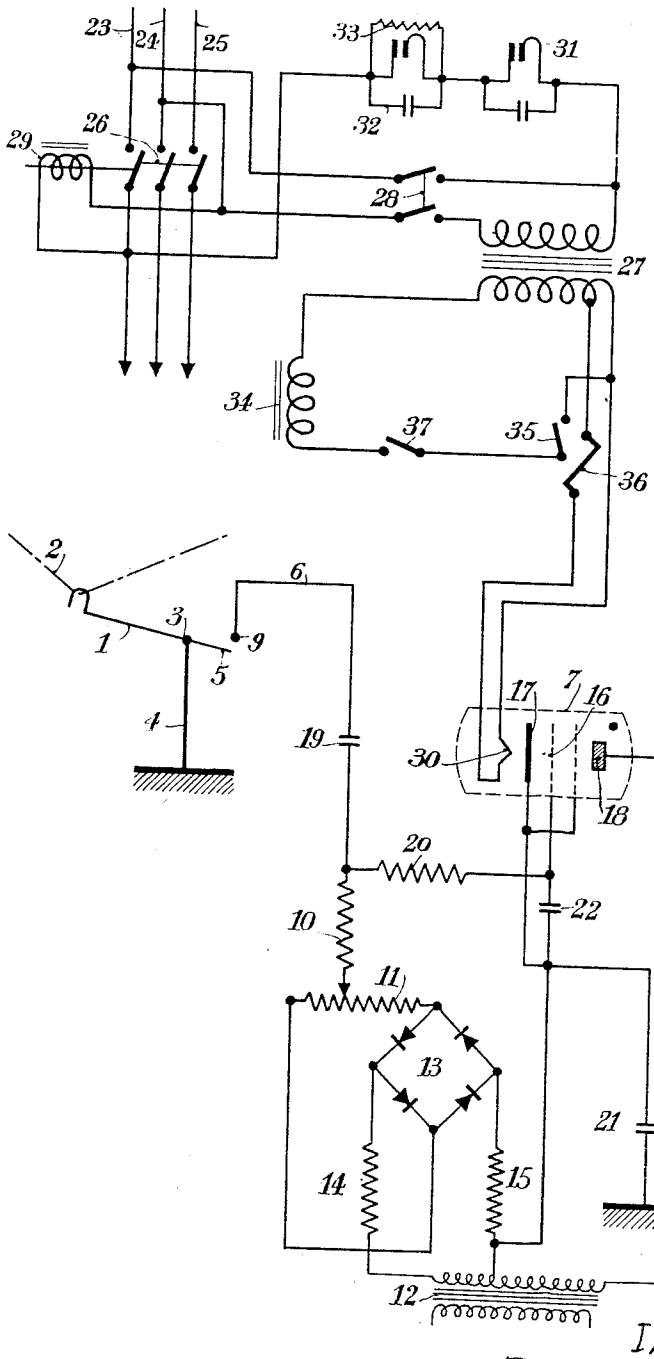
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YARN-CONTROLLED STOPPING DEVICE FOR KNITTING MACHINES

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YARN-CONTROLLED STOPPING DEVICE FOR KNITTING MACHINES

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1

Various electro-mechanical devices have been proposed to automatically stop a knitting machine whenever the yarn or yarns happen to fail. Some of these devices are so elaborate that they are not reliable in operation on an industrial scale. Other devices of simpler design prove too sluggish where associated with up-to-date high-efficiency machinery.

These inconveniences are remedied by the present invention which consists in causing a drop wire to control the operation of a thermionic valve adapted instantaneously to close the machine stopping circuit.

A particular embodiment of the device according to this invention will be described hereinafter for the purpose of exemplification and by no means of limitation, reference being had to the appended drawing which shows the wiring diagram relating to the described embodiment.

The drop wire 1 consists of a thin wire formed at its free end with a hook which rests on the yarn 2 while its portion located in the vicinity of the opposite end is hinged about a horizontal pivot 3 mounted at right angles to the plane of the drawing.

