May 22, 1934. V. FEDERICI 1,959,528

SAFETY CONTROL MECHANISM FOR ELEVATORS

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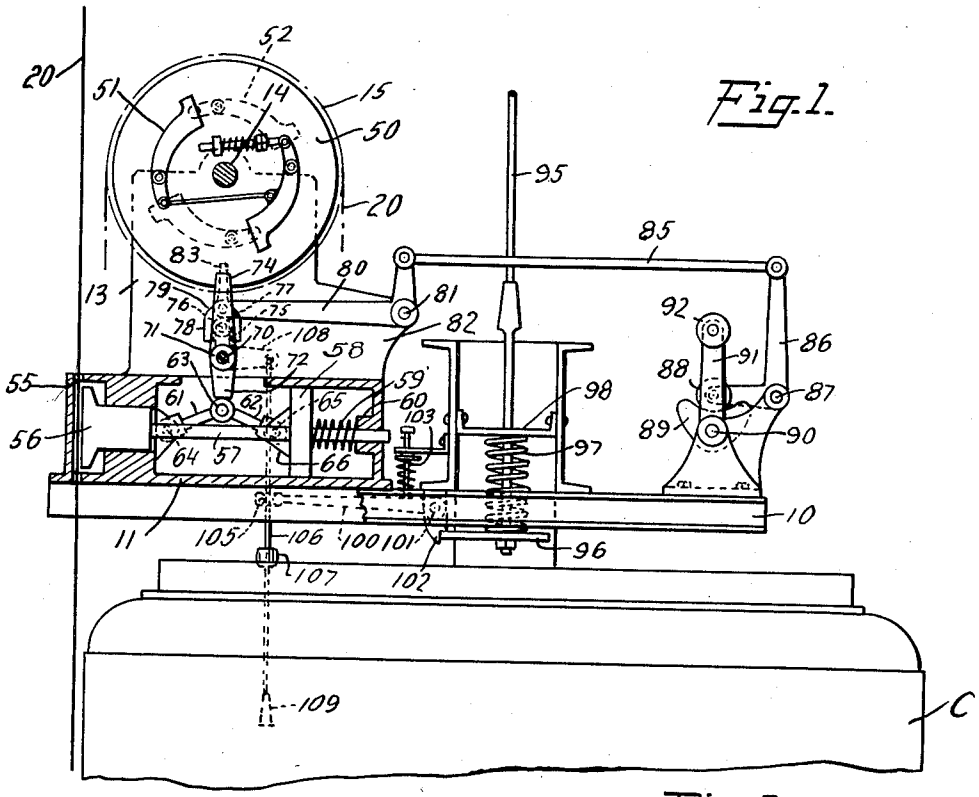

Fig. 1.

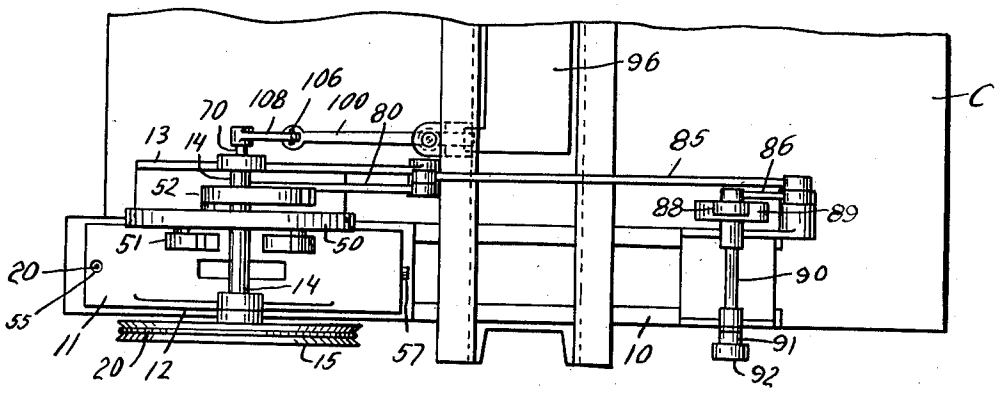

Fig. 3.

