July 11, 1939. R. H. LAWSON ET AL 2,165,975

STOP MOTION

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FIG. 1.

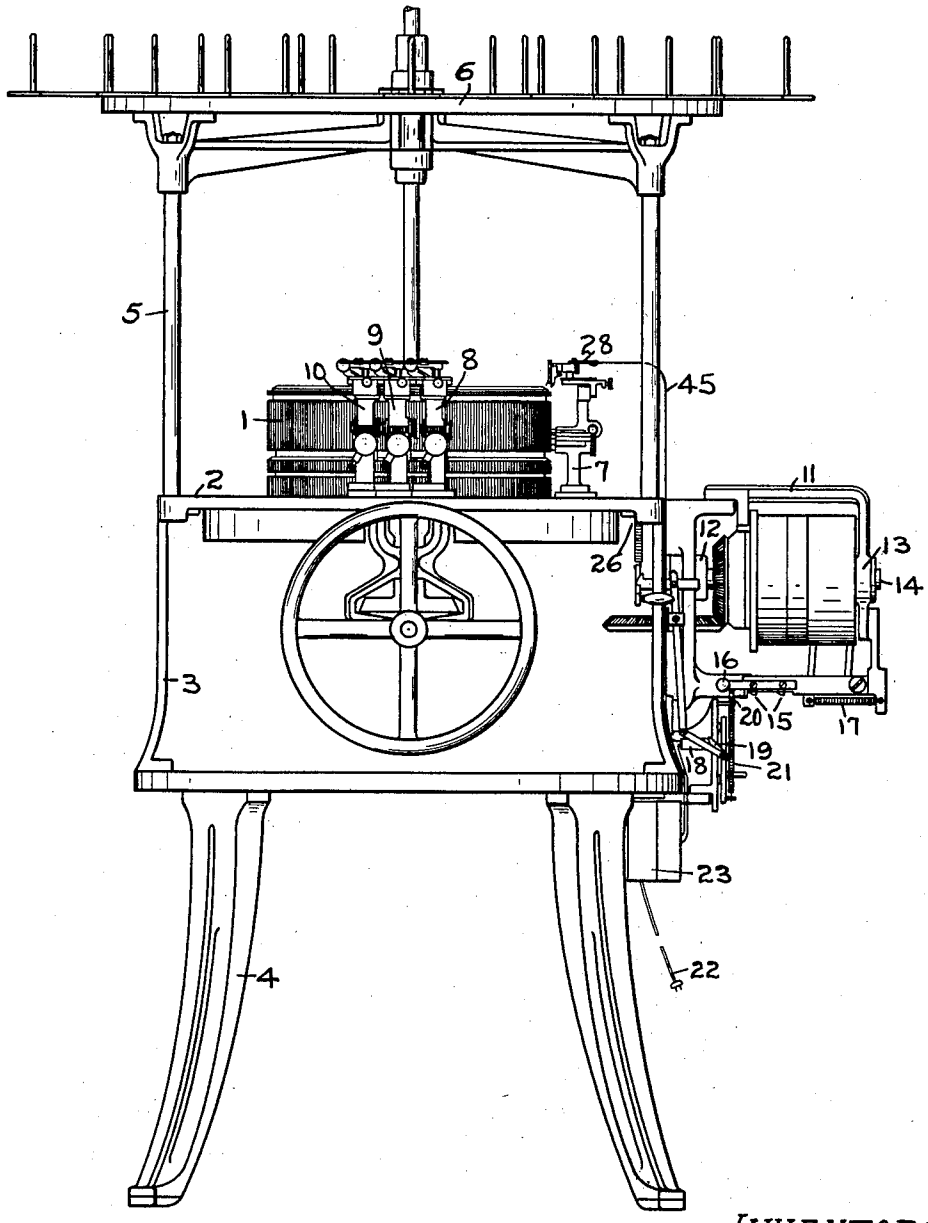

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FIG. 2.

