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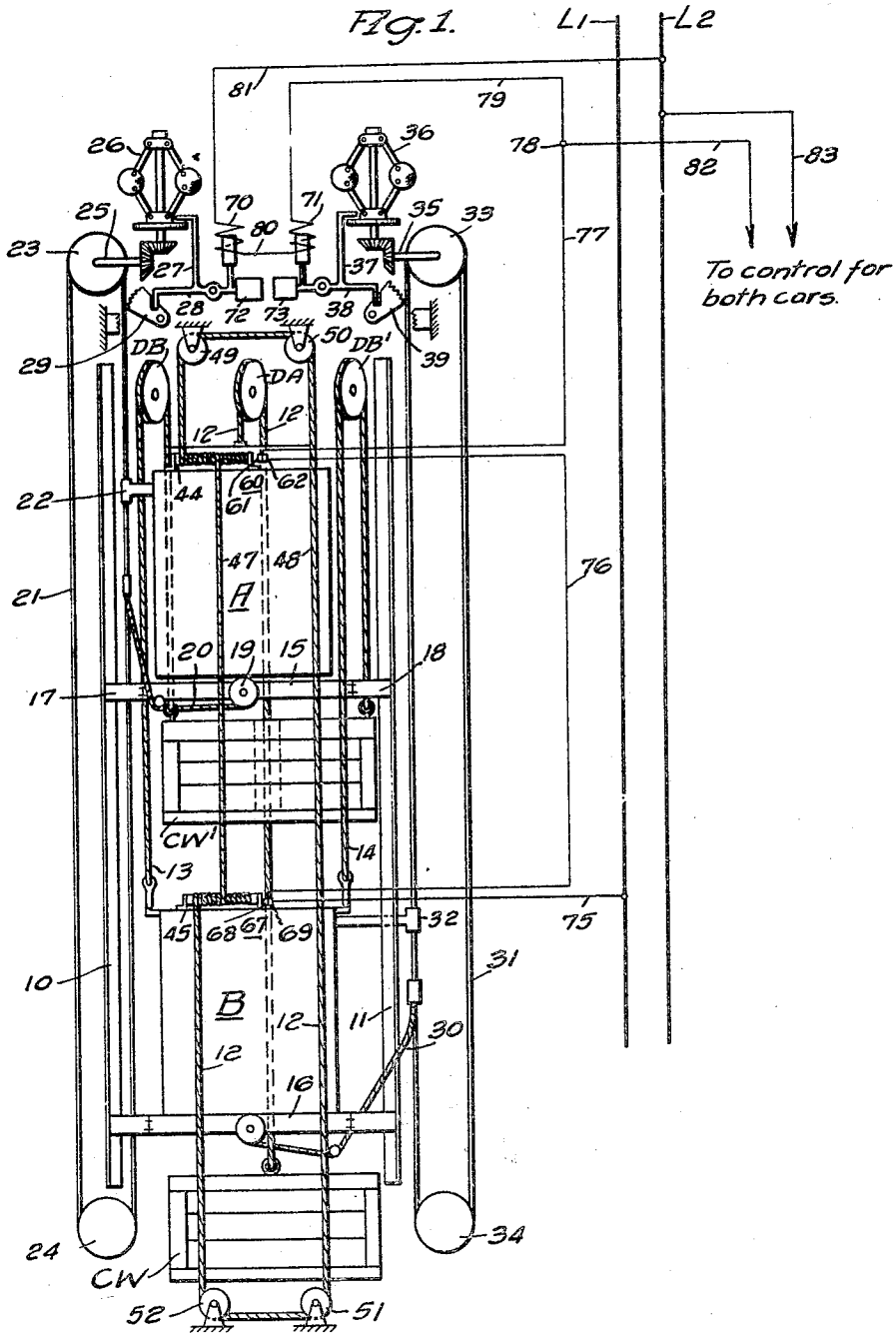
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MULTIPLE CAR ELEVATOR