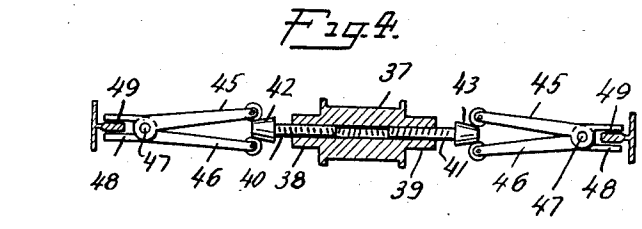

Fig. 4.

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Fig. 2.

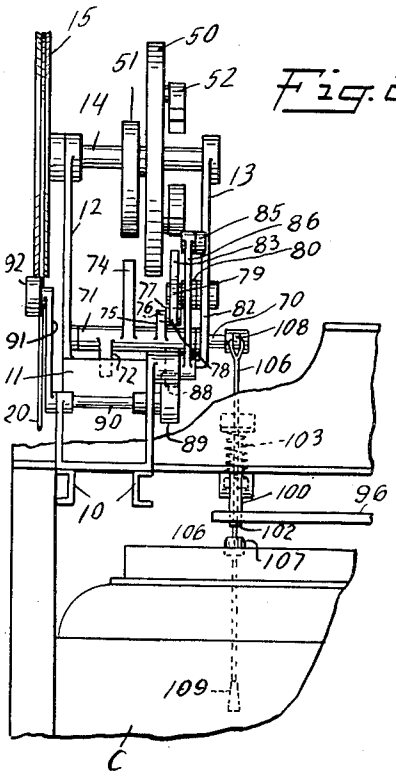


Fig. 6.

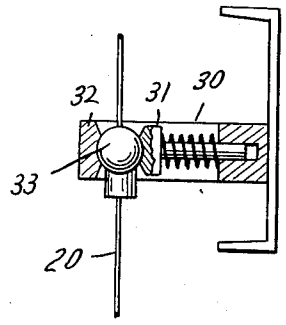
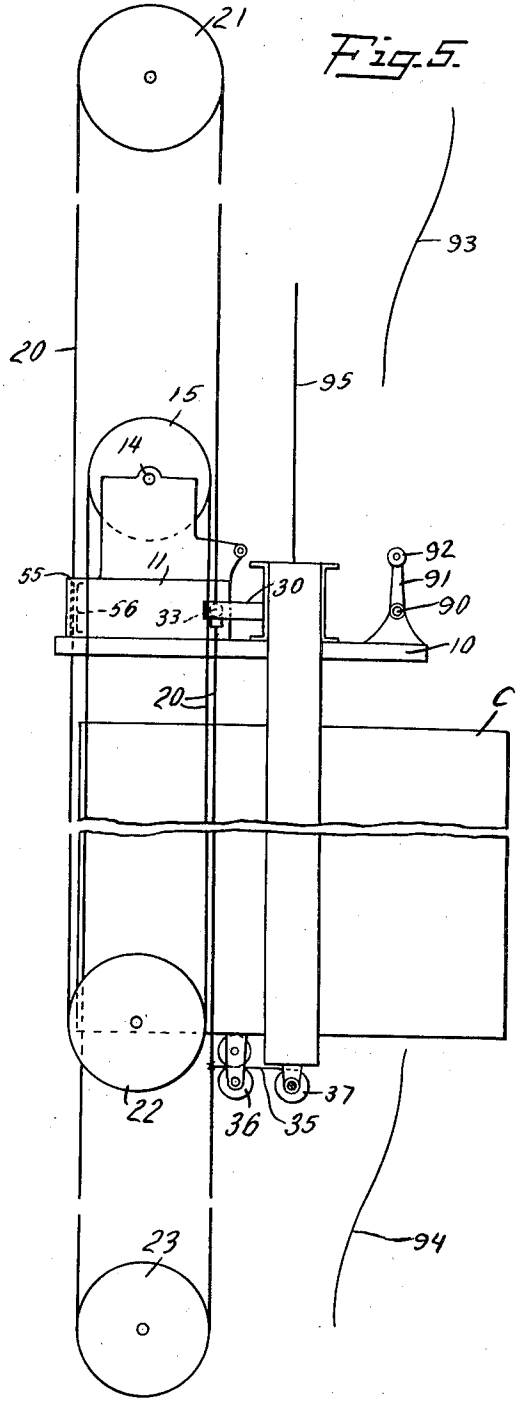


Fig. 5.



