

March 6, 1945.

H. SEARLES ET AL

2,371,110

STOP MEANS FOR TEXTILE MACHINES

Filed March 7, 1944

2 Sheets-Sheet 1

Fig. 1.

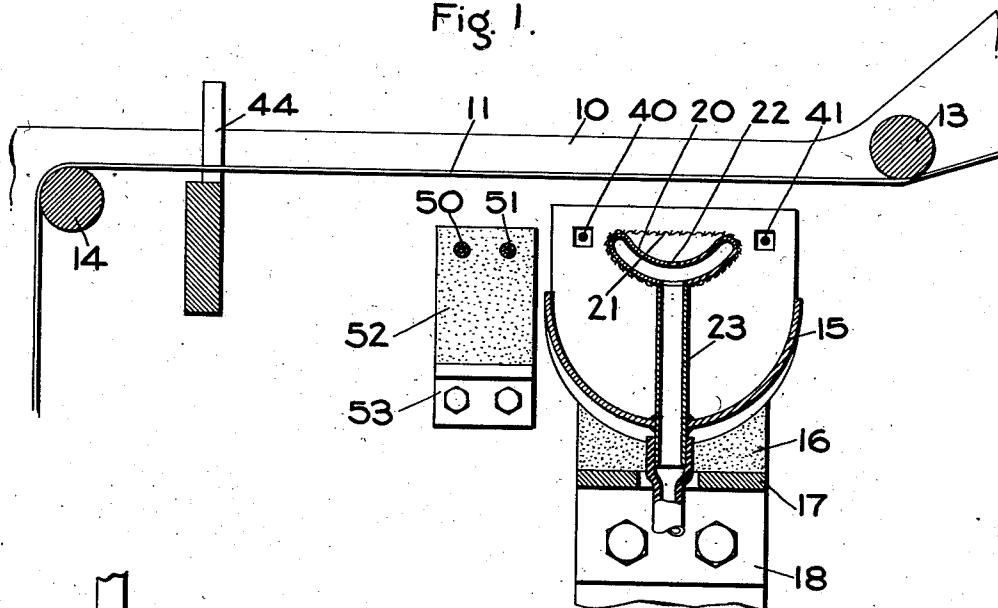
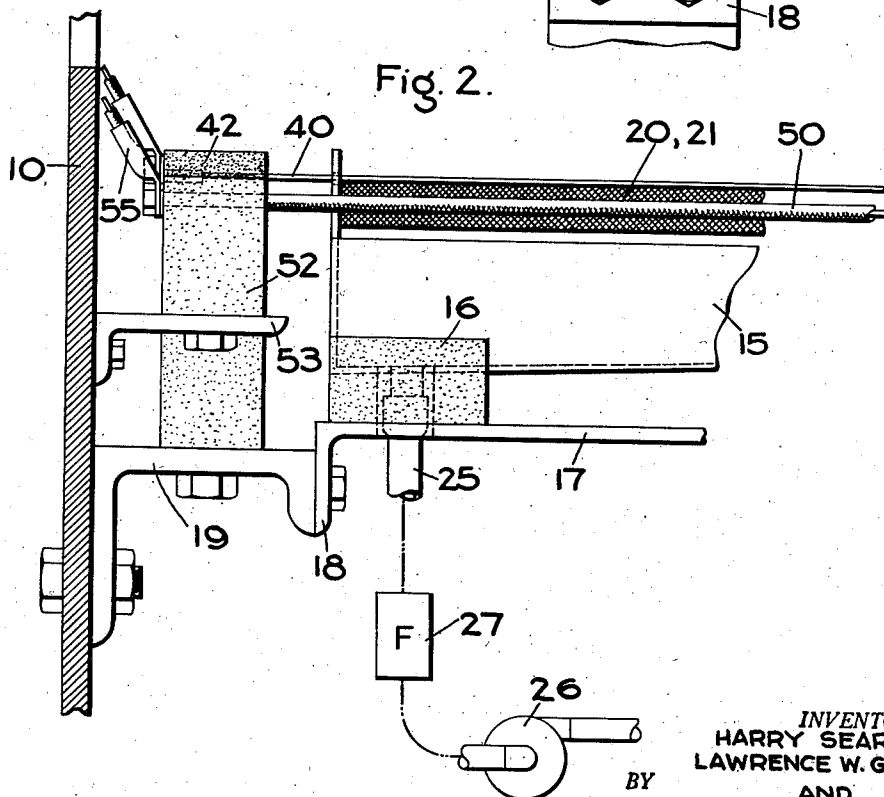


Fig. 2.