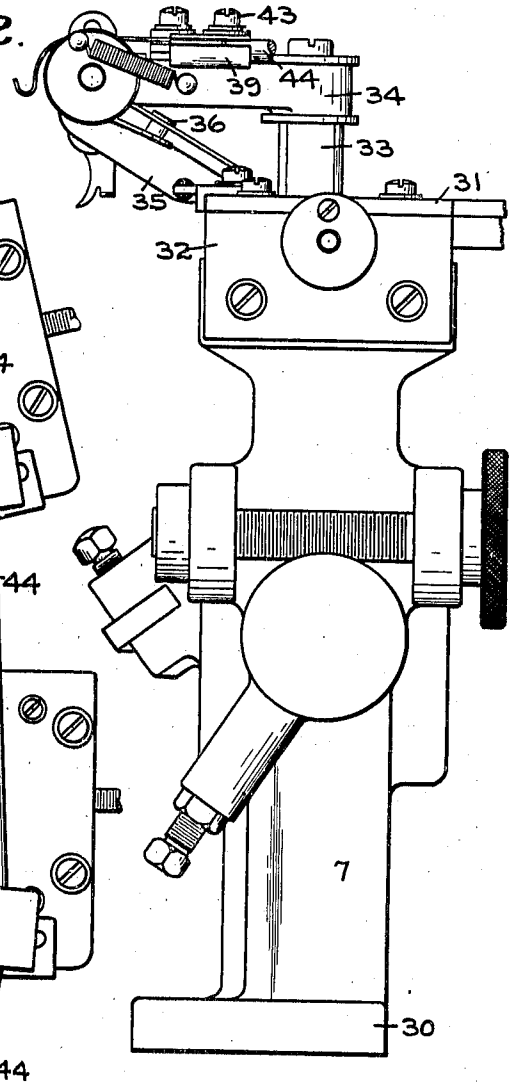

FIG. 3.