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Patented May 22, 1934 1,959,528

UNITED STATES PATENT OFFICE

1,959,528

SAFETY CONTROL MECHANISM FOR ELEVATORS

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Application November 22, 1929, Serial No. 408,940

13 Claims. (Cl. 187—89)

This invention relates to safety mechanism or safety devices for elevators.

It is common practice to provide elevators with governing mechanism so arranged that when the car is traveling at a speed in excess of a predetermined maximum, safety mechanism will be operated to stop the car.

In recent years elevator practice has changed and the speed of operation of elevators has been very materially increased. Furthermore, in buildings being constructed at the present time, the depth of the elevator pit has been greatly decreased and there is a growing tendency to restrict the depth to the least possible amount so as to effect a saving in the excavation and foundation costs.

The increased speeds of operation and the decreased depths of the pits give rise to a serious problem in elevator operation and particularly in the operation of the cars in the terminal zones.

This invention has for its salient object to provide car safety control mechanism so constructed and arranged that the cars will be automatically stopped when they are operating at excessive speeds in the terminal zones.

Another object of the invention is to provide car safety control mechanism so constructed and arranged that the car will be automatically stopped under the following conditions, namely, when operating between the terminal zones at excessive speeds, when the car is operating at speeds above a predetermined maximum in the terminal zones, and when the car suspension cables break or give way.

Another object of the invention is to provide car safety control mechanism so constructed and arranged that the control mechanism will be automatically operated under predetermined conditions or can be manually operated at the will of the car operator.

Further objects of the invention will appear from the following specification taken in connection with the drawings which form a part of this application, and in which

Fig. 1 is a vertical, sectional elevation of mechanism constructed in accordance with the invention;

Fig. 2 is an elevational view taken at right angles to Fig. 1;

Fig. 3 is a top plan view of the mechanism shown in Fig. 1;

Fig. 4 is a sectional elevation showing one form of car stopping mechanism adapted for use in connection with the control mechanism;

Fig. 5 is a diagrammatic view illustrating the operative connections for the control mechanism; and

Fig. 6 is a sectional elevation showing one form of connection that may be used between the elevator car and governor operating cable.

The invention briefly described consists of control mechanism preferably mounted on the car frame and so constructed and arranged that governor mechanism will coact with the safety control mechanism and cause the car to be stopped under a plurality of predetermined conditions. One set of governor devices or weights is arranged to cause the operation of the control mechanism when the car speed between the terminal zones exceeds a predetermined maximum. Another set of governor devices or weights is adapted, through the intervention of mechanism operated by cams in the terminal zones, to cause the operation of the control mechanism when the car is traveling in the terminal zones at excessive speeds. The control mechanism is also automatically operated in case the suspension cables for the car break or become inoperative. In addition to these three sets of conditions under which the control mechanism is automatically operated, the mechanism can be operated manually from within the car.

Further details of the invention will appear from the following description.

In the particular embodiment of the invention illustrated in the drawings, there is shown a portion of an elevator car C on the roof of which is a supporting frame 10 on which the control mechanism is mounted.

A casing 11 is mounted on the frame 10 and in turn supports brackets 12 and 13 in which is mounted a governor shaft 14. The shaft 14 has a grooved pulley 15 at one end thereof which is rotated whenever the car is moving in the following manner: A cable 20 runs over a sheave 21, preferably located at the top of the elevator shaft in the pent house. The cable passes under an idler sheave 22 located below and supported from the bottom of the car and from the sheave 22 passes upwardly around the sheave 15 and downwardly to a sheave 23 near the lower end of the hatchway. This is usually weighted to keep the governor rope in tension. From the sheave 23 the cable 20 passes upwardly to the sheave 21. It will be seen, therefore, that the cable 20 forms a closed loop or is endless.

The cable 20 is normally connected to the car by a bracket 30 which may have resiliently actuated clamping jaws 31 and 32 which normally

engage a ball 33 carried by the cable. This particular construction is illustrated in Fig. 6.

From the foregoing description it will be seen that whenever the car is moving the governor will be rotated at a rate proportional to that of the movement of the car.

