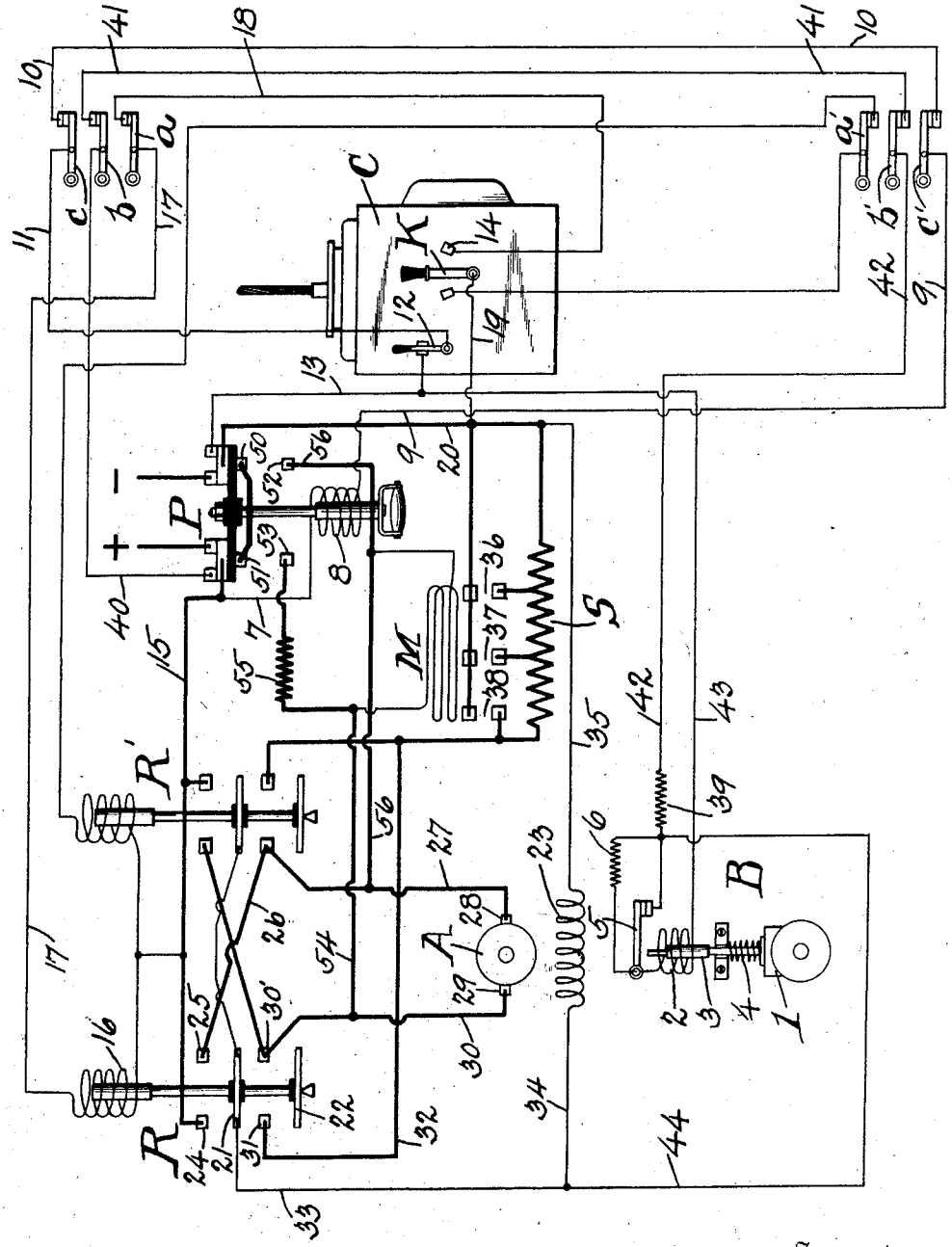
D. L. LINDQUIST.

BRAKE APPARATUS.

