March 29, 1949. V. M. J. ANCET 2,465,829

ELECTRIC CONTROL SYSTEM FOR CIRCULAR LOOMS

Filed May 6, 1947 2 Sheets-Sheet 1

Fig. 1

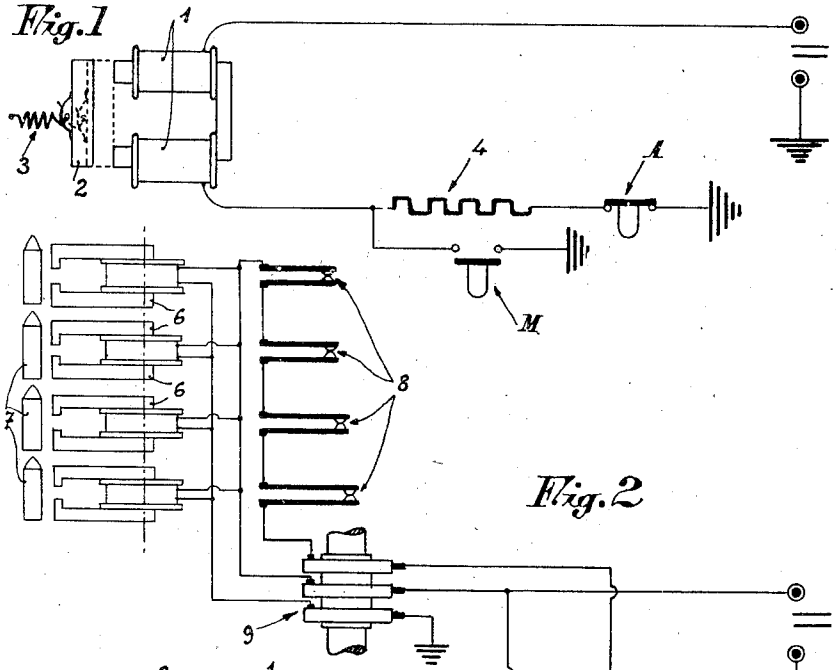
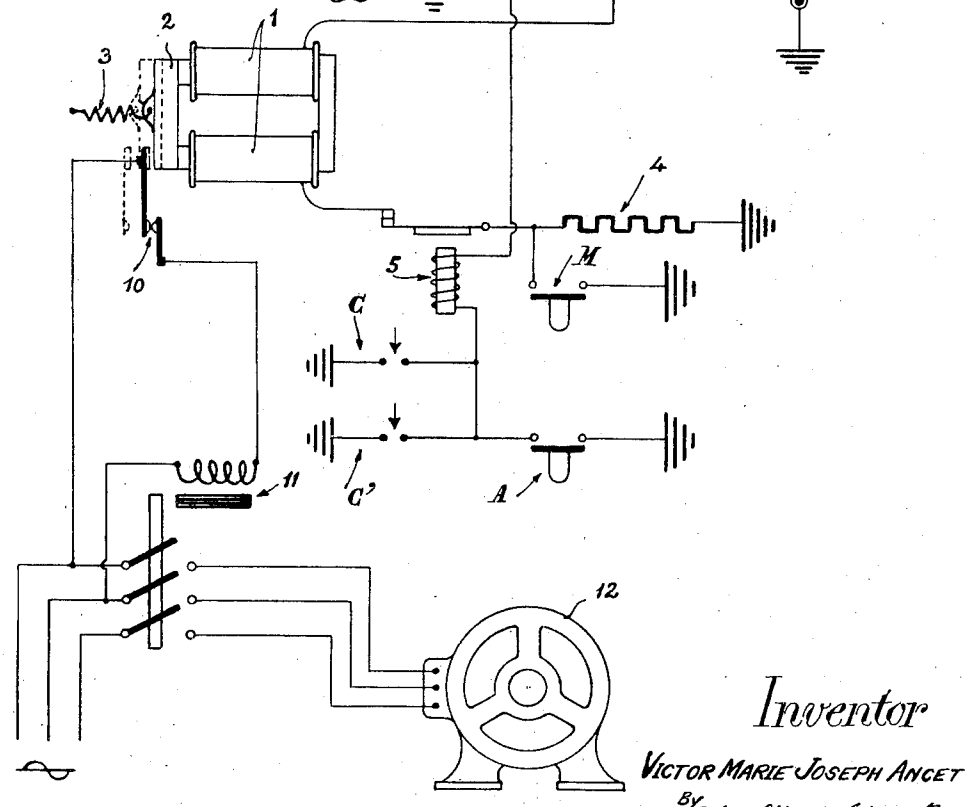