From the showing in Fig. 5 it will be seen that a cable 35 is also connected to the cable 20. Cable 35 passes between a pair of sheaves 36 on the car and is connected to a drum 37 constructed and arranged to operate car stop devices, such as those shown in Fig. 4. The drum 37 has extensions 38 and 39 in which are threaded members 40 and 41 provided on the outer ends thereof with wedges 42 and 43. The wedges engage arms 45 and 46 which are pivoted at 47 and form a part of clamping jaws 48, so positioned as to clamp the elevator guide rails 49. It will be noted that the members 40 and 41 are threaded in opposite directions so that as the drum is rotated the wedges will be forced outwardly, causing the clamping jaws to grip the guide rails and stop the car.

The governor mechanism comprises a central disk 50 and two sets of governor weights 51 and 52 disposed on and pivoted on opposite sides of the disk 50. The set 51 disposed in front of the disk 50 is provided for the purpose of setting in operation a car stop mechanism when the car is traveling at speeds in excess of a predetermined maximum between the terminal zones. The set 52 is constructed to set in operation the car stop mechanism when the car is traveling at lower rates of speed in one of the terminal zones but at speeds in excess of a predetermined maximum.

The casing 11 has a vertical opening 55 therethrough, through which passes the portion of the cable 20 disposed between the sheaves 21 and 22. A plunger 56 is slidably mounted in the casing and has secured thereto an actuating rod 57 having mounted thereon a collar 58 which is engaged by a spring 59 positioned between the collar and the other end 60 of the casing.

The plunger 56 is normally held in retracted position in the following manner: A pair of toggle links 61 and 62 are pivotally connected to each other at 63 and the link 61 is pivoted at 64 to the casing 11 and link 62 is pivoted at 65 to lugs 66 carried by the collar 58.

A shaft 70 is mounted in suitable brackets extending upwardly from the casing 11 and has mounted thereon a sleeve 71 having formed thereon or secured thereto a downwardly extending lug 72. The lug 72 is adapted to engage the pivot 63 of the toggle links 61 and 62 and hold the links in the position shown in Fig. 1. When the links are so held, the collar 58 will be held against the action of the spring 59 and the plunger 56 will be positioned out of engagement with the cable 20. Several different means are provided for rocking the sleeve 71 on the shaft 70 to cause the lug 72 to release the pivot of the toggle links and permit the spring 59 to actuate the rod 57 and plunger 56 to operative position.

In order to cause the sleeve 71 to be rocked and to release the gripping mechanism when the car is traveling at an excessive rate of speed between the terminal zones, an upwardly extending lug 74 is formed on the sleeve 71 and is positioned at the plane of the path of movement of the governor weights 51. When the car is traveling at an excessive rate of speed between the terminal zones, the weights 51 will be swung outwardly by centrifugal force to a sufficient extent to engage the lug 74, thereby rocking the sleeve 71 and the lug 72 carried thereby and releasing the plunger 56.

The governor weights 52 are provided for the purpose of setting in operation the car stopping mechanism when the car is traveling at greater rates of speed than desired in the terminal zones. This is accomplished in the following manner: The sleeve 71 has formed thereon and projecting upwardly therefrom, a lug 75 to which is secured a spindle 76 having mounted thereon a roller 77. The roller 77 is positioned in a fork 78 formed on a lever 79 which is pivotally mounted on one end of a bell crank lever 80 pivoted at 81 to a lug 82 carried by the casing 11. The lever 79 is extended upwardly to form an arm 83 which is normally positioned in the plane of but below the path of movement of the set of governor weights 52. Means is provided, however, for raising the lever 79 to a position in which the governor weights will engage the arm 83, provided the car is traveling above desired rates of speed. When this takes place the lever 79 will be rocked on its pivot on the bell crank lever 80, thus causing the arm 75 and sleeve 71 to be rocked, since this arm carries the roller 77 which is positioned in the fork 78 of the lever 79.

The raising of the arm 83 is accomplished whenever the car enters one of the terminal zones, in the following manner: The bell crank lever 80 is connected by a link 85 to the upper end of a bell crank lever 86 mounted on a fixed pivot 87. The other end of the bell crank lever 86 carries a roller 88 which engages a cam 89 mounted on a spindle 90. The spindle 90 is mounted in suitable bearings and has secured to one end thereof an arm 91 having a roller 92 on the outer end thereof. The roller 92 is adapted to engage cams 93 and 94 which are positioned respectively in the upper and lower ends of the elevator hatchway at the entrances of the terminal zones.