Filed May 27, 1929

2 Sheets-Sheet 1



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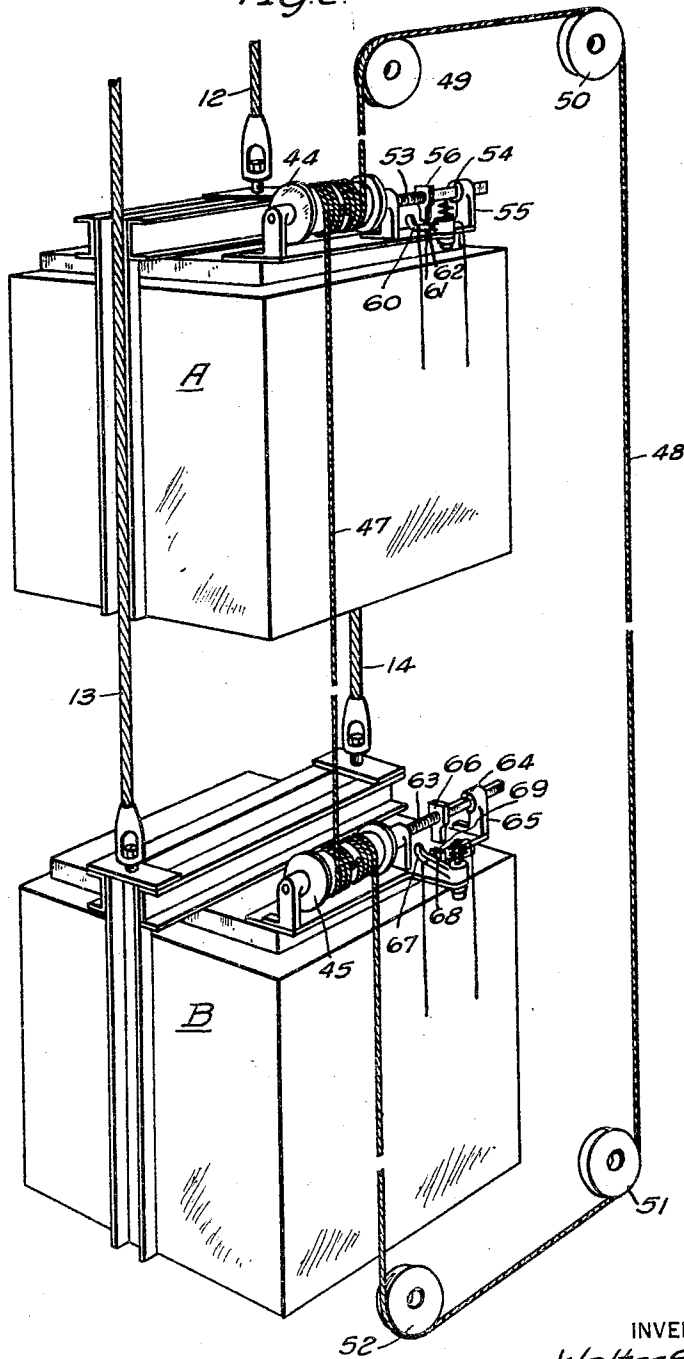
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Fig. 2.



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WALTER S. RUGG, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA

MULTIPLE-CAR ELEVATOR

Application filed May 27, 1929. Serial No. 366,347.

My invention relates to multiple-car elevators and more particularly to safety apparatus for such elevators.

The object of my invention, in general, is to provide safety apparatus for multiple-car elevators that shall be simple and efficient in operation and adapted for ready and economical manufacture, installation and maintenance.

A more specific object of my invention is to provide for preventing the cars in a multiple-car elevator from colliding during their operation.

Another object of my invention is to prevent an upper car from falling on a lower car in a multiple-car elevator.

It is also an object of my invention to provide for disconnecting the power for operating a plurality of cars mounted in the same hatchway when they approach too closely to each other.

Other objects of my invention will, in part, be obvious and will, in part, appear hereinafter.

For an illustration of one of the many forms my invention may take, reference may be had to the accompanying drawings in which:

Figure 1 is a diagrammatic representation of a multiple-car elevator embodying safety apparatus constructed in accordance with my invention; and

Fig. 2 is an enlarged view of the means shown in Fig. 1 for controlling the operation of the safety devices on the car when they approach each other too closely.

The drawings illustrate two elevator cars A and B, respectively, disposed to operate in a single hatchway between a pair of cooperating guide rails 10 and 11.

The car A is suitably suspended by a cable 12 that passes over a hoisting drum DA to a suitable counterweight CW, the cable being connected to the center of the top of the car and to the center of the top of the counterweight.

As shown, the car B is suitably suspended by a pair of cables 13 and 14 that pass over a pair of hoisting drums DB and DB' to a

counterweight CW' through the center of which counterweight the cable 12 passes.

The cables 13 and 14 for car B are disposed to operate along the sides of car A and may be arranged in any suitable manner within the hatchway that will provide the necessary space for the car A.

