

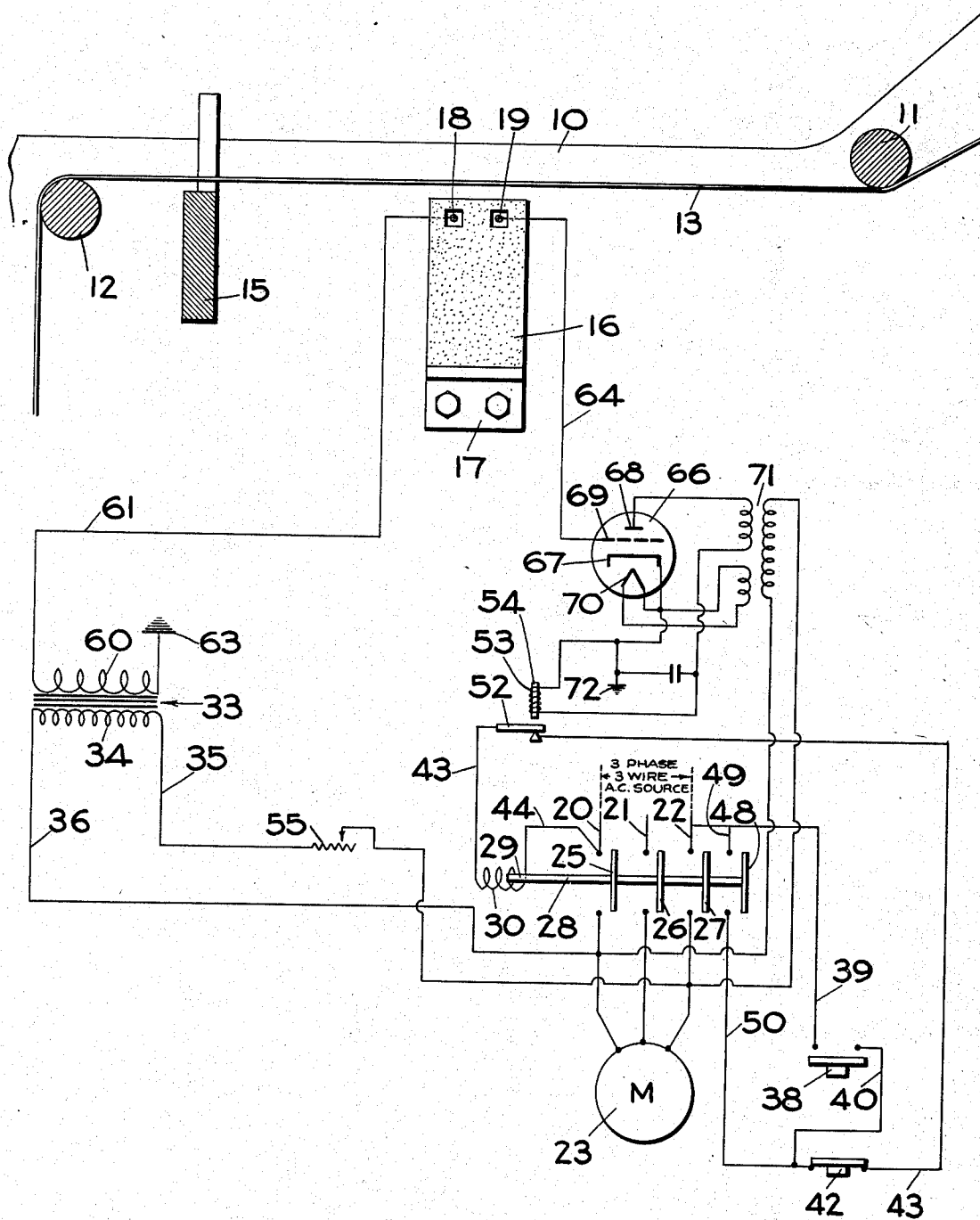
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METHOD OF CONTROLLING TEXTILE MACHINES

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METHOD OF CONTROLLING TEXTILE MACHINES

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This invention relates to a new method of controlling textile machines, and particularly to a novel method of rendering such machines sensitive to and controllable by abnormalities of thread or yarn feeding.

According to the present invention a method is afforded whereby normally non-conductive filaments of thread, yarn or the like are so treated as to serve as electrical conductors, at least during such period of time as they are passing through a portion or portions of textile machinery where means are provided for employing such conductivity to control the machinery, particularly with respect to thread or yarn failure occasioned by breakage, lack of proper tension, or otherwise.