Fig. 2



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Fig. 3

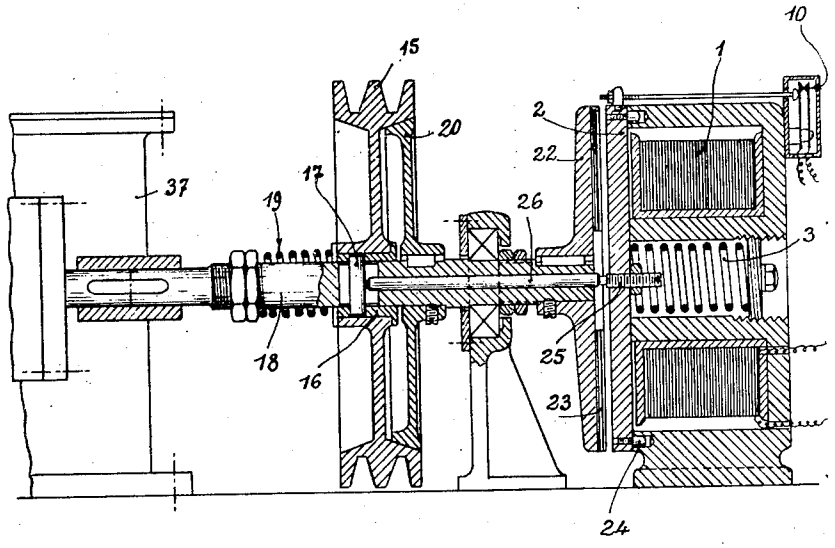
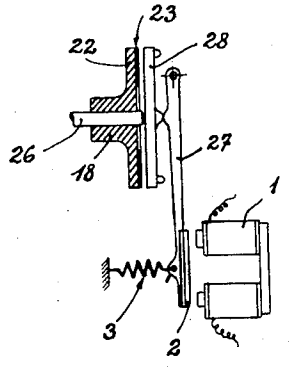


Fig. 4



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ELECTRIC CONTROL SYSTEM FOR CIRCULAR LOOMS

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7 Claims. (Cl. 139—336)

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This invention relates to a novel control system for starting and stopping circular looms, which, more than any other type, must be stopped quickly, if a thread breaks. This is particularly true, if the broken thread is a warp thread, because such a broken thread almost always interferes with the opening of a shed, in which a shuttle is moving, so that, if the shuttle continues to move after the break, there is a risk of serious damage.

Numerous stop motions for stopping circular looms upon the breaking of a thread have heretofore been proposed and such devices ordinarily operate to open or close a circuit. The provision of such a stop motion, which will operate with sufficient rapidity for use in a circular loom, is not easy and the device must be so constructed that the loom may not re-start automatically, after it has been once stopped by the action of the device. An electrical control system for a circular loom, which includes means for stopping the loom automatically upon the occurrence of a thread break should also be so constructed that the loom may be started electrically and with the starting and stopping effected by momentary actuation of suitable switches.

The control system of the present invention is of the electro-mechanical type and it fulfills the requirements above specified.

One of the principal characteristics of the new system is that clutching, declutching and braking of the loom are controlled by a single electromagnet. The exciting current of the magnet is limited by a resistance in series with it to such a value that, when the armature associated with the electromagnet is attracted, it remains attracted with a force just sufficient to counterbalance the action of its return spring. In the new system, an interruption, even of very short duration, of the current supplied to the electromagnet causes rapid release of the armature, so that it can be moved away from the electromagnet by the spring. In order to cause the armature to be re-attracted, it is necessary to increase the exciting current supplied to the electromagnet to compensate for the separation of the armature from the electromagnet and this is accomplished by momentarily short-circuiting the resistance by means of a simple switch.

The stopping of the loom by the release of the armature may be controlled by a manually operated switch or automatically by any detector which interrupts the exciting current of the electromagnet, either momentarily or for a period of time.

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According to another feature of the present invention, the movements of the armature are used to effect the clutching or the declutching and braking of the loom without any other source of energy than the action of the electromagnet or the return spring of its armature. For this purpose, the loom is provided with a clutch, by which its transmission shaft may be connected to a source of power, and one member of the clutch is urged toward the other by a clutch spring. The clutch spring and the return spring of the armature act in opposition and the return spring is the stronger. Accordingly, when the supply circuit through the electromagnet is opened, the return spring moves the armature away from the electromagnet and, at the same time, acts to overcome the clutch spring and separate the two members of the clutch. In the preferred construction, the armature is movable axially but held against rotation and, when it is moved by its return spring, it is forced into contact with a brake disc on the transmission shaft and this brakes that shaft. When the current supply through the electromagnet is increased and the armature is attracted, it is moved away from the brake disc and, at the same time, the clutch spring is free to force the two members of the clutch into engagement.

