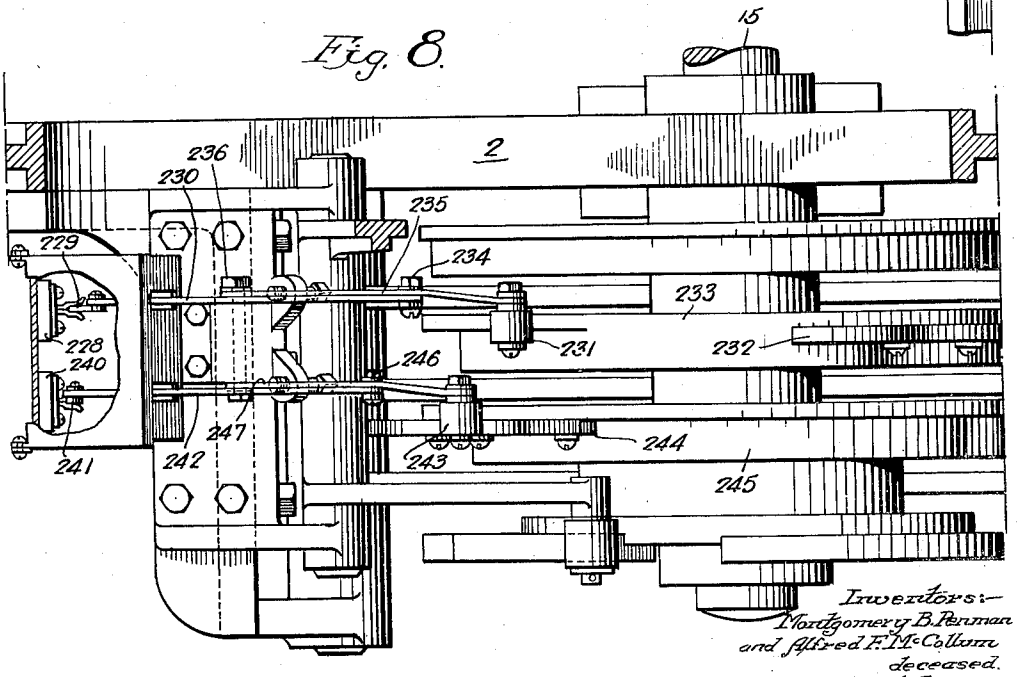


Fig. 8.