Speaking generally, the present invention comprehends the preliminary treatment of thread or yarn in such manner that it becomes electrically conductive, at least to a slight degree, during the required time period. Such conductivity need not be of high degree, since electronic means are provided for suitably amplifying the electrical impulse provided thereby, to a point where such amplified impulse is sufficient to effect machine controlling instrumentalities.

According to the present invention, thread or yarn is preliminarily treated with a salt or other substance which in water solution, or even merely in the presence of moisture gives the thread or yarn conductivity. Preferably, in addition to the substance for imparting conductivity, the thread or yarn is treated with a suitable agent for increasing its hygroscopicity. The invention further involves maintaining a humid atmosphere either generally in the vicinity of the machine or locally at places which will affect the thread or yarn before it reaches the machine controlling means.

Finally, the present invention provides, adjacent a normal thread path, a pair of spaced electrical conductors which comprise the primary circuit of a machine-stopping circuit, in such manner that thread or yarn moving from such normal path, by reason of breakage, lack of proper tension, or otherwise, engages across the conductors and closes the primary machine stopping circuit. The electrical impulse thus developed, albeit relatively small, is greatly amplified by electronic means. The degree of amplification is limited only by the necessities of the machine stopping electromagnets themselves.

For convenience and by way of example, the method of the present invention will be described as used with tricot knitting machines, where a

large number of threads or strands pass in parallel order between a warp beam and the knitting mechanism. It is to be understood, however, that the principles of the invention are applicable to any kind of textile machinery. It is further to be understood that the detailed description which follows is illustrative only, and the principles of the present invention are not limited in any way excepting as defined in the appended claims.

The single figure of drawing includes a fragmentary elevational view of a portion of a tricot knitting machine and a wiring diagram showing the machine stopping electrical circuits in one illustrative form.

In the drawing the numeral 10 designates one of a pair of spaced side frame members of a tricot knitting machine and the numerals 11 and 12 designate, respectively, a conventional whip roll and tension bar. Warp threads are shown extending between and about the whip roll and tension bar at 13. The warp shown is in passage between a conventional warp beam and knitting mechanism, neither of which are illustrated. A sley bar is shown at 15, for keeping the warp threads in properly spaced alignment during their passage to the knitting mechanism.

The numeral 16 designates one of a pair of insulating blocks which are supported by the opposed machine side frame members, as by means of brackets 17. The blocks 16 have stretched therebetween electrical conductors 18 and 19 which form opposed terminals of a primary machine stopping circuit in a manner which will be described in detail later herein. For now it is sufficient to say that bridging the conductors 18 and 19 results in immediate stoppage of the associated knitting machine.

According to the present invention, the warp to be used in the illustrative knitting machine is preliminarily treated with a substance which renders it conductive in the presence of moisture. This may be accomplished by immersing the yarn in a solution of copper sulphate, Glauber's salt, sodium chloride or various chromates. The dry salts themselves, despite their water of crystallization, are not conductors, so that the warp temporarily loses its conductivity upon drying.

It is further desirable to increase whatever natural hygroscopicity the warp may possess, and while this end may be variously attained, a convenient mode of operation is to merely add the electrically conductive agent to a hygroscopic agent, such as glycerine. Other suitable hygroscopic agents are diethylamine, Glysorbine, Trigamine, and triethylamine. The latter is found

to be especially effective when chromic acid is added thereto as the conductive medium or agent.

While treatment of the warp by immersion appears to be most convenient, the application thereto of the desired substances in any other manner is within the purview of the present invention. In practice, the yarn is merely treated by simple slashing and drying during warping.

While subject to variations depending on the conductive and hygroscopic agents used and available, and depending also on the concentrations of such substances, it is found that maintenance of a humidity of at least 50 per cent in the vicinity of the warp will cause it to take on enough moisture between the warp beam and the electrodes 18 and 19 to have electrical conductivity sufficient to provide a relatively small current flow thereacross.

One practical way in which this flow of current may be amplified and utilized to stop the knitting machine when the conductors 18 and 19 are bridged by a broken or slack warp thread will now be described.

In the wiring diagram a conventional three-phase, three-wire alternating current source is indicated at 20, 21, 22 and an electric motor operable therefrom is designated 23. The motor 23 may be the main operating motor of the machine.

