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SAFETY RELEASE MAGNET FOR BRAKE APPARATUS.

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950,223. Patented Feb. 22, 1910.

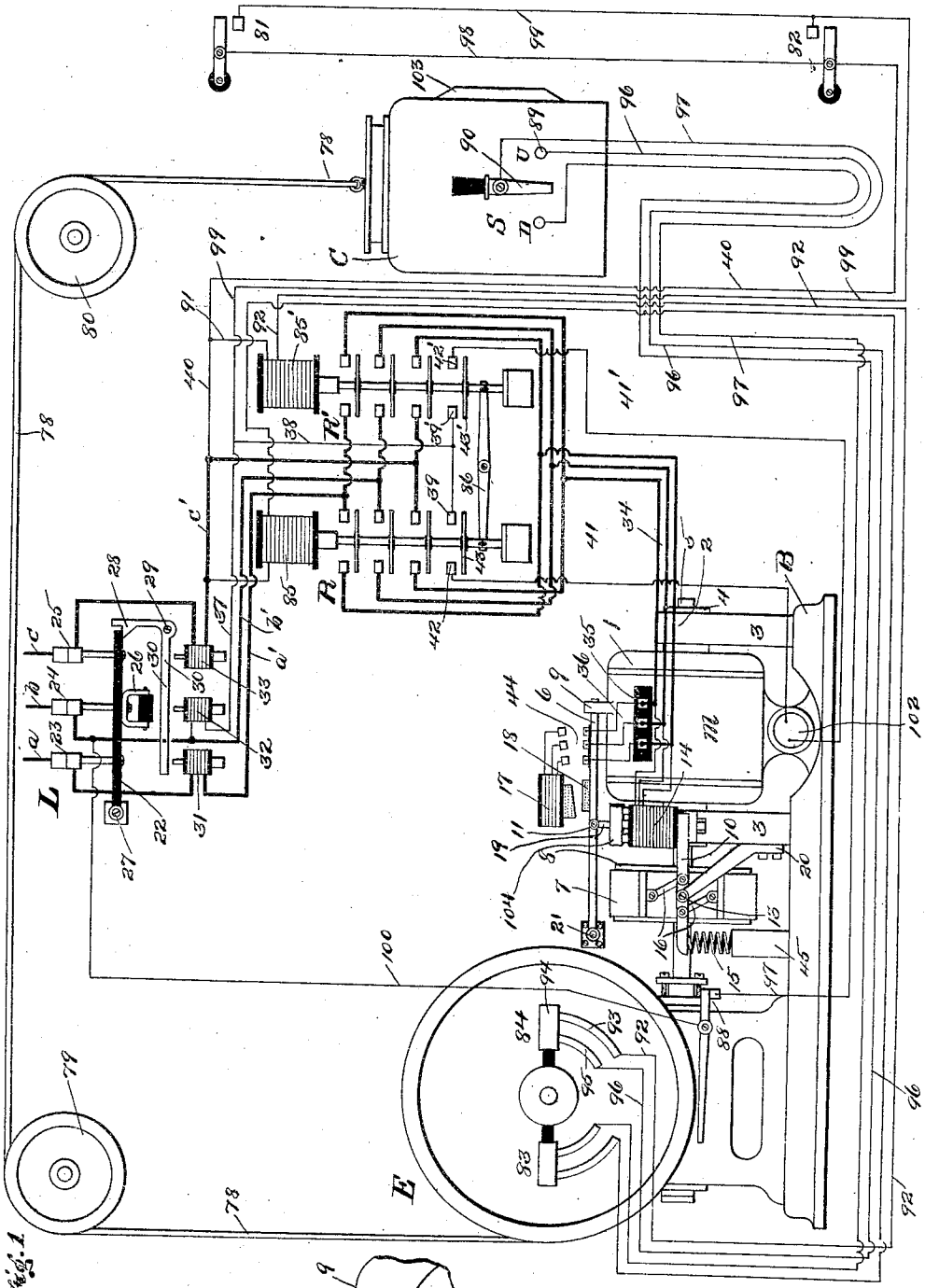

Fig. 1.

Fig. 2.

Witnesses

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SAFETY RELEASE-MAGNET FOR BRAKE-APPARATUS.

950,223. Specification of Letters Patent. **Patented Feb. 22, 1910.**

Application filed July 3, 1906. Serial No. 324,542.

To all whom it may concern:

Be it known that I, WILLIAM N. DICKINSON, Jr., a citizen of the United States, residing at New York city, borough of Brooklyn, in the State of New York, have invented a new and useful Improvement in Safety Release-Magnets for Brake Apparatus, of which the following is a specification.