The accompanying drawings show by way of example one form of embodiment of the invention.

Figure 1 is a circuit diagram of the electromagnet,

Figure 2 is a general circuit diagram incorporating by way of example detectors of one type,

Figure 3 shows in section and in clutched position, an embodiment of the clutch-brake assembly.

Figure 4 shows a modification of Figure 3.

In the construction illustrated, the electromagnet 1 is provided with an armature 2 acted on by a return spring 3, the armature having a limited axial movement. The exciting current maintaining the armature attracted to the electromagnet is limited by a series resistance 4 of such value that, when the armature is in fully attracted position, the electromagnet is just capable of holding it there against the action of the return spring. Accordingly, only a brief interruption of the exciting current is required to cause immediate release of the armature and its movement away from the electromagnet by the return spring. When the armature has thus been moved by the spring, the power of the electromagnet, when supplied with normal exciting current, is not sufficient to re-attract the armature against the force of the spring. However, the armature

can be re-attracted by short-circuiting the resistance 4 by closing the shunt circuit containing the switch M. When the shunt circuit is thus closed, the effect of the resistance is nullified and additional current flows through the electromagnet, so that it becomes powerful enough to draw back the armature against the resistance of the return spring.

Release of the armature for manual stopping of the loom can be effected by momentarily interrupting the exciting circuit by a "stop" switch A.

It will be apparent, therefore, that, with the construction and mode of operation described, starting and stopping are obtained by transitory action on the control contacts M and A without any electrical or mechanical complication, these contacts being constituted in the case of the example shown in the drawing, by simple buttons with return springs.

The thread breakage detectors generally used are designed to stop the loom not by opening, but by closing a circuit. For this reason, the modified system illustrated in Fig. 2 includes a relay 5, which can be actuated by detectors *c*, *c'* to open the exciting circuit of the electromagnet 1 and thus automatically stop the loom, when a thread breaks. The stop switch A is then connected to operate the relay and open the exciting circuit, instead of being placed directly in that circuit as in the Fig. 1 system.

In circular looms, in which the shuttles 7 may be displaced from their carriers 6, the loom must be stopped immediately, when such displacement occurs, and such looms are ordinarily provided with means for actuating a contact 8 to open a circuit, whenever a shuttle is released from its carrier. In the system of the invention, the contacts 8 are connected in series in the exciting circuit of the electromagnet through slip rings 9.

Whenever the clutch, through which a circular loom is driven, is released, it is desirable that the driving motor be stopped. In the new system, a switch 10 actuated by the movements of the armature 2 is included in the circuit of the winding 11 of an ordinary contactor controlling the motor 12, and, when the armature is moved away from the electromagnet by the return spring, the switch 10 is opened and the motor stopped.

A form of clutch assembly, that may be used in the new system, is illustrated in Fig. 3 and it includes a driving pulley 15 loose on a sleeve 16, which is slidable on the loom transmission shaft 18 but connected thereto by a key 17. The sleeve is acted on by a spring 19 tending to engage the pulley frictionally with a coned member 20 keyed on the shaft 18. At the end of the shaft is keyed a disc 22 provided with a friction lining 23.

The electromagnet 1 has annular poles and its armature 2 is in the form of a disc capable of a small displacement towards the disc 22 under the action of its return spring 3. The armature 2 is provided with pins 24, which prevent its rotation, and, at its center, it carries an adjustable abutment screw, which acts on the end of a rod 26 disposed within a longitudinal bore through shaft 18 and engaging the key 17 connected to sleeve 16. The return spring 3 is more powerful than the clutch spring 19.

It will be understood, accordingly, that when the circuit of the electromagnet 1 is broken, whether automatically by one of the detectors *c*, *c'* or 8, or manually by a momentary depression of the button A (Figures 1 and 2), its armature 2 is displaced by the spring 3. As a result, the armature acts through rod 26 to move sleeve 16

and pulley 15 away from coned disc 20 against the action of the clutch spring 19 and the transmission shaft is thus disconnected from the source of power. At the same time, the armature engages the friction surface on disc 22 and brakes the transmission shaft.

