

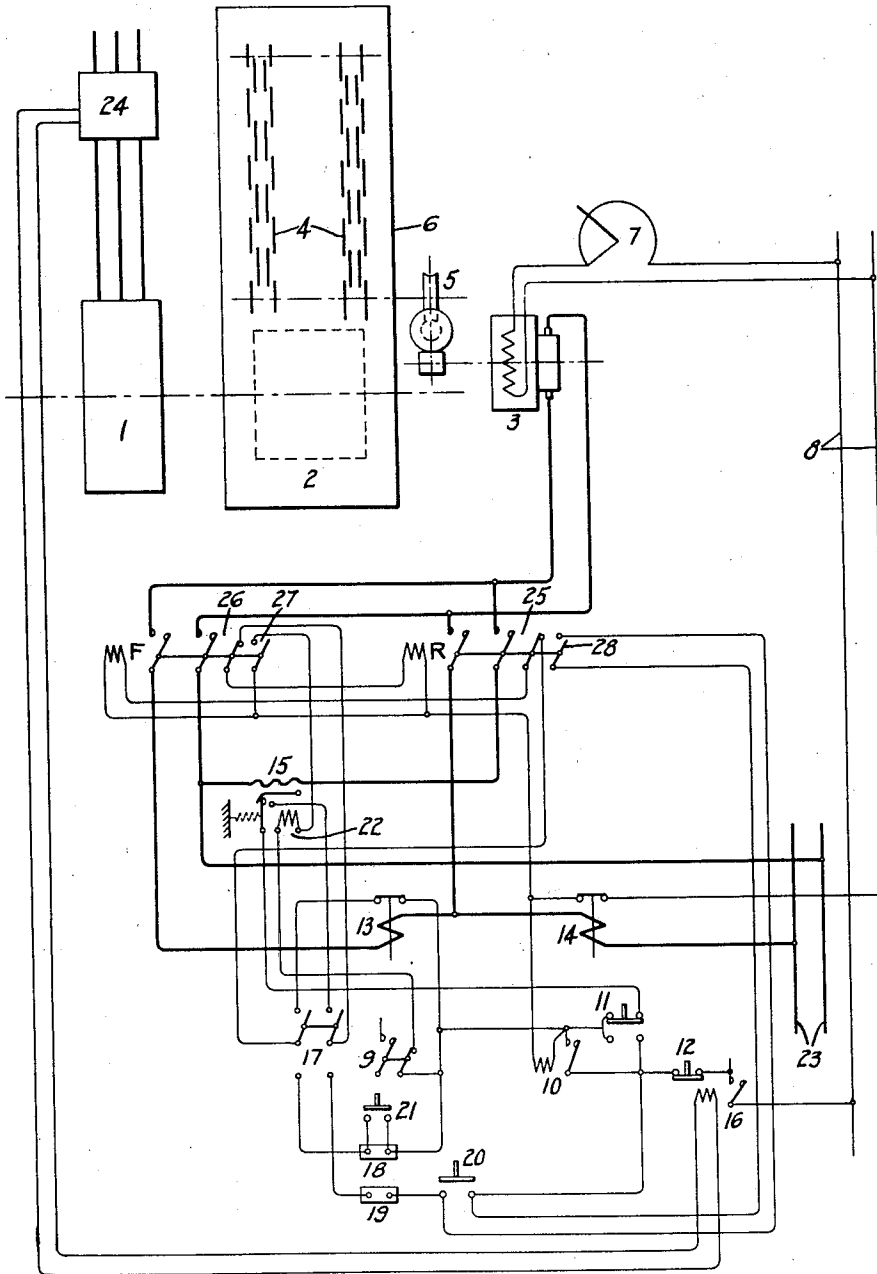
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ELECTRIC MOTOR CONTROL FOR FEED MECHANISMS

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ELECTRIC-MOTOR CONTROL FOR FEED MECHANISMS.

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The present invention relates to an improved system of electric motor control, particularly adapted for the operating conditions which obtain in the feed control of magazine, continuous type, grinders, which are used in the preparation of wood pulp for paper making although not limited to such machines. The electrical equipment of such a machine usually consists of a main motor driving the grindstone, and a feed motor driving chains which force the logs of wood down the magazine on to the stone. It is also usual to provide control gear to vary automatically the speed of the feed motor according to changes in the load on the main motor, so that the output is maintained practically constant, the feed motor being stopped in the case of excessive overload.

It has been found in practice that the stones will not sustain large overloads without injury or fracture, so that the overload protective device must be set "low", and further that the logs are very liable to "pack" in the magazine causing frequent and severe overloads on the feed motor. The result is frequent interruptions in grinding, and if these are due to packing the feed motors have to be reversed for a short time to relieve the packed condition of the logs before grinding can be restarted.

The object of the present invention is to improve the operation by arranging that the overload due to either excess pressure on the stones or "packing" of the logs, instead of stopping the feed motor, reverses it under time limit control to relieve the overload and then runs it forward again to continue grinding. The setting of the time limit is not important, as if the overload is not entirely cleared when the motor tries to run "forward", the overload will trip again and reverse the motor for a second period, and so on until grinding can be continued. I also provide a separate overload relay to protect the feed motor when running reversed, and this can be set "high", as there is no danger of injuring the stone in this case, and the full overload capacity of the motor can be used to clear the jam.

Further, I provide a change-over switch so that the time limit relay and the low-set overload relay are cut out of action and the control circuit put through limit switches, so that the feed motors can be run forward or reverse through the high-set overload relay only, when required for raising and lowering the magazine when changing the stone. This is accomplished by holding the chains stationary and running the feed motors, which being mounted on the top half casing raise and lower the casing up and down the chains.