As shown, the cars A and B are provided with the usual safety devices 15 and 16, respectively. The safety device 15 on the car A is provided with cooperating jaws 17 and 18 for gripping the guide rails 10 and 11 when the safety device is operated. The gripping jaws 17 and 18 are disposed to be operated by a safety drum 19 that is actuated by a safety rope 20 which is attached to a governor rope 21. The governor rope 21 is releasably attached to the car A by a clutch 22 and passes over a sheave 23 at the upper end of the hatchway and under an idler sheave 24 at the lower end of the shaft.

The sheave 23 is rigidly secured to a shaft 25 that is disposed to operate a governor 26 at a speed that is proportional to the "up" and "down" movement of the car. Connected with the governor 26 is a lever 27 that is attached to a pivotal lever 28 for tripping a pair of jaws 29 to grip the governor rope 21, when the car A exceeds a predetermined downward speed, in such manner that the governor rope will be pulled loose from the releasable clutch 22 on the car and, through the safety rope 20, operate the safety device 15 to bring the car to a stop.

The safety device 16 on the car B is similar to the safety device 15 and is operated by a safety rope 30 that is attached to a governor rope 31. The governor rope 31 is releasably attached to the car B by a clutch 32 and passes around a pair of sheaves 33 and 34.

The sheave 33 at the upper end of the hatchway is mounted on a shaft 35 that operates a speed governor 36. Associated with the speed governor 36 is a lever 37 that is attached to a pivotal lever 38 for tripping a pair of clamping jaws 39 to grip the governor rope 31 and thereby cause the application of the safety device 16 to stop the car B when it exceeds a predetermined downward speed.

Inasmuch as safety devices, similar to

those described as mounted upon the cars A and B, are old and well known in the art, a further detailed description thereof will be omitted.

5 In the operation of two or more elevator cars in the same hatchway, it is necessary to make provision not only for preventing the falling of the cars but also for preventing the cars from colliding with each other and for
10 shutting off their power when they approach each other too closely. I have, therefore, provided auxiliary safety apparatus that is operably responsive to the distance between
15 the cars for operating the safety devices 15 and 16 and for cutting off power to the cars when they approach each other too closely.

The auxiliary safety apparatus comprises a movable member, such as a rotatable drum 44, mounted upon the top portion of the car
20 A and a cooperating movable member, such as a rotatable drum 45, that is mounted upon the upper part of the car B. The rotatable drums 44 and 45 are operated, in accordance with the distance between the cars, by means
25 of a pair of ropes 47 and 48. The ends of the rope 47 are fastened to drums 44 and 45 in such manner that they will be wound upon the drums as the drums are rotated when the cars approach each other.

30 The rope 48 is disposed upon a plurality of idler sheaves 49, 50, 51 and 52 that are mounted on the walls of the hatchway and the ends thereof are secured to, and wrapped around, the drums 44 and 45 in opposition to
35 the ends of the rope 47. The two ropes 47 and 48 cooperate with each other in such manner that, when the cars A and B move toward each other, the rotating drums 44 and 45 are caused to rotate by the pull exerted on
40 them by the unwinding of the ends of the rope 48 and thereby wind up the ends of the rope 47 so that when the cars again recede from each other, the drums 44 and 45 will be rotated in opposite directions by the pull exerted on them by the unwinding of the ends
45 of the rope 47.

The drum 44 is provided with a left-hand screw-threaded central aperture in which is disposed the screw-threaded end of a longitudinal slidable shaft 53. The outer end of
50 the slidable shaft 53 is rectangular in cross-section and is mounted in a cooperating rectangular opening 54 in a bracket 55 that is mounted on the top of the car A. The rectangular shape of the slidable shaft 53 prevents the shaft from rotating but permits it to slide back and forth in the opening 54. Therefore, when the drum 44 is rotated by the ropes 47 and 48, it will cause the shaft 53,
55 by reason of its screw-threaded connection therewith, to move to the right or to the left, in accordance with the direction of rotation of the drum.

60 Mounted on the slidable shaft 53 is an arm 56 that is disposed to engage a switch 60 and

separate its contact members 61 and 62 when the shaft is moved to the left a predetermined distance by the rotation of the drum 44.

The drum 45 on the car B is similarly provided with a right-hand screw-threaded central aperture (not shown) in which is disposed the screw-threaded end of a longitudinal shaft 63. The outer end of the shaft 63 is rectangular in cross section and is slidably
70 mounted in a cooperating rectangular opening 64 in a bracket 65 that is mounted on the top of the car B.

Mounted on the slidable shaft 63 is an arm 66 that is disposed to engage a switch 67 and separate its contact members 68 and 69
80 when the shaft is moved to the left a predetermined distance by rotation of the drum 45.