Between the alternating current source, 20, 21, 22 and the motor 23 there is disposed an across-the-line switch having contact members 25, 26 and 27 for closing a circuit between the conductors 20, 21 and 22 and the motor 23. The contact members 25, 26 and 27 may be mounted for joint opening and closing movement upon a rod 28 whose terminal portion may comprise an armature 29 adapted to be attracted by a solenoid winding 30 for closing movement of the contact members 25, 26 and 27. The contact members are conventionally biased to open position by spring means not shown.

For applying a suitable potential across the electrodes 18 and 19, I provide a transformer, designated generally 33, whose primary winding 34 has conductors 35 and 36 which may engage respectively with the conductors 20 and 22 at the motor side of the across-the-line switch, whereby the primary coil 34 will be energized only when the across-the-line switch is in a closed position by reason of energization of the solenoid 30. Since the secondary circuit is normally open during operation of the machine, self-induction of the primary winding will cause it to serve as a choke coil and current flow therein will accordingly be held to a minimum.

Initial closing of the main motor circuit, and consequently of the primary circuit 35, 36 of the transformer 33, is effected by closing of a normally open starting switch 38 which establishes a temporary circuit across the conductors 20 and 22 of the three-wire alternating current source by means of a conductor 39 extending from the conductor 22, the momentarily closed switch 38, a conductor 40 leading therefrom, a normally closed stopping switch 42, a conductor 43 leading to one end of the solenoid winding 30, and a conductor 44 leading from the other end of the solenoid winding to the conductor 20.

As soon as an energizing circuit for the electromagnet 30 is established by operation of the starting switch 38 and the switch contacts move to closed position, a holding circuit is established through a switch contact bar 48 which closes with the contact bars, 25, 26 and 27 and closes

a circuit to the solenoid winding 30 which is in parallel with respect to the starting switch 38 and comprises a conductor 49 from the conductor 38 to one side of the contact bar 48 and a conductor 50 leading from the other side of the contact bar 48 to the conductor 40. The remainder of the holding circuit for the solenoid winding 30 is the same as the starting circuit.

Obviously momentary opening of the holding circuit by breaking the same through manual opening of the normally closed stopping switch 42 de-energizes the solenoid winding 30 and restores the across-the-line switch to open position. A second means for breaking the holding circuit for the solenoid winding 30 takes the form of a normally closed switch 52 interposed in the conductor 43, together with an electromagnet 53 having an iron core 54 for attracting the switch 52 to open circuit position upon energization of the electromagnet 53.

The primary winding 54 may be provided with variable resistance by interposing a rheostat or the like in its energizing circuit as is indicated at 55 in the conductor 35. The secondary winding of the transformer 33 is designated 60 and has as one of its terminals a conductor 61 leading to the electrode 18. The other terminal of the secondary winding 60 is grounded as at 63. The manner in which the secondary circuit is completed across the electrodes 18 and 19 through a conductor 64 will presently appear.

Numeral 66 designates a conventional triode having an indirectly heated cathode 67, a plate 68, control grid 69 and heating filament 70. For applying plate and cathode potentials and for heating the filament 70 a conventional transformer 71 is provided and such transformer may be connected across the conductors 20 and 22 of the primary motor circuit, preferably at the motor side of the across-the-line switch whereby the triode will be energized only when the main motor circuit is closed. The conductor 64 which connects with the electrode 19 terminates in a connection with the control grid 69 of the triode 66 and when a conducting thread bridges between the electrodes 18 and 19 the secondary circuit is complete and extends from the ground 63 through the secondary winding 60, the conductor 61, the electrode 18, the electrically conductive slack thread, the electrode 19, the conductor 64, the control grid 69, the cathode 67 to ground as indicated at 72. This comprises the input circuit of the triode 66. The thus completed input circuit is greatly amplified in the plate or output circuit of the triode which includes the electromagnet 53 and results in the energization thereof to open the switch 52 and break the circuit to the holding solenoid 30. Breaking of this holding circuit de-energizes the entire system including the transformer 33 and the several circuits of the triode 66.

Restarting of the machine can be effected only by removing the abnormal thread from engagement with the electrode conductors 18 and 19. Only a single stage of amplification is illustrated in the drawing but it is believed obvious that as many stages of amplification may be employed as the particular installation requires, depending on how much the particular operating conditions attenuate the flow of current between the electrodes 18 and 19, and various other operating factors.

