A. MAGNUSON.

ELECTRIC MOTOR MECHANISM FOR OPERATING ELEVATOR SAFETIES.

APPLICATION FILED MAY 10, 1906.

1,040,555. Patented Oct. 8, 1912.

Fig. 1.

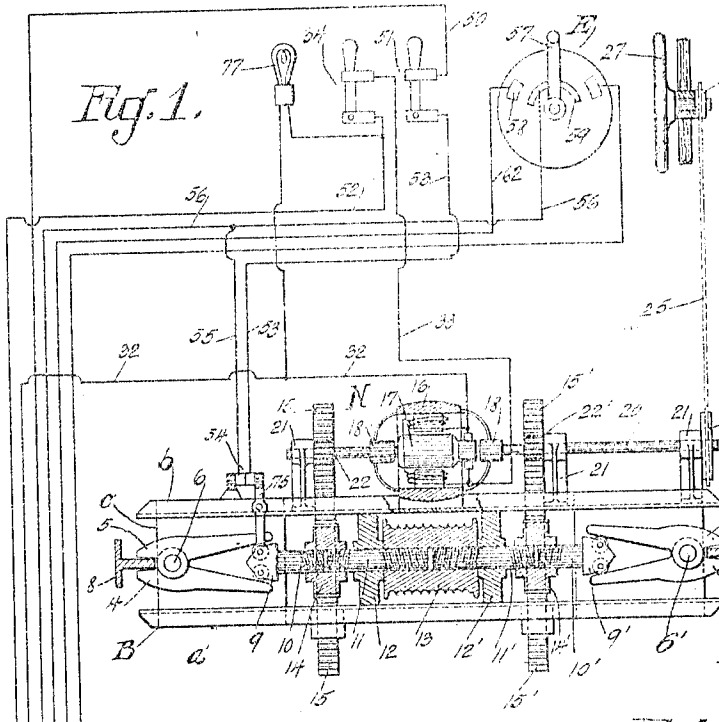


Fig. 3.

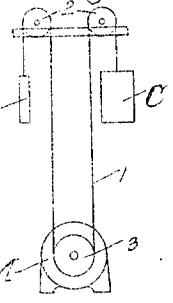


Fig. 4.

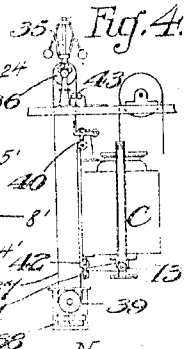
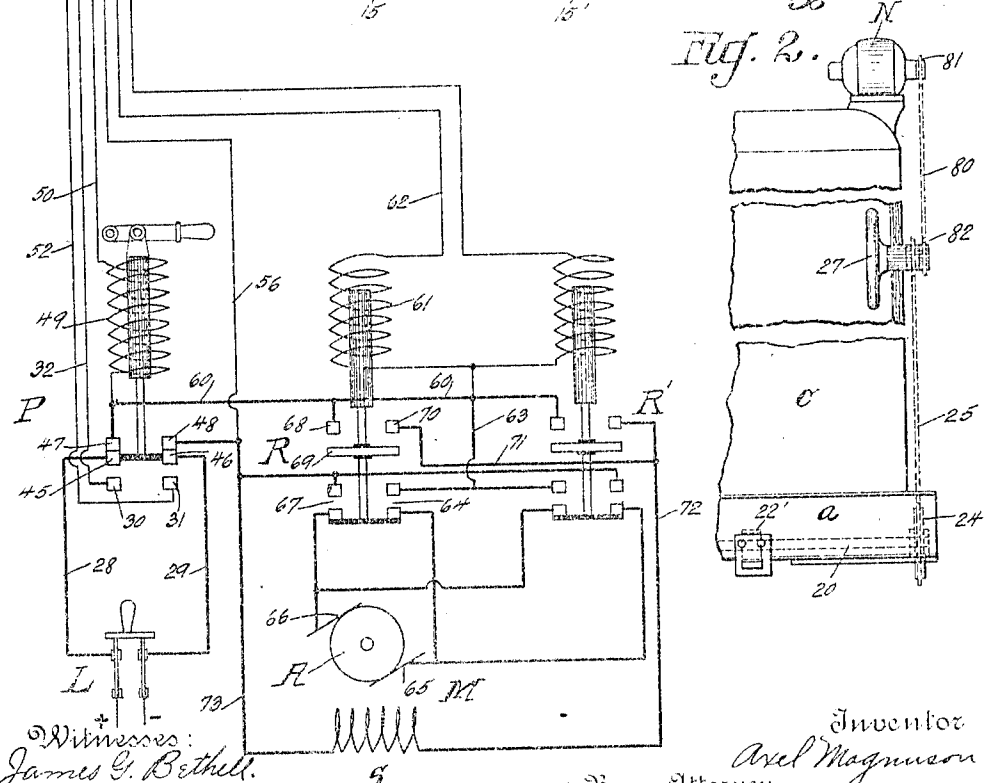


