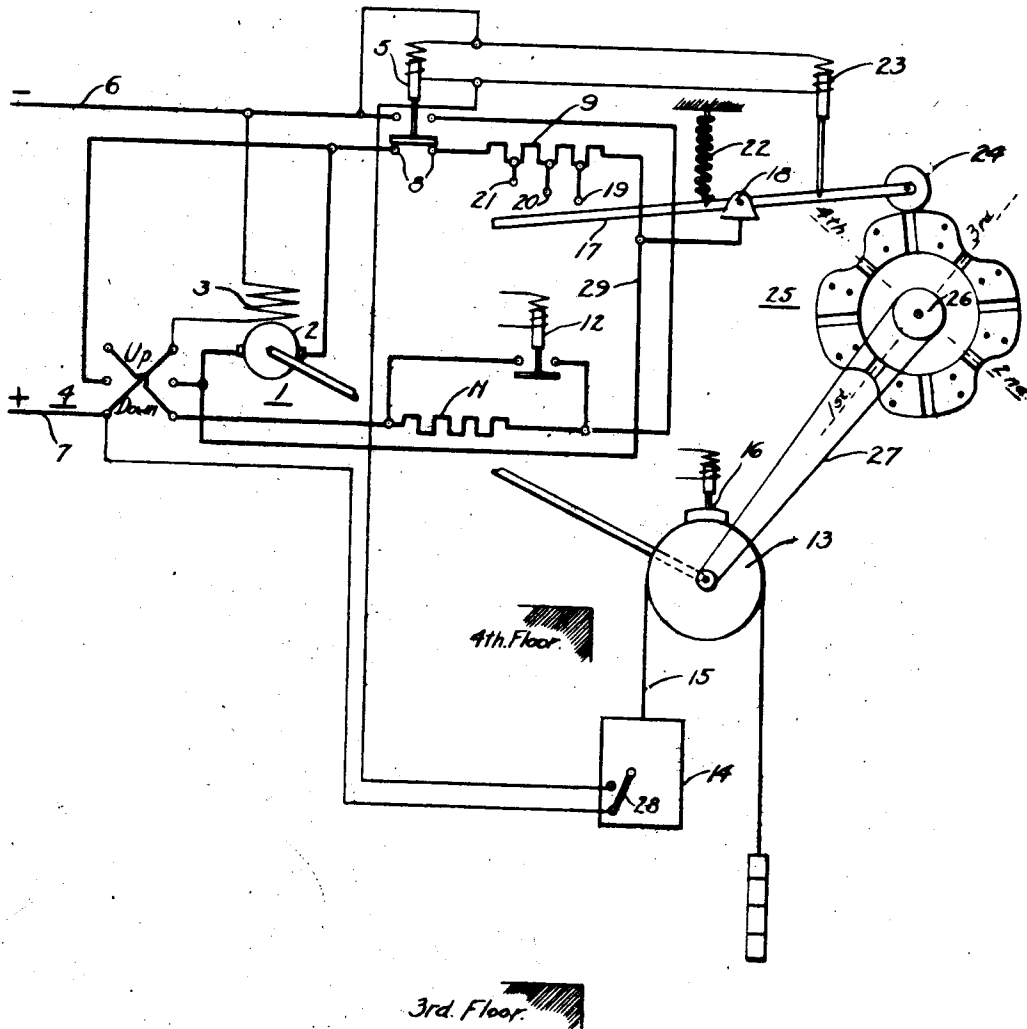


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R. J. WENSLEY
MOTOR CONTROL SYSTEM
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WITNESSES:

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MOTOR-CONTROL SYSTEM

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My invention relates to systems of control and it has particular relation to such systems as are employed in connection with elevators, hoists and similar machines.

5 The object of my invention is to provide dynamic braking means, for a motor, that is variable in accordance with certain positions of the elevator or machine.

Various systems have been employed for 10 effecting variable dynamic braking, in order to more accurately control the stopping of a direct-current motor. In elevator systems it is of particular importance to so control the hoisting motor as to insure reasonably accu- 15 rate stops under varying load conditions.

According to my system, a variable dynamic braking device is controlled by a cam mechanism connected to the hoisting machine, this mechanism being arranged to operate 20 the dynamic braking device at any desired predetermined position of travel of the elevator car, after power is cut off by the car operator.

My invention will be best understood by 25 reference to the accompanying drawing, in which

The single figure is a diagrammatic view of circuits and apparatus embodying my invention.