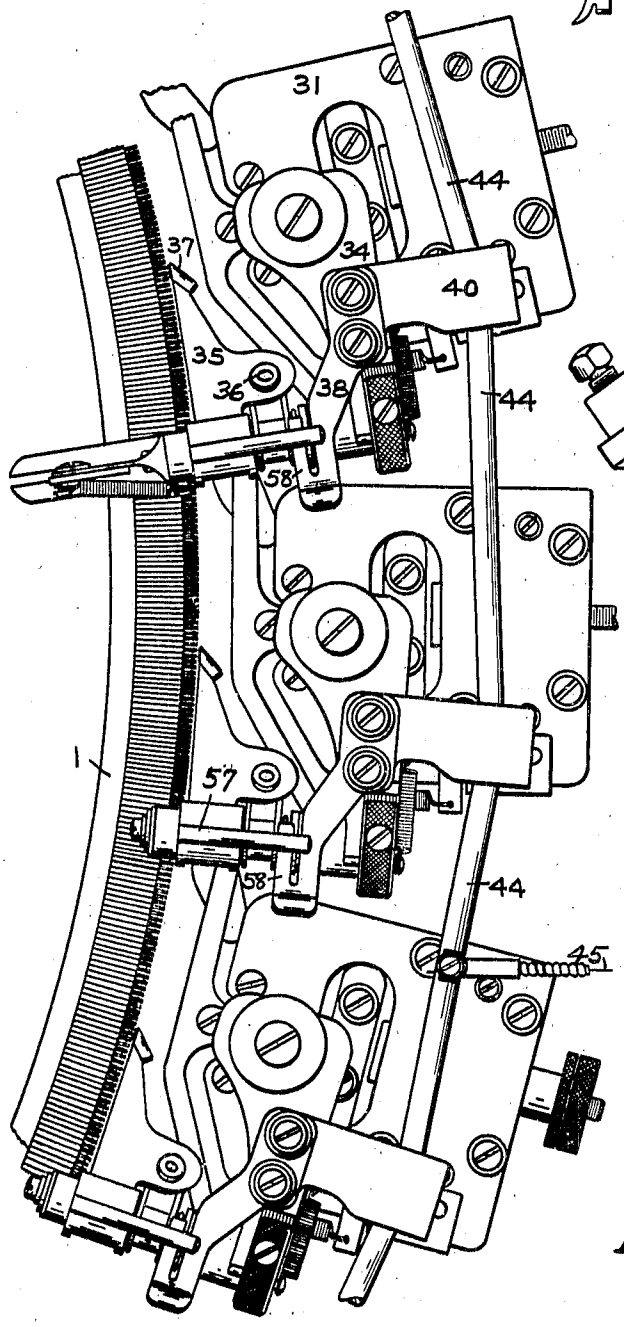

FIG. 4.

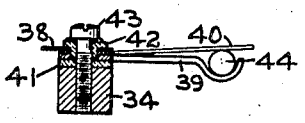

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FIG. 5.

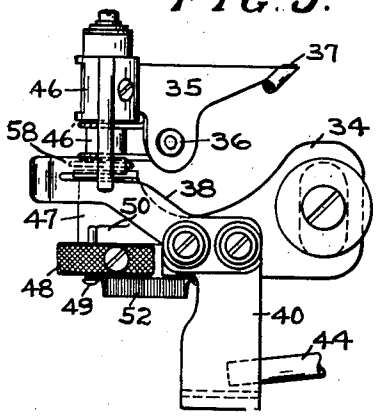


FIG. 7.

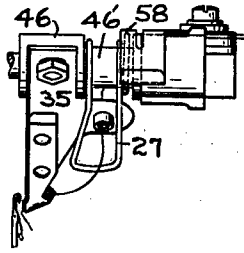


FIG. 8.

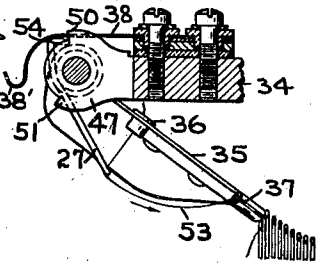


FIG. 9.

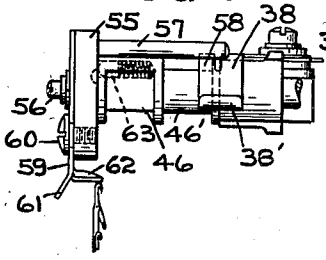


FIG. 10.

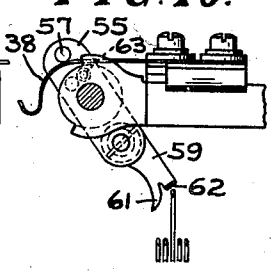


FIG. 6.

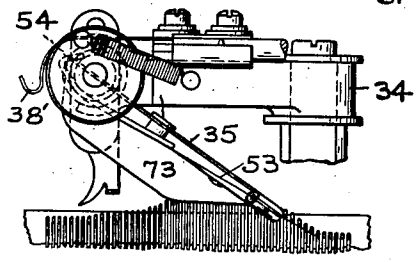


FIG. 11. FIG. 12. FIG. 13.

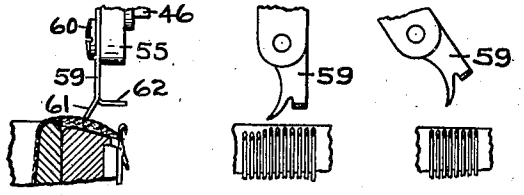


FIG. 14.

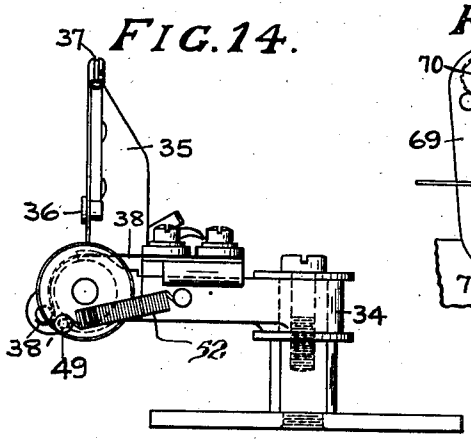


FIG. 15.