Fig. 2.



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UNITED STATES PATENT OFFICE.

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ELECTRIC-MOTOR MECHANISM FOR OPERATING ELEVATOR-SAFETIES.

1,040,555. Specification of Letters Patent. Patented Oct. 8, 1912.

Application filed May 19, 1908. Serial No. 433,780.

To all whom it may concern:

Be it known that I, AXEL MAGNUSON, a citizen of the United States, residing in the city of New York, in the county of New York and State of New York, have invented a new and useful Improvement in Electric-Motor Mechanism for Operating Elevator-Safeties, of which the following is a specification.

My invention relates to emergency brakes for elevator cars, and is adapted for use with that type of brake in which gripping jaws carried by the elevator car are adapted to grip the vertical guide rails in the elevator shaft.

One of the objects of the present invention is to provide an electric motor for operating the brake-applying mechanism.

Another object of the invention is the provision of a manual device in combination with the motor for either applying or releasing the brakes.

Another feature of the invention resides in the means for controlling the brake-operating motor.

Other objects of the invention will appear hereinafter, the novel combination of elements being set forth in the appended claims.

Referring to the accompanying drawings, Figure 1 is a general view showing guide brake mechanism for an elevator, and also showing diagrammatically the electric system of control for the hoisting motor and brake-operating motor; Fig. 2 is a fragmentary view of a modification in which the brake motor is placed on top of the elevator car; Fig. 3 is a diagrammatic view of an elevator system to which my invention may be applied; and Fig. 4 illustrates the governor mechanism for automatically effecting the operation of the brakes when the speed becomes excessive.

The elevator car C is lifted and lowered by the motor M connected to the car through the cables 1 attached to the car C and counterweight W and passing around the guide sheaves 2 and friction drive sheave 3 on the motor shaft. The brake mechanism may be placed either above or below the elevator car, but is preferably located beneath the floor of the car, and, as here shown, is supported by a frame B comprising sides *a* and *b* secured to the under surface of the car floor, and a bottom *c*. Pairs of gripping jaws 4, 5 and 4′, 5′ are pivoted at 6 and 6′, respectively, and are adapted to grip the stationary vertical guide rails 8, 8′. The jaws are operated by cams 9 and 9′ on the outer ends of short rods 10 and 10′. Between these rods and in line therewith are two other rods 11, 11′ mounted in bearings 12, 12′ and having their inner ends provided with right and left-hand screw threads, respectively, to receive the correspondingly threaded safety drum 13. The adjacent ends of the rods 10, 11 and 10′, 11′ have right and left-hand threads to receive the internally threaded pinions 14 and 14′ in mesh with rack bars 15 and 15′. Between the rack bars is a small electric motor N comprising a magnet frame 16 secured to the frame B and an armature 17 mounted in bearings 18, 18. The armature shaft 20 is extended some distance beyond each end of the armature and has bearings in brackets 21 secured to the frame B. Keyed to the shaft 20 are pinions 22 and 22′ meshing with the rack bars, and a sprocket wheel 24 connected by a sprocket chain 25 to a pinion 26 adapted to be operated by a hand wheel 27 located in any convenient position in the car.

The safety drum 13 is operated by the mechanism shown in Fig. 4. A governor 35, of any suitable form, is located at the top of the elevator well. Around the sheave 36 of the governor passes an endless rope 37 which is held taut by means of the weight 38 and sheave 39 at the bottom of the well. The governor rope has the usual yielding connection with the car C at 40, and passes over the directing pulleys 41 and 42 mounted on the lower portion of the car, and thence to the safety drum 13 around which it is wound.