As shown in the appended drawing the swingable drop wire 1 resting on the yarn 2 fed to the frame is earthed through its pivot 3 or in any other manner and through a lead 4. In normal working position the free end 5 of the drop wire is out of contact with an insulated and suitably supported lead 6. Same is connected with the grid 16 of a thermionic valve 7 which is a gas-filled electronic relay, the connexion being effected through a condenser 19 and a resistor 20 of comparatively low value. Said valve 7 performs the function of an instantaneous electronic relay between the input circuit and the circuit for the energization of the electromagnet coil 8 connected to the anode 18 and the cathode 17 of the thermionic valve.

As soon as the yarn 2 fed to the machine happens to fail under the hook of the drop wire 1 the latter drops. Its free end 5 is thereby swung into engagement with the terminal 9 of the lead 6 which is thereby earthed contingently through the machine.

In addition, said grid 16 is connected through a resistor 10 of comparatively high value to the biassing potentiometer 11.

Said potentiometer 11 is fed with rectified current from a transformer 12 through a push-pull rectifier 13 with the interposition of a pair of resistors 14, 15 the values of which are determined in dependency on the characteristics of the rectifier and on the voltage to be impressed upon the grid 16 of the thermionic valve 7.

By means of the adjustable potentiometer 11, with the machine working normally, the grid

2

16 of the valve 7 is biassed negatively so as to check the flow from cathode 17 to anode 18.

In this manner the condenser 19 remains loaded as long as the lead 6 is not earthed.

Upon said lead 6 being earthed consequent to the drop of the drop wire 1 the condenser 19 is unloaded. Owing to the comparatively high ratio between the values of resistors 10 and 20 such a discharge leads to an instantaneous variation in the grid potential, the curve of which sinks to zero. The balance between the potentials of cathode 17 and grid 16 is thus upset and the valve is primed.

The input circuit of the electromagnet coil 8 is closed through the valve 7. Said electromagnet 8, of conventional design, becomes effective to instantaneously bring the machine to stand still. The responsivity of the electronic relay can be adjusted with the aid of the condenser 21 which provides for the electrostatic connection between the cathode 17, the grid 16 and earth. Anyhow, the voltage of condenser 21 remains higher than the voltage of condenser 19.

A condenser 22 interposed in known manner between grid 16 and cathode 17 is provided for the purpose of stabilizing the grid potential in the event variations should occur in the anode current which might lead to an unexpected priming of the valve.

It will be noticed that in this embodiment which is given by way of example the circuits for the biassing and the loading of the valve are separated from the network by the transformer 12 to the primary winding of which current is only fed when the machine is running.

For the sake of safety in operation and reliability in control it is particularly expedient to make it practically impossible to start the machine for the time the valve is heated in. Effectively, it need not be emphasized that the electronic relay must be ready to operate as soon as the machine is started. With this end in view, a system of delaying relays is provided which will be described later on with reference to the drawing.

Moreover, it is also important to stop the machine automatically or to prevent its being restarted whenever the filament of the thermionic valve happens to break.

According, auxiliary circuits may be provided for the sake of safety. A particular embodiment of such improvements is illustrated in the drawing.

23, 24, 25 designate the three leads of the general power system.

Said leads are connected with the motor control automatic switch through a section switch 26 the holding coil 29 of which is energized by the primary winding of the transformer 27.

A 2-pole switch 28 provides for the energization of the coil 29 of said section switch 26.

As soon as the transformer 27 is thrown into circuit the current that flows through its secondary winding provides for the heating up of the filament 30 of the thermionic valve 7; however, the operation of the section relay 26 is delayed by the functioning of suitable relays 31, 32.

Said relays 31, 32 may simply consist of a pair of conventional discharge lamp starters connected in series in the supply line for coil 29.

Each of these relays comprises a rare gas tube, which is generally a neon tube, inside which is mounted a bimetallic strip adapted to engage a contact when heated. When a sufficient tension is applied between said strip and said contact, the ionized gas causes a sufficient heating of the strip to make it engage the contact and thus close the relay. In the embodiment shown in the drawing, the relay 32 is by-passed by a resistor 33 which first causes the relay 31 to ionize and close, whereafter relay 32 in its turn will close with a definite lag which depends on the value of a resistor 33 which is connected in shunt relative thereto. The delay thus brought about in the throwing in of the section switch 26 is sufficient to enable the cathode 17 to heat up before the frame can be switched in.