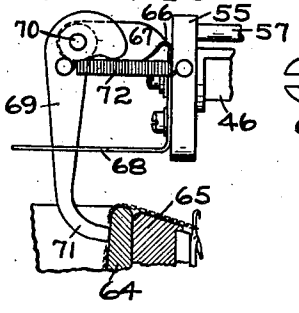


FIG. 16.

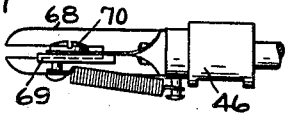
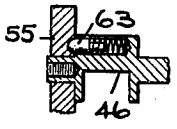


FIG. 9a.



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STOP MOTION

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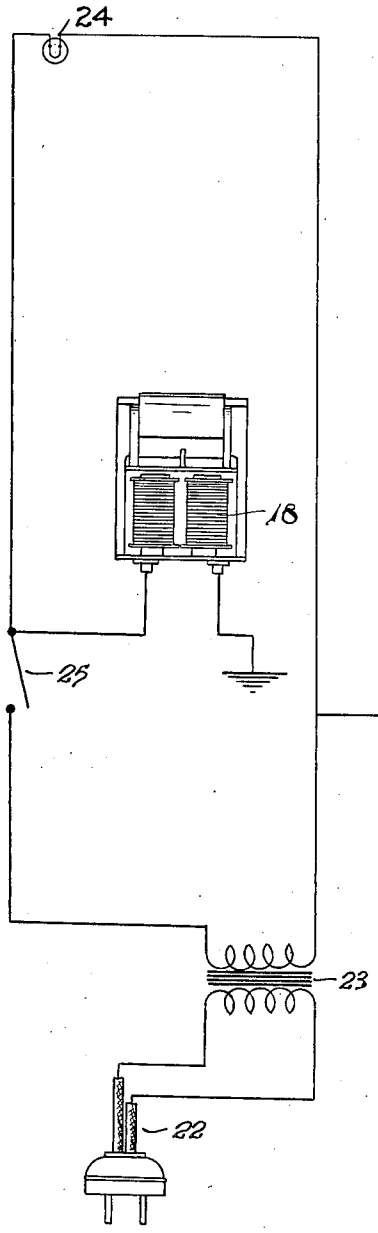
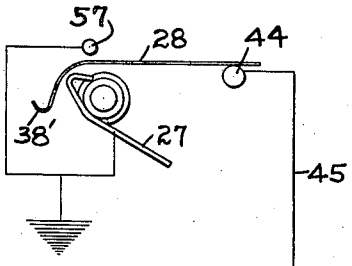


FIG. 17.



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Patented July 11, 1939 2,165,975

UNITED STATES PATENT OFFICE

2,165,975

STOP MOTION

Robert H. Lawson and William L. Smith, Jr., Pawtucket, R. I., assignors to Hemphill Company, Central Falls, R. I., a corporation of Massachusetts

Application October 11, 1935, Serial No. 44,597
In Canada October 20, 1934

6 Claims. (Cl. 66—157)

This invention is concerned with a combined yarn feeding guide and stop mechanisms for use in knitting machines, more especially multi-feed knitting machines.