INVENTOR.
HARRY SEARLES,
LAWRENCE W. GRIFFIS
AND
ELLSWORTH E. CARLSON
Beau, Brooks, Buckley & Beau
ATTYS

March 6, 1945.

H. SEARLES ET AL

2,371,110

STOP MEANS FOR TEXTILE MACHINES

Filed March 7, 1944

2 Sheets-Sheet 2

Fig. 3

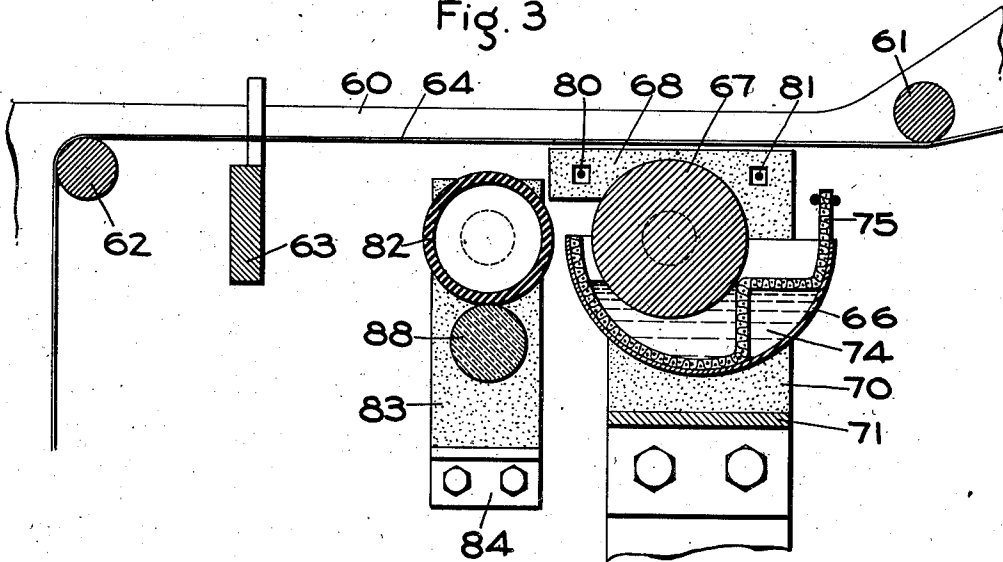
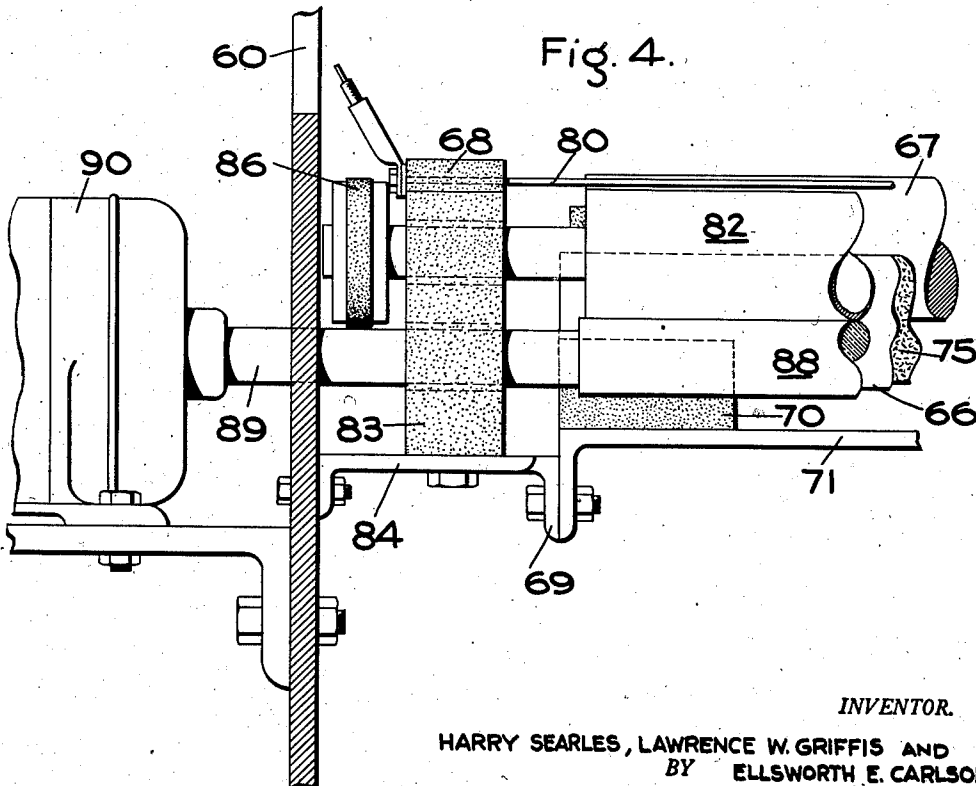