My invention relates to torque-release brake apparatus such as described in my copending application, Serial No. 324,539, filed July 3, 1906, for an improvement in alternating current electric brake and is an improvement of the invention set forth in said application.

One of the objects of my invention is the provision of means for automatically applying the brake within minimum space of time upon interruption of current to the motor or the reduction of potential to a predetermined value.

A further object of my invention is the provision of simple and efficient means for releasing a brake with minimum consumption of current.

Another object of my invention is the provision of means for holding the brake in released position independently of the position of any part of the motor.

Other objects of the invention will appear hereinafter, the novel combinations of elements being pointed out in the claims.

In the accompanying drawing Figure 1 represents diagrammatically an electric elevator system with my invention applied thereto; and Fig. 2 is a detail view of the cam carried by the motor stator frame.

Referring to Fig. 1, B designates a bed plate to which are secured the standards or supports 3 at the upper ends of which are the bearings 2, 2 of the journals 4, 4 of the stator frame 1. 5 designates the rotor shaft which is mounted within and concentric with the journals 4, 4 of the stator frame 1. It will therefore be seen that the stator frame 1 may have a rotative movement relatively to the bearings 2, 2, or to the rotor when held stationary. Any suitable means may be provided for limiting such rotative movement so that the cam 9 will move a predetermined distance to carry the arm 6 out of the recess 12 onto one of its higher portions. Such upward movement of the arm 6 which is pivoted at 21 will carry the armature 18 secured to said arm 6 into engagement with the pole of the holding magnet 17, and substantially at the same time or a short time thereafter, close the switch 44.

8 designates a brake pulley with which is associated a brake 7 connected by the toggle links 16 to the brake lever 10 which in turn is pivoted at 13 to the bracket 20 secured to one of the standards 3. A spring 15 mounted on the standard 45 acts on one end of the brake lever 10 to apply the brake 7 to the pulley 8. At the other end of the brake lever 10 is secured the electromagnet 14 with which is associated an armature 104 connected to the rod 19 which in turn is pivoted at 11 to the armature-carrying arm 6.

A cam 9 in this instance is secured to the top of the motor frame 1 so as to be movable therewith. Any suitable centering device may be employed for normally holding the stator frame 1 and the cam 9 in central position, or for returning the same to central position. It should be noted that the cam 9 actuates the lever 6 at the start to release the brake, but thereafter the brake is held released by the holding magnet 17 independently of the position of the stator frame 1. It should also be observed that by the use of the holding magnet 17, holding magnets associated with the stator frame as described in my application hereinbefore referred to, may or may not be employed, as desired.

For the sake of simplicity I have shown an ordinary multiphase induction motor of the squirrel cage type connected to an elevator winding machine E. The hoisting cable 78 passes over the sheaves 79 and 80 to the car C in which is placed the manual switch S for controlling the reversing switches R and R' which in turn direct the current from the main line to the motor to operate the same in the direction desired.

Assuming that it is desired to operate the car C upwardly, the lever 90 should be moved onto the contact 89, whereupon a single-phase circuit will be closed from the main *c* to and through wires 40 and 91, solenoid 85', wire 92, segment 93 of the machine limit switch 84, bridge piece 94, segment 95, wire 96, contact 89, lever 90, wire 97, slack cable switch 88, wire 100, to one of the other main lines, in this instance that designated

5. The reversing switch R′ will thereupon be closed and both the stator of the motor M and the solenoid 14 will receive current through the leads 34. A torque will consequently be produced between the stator and rotor tending to move the same relatively to each other, but the rotor being held by the brake at this time cannot be moved, but the stator frame will be until its movement is limited by a suitable stop. As soon as the magnet solenoid 14 is energized, it will tend to hold stationary its core and the rod 19 attached thereto. Therefore when the stator frame 1 begins to rotate, the cam 9 will lift the arm 6 together with the rod 19 and solenoid 14. When this occurs the brake apparatus will be operated to release the brake and at about the same time that the brake is fully released, the armature 18 is brought into engagement with the pole of the holding magnet 17. The switch 44 is also closed so that the magnet 17 will receive current through the leads 36 from the motor terminals 35 a short time after or at about the same time the armature 18 engages the pole of the magnet 17. The holding magnet is thus energized while its magnetic circuit is closed and thus takes only a very small current. This holding magnet retains the brake in off position after current has been applied to the motor. It should also be noted that the magnet 14 consumes little current for the reason that its magnetic circuit is always substantially closed. I have shown a multiphase magnet 14 having an armature 104 for the sake of simplicity, but it is obvious that any electro-magnet particularly adapted for alternating currents may be used and the armature of such magnet connected to the rod 19 and so arranged that normally it would always be in engagement with the poles of the magnet. In case that the current from the main line to the motor is interrupted, or the circuits to the motor are in any way deranged so as to allow the motor to come back to central position, the brake will be immediately applied to stop the hoisting apparatus and the car. In case of mere interruption of current as when the switch in the car is moved back to central position and the reversing switch R′ is consequently opened, the electro-magnet solenoid 14 will be released and its weight as well as the spring 15 will immediately apply the brake before the stator frame has time to return to central position.