In the drawings:

Fig. 1 shows a view of a multi-feed knitting machine with the stopping mechanism applied thereto;

Fig. 2 is an elevation showing one of the single guiding and stopping devices which is applied to each yarn feeding station;

Fig. 3 is a fragmentary plan view showing three of the yarn guides and stop motions applied to adjacent cam blocks;

Fig. 4 is a sectional view showing in detail the manner in which adjacent stopping assemblies are connected to form a complete electrical circuit;

Fig. 5 is a plan view showing one of these assemblies with the yarn feeding finger in operative position;

Fig. 6 is an elevation corresponding to Fig. 5, the yarn being shown feeding to the needles;

Fig. 7 is an elevation showing how the detent engages yarn which has been broken;

Fig. 8 is a view partly in section showing the mechanism of Fig. 7 as seen from another angle;

Fig. 9 is an elevational view showing how the stopping device is operated when contacted by a needle having a broken butt;

Fig. 9a is a partial sectional view showing the plunger of Fig. 9 in greater detail;

Fig. 10 is a view corresponding to Fig. 9, but showing the device as seen from another angle;

Fig. 11 is a sectional view showing how the stopping device is actuated when fabric has bunched up after being cast off the needles;

Figs. 12 and 13 are elevations showing the normal and stopping positions respectively of the fabric engaging finger shown in Fig. 11;

Fig. 14 is an elevation showing the yarn finger and stopping assembly, the yarn finger being swung upwardly to an inoperative position;

Fig. 15 is a sectional view showing a part of the stopping device which functions upon engagement with a hole in the fabric;

Fig. 16 is a plan view showing the elements of Fig. 15; and

Fig. 17 is a diagrammatic view showing the electrical circuit of which this stop motion forms a part.

The stopping mechanism herein shown and described is particularly adapted to be used with multi-feed knitting machines and forms a unitary structure in combination with the yarn feeding finger which is essential to deliver yarn to the needles at each feeding station. As shown, this feeding and stopping device is quickly attached or detached from one of the cam block assemblies upon which it is mounted, it being possible to remove one or more of these combined feeding and stopping assemblies without disturbing the function of those remaining. It is also possible to remove any number of the cam blocks with their attached stopping and feeding assemblies without in any way detracting from the ability of those remaining to continue knitting fabric. While we have chosen to illustrate and described the invention relative to a multi-feed machine of the type shown, we do not intend to limit our invention to the specific construction shown since the same may be applied to all general classes of circular knitting machines.

Referring to Fig. 1, a multi-feed knitting machine is shown having a needle cylinder 1 within which are mounted needles of either the latch or spring beard type, said cylinder being rotatable in a circular base 2 mounted on a frame 3 which is supported by a plurality of legs 4. Upright posts 5 support a creel generally indicated by numeral 6 upon which a supply of knitting yarns equal in number to the feeding stations spaced about said needle cylinder are placed. A plurality of individual cam assemblies are spaced about said needle cylinder, one of these assemblies being shown at 7, and three similar assemblies being shown at 8, 9 and 10. For purposes of clearness the complete complement of individual cam assemblies has not been shown. The invention is not necessarily limited in application to a machine having individual cam assemblies like those herein illustrated in Figs. 1, 2 and 3, but may be used and would be particularly useful in any multi-feed knitting machine wherein cams are mounted in a continuous ring encircling a needle cylinder.

The framework of the machine has been extended to one side to provide an extension 11 and bearings 12 and 13 within which a shaft 14 is rotatably mounted. Driving and loose pulleys are associated with shaft 14 in a manner to receive power from some source through a belt and are adapted to drive the elements of the machine through gearing not shown herein since it forms no part of the present invention. A belt shifter is mounted to slide horizontally below the pulleys and is held in driving position by one or the other of two catches 15 which are held by a fixed latch which is attached to the frame. The operator may unlatch this belt shifter by lifting up-

wardly on handle 16 in which case the spring 17 will draw the shifter and belt over on to the loose pulley. In case one of the feeding yarns breaks or when fabric becomes loaded up on the needles or for any of the other reasons herein given, an electrical circuit is completed which energizes a magnet at 18, said magnet withdrawing a catch which releases a latch 19 allowing a plunger 20 to be pulled upwardly by spring 21 so that the belt shifter will be automatically released and the belt shifted to the loose pulley by means of spring 17. Other means of throwing off the drive, with or without a brake, may be employed without departing from the spirit of the invention.