Fig. 4.



INVENTOR.

HARRY SEARLES, LAWRENCE W. GRIFFIS AND
BY ELLSWORTH E. CARLSON

Bean, Brooks, Buckley & Bean.
ATTYS.

UNITED STATES PATENT OFFICE

2,371,110

STOP MEANS FOR TEXTILE MACHINES

Harry Searles, Saratoga Springs, Lawrence W. Griffith, Buffalo, and Ellsworth E. Carlson, Kenmore, N. Y., assignors to Van Raalte Company, Inc., New York, N. Y.

Application March 7, 1944, Serial No. 525,366

18 Claims. (Cl. 66—163)

This invention relates to textile machines and particularly to improvements in the feeding of thread or yarn therein or thereto. More particularly, the invention is directed to stop means for use in the textile arts for causing machine stoppage under abnormal conditions of thread or yarn passage.

In United States Letters Patent No. 2,330,212, dated September 28, 1943, granted to Clyde B. Hayes and Henry J. Czech, there is disclosed a novel stop means for textile machines wherein the necessity for individual drop wires or heddles for each thread is obviated by the provision of a pair of spaced electrodes which are effective to close an electrical circuit when bridged by a thread having electrically conductive properties. In the aforesaid application a pair of spaced parallel rollers are provided and the rollers, which comprise a single electrode, rotate counter to the direction of thread movement. The second electrode is disposed between the pair of spaced rollers.

In the stop means of the patent referred to in the preceding paragraph, the force of gravity alone is relied upon for causing broken or slack threads or strands to fall to the stop means for activating the same. This renders operation uncertain under some conditions. By way of example, cotton thread or yarn may be characterized by the presence of minute cotton fibres which project laterally from the main body of the thread. In certain textile machines, tricot knitting machines for instance, a number of threads or strands may extend in relatively close adjacency.

In the case of thread or yarn having the fuzzy characteristics referred to above, a thread which is not under tension, by reason of breakage or otherwise, may continue to be supported in its normal path and fed therealong by adjacent threads or strands by reason of contact between the projecting tentacles or processes of adjacent threads or strands.

The foregoing reference to cotton yarn is set forth merely by way of example and similar difficulties may be encountered in the use of other strands or threads, either natural or synthetic. Slight misalignments of warp may result in an untensed or broken thread being supported by adjacent threads even without the objectionable tentacles or fuzz found on cotton yarn.

Further, other influences may militate against the prompt dropping of abnormal threads or strands, particularly where relatively fine thread or yarn is being operated upon. Casual convection currents and the attractive or repulsive effects of extraneous static electrical charges are among the adventitious influences which may prevent or delay the prompt dropping of slack, broken or otherwise abnormal threads or strands.

While in the specific example herein described in detail reference is had to a warp stop of the conductive liquid type, in certain aspects the present invention is applicable to any textile machine stopping arrangement wherein mere displacement of a thread or strand from its normal path effects machine stoppage, without the usual and conventional interposition of heddles or drop wires.

According to the present invention means are provided for exerting an electrostatic attractive force against a number of threads or strands as they pass the stop means in such a way that if any of them become slack or broken, it will be quickly displaced from the normal thread path by electrostatic attraction, the displacement serving to activate stop means. The electrostatic field may be generated in a variety of ways. Two embodiments described in detail hereinafter and illustrated in the accompanying drawings show means for applying electrostatic charges created both frictionally and inductively.

While the disclosed embodiments show electrostatic means for supplementing the attraction of gravity on the several threads or strands, electrostatic forces of sufficient intensity may be generated whereby to cause upward displacement of threads, in which case the stop means will be above a bank of threads. Similarly, sufficient electrostatic force may be provided to displace threads or strands laterally from a normal vertical or oblique path.