From the foregoing description it will be seen that whenever an elevator car enters the terminal zones, the arm 91 will oscillate the shaft 90 and the cam 89 carried thereby. The oscillation of the cam in either direction will swing the bell crank lever 86 on its pivot 87 in a clockwise direction, thus pulling the link 85 to the right, viewing Fig. 1, rocking the bell crank lever 80 on its pivot 81 in a clockwise direction, and raising the arm 83 into a position to be engaged by the governor weights 52, provided the car is operating at such a speed to cause the weights to be swung outwardly a sufficient extent to engage the arm 83. When this arm is engaged by the weights, the sleeve 71 will be rocked and the lug 72 will release the toggle links, thus causing the plunger 56 to grip the cable 20. The shape of cams 93 and 94 is proportioned to the normal rate of deceleration of the elevator car in the terminal zones, so that the automatic actuation of the car safety or stopping device will occur whenever the decreasing rate of speed of the car is greater than it should be at any given point.

Means is also provided for causing the plunger 56 to grip the cable 20 when the suspension cables on which the car is supported are broken. The suspension cables 95 are connected to a plate 96 which engage springs 97 positioned beneath a supporting beam 98 carried by the frame of the car. Thus the car is supported by the cables through the intervention of the springs 97. A lever 100 is mounted on a fixed pivot 101 and has one end 102 disposed normally in engagement with one edge of the plate 96. A spring 103 en-

gages the lever 100 and tends to swing the lever in an anti-clockwise direction about its pivot 101. This tendency, however, is counteracted by the engagement of the end 102 of the lever with the edge of the plate 96. The outer end of the lever 100 has an opening 105 through which extends a chain 106 having a ball 107 secured thereto and disposed below the lever 100. The upper end of the chain 106 is connected to an arm 108 which in turn is secured to the sleeve 71.

When the suspension cables 95 break, the springs 97 will force the plate 96 downwardly, thus releasing the lever 100, which will be swung about its pivot by the spring 103 and will engage the ball 107 and depress the chain 106, thus causing the arm 108 to oscillate the sleeve 71 and in the manner hereinbefore described, to cause the plunger 56 to grip the cable 20. The chain 106 is preferably extended downwardly through the roof of the car and is provided with a handle 109 at the lower end thereof, by means of which the car operator can pull the chain and set in operation the car stopping mechanism.

When the cable 20 is gripped by the plunger 56, further movement of the car will cause the cable 35 to rotate the drum 37, thus setting in operation the clamping jaws 48 and causing these jaws to grip the guide rails and stop the car. Since the cable 20 is gripped on the opposite side of the sheave 21 from the lap of the cable to which is secured the cable 35, it will be obvious that the car will be stopped after movement one-half of the distance required to stop the car should the gripping device be applied to the other lap of the cable.

From the foregoing description it will be seen that simple, practical and effective means have been provided for automatically setting in operation the car stop mechanism when the car is traveling between the terminal zones at excessive speeds, when the car is traveling in the terminal zones at speeds in excess of predetermined rates, and when the suspension cables break. Furthermore, means has been provided for manually causing the safety car stop mechanism to operate.

Two sets of governor weights have been shown and described, but if desired, the parts associated with the lug 75 may be connected with the lug 74 and actuated by the governor weights 51.

Although one specific embodiment of the invention has been particularly shown and described, it will be understood that the invention is capable of modification and that changes in the construction and in the arrangement of the various cooperating parts may be made without departing from the spirit or scope of the invention, as expressed in the following claims.

The terminal zones are those parts of the ends of path of travel of the car during which the car speed is decreased until it comes to rest.

What I claim is:

1. In combination an elevator car, a stop device therefor, mechanism normally operative in response to car movement for actuating the stop device, a single control member for maintaining said actuating mechanism unresponsive to car movement, plural devices for selectively actuating said control member, either of which when actuated moves the control to effect normal operation of the stop actuating mechanism in response to car movement, and speed responsive means for actuating said control actuating means, one of said control actuating means being actuated in response to predetermined car speed between terminal zones, and another of said control actuating means being actuated in response to predetermined car speed within the terminal zones.

2. In combination an elevator car, a stop device therefor, mechanism normally operative in response to car movement for actuating the stop device, control means for maintaining said actuating mechanism unresponsive to car movement, plural devices for selectively actuating said control means in response to car speed and car position, either of said devices which when actuated moves the control to effect normal operation of the stop actuating mechanism in response to car movement, and constantly driven speed responsive means for actuating said control actuating means, one of said control actuating means being actuated in response to predetermined car speed between terminal zones, and another of said control actuating means being actuated in response to predetermined car speed within the terminal zones.