Referring to Figs. 1 and 17 we will indicate how the machine is wired to provide an electrical circuit which makes it possible for the stop motion to instantaneously release the belt shifter and stop the machine. The current is taken from any ordinary source at 22 and passes through transformer 23 where it is stepped down to a suitable voltage for the purpose herein concerned. Under normal operating conditions the current merely completes a circuit through a light at 24, knife switch 25 being closed, this light indicating to the machine operator that the several yarns are feeding properly and that none of the stop motions are being actuated for any of the usual causes. A combined magnetically operated catch and buzzer indicated at 18, operates to latch the plunger 20 and also a brake generally indicated at 26, but not described herein since it forms no important part of the invention, in an inoperative position. In the event that one of the detents 27 or any of the other associated detents which are to be described later is allowed to swing from an inactive position to contact an element which terminates the live portion of said circuit, generally indicated at 28 and which is insulated from the machine but connected through suitable connections to the electrical circuit previously described, a different circuit will be completed through the machine ground which will energize the magnetic catch at 18 and release the belt shifter and/or brake. At the same time knife switch 25 will be opened, and, of course, light 24 will cease to burn indicating that the circuit has been closed to the flow of current. The knife switch 25 may be of conventional construction and is to be tripped by plunger 20 or any of the other parts actuated therewith upon shifting of the belt.

Referring to Figs. 2 and 3, one of the individual cam blocks 7 is shown which has a base 30 for attaching to the frame of the machine and also carries needle cams, jack cams and sinker cams which operate on needles and sinkers to draw stitches as they pass behind each of these cam blocks. These sinker cams are mounted under a plate 31 which is attached to the upper end of block 7 by means of a suitable angular connecting piece 32. A stud 33 is arranged to project upwardly from plate 31 and attached to the upper end of this stud by means of a suitable connecting bolt or screw is a support 34 which carries a yarn guiding finger 35 having two porcelain guides 36 and 37 through which the yarn is threaded as it is led to the needles. This yarn guiding finger is capable of being swung upwardly to an inactive position (Fig. 14) wherein it will not operate to feed yarn to the needles and the finger is held in either of its extreme positions by means of a spring and stops later to be described. The fact that this yarn guide swings to the upper extremity not only makes it possible for one of the feeds to be dropped out, but such movement greatly facilitates the threading of the guide itself. The support 34 has a slot therein which extends in such a direction that the support and its attached parts may be adjusted radially of the machine to properly position the guide just outside the needle circle but out of contact with the needles.

A contact element 38 is attached to support 34 along with a pair of radially projecting strips 39 and 40 shown in Fig. 4, the three elements being insulated from the support by means of washers 41 and 42 through which pass screws 43. The lower strip 39 has a curved outer end in which seat bars 44, a plurality of which extend between adjacent stop motions as they are spaced about the machine. It is possible to quickly remove these bars since the upper strip 40 is flexible and merely serves to maintain said bars in place. One of the bars 44 has attached thereto a conductor 45 which leads down to the transformer or other source of electrical current. It is to be understood, of course, that batteries may be used in place of the transformer herein shown. Any pair of bars 44 except one including the bar to which conductor 45 is attached may be removed from the machine to render one of the stop motions inoperative in case it is not desired to use the particular yarn feed corresponding or in the event that a complete cam block assembly is to be temporarily taken out of action. This removal will not affect the function of the stop motions remaining, and, for this reason, the stop motions and their connecting elements are particularly adapted to multi-feed machines having a great number of feeds since they act collectively, but are also capable of performing their function individually if need be.

Referring to Figs. 5–8 and 14, the stop motion assembly will be described in greater detail. The yarn feeding finger 35 is fixed to a short spindle 46 which passes through a bearing 47 in one end of support 34. A knurled thumb wheel 48 is secured by means of a set screw to the opposite end of this spindle 46 to hold it in axial position in its bearing and also to serve as a means of manually rotating said yarn feeding fingers into and out of active position. A pin 49 passes through knurled wheel 48 and is so positioned circumferentially of the same as to limit the swing of said yarn finger in both directions as it stops against either one of the shoulders 50 or 51, Fig. 8. At the other end of this pin 49 has been attached a coil spring 52 which is connected at its outer end to the support. This spring is under sufficient tension to maintain the yarn finger in either of its extreme positions as shown in Figs. 6 and 14.