By way of example the invention is shown, in the present instance, as applied to a tricot knitting machine, and again by way of example, it will be assumed that cotton thread or yarn is being knitted. It is to be understood, however, that the principles of the invention are not limited in spirit or scope to the example set forth, nor otherwise than as defined in the appended claims.

In the drawings:

Fig. 1 is a fragmentary side elevational view of one form of the stop means of the present invention shown in cross section as it might be applied to a tricot knitting machine;

Fig. 2 is a fragmentary front elevational view of the stop means of Fig. 1;

Fig. 3 is a view similar to Fig. 1 but showing an alternative form of the invention; and

Fig. 4 is a view similar to Fig. 2 but showing the stop means of Fig. 3.

Throughout the several figures of the drawings like characters of reference denote like parts. In the accompanying drawings we have illustrated only the electrodes comprising the present novel arrangement. These electrodes are preferably associated with machine controlling electrical circuits in the manner clearly shown and described in Hayes et al. Patent No. 2,330,212,

wherein the circuit containing the electrodes serves as the input of an audion amplifier whose output circuit directly controls machine operation by association with conventional relay operated switches. Since every detail of the electrical portion of the device of the present invention, beginning with the electrical conductors leading from the illustrated electrodes, may be identical with the electrical means shown and completely described in the prior application, the disclosure of that part of the present device will not be repeated here.

In Figs. 1 and 2 the numeral 10 designates one of a pair of side frame members of a textile machine which, as has been indicated, may be a tricot knitting machine. Thread or yarn is designated 11 in Fig. 1 and, in the example given, comes from the right as viewed in Fig. 1 from a warp beam (not shown).

In Fig. 1 the numerals 13 and 14 designate a whip roll and a tension bar, respectively, which are schematically shown. In the illustrated instance the whip roll 13 and tension bar 14 serve to guide the warp in a substantially horizontal direction during its passage between those two elements. From the tension bar 14 the thread or yarn moves downwardly to the knitting mechanism of the machine (not shown).

It may be reiterated here that any form of electro-sensitive warp stop means may be used in combination with the present thread or yarn diverting means without departing from the basic teachings of the present invention. Specific preferred forms of the stop means per se are, however, set forth here by way of example.

It is contemplated that more than one separate set of machine stopping devices may be used in a given machine, where separate thread or yarn paths exist. This will be found, for instance, in conventional tricot machines employing more than one warp beam.

In Figs. 1 and 2 the numeral 15 designates an elongate pan which extends from one end of the machine to the other beneath the entire warp. The pan 15 may be attached to the machine in any convenient manner. In its illustrated form the pan 15, which is of arcuate transverse cross section, rests in a pair of insulating blocks 16 which in turn are secured to a base plate 17 whose opposite ends may be downwardly flanged as at 18, for securement to inverted U-shaped brackets 19 carried by the side frames of the machine.

In the alternative, the pan 15 may be secured directly to the machine frame and thus constitute a ground electrode. A tube 20 is shown supported at its opposite ends by the end walls of pan 15. The preferred cross sectional form of tube 20 is shown in Fig. 1 and it has disposed thereabout a sleeve 21 of relatively closely knit fabric which fits snugly about the tube so that the fabric stretches tautly across the convex upper side of the tube. Such convex upper side is provided with a series of apertures 22 which extends substantially the entire length of tube 20.

The interior of tube 20 is fed with liquid which may be a water solution of a suitable salt or other agent calculated to render thread or yarn electrically conductive when it is wet with the liquid. While any conductive liquid may be employed, an example of a satisfactory liquid is a water solution of chromate. The liquid is introduced through a conduit 23 which communicates with the bottom of tube 20 substantially at its center. The liquid is fed to tube 20 at

moderate pressure so that liquid emerges from the apertures 22 to keep the fabric stretched across the top of tube 20 thoroughly wet. Excess liquid spilling over the edges of tube 20 or dropping from the bottom of fabric sleeve 21 is caught by pan 15 which, in the illustrated form, is pitched lengthwise so that liquid caught thereby is drained off through a conduit 25.

As indicated schematically in Fig. 2, the drain conduit 25 leads to the inlet side of a pump 26 whose outlet communicates with the conduit 23 leading to tube 20. In Fig. 2 the numeral 27 schematically indicates the presence of a filter unit in conduit 25.