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STOP MOTION FOR LOOMS

Filed March 17, 1934 6 Sheets-Sheet 6

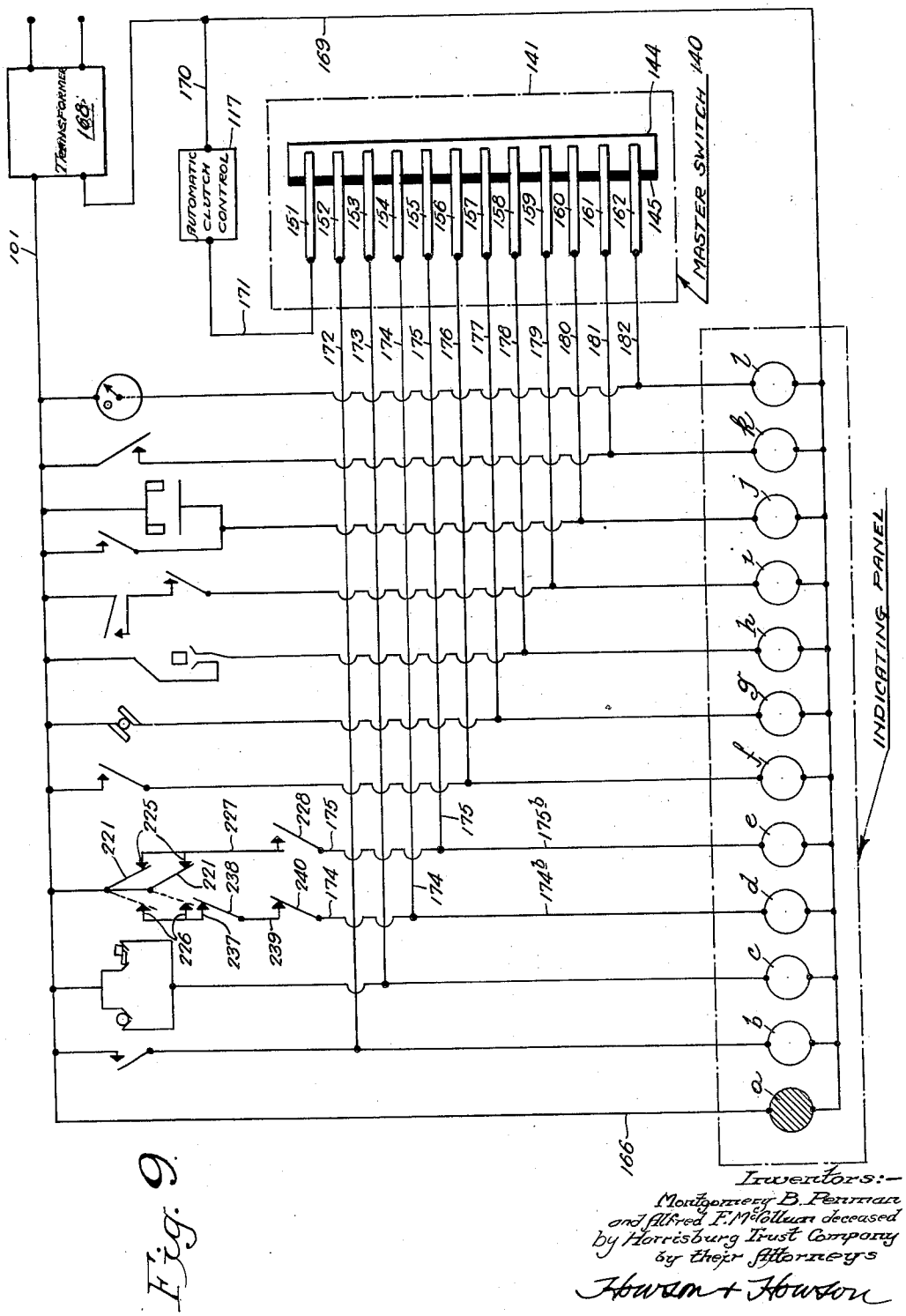


Fig. 9.

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Patented Sept. 11, 1934 1,973,655

UNITED STATES PATENT OFFICE

1,973,655

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 17, 1934, Serial No. 716,148

5 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 around 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 ordered 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" and marks.

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 applicants' parent application Serial No. 660,166 filed March 9, 1933, concerns the means for detecting the absence of a tube frame or tuft yarn spool from its ordered position on the carrier chains at the removing station and the improper returning of the tube frame to its ordered position on the carrier chains.

The construction and operation of the detecting, signalling and stop-effecting mechanisms, forming the subject matter of the present application and the cooperation of these mechanisms 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;

Fig. 4 is an enlarged front elevation of one end of the tube frame supporting means at the position or station where the tube frames are removed from the carrier chains and illustrating spool-detecting mechanism at said station;

Fig. 5 is a sectional elevation taken on the line 5—5, Fig. 4;

Fig. 6 is a diagrammatic view illustrating the operation between the spool detector and control switches actuated by cams on the main shaft of the loom;

Fig. 7 is an enlarged detail side elevation of the cam switches shown in Fig. 6;

Fig. 8 is a plan view of the mechanism shown in Fig. 7; and

Fig. 9 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 comprises the usual side frames 1 and 2, which are integrally connected by the usual transverse frame members 3, 3.

Extending laterally from the right side main frame 1 is a lateral extension frame which supports the driving motor (not shown), which rotates the main drive shaft of the loom and a constantly rotating member of the main clutch which is freely mounted thereon, the second

member of the clutch being splined to the shaft and providing readily releasable driving connection between the motor and shaft. The main drive shaft is operatively connected to and 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 2 and 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 and 2 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 an upper horizontal run and in a series of short long vertical runs which form a circuitous path to be 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.

The carrier chains 40, 40 are advanced intermittently by the usual pawl and ratchet mechanism, which intermittently rotates the shaft 52 at the lower end of the front vertical run of the carrier chains.

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 55a 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, it 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, carried on the outer ends of vertically rockable arms 59, 59 which forms 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 frames 1 and 2 respectively.

Each of the grippers 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 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 at 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 50 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 the 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 55a 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 cooperating laterally oscillating blade 88 operated in the usual manner in timed relation with the other elements of the loom.

After the tuft yarns are severed in the manner noted the links and levers just described are actuated reversely to replace the tube frame on the carrier chains 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 mechanisms of the stop motion forming the subject of the present invention.

One of the causes for the expensive marks and/or "smashes" above referred to resides in the absence of a tube frame and/or its associated spool from the carrier chains at the position where the tube frame grippers register with the tube frames; another resides in the failure of the tube frame grippers to remove both ends of the tube frame completely from the carrier chains at the above noted registry position; and another resides in the failure of the grippers to replace the frame properly on the carrier chains.

The present invention concerns the provision of suitable detectors for each of the conditions above described and which necessitate long periods of idleness of the loom while making repairs.

Each of the detecting mechanisms above noted is provided with a switch connected in electric circuit with an automatic clutch release unit by which immediate stopping of the loom is effected upon detection of any of the conditions noted above. Also included in the electric circuit is a system of signals 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 con-

trol of a master switch which is actuated by, in the present instance, the main clutch lever of the loom.