A condition which suggests itself as to the advantageous employment of the additional magnet which may be termed a releasing magnet, is the case of a very large motor whose stator might not centralize on the cut-off of the current as promptly as desired, and as the armature and pole pieces of the releasing magnet would part company instantly, the brake would be instantly applied. It will be observed also that this releasing magnet could be employed in conjunction with a mechanically controlled alternating current elevator and would prevent the releasing of the brake save when current was available for the releasing magnet circuit, and would at the same time include the feature of consuming only a minimum current owing to the fact that in the regular action of the elevator current would be applied to this releasing magnet only when its magnetic circuit was closed.

It will be observed that the circuits of the elevator system illustrated in Fig. 1 have been provided with the regular type of automatic limit switches on the elevator machine to bring the car to rest at its normal limits of travel, and still allow it to be regularly operated in the opposite direction to that in which it reached the last limit. This is in accord with common usage. I have provided, however, an additional switch L which may take the place of an ordinary main line switch. This switch may be of any desired construction and is shown in Fig. 1 diagrammatically merely to illustrate its functions. In this instance I have shown the movable contacts, 23, 24 and 25 secured to a bar of insulation 22 which is pivoted at 27 and provided with a handle 26. A latch 28 pivoted at 29 normally holds the switch L in closed position. This latch is provided with an arm 30 extending in the path of movement of the cores of the magnets 31, 32 and 33. The two outer magnets 31 and 33 are shown in series with their respective phase circuits a' and c' and are in general arrangement, similar to the overload release coil of an ordinary direct current circuit-breaker, preferably with time element release. The middle coil 32 is connected in the same phase as that of the solenoids 85 and 85′ associated with the reversing switches R and R′. The three pole switch L is designed to be closed by hand and to be opened by one of the tripping devices referred to, and these tripping devices may be operated either by single or multiphase coils using either single or multiphase current as desired, but the principle of the action is as above stated. That is, if the current from the main line exceeds a predetermined value, either the magnet 31 or the magnet 33 or both will project their cores against the arm 30 to release the latch 28 and thus permit the main line switch L to be opened and the current to the motor entirely interrupted. In such case it is obvious the current to the brake-releasing magnet will also be deënergized and the brake applied.

It should be noted that the reversing switches R and R′ comprise additional fixed contacts 39, 42, and 39′, 42′, adapted to be electrically connected by the plates 43 and 43′. The contacts 42 and 42′ are connected

respectively by the wires 41 and 41′ to switch apparatus not shown but operated upon movement of the stator frame. If the reversing switch R′ has been operated to closed position the stator frame 1 is rotated in such a direction that the circuit through the coil 32, wire 37, wire 38, contact 39′, plate 43′, contact 42′, wire 41′, is kept open at the switch 102. But should the phases of the main line be reversed for any reason whatever so that the motor would not operate in the proper direction, this circuit through the magnet 32 would be closed and latch 28 operated to release the arm 22 and allow the main line switch L to be moved to open position. In other words, if the phase relation of the current passing through the leads of the main line circuit is reversed so that the motor would tend to operate the car in a direction opposite to that desired, the tripping device would immediately be operated upon the closure of one of the reversing switches and the main line current entirely cut off. In such event, although the stator frame may have moved to such a position as to have released the brake, such brake will be again immediately applied on the interruption of the main line current. The circuits and the switch 102 are not fully shown in the drawing for the reason that this means for cutting off the motor current upon phase reversal is described and claimed in my co-pending application, Serial No. 324,541, filed July 3, 1906, for an improvement in anti-phase reversing devices. Should the car go beyond its normal limits of travel, the cam 103 on the car will operate the hatchway limit switch 81 or 82. In either case a circuit will be closed from the main *c′* through the wires 40, limit switch 82 or wire 98 and limit switch 81, to wire 99, and thence through the coil 32 to the main *b′*. It will therefore be evident that the latch 28 will be released and the main line circuit opened to effect the deënergization of the releasing magnet 14 and the consequent application of the brake to positively stop the elevator hoisting machine and the car. Of course if the main line switch has been opened by reason of main line phase reversal, or by reason of the car over-running its normal limit of travel, the apparatus must be inspected and the main line switch replaced in closed position manually. In case of a limit switch 81 or 82 operating, such main line switch could be held closed until the car moved away from such limit switch and until the latter moved back to open position as shown in the drawing.