In order that the auxiliary safety apparatus may set the safety devices 15 and 16 into operation to stop the cars A and B when they approach each other too closely, the contact members 61 and 62 of the switch 60 and the contact members 68 and 69 of the switch 67 are connected in series with a circuit for controlling the operation of a pair
85 of electromagnets 70 and 71 that are associated with the safety governors 26 and 36. The electromagnets 70 and 71 are disposed above a pair of weighted members 72 and 73 in such manner as to lift the weighted
90 members and hold them in a suspended position when energized. When the electromagnets 70 and 71 are deenergized, the weighted members 72 and 73 fall and bias the pivotal arms 28 and 38 to close the clamping jaws 100 29 and 39 on the governor cables 21 and 31. However, as long as the cars A and B remain a safe distance apart, the contact members on the switches 60 and 67 will remain closed and maintain the circuit for energizing the electromagnets 70 and 71 to restrain the weights 72 and 73 from actuating the gripping jaws 29 and 39.

It will be noted, by referring to the drawings, that the control circuit for both cars is also connected in series with the circuit through the contact members of the switches 60 and 67 and, therefore, that the power for operating the cars will be cut off when either one or both of the switches 60 and 67
110 are moved to open position by the cars approaching too closely to each other.

The operation of the apparatus is as follows:

Assuming that the cars are moving at a
120 safe distance apart in the hatchway, then power for energizing the electromagnets 70 and 71 and for operating the control means for the cars will be supplied by way of a circuit that extends from supply conductor L1,
125 through conductor 75, the contact members 69 and 68 of switch 67, conductor 76, the contact members 61 and 62 of switch 60 and conductor 77, to a junction point 78, one branch extending, through conductor 79, the 130

coil of electromagnet 71, conductor 80, the coil of electromagnet 70 and conductor 81, to supply conductor L2, and the other branch extending, through conductor 82 and thence, through the control means (not shown) for both cars and conductor 83, to supply conductor L2.

Assuming now that the cars approach each other closely, as they come into close proximity, the drum 45 is rotated in a clockwise direction, as illustrated in Fig. 2, by the pull exerted by the unwinding of the lower end of the rope 48, while the drum 44 is rotated in a counterclockwise direction by the pull exerted by the unwinding of the upper end of the rope 48. As the drums 44 and 45 are rotated by the unwinding of the ends of the rope 48, the shafts 53 and 63 by reason of their screw-threaded connection to the drums, are moved to the left. As the cars continue to approach and arrive at a predetermined distance from each other, the arms 56 and 66 mounted on the shafts 53 and 63 move to such points that they bear upon the switches 60 and 67, thus causing them to separate their contact members to break the circuit for operating the cars and also that for energizing the electromagnets 70 and 71.

Upon the magnet 70 being deenergized, the weight 72 drops and actuates the pivotal arm 28 to apply the gripping jaws 29 to stop the governor cable 21. When the governor cable 21 is stopped by the action of the jaws 29, it is pulled loose from the releasable clutch 22 on the car A, and a further descent of the car A will thereupon pull the safety rope 20 from the safety drum 19, thus rotating it and thereby causing the gripping jaws 17 and 18 to be applied to the guide rails 10 and 11 to stop the car.

At the same time, the deenergization of the electromagnet 71 permits the weighted member 73 to drop and thereby actuate the pivotal arm 38 to set the gripping jaws 39 against the governor cable 31. Thereupon, a downward movement of the car B will cause the governor cable 31 to be pulled loose from the releasable clutch 32 on the car B. Any further descent of the car B will then pull the safety rope 30 from the safety drum on the safety device 16 and thereby cause its gripping jaws to be applied to the guide rails 10 and 11 to stop the car.

Inasmuch as the control circuit for supplying power to the cars A and B is also connected through the contact members 61 and 62 on the switch 60 and the contact members 68 and 69 on the switch 67, the opening of these contact members will also open the control circuit for the cars and thereby cause the cars to be disconnected from their source of power when they approach too closely.

It will be observed, therefore, that I have provided auxiliary safety apparatus for multiple-car elevators that will prevent the

cars from colliding and will cause their operating power to be cut off when they approach each other too closely.

While I have illustrated and described only one specific embodiment of my invention, I realize that it is susceptible of wide application and I do not desire to be limited to the precise system illustrated and described.