Connected with the secondary winding of transformer 27 is also a coil 34 which serves to hold the automatic motor control switch (not shown).

The operation of said automatic motor control switch is arranged subject to the closing of the circuit through which coil 34 is supplied with current. Such a closing is ensured on the one hand by the throwing into engagement of the arm 35 actuated by a relay 36 connected in series with the current-supply circuit for the filament 30 and on the other hand by means of a starting push 37.

A plurality of such pushes 37 may be arranged at several places on the machine in order that the switch 34 can be thrown in, and consequently the machine set into operation in the best possible conditions.

The supply of current to the machine is controlled as follows by the filament circuit:

As soon as the circuit through filament 30 happens to be broken relay 36 will release the arm 35, whereby the motor control switch holding circuit through coil 34 is likewise broken and the machine is stopped automatically.

What I claim is:

1. A device for automatically stopping a knitting machine whenever the yarn happens to be broken, which device comprises an electronic relay of the gaseous atmosphere type, an electromagnet adapted to stop the knitting machine when energized and having its energizing circuit inserted in the anode circuit of said relay, means for causing a continuous negative biassing of the grid of said relay, and a drop wire having a rest on the yarn and adapted to cause an instantaneous variation of the potential of the grid whenever said rest comes to fail.

2. A device for automatically stopping a knitting machine whenever the yarn happens to be broken, which device comprises an electronic relay of the gaseous atmosphere type, an electromagnet adapted to stop the knitting machine when energized and having its energizing circuit inserted in the anode circuit of said relay, means for negatively biassing the grid of said relay, a condenser having one armature connected to said grid, and a drop wire having a rest on the yarn and adapted to earth the other armature of said condenser whenever said rest comes to fail, thereby unloading the condenser and causing the grid to let a current flow through the anode circuit, which current energizes the electromagnet and causes the knitting machine to stop.

3. A device for automatically stopping a knitting machine whenever the yarn happens to be broken, which device comprises an electronic relay of the gaseous atmosphere type, an electromagnet adapted to stop the knitting machine when energized and having its energizing circuit inserted in the anode circuit of said relay, a rectifier, a biasing circuit connecting said rectifier to the grid of the relay and adapted to bias negatively said grid, a condenser having one armature connected to said grid, and a drop wire having a rest on the yarn and adapted to earth the other armature of said condenser whenever said rest comes to fail, thereby unloading the condenser and causing the grid to let a current flow through the anode circuit, which current energizes the electromagnet and causes the knitting machine to stop.

4. A device for automatically stopping a knitting machine whenever the yarn happens to be broken, which device comprises an electronic relay of the gaseous atmosphere type, an electromagnet adapted to stop the knitting machine when energized and having its energizing circuit inserted in the anode circuit of said relay, means for causing a continuous negative biassing of the grid of said relay, a drop wire having a rest on the yarn and adapted to cause an instantaneous variation of the potential of the grid whenever said rest comes to fail, and an auxiliary relay in the filament circuit adapted to stop the machine in the event the current should fail to flow through said filament consequent to the breakage of the same.

5. A device for automatically stopping a knitting machine whenever the yarn happens to be broken, which device comprises an electronic relay of the gaseous atmosphere type, an electromagnet adapted to stop the knitting machine when energized and having its energizing circuit inserted in the anode circuit of said relay, means for causing a continuous negative biassing of the grid of said relay, a condenser having one armature connected to said grid, a drop wire having a rest on the yarn and adapted to earth the other armature of said condenser whenever said rest comes to fail, thereby unloading the condenser, causing the grid to let a current flow through the anode circuit, energizing thus the electromagnet and causing the knitting machine to stop, and time relays adapted to delay the starting of the machine up to sufficient heating of the electronic relay.

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