Although I have herein shown my invention applied to a motor of an elevator system, it may have a general application. For instance it may be applied to direct current motors or to any form of alternating current or direct current apparatus in which the action of the brake simultaneously with or approximately simultaneously with the application or interruption of power, or current to the motor, is desired.

Obviously those skilled in the art may make various modifications in the details and arrangement of parts as herein disclosed without departing from the spirit and scope of my invention as defined by the claims. I desire therefore not to be limited to the precise construction herein described and shown.

Having thus fully described my invention, what I claim and desire to have protected by Letters Patent of the United States is:

1. The combination with a motor, of a brake therefor, an electro-responsive device, an armature for said electro-responsive device, and automatic means dependent upon closing a circuit to the motor for moving said electro-responsive device and the armature to effect the release of the brake.

2. The combination with a motor, of brake apparatus therefor, an electro-magnet, an armature associated with said electro-magnet, and means dependent upon a part of the motor for actuating both said electro-magnet and armature to effect the release of the brake.

3. The combination with a motor, of a brake therefor, an electro-magnet connected to said brake, an armature for said electro-magnet, and means operated by movement of a part of the motor for lifting said electro-magnet by its armature to effect the release of the brake.

4. The combination with a motor, of a brake therefor, brake-applying apparatus, an electro-magnet, and means dependent upon the energization of said electro-magnet and upon movement of a part of the motor to move the same and act upon said brake-applying apparatus to release the brake.

5. The combination with an electric motor, of a brake therefor, brake-applying apparatus, an electro-magnet connected to said apparatus, and means dependent upon the energization of said electro-magnet and upon a part of the motor to lift the same and actuate said brake-applying apparatus to release the brake.

6. The combination with a motor, of brake apparatus therefor, means dependent upon a part of the motor to release the brake, and means independent of the motor for holding the brake in released position.

7. The combination with a motor, of brake apparatus therefor, means dependent upon a part of the motor to release the brake, and electro-magnetic mechanism for holding the brake in released position independently of the motor.

8. The combination with a motor, of brake apparatus therefor, an electro-magnet for holding the brake released independently of the motor, a normally open switch for con-

trolling the electric circuit of said holding electro-magnet, and means operated upon movement of a part of said motor for releasing said brake, closing the magnetic circuit of said electro-magnet, and closing said electric switch.

9. The combination with a motor, of a brake, an alternating current electro-magnet, an armature normally closing the magnetic circuit of said electro-magnet, an actuating device for moving said magnet and armature to release the brake, and an additional alternating current magnet for holding said brake in released position.

10. The combination with a motor, of a brake therefor, a multiphase electro-magnet connected to said brake, an armature normally closing the magnetic circuit of said magnet, and means dependent upon the motor for actuating said armature and electro-magnet to release the brake only when said magnet is energized.

11. The combination with a motor, of a brake therefor, a movable alternating current electro-magnet, an armature completing the magnetic circuit of said magnet, automatic means for moving said magnet and the armature to release the brake, and connections for effecting the application of the brake upon the deënergization of said electro-magnet.

12. The combination with a motor, of a brake therefor, a movable electro-magnet, an armature completing the magnetic circuit of said magnet, means actuated by the movement of a part of the motor for moving said magnet by its armature to release the brake, and connections between the magnet and brake permitting the latter to be applied independently of armature movement when current to the magnet is interrupted.

13. In a torque-release brake, the combination with a motor having both parts rotatably mounted, a brake for one of said parts, brake-releasing apparatus, means acted upon by the other part of said motor for releasing the brake, and means for holding said brake in released position independently of said last-named part.

14. In a torque-release brake, the combination with a motor having a revoluble frame, a brake for the rotative part of the motor, means acted upon by said revoluble frame for releasing the brake, and a device for holding said brake released independently of the position of said revoluble frame.

15. In a torque-release brake, the combination with an electric motor having a revoluble frame, a brake for the rotative part of the motor, an electro-magnet, an armature closing the magnetic circuit of said magnet, and means acted upon by the motor frame for moving said magnet and armature to effect the release of the brake.