A detent 27 is pivoted on a sleeve 46' on spindle 46 and is held upwardly against the action of gravity by means of the yarn 53 as it passes downwardly to the needles through guides 36 and 37. In case the yarn breaks or becomes excessively slack the detent will swing downwardly (Fig. 8) until a projection 54 at the upper end thereof strikes against contact element 38 thereby completing a circuit through the machine ground to magnetically operate catch 18. The machine will then be stopped as described above.

Referring to Figs. 5 and 9–13, a part of the stop motion will be described which provides for stopping the machine when a butt is broken on a needle or, if for any other reason, a needle does not adhere to the path in which it is designed to

travel. This device also works upon loading up of the fabric on the needles in which case the fabric will build or pucker up on top of the stitch ring as shown in Fig. 11. An arm designated by numeral 55 is pivoted on the end of spindle 46 by means of a screw 56 projecting from that spindle, and further, carries a pin 57 at its upper end which projects inwardly far enough to contact the strip 38 when it is actuated. This strip 38 has been provided with a separate extension 58 which may be bent to a suitable arc which will provide for pin 57 making contact with it whenever the arm 55 is rotated through a slight angle as shown in Fig. 10. An extension 59 provided with a long slot therein which engages about screw 56 and is clamped in position by another shouldered screw 60 has a hooked projection 61 at its lower end which will engage the fabric whenever the same has loaded up on the needles, the same extension 59 has a second projection 62 which extends at right angles over the path of needles which normally pass beneath when they are properly guided by their cams. Spindle 46 has a spring pressed plunger 63 therein which normally engages a corresponding indentation in arm 55 to maintain the same in a substantially vertical position.

In operation the arm 55 and its projecting pin 57 will be swung from its vertical position until said projecting pin contacts element 38 and/or the extension 58 whenever a needle passes through which has for some reason failed to be guided within the proper pathway as shown in Figs. 9 and 10, also upon loading up of the needles as shown in Fig. 11. Extension 59 is adjustable along arm 55 by means of clamping screw 60. Whenever the yarn feeding finger is swung to an inoperative position, arm 55 will be rotated around with that finger to the position of Fig. 14 wherein pin 57 will engage the hooked end 38' of contact strip 38. The portion of the stop motion which functions on yarn breakage is included with every yarn finger, but it is preferable although not necessary, to use the elements which have been described relative to Figs. 9–13 at spaced feeds about the machine, since they do not function except at very rare occasions.

In Figs. 15 and 16 a modified attachment is shown applied to arm 55 which actuates the stop motion whenever fabric having a hole therein passes downwardly over a fabric supporting ring 64 which is adjacent stitch ring 65. In this case arm 55 and pin 57 function in exactly the same way they did in the modification described above, but have attached thereto in place of extension 59, a bracket 66 which has a vertically disposed extension 67 at the top and a forked projection at 68 extending laterally from the bottom. An arm 69 is pivoted at 70 and curves inwardly at its lowermost end to form a feeler 71 which will engage any hole in the fabric as it passes over element 64. Since the cylinder, the stitch ring and fabric ring 64 are rotating, the lower end of arm 69 which engages a hole in the fabric will be swung in such a direction to force pin 57 into contact with strip 38 or extension 58 thereof. A spring 72 is attached at one end to arm 69 and at its opposite end to element 55 to resiliently press feeler 71 against the fabric. This stop which operates upon engaging a hole in the fabric is also used upon only a few of the feeds of the machine since it is a very rare occurrence to encounter such imperfections, and if a hole is actually found in the fabric, there is no particular advantage in stopping the machine in a very short space as is necessary upon breakage of one of the feeding yarns.