APPLICATION FILED APR. 5, 1911.

1,041,642. Patented Oct. 15, 1912.



Witnesses:
Ernest L. Gale Jr.
L. F. Rule.

Inventor:
David L Lindquist
By L W Campbell
Attorney

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UNITED STATES PATENT OFFICE.

DAVID L. LINDQUIST, OF YONKERS, NEW YORK, ASSIGNOR TO OTIS ELEVATOR COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

BRAKE APPARATUS.

1,041,642. Specification of Letters Patent. Patented Oct. 15, 1912.

Application filed April 5, 1911. Serial No. 619,069.

To all whom it may concern:

Be it known that I, DAVID L. LINDQUIST, a subject of the King of Sweden, residing at Yonkers, in the county of Westchester and State of New York, have invented a new and useful Improvement in Brake Apparatus, of which the following is a specification.

My invention relates to brake-controlling apparatus and may be considered as a modification of or an improvement on the brake-controlling mechanism disclosed in the patent to John E. Boyce, 814,669, March 13, 1906, for elevator brakes.

An arrangement like that shown in the patent above named has been found in some instances and under some conditions of operation objectionable for the reason that it places the control of the brake too much in the hands of the operator, permitting the brake to be applied with too much power under ordinary operating conditions.

An object of my invention is to provide in connection with an electromagnetic brake, as used in an elevator controlling system, means for preventing the brake from being applied with full power in the normal stopping of the motor, said means being automatic in operation and independent of the operation of the car controller.

Other objects of the invention and the exact nature thereof will appear hereinafter.

The accompanying drawing is a diagrammatic view of an elevator car, motor and controlling apparatus.

The brake apparatus as conventionally shown comprises a brake shoe 1, a brake coil 2, magnet core 3 and a brake applying spring 4. When the brake coil 2 receives current, the brake shoe 1 is lifted against the tension of the spring 4. The brake magnet when energized not only lifts the brake but also opens the switch 5 in shunt with a resistance 6. The system of control for the motor comprises a potential switch P, reversing switches R and R′, an accelerating magnet M, starting resistance S, upper limit switches a, b, c, and lower limit switches a', b', c'. Current is supplied from the positive and negative mains, designated + and — connected to any suitable source of current supply. When the potential switch is closed a holding circuit therefor is established as follows: from the positive main through the wire 7, potential switch magnet coil 8, wire 9, limit switch c', wire 10, limit switch c, wire 11, car safety switch 12 in the car C, and wire 13 to the minus main. If the car switch K is thrown, for example, to the right, to engage the contact 14, a circuit for the reversing switch R is established as follows: from the positive main through the conductor 15, magnet coil 16 of the reversing switch R, conductor 17, limit switch a, wire 18, contact 14, car switch K, and conductors 19 and 20 to the negative main. The reversing switch R operates to lift the bridging contacts 21, 22, into engagement with the coöperating stationary contacts and establishes circuits for the motor armature A and a motor shunt field coil 23. The armature circuit may be traced from the positive main through conductor 15, contacts 24, 21, 25, conductors 26, 27, armature brush 28, through the armature A, brush 29, conductor 30, reversing switch contacts 30′, 22, 31, conductor 32, starting resistance S, and conductor 20 to the negative main. The circuit for the shunt field coil is from the positive main through the conductors 15, through contact 24 to 21, through conductors 33, 34, shunt field coil 23 and conductors 35 and 20 to the negative main. The brake magnet also receives current and lifts the brake as will be fully set forth hereinafter. As the motor receives current with the starting resistance in series with the armature it runs at slow speed. The accelerating magnet M being connected as usual across the motor armature receives a gradually increasing current as the armature speeds up and operates to successively close the switch contacts 36, 37, 38, thereby gradually short-circuiting the starting resistance and bringing the motor up to full speed. While the motor is at rest a circuit is normally maintained through the brake magnet winding and resistance 39 in series therewith. This circuit may be traced as follows: from the positive main through conductor 40, limit switch b, conductor 41, limit switch b', conductor 42, resistance 39, switch 5, brake magnet coil 2, and conductors 43 and 13 to the minus main. The resistance 39 is such that the brake coil only receives a weak current, insufficient to lift the brake. When a reversing switch is operated however, the resistance 39 is short-circuited and the brake coil receives the full line potential so that

the brake is lifted. The brake circuit established by the operation of the reversing switch K is as follows: from the positive main through the conductor 15, reversing switch contacts 24, 21, wires 33 and 44, switch 5, brake coil 2, wires 43 and 13 to the negative main.