30 A hoisting motor 1, having an armature 2 and a field-magnet winding 3, is operatively connected through a reversing switch 4 and a line switch 5 to line conductors 6 and 7. Switch 5 is provided with dynamic braking 35 contact members 8 for controlling a resistor 9, which may thereby be connected in circuit with armature 2. A starting resistor 11 and a controlling switch 12 therefor, may be employed in the customary manner. Any other 40 suitable system of acceleration may be utilized. A hoisting drum 13 is driven by the armature 2 and is arranged in the usual manner for controlling an elevator car 14 by means of one or more hoisting cables 15. An 45 electromagnetic brake 16, of any well-known type, maintains the car 14 at any point of travel when the motor is inoperative.

50 A movable switch member 17 is pivotally mounted on a shaft 18 and one end of the switch member is arranged to successively en-

gage a plurality of stationary contact members 19, 20 and 21. A spring 22 is provided for biasing switch member 17 toward the stationary contact members 19, 20 and 21, and an 55 electromagnet having a coil 23 is arranged for opposing the operation of spring 22. The opposite end of switch 17 carries a roller 24. An adjustable cam device 25 is rotatably mounted upon a shaft 26 and mechanically 60 connected, by means of a chain 27, or other suitable driving means, to drum 13. The cam device 25 is provided with a plurality of notches, each notch corresponding to a floor level or landing for the car 14, as indicated by the legends 1st, 2nd, etc. The device 25 is, 65 of course, so geared to the drum 13 that the angular movement of said device corresponds to the vertical movement of the car 14. Between floor stops of the elevator, the roller 24 maintains switch 17 in its inoperative illustrated position. A switch 28 is mounted in 70 the car 14 for controlling coil 23 to prevent cam device 25 from actuating switch 17, except as hereinafter described.

The operation of my invention may be set 75 forth as follows:

Motor 1 is started and controlled in the usual manner by means of reversing switch 4 and line switch 5, the latter being preferably controlled by means of car switch 28. Acceleration of the motor is accomplished in the 80 usual manner by means of resistor 11 and accelerating switch 12.

When the switch 5 occupies its upper or closed position, resistor 9 is excluded from 85 the motor circuit. Coil 23 is also energized upon the closure of switch 28, so that dynamic braking switch member 17 is rendered ineffective during normal operation of the hoisting motor, irrespective of the position 90 of cam device 25.

When the car 14 approaches any desired landing, switch 28 is opened by the operator to release switch 5 and to de-energize coil 23. When switch 5 assumes its illustrated position, a dynamic braking circuit is established 95 comprising the armature 2, dynamic braking contact members 8, resistor 9 and conductor 29. As the car 14 approaches the landing position, roller 24 gradually rolls into 100

the notch, in the cam mechanism 25, corresponding to the particular landing. Therefore, switch 17, which is biased by means of spring 22, successively engages stationary contact members 19, 20 and 21 to gradually shunt portions of dynamic braking resistor 9 and accordingly increase the dynamic braking effect upon the armature 2. If the elevator is operating slowly, switch 17 is correspondingly operated and said portions of resistor 9 are, consequently, more gradually excluded. It is apparent that the dynamic braking effect on the motor 1 may thus be controlled to a considerable degree in accordance with the car speed, which is also a function of the car load.

I have illustrated one form of my invention that embodies simple and effective means for accomplishing variable or graduated dynamic braking of a hoisting motor, the braking becoming increasingly effective as the car approaches any floor level. Other forms of dynamic braking switch mechanism, as well as modifications of my cam mechanism, may readily be made without departing from the spirit and scope of my invention.

I claim as my invention:

1. The combination with a hoisting mechanism and a driving motor therefor, of a dynamic braking resistor, means for successively shunting portions of said resistor, electro-responsive means for rendering the shunting means ineffective, and a cam device controlled in accordance with different positions of said hoisting mechanism for mechanically actuating said shunting means.

2. The combination with an elevator mechanism and a driving motor therefor, of a dynamic braking resistor, means for successively shunting portions of said resistor, electro-responsive means for rendering the shunting means ineffective, and cam actuated means controlled in accordance with the distance covered by the elevator for actuating said shunting means.

3. The combination with an elevator mechanism and a driving motor therefor, of a dynamic braking resistor, means for successively shunting portions of said resistor, electro-responsive means for rendering the shunting means ineffective, and a cam mechanism operated by the movement of the elevator for mechanically actuating said shunting means.