The assembly, including the pan 15, tube 20 and wetted fabric 21, comprises one electrode of the primary machine stopping circuit. The opposite electrode comprises a pair of wires 40 and 41 which are stretched between insulating blocks 42 and carried thereby. The wires 40 and 41 extend parallel to tube 20 at opposite sides thereof and are preferably disposed so that their top surfaces are substantially co-planar with the top surface of tube 20 and sleeve 21 as shown in Fig. 1.

The degree of spacing of tube 20 relative to the normal path of the warp and the disposition of wires 40 and 41 with respect to both the warp and tube 20 will vary between certain limits, according to whether the warp being handled is nylon, cotton, rayon, silk, wool or other material.

In Fig. 1 a sley bar is shown at 44, between the stop means and the tension bar 14, for retaining proper spacing of the individual threads of the warp.

A critical factor in the warp stop set forth herein is the provision of an abundance of moisture at the upper surface of fabric sleeve 21, so that threads engaging it wet out rapidly and the liquid taken up in wetting out is immediately replaced so that the wetting out process may continue until either of the electrodes 40 or 41 is encountered, whereupon machine stoppage occurs instantaneously.

Referring particularly to Fig. 1, the numerals 50 and 51 designate a pair of insulated conductors extending substantially parallel to the previously described stop mechanism and to each other. The conductors 50 and 51 are supported by blocks 52 which in turn may be supported by brackets 53 secured to machine side frame 10 and its companion side frame at the opposite side of the machine. In Fig. 2 the numeral 55 designates an electrical connection for conductor 50 and the conductor 51 has a like connection, not shown.

The fundamental principle of the form of the invention illustrated in Figs. 1 and 2 is the establishment of an electrostatic difference of potential between the conductors 50 and 51, whereby an attractive force is exerted against the warp 11. This results in immediate movement of broken or slack threads or strands from the normal path to the conductors 50 and 51, which insures their immediate engagement with the tube 20 and the electrodes 40 and 41 and the consequent stopping of the machine.

The provision of the desired electrostatic difference of potential across conductors 50 and 51 may be effected in any manner known to those skilled in the electrical arts. It is contemplated that in the example of Figs. 1 and 2 the conductors 50 and 51 may comprise the opposed electrodes of a conventional electrostatic induction machine (not shown) which may be a Wimshurst or a Toepler-Holtz static induction machine.

In the embodiment of Figs. 3 and 4 the same

general purpose is in view, namely, the attraction of slack or broken warp threads to an electro-sensitive stop device by the attractive force of an electrostatic charge. In the apparatus of Figs. 3 and 4, however, the electrostatic charge is generated frictionally.

As in Figs. 1 and 2, the embodiment of Figs. 3 and 4 illustrates a knitting machine side frame element 60, a whip roll 61, a tension bar 62, a sley bar 63 and warp threads extending between the whip roll 61 and the tension bar 62, as at 64. Referring particularly to Fig. 3, an elongate pan 66 extends transversely beneath the warp and a roller 67 is journaled in bearing blocks 68 which in turn are supported by inverted U-shaped brackets 69 secured to the side frame members of the machine. The pan 66 rests on a pair of insulating blocks 70 which are supported by a plate 71 which connects at its opposite ends with the brackets 69.

The pan 66 contains conductive liquid 74 and a wick 75 insures uniform liquid coating of the roller 67 upon rotation thereof and prevents the possibility of splashing of liquid from the pan. The assembly comprising the pan, the roller 67, the wick and the liquid comprises one electrode of a machine stopping circuit and a pair of exposed conductors 80 and 81 which extend parallel to roller 67 at opposite sides thereof, being supported between the blocks 68, comprise the opposed electrode.

A second roller 82 is journaled in insulating blocks 83 which are secured to the machine side frames by brackets 84. The rollers 67 and 82 are belt-connected as at 86 for joint rotation in a counter-clockwise direction as viewed in Fig. 3 and they are intended to be continuously driven at a moderate speed by connection with any suitable shaft of the knitting machine (not shown). Speeds of the general order of 8 R. P. M. are suitable. The roller 82 is hollow and is the element which receives the electrostatic charge for attracting slack or broken warp threads in the warp stop arrangement of Figs. 3 and 4.