I claim as my invention:

1. The combination with a plurality of elevator cars operable in the same hatchway and motive means for actuating said cars, of a safety mechanism therefor comprising a movable member disposed on each of said cars, means connected to each of said movable members and operably responsive to relative motion of said cars for operating said movable members, and means responsive to operation of said movable members for rendering said motive means inoperative when said cars approach each other within a predetermined distance.

2. The combination with a plurality of elevator cars operable in the same hatchway and motive means for actuating said cars, of a safety mechanism therefor comprising a rotatable member disposed on each of said cars, means connected to each of said rotatable members and operably responsive to relative motion of said cars for operating said rotatable members, and means responsive to operation of said rotatable members for rendering said motive means inoperative when said cars approach each other within a predetermined distance.

3. The combination with a plurality of elevator cars operable in the same hatchway and motive means for actuating said cars, of a safety mechanism therefor comprising a drum disposed on each of said cars, a flexible member connected to each of said drums and operably responsive to relative movement of said cars for rotating said drums, and means responsive to the rotation of said drums for rendering said motive means inoperative when said cars approach each other within a predetermined distance.

4. The combination with a plurality of elevator cars operable in the same hatchway and motive means for actuating said cars, of a safety mechanism therefor comprising a drum rotatably disposed on each of said cars, a plurality of rotatable members mounted on said hatchway, a flexible member directly connecting said drums, a second flexible member disposed over said rotatable members and connected to said drums, said flexible members being connected to said drums in such manner as to cause the drums to rotate upon relative movement of the cars and means operably responsive to rotation of the drums for rendering the motive means inoperative when the cars approach each other within a predetermined distance.

5. The combination with two elevator cars operable in the same hatchway and motive means for actuating said cars, of a safety mechanism therefor comprising a movable member disposed on one of said cars, means connected to the other car and to said movable member and operably responsive to relative movement of the cars for operating said movable member, and means operably responsive to operation of said movable member for rendering said motive means inoperative when the cars approach each other within a predetermined distance. 70

6. In a safety mechanism for an elevator having a plurality of cars disposed in the same hatchway, the combination with a safety device disposed on each car, of controlling means therefor comprising a movable member disposed on each of said cars, means connected to each of said movable members and operably responsive to relative motion of said cars for operating said movable members, and means operably responsive to operation of said movable members for actuating said safety devices to stop said cars when they approach each other within a predetermined distance. 80

7. In a safety mechanism for an elevator having a plurality of cars disposed in the same hatchway, the combination with a safety device disposed on each car, of controlling means therefore comprising a rotatable member disposed on each of said cars, means connected to each of said rotatable members and operably responsive to relative motion of said cars for operating said rotatable members, and means operably responsive to operation of said rotatable members for actuating said safety devices to stop said cars when they approach each other within a predetermined distance. 85

8. In a safety mechanism for an elevator having a plurality of cars disposed in the same hatchway, the combination with a safety device disposed on each car, of controlling means therefor comprising a drum rotatably disposed on each of said cars, a flexible member connected to each of said drums and operably responsive to relative movement of the cars for rotating said drums, and means responsive to rotation of said drums for actuating said safety devices to stop said cars when they approach each other within a predetermined distance. 90

9. In a safety mechanism for an elevator having a plurality of cars disposed in the same hatchway, the combination with a safety device disposed on each car, of controlling means therefor comprising a drum rotatably disposed on each of said cars, a plurality of rotatable members mounted in said hatchway, a flexible member directly connecting said drums, a second flexible member disposed over said rotatable members and connected to said drums, said flexible members being connected to said drums in such manner as to cause the drums to rotate upon relative movement of the cars, and means operably responsive to rotation of the drums for said safety devices to stop said cars when they approach each other within a predetermined distance. 95

10. In a safety mechanism for an elevator having a plurality of cars disposed in the same hatchway, the combination with a safety device disposed on each car, of controlling means therefor comprising a movable member disposed on one of said cars, means connected to said movable member and to the other of said cars and operably responsive to relative movement of the cars for operating said movable member, and means operably responsive to operation of said movable member for actuating said safety devices when the cars approach each other within a predetermined distance. 100

11. The combination with two elevator cars operable in the same hatchway, motive means for actuating said cars, and a safety device disposed on each of said cars, of an auxiliary safety mechanism comprising a movable member disposed on one of said cars, means connected to the movable member on the one car and to the other car and operably responsive to relative movement of the cars for operating the movable member, and means operably responsive to operation of the movable member for rendering said motive means inoperative and actuating said safety devices to stop the cars when they approach each other within a predetermined distance. 105

In testimony whereof, I have hereunto subscribed my name this 20th day of May, 1929.
WALTER S. RUGG. 105

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