3. In combination an elevator car, a stop device therefor, mechanism normally operative in response to car movement for actuating the stop device, control means for maintaining said actuating mechanism unresponsive to car movement, plural devices for selectively actuating said control means in response to car speed and car position, either of which said devices when actuated moves the control to effect normal operation of the stop actuating mechanism in response to car movement, and constantly driven speed responsive means for actuating said control actuating means, one of said control actuating means being actuated in response to predetermined car speed between terminal zones, and another of said control actuating means being actuated in response to predetermined car speed within the terminal zones, and means responsive to car position for automatically rendering one of said actuating devices operative or inoperative with respect to the constantly driven speed responsive means according to whether the car is traveling between terminals or within a terminal zone.

4. In combination an elevator car, a stop device, operating mechanism normally operative in response to car movement for actuating the stop device, means for setting said mechanism in operation, control means for holding said mechanism against operation, shiftable means for actuating the control means for releasing the holding means, speed controlled means for actuating the releasing means, and means operable in response to car position to move the releasing means into operable position with reference to the speed controlled means when the car enters the terminal zone, whereby to effect operation of the stop device if the speed of the car exceeds a predetermined value in the terminal zone.

5. In combination an elevator car, a stop device, operating mechanism therefor, means for setting the mechanism in operation, means for holding said means against operation, means for releasing said holding means, means responsive to car speed for actuating the release means, and means operative only when the car reaches a terminal zone for moving said release means into operative relation with the speed control means for actuation thereby.

6. In combination, an elevator car, a stop device, operating means therefor including a spring actuated element for setting said means in operation, means for holding said element against operation, and a plurality of actuating means for releasing said holding means to release the operating means for effective operation, means

responsive to car speed for operating said actuating means, one of said actuating means being controlled by the speed of operation of the car between the terminal zones and another of said actuating means being controlled by the speed of operation of the car in the terminal zones.

7. In combination, an elevator car, a stop device therefor, means controlling the effective operation of said stop device, means coacting with a part of said controlling means to prevent effective operation of said device, a governor, and two separate actuating means for said last named means operable by said governor at relatively different speeds of travel of the car to permit effective operation of said stop device.

8. In combination, an elevator car, a stop device, actuating means therefor, a governor, an element disposed normally out of operative relation to the governor for setting said actuating means in operation, and means for moving said element into operative relation with the governor when the car is in a terminal zone.

9. In combination, an elevator car, a stop device, actuating means therefor, a governor, an element disposed normally out of operative relation to the governor for setting said actuating means in operation, and means for moving said element into operative relation with the governor when the car is in a terminal zone, the position into which said element is moved varying in proportion to the deceleration of the car as the car approaches the end of said zone.

10. In combination, an elevator car, a car safety stop, mechanism for actuating said stop, a device for preventing the operation of the actuating mechanism, releasing means for said device, a governor arranged to engage the releasing means when the car speed between terminal zones exceeds a predetermined maximum, and means operated when the car is in a terminal zone for permitting the governor to engage the releasing device at lower car speeds.

11. In combination, an elevator car, a hoisting cable therefor, a car safety stop, mechanism for actuating said stop, a device for preventing the operation of the actuating mechanism, releasing means for said device, a governor arranged to engage the releasing means when the car speed between terminal zones exceeds a predetermined maximum, means operated when the car is in a terminal zone for permitting the governor to engage the releasing device at lower car speeds, and means controllable by the hoisting cable for actuating the releasing means.

12. In combination, an elevator car, a hoisting cable therefor, a car safety stop, mechanism for actuating said stop, a device for preventing the operation of the actuating mechanism, releasing means for said device, a governor arranged to engage the releasing means when the car speed between terminal zones exceeds a predetermined maximum, means operated when the car is in a terminal zone for permitting the governor to engage the releasing device at lower car speeds, means controllable by the hoisting cable for actuating the releasing means, and a manually actuable device connected with said releasing means.

13. In combination with an elevator car, a braking device carried thereby, a speed responsive device actuated in accordance with the speed of the elevator car for applying the braking device when the car overspeeds, and means actuated thereby for applying the braking device if the speed of the car is not properly reduced as the car approaches a terminal.

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