16. In a torque-release brake, the combination with a motor having a revoluble frame, a brake for the rotative part of the motor, an electro-magnet connected to said brake, an armature closing the magnetic circuit of said magnet, actuating mechanism connecting said armature to the motor frame, and means for supplying current to the magnet and the motor to effect the operation of said actuating device and the release of said brake.

17. In a torque-release brake, the combination with an alternating current motor, the frame of said motor having a limited revoluble movement, of a brake, brake-applying apparatus means acted upon by said frame to move said brake-applying apparatus to effect the release of the brake, and an alternating current magnet for holding said brake released independently of said motor frame.

18. In a torque-release brake, the combination with an alternating current motor, the frame of said motor having a limited revoluble movement, of a brake, brake-applying apparatus, an alternating current electro-magnet, an armature normally closing the magnetic circuit of said magnet, actuating mechanism operated by the motor frame for moving said electro-magnet and armature to effect the release of the brake, and an additional electro-magnet for holding said brake in released position.

19. In a torque-release brake, the combination with an alternating current motor, the frame of said motor having a limited revoluble movement, of a brake, brake-applying apparatus, an alternating current electro-magnet, an armature normally closing the magnetic circuit of said magnet, actuating mechanism connecting said armature and motor frame, and means for supplying current to the magnet and motor to effect a movement of said frame to operate said actuating mechanism and release the brake.

20. In a torque-release brake, the combination with an induction motor, one part thereof having a limited revoluble movement, of a brake, means dependent upon the movement of said revoluble part for releasing the brake, and means independent of said revoluble part for holding the brake released.

21. In a torque-release brake, the combination with an induction motor, a stator frame thereof having a limited revoluble movement, of a brake, an alternating current magnet, an armature normally completing the magnetic circuit of said magnet, and means dependent upon the energization of said magnet and actuated by the stator frame to move said magnet and armature to effect the release of the brake.

22. In a torque-release brake, the combination with an induction motor, a stator

frame thereof having a limited revoluble movement, of a brake, an alternating current magnet, and means dependent upon the actuation of said magnet and actuated by the stator frame, to move said magnet and release the brake, said means comprising an armature normally completing the magnetic circuit of said magnet and permitting the brake to be applied before the stator frame returns to normal position upon the current supply to the magnet and the motor being interrupted.

23. The combination with a motor, of a brake, a magnet, an armature, an actuating device for moving said magnet and armature to release the brake, and an additional magnet for holding said brake in released position.

24. The combination with an alternating current motor of the induction type and having a revoluble stator frame, of a brake for the rotor, a multiphase electro-magnet, an armature normally closing the magnetic circuit of said electro-magnet, means acted upon by the stator frame for moving the armature and the magnet to release the brake, a holding electro-magnet, and means for closing the magnetic and electric circuit of said holding magnet when the brake is released.

25. The combination with an alternating current motor of the induction type and having a revoluble stator frame, of a brake for the rotor, a multiphase electro-magnet, an armature normally closing the magnetic circuit of said electro-magnet, means for moving both the magnet and armature to release the brake when the stator frame is revolved a predetermined distance upon application of current to the magnet and the motor, a holding electro-magnet, and means for closing the magnetic and electric circuit of said holding magnet upon the brake being released.

26. In an elevator system, the combination with a car, hoisting apparatus and motor, of a brake for the rotating part of said motor, means actuated by the other part of said motor for releasing the brake, and an electro-magnet for holding said brake in released position independently of said last-named motor part.

27. The combination in an elevator system with a car, hoisting apparatus and induction motor, said motor comprising a rotating part and a part having a limited revoluble movement, of brake apparatus for said motor, a multiphase electro-magnet, an armature normally closing the magnetic circuit of said multi-phase electro-magnet, means acted upon by the revoluble part of said motor to effect the release of the brake, and an additional multiphase electro-magnet for holding said brake released independently of the position of said revoluble frame.

28. In an elevator, the combination with a car, hoisting apparatus, and an induction motor, said motor comprising a revoluble stator frame, of a brake for the rotor of said motor, brake-applying apparatus, a multiphase electro-magnet, an armature normally closing the magnetic circuit of said electro-magnet, a cam carried by the stator frame, means actuated by said cam for moving said armature and electro-magnet to effect the release of said brake against the action of the brake-applying apparatus, a multiphase holding electro-magnet, and means co-acting with said brake-releasing means for completing both the magnetic and electric circuits of said holding electro-magnet upon the brake being released.

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

WILLIAM N. DICKINSON, JR.

Witnesses:

CHARLES M. NISSEN,

W. H. BRADY.