4. The combination with a hoisting mechanism and a driving motor therefor, of means for accelerating the motor, means for decelerating the motor comprising a resistor and means for successively shunting different sections of the resistor, a cam mechanism controlled by the hoisting mechanism for actuating said shunting means, a coil for rendering said shunting means ineffective and

spring actuating means opposing the effect of said coil.

5. In a control system for hoisting mechanisms, in combination, a motor for operating the hoisting mechanism, a controller for controlling the energization of the motor, a dynamic braking resistor for the motor, a spring-biased switch member for shunting the resistor to vary the braking force, a rotatably mounted cam for actuating the switch member, means for actuating the cam member in accordance with the movements of the hoisting mechanism, said cam being provided with a plurality of cam faces one for each of a predetermined number of stopping positions, said faces being disposed to control the movement of said switch member, whereby the resistance of the dynamic braking circuit is rendered dependent upon the position of the hoisting mechanism with respect to a stopping position.

6. In a control system for hoisting mechanisms, in combination, a motor for operating the hoisting mechanism, a source of power for the motor, a switch for controlling the operation of the motor, a dynamic braking resistor disposed to be connected across the motor terminals in response to the operation of said control switch, a movable switch blade disposed to successively shunt different sections of the resistor, and means actuated in accordance with the movement of the hoist for mechanically actuating the movable switch blade, said means being disposed to vary the degree of braking force dependent upon the position of the hoisting mechanism when the control switch is operated.

7. In a control system for hoisting mechanisms, in combination, a motor for operating the hoisting mechanism, a source of power for the motor, a switch for controlling the operation of the motor, a dynamic braking resistor disposed to be connected across the motor terminals in response to the operation of said control switch, a movable switch blade disposed to successively shunt different sections of the resistor, and means actuated in accordance with the movement of the hoist for mechanically actuating the movable switch blade, said means being disposed to gradually effect a reduction in resistance of the dynamic braking circuit in response to the opening of the control switch when the hoist is within a predetermined distance from the stopping position.

8. In a control system for hoists, in combination, a motor for actuating the hoist, a source of power for the motor, a switch for controlling the operation of the motor, a dynamic braking resistor disposed to be connected to the motor in response to the operation of the control switch, and a mechanically actuated switch for successively shunting different sections of the resistor, said switch comprising a pivotally mounted contact arm,

and a cam member actuated in accordance with the movement of the hoist for actuating the contact arm, thereby to render the dynamic braking of the motor dependent upon the position of the hoist.

5 9. In a control system for hoisting mechanisms, in combination, a motor for operating the hoisting mechanism, a source of power for the motor, a dynamic braking resistor, a controller for governing the operation of the motor and establishing a dynamic braking circuit, said dynamic braking circuit having a predetermined maximum resistance value, and a mechanically actuated switch disposed
10 to successively shunt sections of the resistor to reduce the resistance of the braking circuit, said switch having a rotatable cam-shaped operating member driven in accordance with the movements of the hoisting
15 mechanism.

20 10. In a control system for hoisting mechanisms, in combination, a motor for operating the hoisting mechanism, a source of power for the motor, a dynamic braking resistor, a controller for governing the operation of the motor and establishing a dynamic braking circuit, a pivotally mounted contact making
25 arm for shunting sections of the resistor, the number of resistor sections shunted being dependent upon the position of the arm, a rotatable disc members driven in accordance with the movements of the hoisting mechanism for actuating the contact making arm, said disc member being provided with a plu-
30 rality of cam faces disposed to engage said arm, whereby the resistance of the dynamic braking circuit may be varied in a predetermined manner at predetermined intervals in the travel of the hoisting mechanism.

40 11. In a control system for hoisting mechanisms, in combination, a motor for operating the hoisting mechanism, a source of power for the motor, a dynamic braking resistor, a controller for governing the operation of the
45 motor and establishing a dynamic braking circuit, a pivotally mounted switch member disposed to successively shunt different sections of the resistor, said switch member being biased toward the shunting position, a
50 rotatably mounted cam for controlling the movement of the switch member, means for driving the cam in accordance with the movement of the hoisting mechanism, the face on the cam being adapted to effect the stopping
55 of the hoist in different positions and means controlled by the motor controller for rendering the operation of switch member responsive to the movements of the cam to vary the resistance of the dynamic braking circuit
60 in accordance with the position of the hoist.

In testimony whereof, I have hereunto subscribed my name this 15th day of February 1923.

ROY J. WENSLEY.