The master switch 140 comprises a casing 141 secured in fixed position to the frame of the loom, as shown in Fig. 9. 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 141 and of such a diameter as not to contact with the extension of the said switch bar.

Secured to the extension outside the casing 141 is a lever composed of fiber or other insulating material. The outer end of the lever is connected by a link to an arm comprising an extension of the main 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. 9, 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, the main 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 for purposes hereinafter described.

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. 9. 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.

With regard to trouble arising from the absence of a tube frame, and/or an associated tuft yarn spool, from the carrier chains at the registery position A such condition is detected by the mechanism shown in Figs. 5 and 6. As the carrier chains 40 pass around the sprockets 52*a* at the opposite ends of the shaft 52, one of the tube frames 50, under normal conditions, is brought into the position A. The tuft yarn spool 55 carried by this positioned tube frame contacts with a laterally extending lug 220 on or with the curved bottom of a vertically operable substantially U-shaped detector and switch member 221, which is disposed around and in contact with the shaft 52 and is provided with one long leg 222 which is slidably mounted in an insulating block 223 secured to one of the bearings 53 in which the shaft 52 is rotatably mounted. The upper end of the long leg 222 of the U-shaped detector 221 is provided with a laterally extending pin 224 which, when the U-shaped detector is raised by reason of contact of the lug 220 of the detector 221 with a spool 55, contacts with a switch element or contact 225 carried by the insulating block 223.

Should the spool be absent from the tube frame or the tube frame absent from the carrier chains 40, the U-shaped element is not raised, as noted above, consequently the pin 224 remains at rest on a second contact 226 carried by the insulating block 223.

There is one of these U-shaped detectors and its asociated switch elements 225 and 226 at each side of the loom for cooperation with opposite ends of the spool respectively, and the corresponding switch elements 225 and 226 are connected to the single conductors 227 and 237 respectively to operate the stop motion if one or the other or both ends of the spool are missing from their ordered positions on the chains 40, 40 respectively.

The switch element 225 is connected by a conductor 227 to one terminal of a mechanically operable switch 228, the movable element 229 of which is pivotally connected to one end of a link 230, the opposite end of which is pivotally connected at 234 to a lever 235. The lever 235 is provided at one of its ends with a cam follower 231 arranged to be engaged by a cam 232 carried by a disc or wheel 233 secured to the main shaft 15 of the loom. The opposite end of the lever 235 is pivotally connected at 236 to a fixed portion of the loom.

The contact element 226 is connected by a conductor 237 to one terminal of a manually operable switch 238, the second terminal of which is connected by a conductor 239 to one terminal of a mechanically operable switch 240. The movable element 241 of the switch 240 is pivotally connected to one end of a link 242, the opposite end of which is pivotally connected at 246 to a lever 247. The lever 247 is provided at one of its ends with a cam follower 243 arranged to be engaged by a cam 244 carried by a disc 245 secured to the main shaft 15 of the loom. The opposite end of the lever 247 is pivotally connected at 248 to a fixed portion of the loom.

The second terminal of the cam-operated switch 228 is connected by the conductor 175 to the contact 155 of the master switch 140 and by a conductor 175*b* to one side of the signal light *e*. The second terminal of the cam-operated switch 240 is connected by the conductor 174 with the contact element 154 of the master switch 140 and by a conductor 174*b* to one side of the signal light *d*.

During normal operation of the loom the manual switch 238 is closed and in the event of there being no spool in the tube frame that is newly positioned at station A, or should the tube frame itself be absent from its ordered position on the carrier chains when that portion of the chains is moved to this station the spool detector 221 will close the circuit between the contact 226 and the side 167 of the secondary circuit through the shaft 52. As the main shaft 15 of the loom continues to rotate the cam 244 will engage the

cam follower 243, thereby rocking the switch element 241 about its pivot and closing the circuit through the switch 240, whereupon current will flow through the conductor 174 and the contact 154 of the master switch 140, thence through the contact 151 of said master switch, the conductor 171, the coil of the automatic clutch release unit 117 and the conductor 170 to the second side 169 of the secondary circuit of the transformer 168, thereby stopping the loom.

At the same time current will flow through the conductor 174*b* and through the signal light *d* indicating to the weaver that the loom has stopped as a result of the absence of the spool or tube frame from the carrier chains 40 at position A.

If a tube frame and spool are in the chains 40 at position A the detector 221 will be raised as indicated in Fig. 6, thereby making contact with the contact element 225 which closes the circuit through the conductor 227 up to the cam-controlled switch 228.