The accompanying diagram illustrates one method of carrying this invention into effect. Only those control devices relevant to the features of control being described are shown, it being understood that a complete equipment would include several other additional features. It should also be understood that the scheme applies equally to double-stone grinders, i. e., where two stones are coupled, one each end, to one main motor, in which case there are two feed motors and these would be supplied with separate control gear so that each feed motor would clear itself of overloads as described above independently of the other.

In the diagram 1 represents the main motor driving the stone 2. The feed motor 3 shown as a shunt wound direct current machine drives the chains 4 through gearing 5. There will be one pair of chains on two opposite sides of the magazine 6, both pairs being driven by the feed motor. The shunt field of the motor with rheostat 7 in circuit is energized from constant voltage bus bars 8. The feed motor has reversing contactors (F) giving rotation in the forward direction, i. e., when grinding and (R) giving reverse rotation. There will also be accelerating contactors and starting resistance with standard arrangements for operation in correct sequence, but these are not shown except 9, representing the last accelerating contactor to close. This is shown since an interlock on this contactor could conveniently be used in the control system described below.

The feed motor armature circuit is shown connected to bus bars 23, which will usually be a variable voltage supply controlled automatically in accordance with the load on the main motor.

A pilot contactor 10 is provided and this would be closed when push button 11 is pressed for forward operation. Two overload relays 13 and 14 are shown, also a time limit relay 15. The time limit relay is indicated as of the thermal type which is connected to be set in operation when the reverse connections for the feed motor are established to automatically interrupt these connections after a definite time interval. The control circuit for the feed motor is taken through a stop button 12 and a low voltage relay 16 which is closed only if the main motor is energized through switch 24 to ensure that the feed motor is not started with the stone stationary.

The charge-over switch is shown at 17 and limit switches at 18 and 19 and when these are in circuit a push button 20 is provided for reverse running, and "inch" button 21 for fine control over the magazine casing when lowering the last few inches into position.

The operation is as follows:—

Assume normal grinding is required, i. e., the switch 17 is in its "up" throw. Button 11 is pressed energizing coil of pilot contactor 10 through 16, 12, 11 and 14. On 10 closing and being retained through its own contacts the forward contactors F are energized through relay 13, (set low to protect the stones) 17, "off" position interlock 25 on R and relay 14. The reverse contactors R cannot close as their circuit is broken by the button 11. Should the relay 13 trip it will open contactors F which in turn will close contactors R through 16, 12, 10, 11, time limit relay 15, 17, interlock 26 on F and relay 14 (set high as explained above). After any predetermined time interval covered by the range of the relay 15, its contacts will open and in so doing open the contactors R, and contactor F will now close again through the circuit previously described. Relays 13 and 14 are self-resetting by gravity, but the relay 15 is reset by means of a coil 22 energized through interlock 27 of contactor F, and the interlock on contactor 9. Relay 15 is self-retaining when reset and therefore coil 22 can now be de-energized and this is done by the opening of the interlock on contactor 9 when contactor 9 closes.

The above sequence of events occurs every time relay 13 trips and the equipment requires no manual operation unless relay 14 trips, which means that the feed motors are not powerful enough to clear the jam in the magazine, when working up to the limit set by the relay and in such extreme circumstances hand control is advisable.

The operation for stone inspection or changing would be as follows:—

Switch 17 would be thrown over to its down position, with the feed motor at rest.

When the magazine casing is ready for raising, button 20 would be pressed and the reverse contactors R would be closed through 16, 12, 20, 19, 17, 26 and 14. R would be retained through its own interlock 28 when the button is released, and the motor will run until shut down by the limit switch 19.

When the casing is ready for lowering button 11 would be pressed closing the pilot contactor, and the forward contactors F through 16, 12, 10, 18, 17, 25 and 14. F will be retained through 10 and the motor will run until shut down by limit switch 18 which would be arranged to operate a few inches short of the full travel of the casing. The final adjustment for bolting up would then be made by means of the push button 21, which only allows the feed motor to run while it is depressed.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. In combination, a feed mechanism for a grinder or the like, a motor for driving said mechanism, and electroresponsive means governed in accordance with the load on said motor for automatically governing the direction of operation of said motor to regulate the feed of the grinder.

2. In combination, a feed mechanism for a grinder or the like, a motor for driving said mechanism, directional switch mechanism for said motor, and electroresponsive means governed in accordance with the load on said motor for automatically effecting operation of said switch mechanism to reverse the direction of operation of said motor and said feed mechanism, the said means including mechanism whereby the extent of the reverse operation of said motor and feed mechanism is automatically limited.

3. In combination, a feed mechanism for a grinder or the like, a feed motor for driving said mechanism, electroresponsive means governed in accordance with the load on said motor for automatically reversing the direction of operation of said motor and said feed mechanism, and a time interval device set in operation when the feed motor is reversed for automatically limiting the extent of operation of the feed motor and feed mechanism in the reverse direction.

4. In combination, a feed mechanism for a grinder or the like, a motor for driving said mechanism, means responsive to the current taken by said motor, directional switch mechanism for controlling said motor, and connections through which said means automatically governs said switch mechanism to automatically reverse the direction of operation of said motor and said feed mechanism for a limited extent of operation and to automatically stop said motor in case the current taken thereby in said reversed direction of operation exceeds a predetermined value.

5. In combination, a feed mechanism for a grinder or the like, a motor for driving the feed mechanism, reversing switch mechanism for said motor, a relay responsive to the current taken by said motor, a time element device, and connections through which said relay governs said switch mechanism to reverse the direction of operation of said motor and said feed mechanism and set said device in operation to limit the extent of said reverse operation. 10

In witness whereof, I have hereunto set my hand this 11th day of January, 1927.

RALPH D. GIVEN.