What is claimed is:

1. The method of controlling a textile machine comprising applying to normally non-conduc-

tive threads to be used therein a solution containing a substance electrically conductive in the presence of moisture, drying the threads to precipitate said substance, moving the threads in a normal path in said machine, maintaining a degree of humidity sufficient to render the threads conductive, and disposing electro-sensitive machine controlling means adjacent to but spaced from the normal path, whereby abnormally feeding threads engage said means to control the machine.

2. The method of controlling a textile machine comprising applying to normally non-conductive threads to be used therein a solution containing a substance electrically conductive in the presence of moisture, drying the threads to precipitate said substance, moving the threads in a normal path in said machine, maintaining a degree of humidity sufficient to render the threads conductive, and disposing spaced terminals of an electrical machine controlling circuit adjacent to but spaced from the normal path, whereby abnormally feeding threads engage said terminals to close said circuit.

3. The method of controlling a textile machine comprising applying to normally non-conductive threads to be used therein a substance electrically conductive in the presence of moisture, moving the threads in a normal path in said machine, maintaining a degree of humidity sufficient to render the threads conductive, and disposing electro-sensitive machine controlling means adjacent to but spaced from the normal path, whereby abnormally feeding threads engage said means to control the machine.

4. The method of controlling a textile machine comprising applying to normally non-conductive threads to be used therein a substance electrically conductive in the presence of moisture, moving the threads in a normal path in said machine, maintaining a degree of humidity sufficient to render the threads conductive, and disposing spaced terminals of an electrical machine controlling circuit adjacent to but spaced from the normal path, whereby abnormally feeding threads engage said terminals to close said circuit.

5. The method of controlling a textile machine comprising applying to normally non-conductive threads to be used therein a substance electrically conductive in the presence of moisture, moving the threads in a normal path in said machine, providing sufficient moisture to render the threads conductive, and disposing electro-sensitive machine controlling means adjacent to but spaced from the normal path, whereby abnormally feeding threads engage said means to control the machine.

6. The method of controlling textile machines comprising applying to normally non-conductive threads to be used therein a substance electrically conductive in the presence of moisture, moving the threads in a normal path in said machine, providing sufficient moisture to render the threads conductive, and disposing spaced terminals of an electrical machine controlling circuit adjacent to

but spaced from the normal path, whereby abnormally feeding threads engage said terminals to close said circuit.

7. The method of controlling a textile machine comprising applying to normally non-conductive threads to be used therein a solution containing a substance electrically conductive in the presence of moisture and a hygroscopic agent, drying the threads, feeding the threads in a normal path in said machine, maintaining a degree of humidity sufficient to render the threads conductive, and disposing spaced terminals of an electrical machine controlling circuit adjacent to but spaced from the normal path, whereby abnormally feeding threads engage said terminals to close said circuit.

8. The method of controlling a textile machine comprising applying to normally non-conductive threads to be used therein a solution containing a substance electrically conductive in the presence of moisture and a hygroscopic agent, drying the threads, feeding the threads in a normal path in said machine, maintaining a degree of humidity sufficient to render the threads conductive, and disposing electro-sensitive machine controlling means adjacent to but spaced from the normal path, whereby abnormally feeding threads engage said means to control the machine.

9. The method of controlling a textile machine comprising applying to normally non-conductive threads to be used therein material electrically conductive in the presence of moisture and capable of increasing the hygroscopicity of the threads, feeding the threads in a normal path in said machine, maintaining a degree of humidity sufficient to render the threads conductive, and disposing electro-sensitive machine controlling means adjacent to but spaced from the normal path, whereby abnormally feeding threads engage said means to control the machine.

10. The method of controlling a textile machine comprising applying to normally non-conductive threads to be used therein material electrically conductive in the presence of moisture and capable of increasing the hygroscopicity of the threads, feeding the threads in a normal path in said machine, providing sufficient moisture to render the threads conductive, and disposing electro-sensitive machine controlling means adjacent to but spaced from the normal path, whereby abnormally feeding threads engage said means to control the machine.

11. The method of controlling a textile machine comprising applying to normally non-conductive threads to be used therein a material electrically conductive in the presence of moisture and capable of increasing the hygroscopicity of the threads, feeding the threads in a normal path in said machine, providing sufficient moisture to render the threads conductive, and disposing spaced terminals of an electrical machine controlling circuit adjacent to but spaced from the normal path, whereby abnormally feeding threads engage said terminals to close said circuit.

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