A satisfactory material for the roller 82 is molded phenolic-bonded fibre and it will be noted that a further roller 88 is journaled in blocks 83 in such position as to have tangential contact with roller 82. The roller 88 is of glass, amber, or other material having similar ability to generate an electrostatic charge. A mounting shaft 89 for roller 88 extends to a point outside of frame 60, as appears in Fig. 4, where it may have direct connection with the drive shaft of an independent electric motor 90. The motor 90 rotates the roller 88 at a relatively high speed and its frictional rubbing action imparts a substantial electrostatic charge to roller 82 to attract slack or broken threads.

The rotative movement of rollers 67 and 82 tends to move threads in contact therewith from roller 67 to electrode wire 80 whereby the thread or yarn wetted by roller 67 closes a machine stopping circuit.

Referring now again to the embodiment of Figs. 1 and 2, where two warp beams are employed, as in conventional tricot knitting machines, and consequently separate warp paths exist, the liquid flow circuit may include both warp stops in series, flow of liquid from an upper warp stop to a lower one being under the force of gravity.

What is claimed is:

1. In a textile machine having knitting mechanism, a warp beam for supplying yarn thereto, and means for constraining normal threads to a

predetermined normal path between said warp beam and said knitting mechanism; stop means adjacent said normal thread path and sensitive to displacement of a thread from said predetermined normal path, and means providing an electrostatic field of sufficient intensity to displace broken or slack threads from said normal path to actuate said stop means.

2. In a textile machine having knitting mechanism, a warp beam for supplying yarn thereto, and means for constraining normal threads to a predetermined normal path between said warp beam and said knitting mechanism; a machine-stopping circuit having spaced electrodes adjacent said normal thread path, said circuit being closable by displacement of a thread from said predetermined normal path to said electrodes, and means providing an electrostatic field of sufficient intensity to displace broken or slack threads from said normal path to actuate said stop means.

3. In a textile machine having thread-feeding means and means for constraining normal threads to a predetermined normal path, stop means adjacent said normal thread path and sensitive to displacement of a thread from said predetermined normal path, and means for generating an electrostatic field of sufficient intensity to displace broken or slack threads from said normal path to actuate said stop means.

4. In a textile machine having thread-feeding means and means for constraining normal threads to a predetermined normal path, a machine-stopping circuit having spaced electrodes adjacent said normal thread path, said circuit being closable by displacement of a thread from said predetermined normal path to said electrodes, and means for generating an electrostatic field of sufficient intensity to displace broken or slack threads from said normal path to actuate said stop means.

5. In a textile machine having knitting mechanism, a warp beam for supplying yarn thereto, and means for constraining normal threads to a predetermined normal path between said warp beam and said knitting mechanism; stop means adjacent said normal thread path and sensitive to displacement of a thread from said predetermined normal path, and means for generating an electrostatic field to urge broken or slack threads from said normal path to actuate said stop means.

6. In a textile machine having thread-feeding means and means for constraining normal threads to a predetermined normal path, stop means adjacent said normal thread path and sensitive to displacement of a thread from said predetermined normal path, and means for generating an electrostatic field to urge broken or slack threads from said normal path to actuate said stop means.

7. In a textile machine having knitting mechanism, a warp beam for supplying yarn thereto, and means for constraining normal threads to a predetermined normal path between said warp beam and said knitting mechanism; stop means adjacent said normal thread path and sensitive to displacement of a thread from said predetermined normal path, means likewise adjacent said stop means and likewise adjacent said thread path for receiving an electrostatic charge to attract broken or slack warp threads to actuate said stop means, and means movable frictionally against said last mentioned means for generating said electrostatic charge.

8. In a textile machine having knitting mechanism, a warp beam for supplying yarn thereto,

and means for constraining normal threads to a predetermined normal path between said warp beam and said knitting mechanism; a machine-stopping circuit having spaced electrodes adjacent said normal thread path, said circuit being closable by displacement of a thread from said predetermined normal path to said electrodes, means likewise adjacent said stop means and likewise adjacent said thread path for receiving an electrostatic charge to attract broken or slack warp threads to actuate said stop means, and means movable frictionally against said last mentioned means for generating said electrostatic charge.