During the normal operation of the loom the grippers 56 at this time should engage and remove the tube frame which is registered at position A from the carrier chains in the manner above described. The cams 71, 75 and 83 are arranged on the main shaft 15 in such relation to the cam 232 which controls the switch 228 that in event of the grippers failing to remove the tube frame from the carrier chains at the proper time in the cycle of operations the cam 232 will immediately effect closing of the switch 228 which completes the circuit from the detector 221 through the contact 225 and conductor 227 and switch 228 to and through the conductor 175 to the contact 155 of the master switch 140, thence through the automatic clutch release unit 117 by which stopping of the loom is immediately effected, current at the same time flowing through the conductor 175*b* to the signal light *e*.

Should the grippers 56 fail to reinsert the tube frame properly in the chains 40, 40, at position A, the tube frame will drop at one or both ends immediately upon release from the grippers 56, whereby the U-shaped detector will make contact with the element 226 and the cam 244 is of such length circumferentially that the switch 228 will be closed at such time, thus the loom will be stopped immediately.

Upon referring to the electric diagram shown in Fig. 9, it will be obvious that when current is caused to flow through any of the conductors 172 to 182 inclusive, such current will flow through the contact element of the master switch 140 to which the particular 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. Incidentally 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.

While a pilot light *a* is shown in Fig. 9 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 a loom employing a plurality of respectively associated yarn spool and spool-supporting elements in predetermined order on a conveyer for successive registration with a predetermined station along a path traveled by said conveyer, means for detecting the absence of one of said elements from its ordered position on the conveyer when said ordered position registers with said station including a switch operable by said element when in its ordered position at said station, a second switch operable in timed relation to the first said switch, and an electrically operable device in circuit with said switches for stopping the loom by inaction of the first said switch.

2. In a stop motion for a loom employing a plurality of respectively associated yarn spool and spool-supporting elements in predetermined order on a conveyer for successive registration with a predetermined station along a path traveled by said conveyer, means for removing said associated elements from said station, means for detecting the presence of said respectively associated elements at said station subsequent to the expected said removal thereof including a switch operable by said associated elements in moving into registry with said station and reversely operable by the said removal of said elements from said station, a second switch operable subsequent to the expected removal of said elements from said station, and an electrically operable device in circuit with said switches for stopping the loom by failure of said first switch to effect said reverse actuation.

3. In a stop motion for a loom employing a plurality of respectively associated yarn spool and spool-supporting elements in predetermined order on a conveyer for successive registration with a predetermined station along a path traveled by said conveyer, means for detecting the absence of one of said elements from its ordered position on the conveyer when said ordered position registers with said station including a normally closed switch operable to a circuit opening position by said element when in its ordered position at said station, a normally open switch operable to a circuit closing position in timed relation to the opening of said normally closed switch, and an electrically operable device in circuit with said switches for stopping the loom by failure of the first said switch to open said circuit before the closing of the normally open switch.

4. In a stop motion for a loom employing a plu-

rality of respectively associated yarn spool and spool-supporting elements in predetermined order on a conveyer for successive registration with a predetermined station along a path traveled by said conveyer, means for removing said associated elements from said station, means for detecting the presence of said respectively associated elements at said station subsequent to the expected removal thereof from said station, said means including a normally open switch operable to a circuit closing position by said associated elements in moving into registry with said station and reversely operable to its circuit opening position by said removal of said elements from said station, a second normally open switch operable to a circuit closing position subsequent to the expected removal of said elements from said station, and an electrically operable device in circuit with said switches for stopping the loom by failure of said first switch to open said circuit prior to the closing of said second normally open switch.

5. In a stop motion for a loom employing a plurality of respectively associated yarn spool and spool-supporting elements in predetermined order on a conveyer for successive registration with a predetermined station along a path traveled by said conveyer, means for removing said associated elements from said station, a double throw switch including a terminal for detecting the absence of one of said elements from its ordered position on the conveyer when said ordered position registers with said station, a terminal for detecting the presence of said respectively associated elements at said station subsequent to the expected said removal thereof from said station, a switch blade normally in circuit closing contact with the first said terminal and operable into circuit closing contact with the second said terminal by said associated elements in moving into registry with said station and reversely operable into circuit closing contact with the first terminal by the said removal of said elements from said station, a shaft controlling the removal of said associated elements from said station, a normally open switch in circuit with said second terminal and operable by said shaft into circuit closing position subsequent to the expected removal of said elements from said station, a normally open switch in circuit with the first said terminal and operable into circuit closing position in timed relation to the expected removal of said associated elements from said station switch, and an electrically operable device in circuit with said switch blade and terminals for stopping the loom by failure of said switch blade to be moved out of circuit closing relation to the first said terminal prior to the closing of the shaft operated switch in circuit therewith and for stopping the loom by failure of said switch blade to be moved out of circuit closing relation to said second terminal prior to the closing of the second of said shaft-controlled switches.

MONTGOMERY B. PENMAN.
HARRISBURG TRUST COMPANY,
Executor of the Estate of Alfred F. McCollum, Deceased,
By EDWIN KEISTER,
Vice-President and Trust Officer.