Referring to Fig. 6, it will be noted that yarn guide finger 35 is provided with a downwardly projecting flange 73 which is beveled along its lower edge and is located very closely adjacent the rotating circle of needles. This lower edge serves very effectively to open and hold open any needle latches which tend to swing outwardly under the centrifugal force exerted upon them.

The yarn feeding and stop-motion assembly which has been described above forms a particularly compact unit which acts practically independent of other elements of the machine and very effectively stops or initiates the stopping mechanism of the knitting machine whenever a yarn breaks, upon loading up of the needles, upon encountering holes in the fabric and whenever a needle fails to be properly guided within its intended pathway. Any one of the feeding fingers can be instantaneously thrown out of action and that stopping mechanism which accompanies said finger is capable of being immediately disconnected from all those adjacent by simply removing the bar 44 on either side of the same. This complete detachment of one of the assemblies does not in any way affect the full and complete function of those remaining. The machine may be set up with only the stop motions which function upon yarn breakage, or it may be provided with any number of the other motions which it is considered necessary to have, and these other motions function in combination with the same contacting elements and electrical circuit without any change or adjustment on this latter mechanism.

The invention has been described relative to one particular embodiment of the same, but it is evident that many modifications may occur to one skilled in the art without departing from the original spirit of the invention, and we do not intend to be limited except by the scope of the appended claims.

We claim:

1. A stop motion for a multi-feed knitting machine including an electric circuit and individual stop motions associated with each of several feeds, the circuit including detachable current carrying parts, the construction being such that by detaching certain ones of said current carrying parts the stop motions at several of the feeds may be rendered ineffective without rendering ineffective the stop motions at the other feeds.

2. In a knitting machine, the combination of a plurality of yarn feeding assemblies, yarn feeding fingers common to each assembly, supports for carrying said fingers, extensions projecting from said support and insulated from the same, a contact piece also insulated from said support, a detent associated with each support and its finger and arranged to be held in one position by a feeding yarn and to engage the contact piece whenever said yarn fails to hold its detent in an uppermost position, quick detachable bars extending between said extensions one of which is connected to a source of electric current.

3. In a knitting machine, the combination of a yarn feeding finger, a support to which said finger is attached, means for carrying an electric current into close proximity to said finger and stopping means associated with said finger and its support, said means being arranged to contact the current carrying means upon breakage of yarn, and a second stopping means arranged to contact the same member when a needle passes

outside its normal pathway or when fabric loads up on needles.

4. In a knitting machine, the combination of yarn feeding means at each of a plurality of feeding stations, stopping means including current carrying devices and yarn controlled detents operable upon breakage of yarn to contact said current carrying devices and complete a circuit, removable connections for carrying current between said devices, the construction being such that one or more of said connections may be removed to isolate one or more of said stopping means at certain of the feeding stations without affecting those remaining.

5. In a knitting machine, a plurality of feeding stations and means for feeding yarn at each feeding station, stop mechanism associated with said feeding means at each station including current carrying members connected to a source of current and connectible to ground by yarn controlled detents, at least one such detent being associated with each of the feeding means, connecting means for carrying current between the stopping mechanisms at adjacent feeding station, the construction being such that one or a plurality of said connecting means may be removed and the associated stopping devices connected thereby rendered inoperative without affecting the function of those remaining.

6. In a multi-feed knitting machine the combination of knitting instrumentalities and a plurality of yarn feeding means spaced about said machine at each of which means said instrumentalities draw yarn to knit a fabric, stopping means adjacent each of the said feeding means for stopping the machine upon an abnormal condition in the feeding yarn including a yarn engaging detent and current carrying elements, one of which elements is removable and extends from that stopping means to the next, the construction being such that one or more of the stopping means may be rendered inactive upon removal of connecting, current carrying elements without affecting stopping of the machine as influenced by those stopping devices remaining.

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