9. In a textile machine having thread-feeding means and means for constraining normal threads to a predetermined normal path, stop means adjacent said normal thread path and sensitive to displacement of a thread from said predetermined normal path, means likewise adjacent said stop means and likewise adjacent said thread path for receiving an electrostatic charge to attract broken or slack warp threads to actuate said stop means, and means movable frictionally against said last mentioned means for generating said electrostatic charge.

10. In a textile machine having thread-feeding means and means for constraining normal threads to a predetermined normal path, a machine-stopping circuit having spaced electrodes adjacent said normal thread path, said circuit being closable by displacement of a thread from said predetermined normal path to said electrodes, means likewise adjacent said stop means and likewise adjacent said thread path for receiving an electrostatic charge to attract broken or slack warp threads to actuate said stop means, and means movable frictionally against said last mentioned means for generating said electrostatic charge.

11. In a textile machine having knitting mechanism, a warp beam for supplying yarn thereto, and means for constraining normal threads to a predetermined normal path between said warp beam and said knitting mechanism; stop means adjacent said normal thread path and sensitive to displacement of a thread from said predetermined normal path, means likewise adjacent said stop means and likewise adjacent said thread path for receiving an electrostatic charge to attract broken or slack warp threads to actuate said stop means, and means movable frictionally against said last mentioned means for generating said electrostatic charge.

12. In a textile machine having thread-feeding means and means for constraining normal threads to a predetermined normal path, stop means adjacent said normal thread path and sensitive to displacement of a thread from said predetermined normal path, means likewise adjacent said stop means and likewise adjacent said thread path for receiving an electrostatic charge to attract broken or slack warp threads to actuate said stop means, and means movable frictionally against said last mentioned means for generating said electrostatic charge.

13. In a textile machine having knitting mechanism, a warp beam for supplying yarn thereto, and means for constraining normal threads to a predetermined normal path between said warp beam and said knitting mechanism; stop means adjacent said normal thread path and sensitive to displacement of a thread from said predetermined normal path, and an electrical circuit having

spaced terminals and induction means for generating an electrostatic potential gradient thereacross, said spaced terminals being adjacent said thread path and said stop means to attract broken or slack warp threads to actuate said stop means.

14. In a textile machine having knitting mechanism, a warp beam for supplying yarn thereto, and means for constraining normal threads to a predetermined normal path between said warp beam and said knitting mechanism; a machine-stopping circuit having spaced electrodes adjacent said normal thread path, said circuit being closable by displacement of a thread from said predetermined normal path to said electrodes, and an electrical circuit having spaced terminals and induction means for generating an electrostatic potential gradient thereacross, said spaced terminals being adjacent said thread path and said stop means to attract broken or slack warp threads to actuate said stop means.

15. In a textile machine having thread-feeding means and means for constraining normal threads to a predetermined normal path, stop means adjacent said normal thread path and sensitive to displacement of a thread from said predetermined normal path, and an electrical circuit having spaced terminals and induction means for generating an electrostatic potential gradient thereacross, said spaced terminals being adjacent said thread path and said stop means to attract broken or slack warp threads to actuate said stop means.

16. In a textile machine having thread-feeding means and means for constraining normal threads to a predetermined normal path, a machine-stopping circuit having spaced electrodes adjacent said normal thread path, said circuit being closable by displacement of a thread from said predetermined normal path to said electrodes, and an electrical circuit having spaced terminals and induction means for generating an electrostatic potential gradient thereacross, said spaced terminals being adjacent said thread path and said stop means to attract broken or slack warp threads to actuate said stop means.

17. In a textile machine having knitting mechanism, a warp beam for supplying yarn thereto, and means for constraining normal threads to a predetermined normal path between said warp beam and said knitting mechanism; stop means adjacent said normal thread path and sensitive to displacement of a thread from said predetermined normal path, and an electrical circuit having spaced terminals and induction means for generating an electrostatic potential gradient thereacross, said spaced terminals being adjacent said thread path and said stop means to attract broken or slack warp threads to actuate said stop means.

18. In a textile machine having thread-feeding means and means for constraining normal threads to a predetermined normal path, stop means adjacent said normal thread path and sensitive to displacement of a thread from said predetermined normal path, and an electrical circuit having spaced terminals and induction means for generating an electrostatic potential gradient thereacross, said spaced terminals being adjacent said thread path and said stop means to attract broken or slack warp threads to actuate said stop means.

HARRY SEARLES.
LAWRENCE W. GRIFFIS.
ELLSWORTH E. CARLSON.