To stop the motor the car switch K is brought back to central position, thereby opening the circuit through the reversing switch magnet and causing the reversing switch R to open. The current supply is thereby cut off from the motor armature. The short circuit for the resistance 39 is also opened at the reversing switch contacts 21 and 24. As the brake when lifted holds the switch 5 open, the resistances 6 and 39 are now both in series with the brake coil. The resistance 6 is quite high, so that the current through the brake coil is reduced to a small value and permits the brake to be applied immediately with considerable power. The application of the brake however permits the switch 5 to close and short circuit the resistance 6 leaving only the resistance 39 in series with the brake coil. The current through the brake coil is therefore increased and eases off the brake somewhat, but maintains sufficient pressure thereon to bring the motor smoothly and quickly to rest. It should be noted in this connection that when the brake is lifted, a comparatively small holding current is required. It is therefore of importance to have a comparatively high resistance 6 initially in the brake circuit to insure the brake being applied. It will be observed that the operation of this means for preventing a too powerful application of the brake is independent of the car controller K, that is, it operates automatically and the brake cannot be applied with full power by any manipulations of the car controller. In case of an emergency the operator may open the car safety switch 12, thereby opening the circuit through the potential switch magnet and causing the potential switch to open. This cuts off all current from the motor and opens the brake magnet circuit so that the brake is applied with full power to bring the motor quickly to rest. The opening of the potential switch also brings the back contacts 50 and 51 into engagement with the stationary contacts 52 and 53, respectively, and establishes a local circuit across the armature. This circuit may be traced from the brush 29 through conductors 30, 54, resistance 55, contacts 53, 51, 50, 52, conductors 56 and 27, to the brush 28. This circuit permits a dynamic braking current through the armature which operates in the usual way to assist in stopping the motor. If the car is permitted to travel beyond its normal limits the limit switches are operated to automatically bring the car to rest. In going up, for example, the limit switches *a*, *b* and *c* are operated in succession. The switch *a* opens the reversing switch magnet circuit and has the same effect as the opening of the car switch. The opening of the switch *b* opens the brake magnet circuit and permits the brake to be applied with full power. The switch *c* serves to open the potential switch with the result above noted. Ordinarily the car will be brought to rest before all of the switches have opened.

To start the car down the controller switch K is moved to the left thereby establishing a circuit for the reversing switch R′. The operation is similar to that already described except that the direction of current through the armature is reversed.

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

1. The combination with an electric motor, of a brake, a manual device for controlling the supply of current to the motor, means for applying the brake with full power, and means for automatically applying the brake with a reduced power whenever the said manual device is moved into position to cut off the supply of current from the motor.

2. The combination of an electric motor, a manual controller therefor, an electromagnetic brake, circuits for the brake magnet winding independent of said controller, and means associated with one of said circuits for effecting the application of the brake with a reduced power when the controller is operated to cut off current from the motor.

3. The combination of an electric motor, a manual controlling device therefor, an electric brake, and means independent of said manual controlling device for automatically easing off the brake during the stopping of the motor.

4. The combination of an electric motor, manual controlling means therefor, an electro-responsive brake, means independent of said controlling means to automatically apply the brake with a reduced power during the normal stopping of the motor, and additional means to effect the application of the brake with full power.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

DAVID L. LINDQUIST.

Witnesses:
EDWARD H. STEELE,
GEORGE D. ROSE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."