The operation is as follows: Normally the governor rope travels with the car and rotates the sheaves at the top and bottom of the well and also the centrifugal governor mechanism. When the car speed exceeds a predetermined limit, the governor operates the gripping device 43 to hold the governor rope stationary. As the car continues to

move, the governor rope will be disconnected from the car at 40 and the relative movement of the rope and car will rotate the safety drum 13. The motion of the drum 13 begins substantially at the same time the governor rope is gripped, and the rods 11 and 11′ which are held against rotation immediately commence to move out longitudinally and carry with them the pinions 14, 14′, the rods 10, 10′ and the cams 9, 9′, the latter operating to apply the gripping jaws to the guide rails.

The present invention is especially adapted for use with electrically operated and controlled elevators, and by way of illustration I have herein shown a well known system of electrical control in connection with my invention. This system comprises a motor armature A, a shunt field winding S, reversing switches R, R′, a potential switch P, and a controller switch E in the elevator car. The positive and negative mains designated + and −, respectively, are connected to any suitable source of current supply. Current from these mains is supplied through the main line switch L, conductors 28 and 29, and potential switch P to the various motor controlling and operating circuits. The circuit through the potential switch magnet is as follows,—from the positive main through the switch L, conductor 28, contacts 45 and 47, winding 49 of the potential switch magnet, conductor 50, safety switch 51 in the car, conductor 53, switch 54, conductors 55 and 56, contacts 48 and 46, conductor 29 and switch L to the negative main. This circuit is normally closed and receives current to hold the potential switch closed so that current may be supplied to the motor M and controlling circuits.

The parts are shown in their normal position with the motor at rest. If the controller lever 57 in the car be moved to the left to bridge the contacts 58 and 59, a circuit will be established as follows,—from the positive main through the potential switch contacts 45, 47, conductor 60, magnet winding 61, conductor 62, contact 58, switch lever 57, contact 59, conductor 56, and to the negative main. The reversing switch R will now operate to close a circuit to the motor armature as follows,—from the positive main through the potential switch, conductors 60, 63, reversing switch contacts 64, brush 65, armature windings, brush 66, reversing switch contacts 67, and to the negative main. A circuit will also be established through the shunt field winding S which may be traced through the conductor 60, reversing switch contacts 68, 69, 70, conductors 71, 72, field winding S, and conductor 73. The motor armature and field winding now receive current and the motor is operated to lift the car. A reversal of the controller lever 57 effects a reversal of the motor in the well known manner.

The circuit for the brake motor N is controlled by the potential switch P and is open at the contacts 30, 31 while the potential switch is closed. When the potential switch magnet drops its armature, a circuit to the motor N is closed as follows,—from the positive main through conductor 28, contacts 45, 30, conductor 32 to the motor, through the shunt field and armature windings of the motor, conductor 33, switch 34, conductor 52, contacts 31, 46, and thence to the negative main. A pilot lamp 77 is connected between the conductors 32 and 52 and serves to indicate when the potential switch is open.

Whenever the potential switch magnet solenoid releases its plunger, either on account of the main line potential falling below a predetermined value or the magnet circuit being interrupted at any point, the current supply will be cut off from the hoisting motor M, and the usual electro-magnetic brake for said motor will be applied to bring the motor and car to rest. As the potential switch opens the main motor circuits, it also closes the circuit for the motor N which immediately commences to rotate its armature and apply the emergency brakes. The movement of the armature is transmitted through the pinions 22 and 22′ and rack bars to the pinions 14 and 14′. The rotation of the pinions 14 and 14′ on the rods 11 and 11′ moves said pinions and the rods 10 and 10′ outwardly, and the rotation of the pinions on the rods 10 and 10′ gives said rods an additional movement toward the gripping jaws. The cams 9 and 9′ are thus moved outwardly and operate the gripping jaws in an obvious manner.

It will be noted that the conditions for supplying current to the motors M and N are such that the current supply to the hoisting motor is always cut off while the brake motor N is receiving current; that is, the potential switch always keeps the current supply cut off from at least one of the motors.

The emergency brake may be applied by the operator in the car at any time by opening the safety switch 51 in the potential switch magnet circuit. Any of the usual automatic safety switches may be placed in this circuit, as, for example, the stop limit switches that are automatically opened when the car nears its limits of travel, the slack cable switch, or the speed governor switch.