The embodiment of Figure 3 can be modified as shown in Figure 4 in which the electromagnet 1 is placed to one side with respect to the shaft 18 and transmits the displacement of its armature 2 through a pivoted lever 27 which exerts its thrust against the centre of a non-rotating disc 23 taking the place of the armature proper 2 of Figure 3.

Finally as is obvious and as follows from what is stated above, the invention is in no way limited to the particular embodiments described above, nor to the details of their various parts, but includes all modifications within the scope of the claims.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

What I claim is:

1. In a motor-controlled circular loom, an electric control system comprising an electromagnet, an armature for said electromagnet adapted to control the clutching, declutching and braking of the loom, a feed circuit for said electromagnet, a resistance in said circuit, a spring urging the armature away from the electromagnet, a switch in the circuit in series with the resistance and controlled by the operation of the loom, a shunt across the resistance adapted to cancel the voltage-dropping effect of said resistance, and a switch in said shunt for closing the latter and thereby increasing the energization of the electromagnet.

2. In a motor-controlled circular loom, an electric control system comprising an electromagnet, an armature for said electromagnet adapted to control the clutching, declutching and braking of the loom, a feed circuit for said electromagnet, a resistance in said circuit, a spring urging the armature away from the electromagnet, when the latter is deenergized, with a force sufficient to prevent the electromagnet, when reenergized through the resistance, from pulling back the armature, a switch in the circuit in series with the resistance and controlled by the operation of the loom, a shunt across the resistance adapted to cancel the voltage-dropping effect of said resistance, and a switch in said shunt for closing the latter and thereby increasing the energization of the electromagnet.

3. In a motor-controlled circular loom, an electric control system comprising an electromagnet, an armature for said electromagnet adapted to control the clutching when attracted and the declutching against the clutch spring when released, a feed circuit for said electromagnet, a resistance in said circuit, a spring urging the armature away from the electromagnet with a power higher than that of the clutch spring, a switch in the circuit in series with the resistance and controlled by the operation of the loom, a shunt across the resistance adapted to cancel the voltage-dropping effect of said resistance, and a switch in said shunt for closing the latter and thereby increasing the energization of the electromagnet.

4. In a motor-controlled circular loom, an electric control system comprising an electromagnet, an armature for said electromagnet adapted to

control the clutching when attracted and the declutching against the clutch spring when released, a feed circuit for said electromagnet, a resistance in said circuit, a spring urging the armature away from the electromagnet with a power higher than that of the clutch spring, a pair of rotary and non-rotary braking friction surfaces which are adapted to cooperate to effect the braking of the loom and of which the non-rotary one is rigid with the armature, a switch in the circuit in series with the resistance and controlled by the operation of the loom, a shunt across the resistance adapted to cancel the voltage-dropping effect of said resistance, and a switch in said shunt for closing the latter and thereby increasing the energization of the electromagnet.

5. In a motor-controlled circular loom, an electric control system comprising an electromagnet, an armature for said electromagnet adapted to control the clutching when attracted and the declutching against the clutch spring when released, a feed circuit for said electromagnet, a resistance in said circuit, a spring urging the armature away from the electromagnet with a power higher than that of the clutch spring, a pair of rotary and non-rotary braking friction surfaces which are adapted to cooperate to effect the braking of the loom and of which the non-rotary one is rigid with the armature, means operable by the armature for controlling the energization of the loom motor, a switch in the circuit in series with the resistance and controlled by the operation of the loom, a shunt across the

resistance adapted to cancel the voltage-dropping effect of said resistance, and a switch in said shunt for closing the latter and thereby increasing the energization of the electromagnet.

6. In a motor-operated circular loom, an electric control system comprising an electromagnet, an armature therefor operable to control the clutching and declutching of the transmission shaft of the loom, a supply circuit for the electromagnet, a resistance in the circuit, a spring urging the armature away from the electromagnet, a stop limiting the movement of the armature by the spring, a switch in the supply circuit, and means for establishing a shunt circuit around the resistance and thereby increasing the energization of the electromagnet.

7. In a motor-operated circular loom, an electric control system comprising an electromagnet, an armature therefor operable to control the clutching and declutching of the transmission shaft of the loom, a supply circuit for the electromagnet, a resistance in the circuit, a spring urging the armature away from the electromagnet, a stop limiting the movement of the armature by the spring, a switch in the supply circuit, and means for nullifying the voltage-dropping effect of the resistance and thereby increasing the energization of the electromagnet to enable it to pull the armature away from the stop against the force of said spring.

VICTOR MARIE JOSEPH ANCET.

No references cited.