A switch lever 75 is connected at one end to the cam 9 and holds the switch 54 closed while the cam is in its inner position and the gripping jaws released. When the cam is moved outwardly, however, to operate the gripping jaws, the switch 54 is opened to open the potential switch magnet circuit.

When the safety drum 13 is rotated automatically by the governor to apply the emergency brakes it will not only do so by a direct operation of the cams 9 and 9', but the initial movement of the cam 9 will open the switch 54 and effect the operation of the motor N which will increase the power and speed with which the cams are operated, while at the same time cutting off the current supply from the hoisting motor.

The hand wheel 27 forms a convenient means for releasing the gripping jaws and bringing the rack bars back to initial position after the motor N has operated. It may also be used either to relieve the brakes sufficiently to permit the car to gradually slide down to a floor landing or any desired position after the brakes have been operated, or to tighten the gripping jaws and hold the car more firmly.

In the arrangement shown in Fig. 2 the motor N is placed on top of the elevator car instead of being placed under the car with its armature mounted on the shaft 20. A sprocket chain 80 connects the sprocket wheels 81 and 82 secured respectively to the motor shaft and to the shaft of the hand wheel 27. The operation is the same as that of the arrangement shown in Fig. 1, the power from the motor in this instance being transmitted through the chains 80 and 25 to the shaft 20.

Various changes in the details of construction and arrangement of parts might be made without departing from the spirit and scope of the invention, and I wish therefore not to be limited to the precise construction herein disclosed.

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

1. In an elevator, the combination of an elevator car, a car brake comprising brake members carried by the car and coöperating stationary brake members, a rotary electric motor carried by the car, and positively driven operating connections between the motor and the said first-named members.

2. In brake mechanism, the combination with gripping jaws, of a screw-threaded rod, a cam carried by the rod, a pinion mounted on the rod, an electric motor, and gearing between the motor and said pinion.

3. In brake mechanism, the combination with gripping jaws, of a rotary electric motor, a rack and pinion operated by the motor to apply the brake, and mechanism between the rack and pinion and the gripping jaws for operating the latter.

4. The combination with a gripping device, of a rack bar, power-transmitting means between said parts, and an electric motor for operating the rack bar to apply the gripping device.

5. The combination with a brake, of an automatically operable device for operating the brake, a second device for effecting an additional operation of the brake, and an electric motor for operating said second device.

6. The combination with a brake, of an automatic device for operating the brake, mechanism for effecting an additional operation of the brake, an electric motor for operating said mechanism, and means operated by said device for controlling the supply of current to the motor.

7. The combination with a brake, of successively operative brake applying devices, one of which is automatically operable independent of the other, a rotary electric motor for operating one of said devices, and a switch operated by the other of said devices and controlling the supply of current to the motor.

8. In an elevator, the combination with a car, of a car brake, a safety drum, operating means therefor, operating connections between the safety drum and brake, additional brake-operating mechanism, an electric motor for operating said mechanism, and means operated by the operation of the safety drum to effect a supply of current to the motor.

9. In an elevator, the combination with a car, of a car brake, an electric motor for operating the brake, a safety circuit, and means for automatically closing a circuit to said motor when the safety circuit is opened.

10. In an elevator, the combination with a car, of a brake, an electric motor for operating the brake, a source of current supply, and a potential switch, operable to automatically close a circuit to said motor when the potential switch is opened.

11. In an elevator, the combination with a car, of an electric hoisting motor, a car brake, an electric motor for operating said brake, a source of current supply, and an electro-magnetic potential switch controlling the supply of current to said motors and permitting current to only one motor at a time.

12. In an elevator, the combination with a car, of an electric hoisting motor, a car brake, an electric motor for operating said brake, and an electro-magnetic potential switch controlling the supply of current to the motors by opening the circuit of the brake magnet motor when energized and opening the circuit of the hoisting motor when deënergized.

13. In an elevator, the combination with an elevator car, of a brake member carried by the car, a coöperating stationary brake member, a rotary electric motor on the car, brake operating mechanism connected to the motor and brake, and a hand wheel connected to said mechanism.

14. In an elevator, the combination with a car, of guide rails, gripping jaws for said guide rails, mechanism for operating said jaws, a rotary electric motor geared to said mechanism, and a hand wheel geared to the shaft of said motor.

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

AXEL MAGNUSON.

Witnesses:
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