LOAD COMPENSATOR FOR AUTOMATIC ELEVATORS FOR MAKING MORE PERFECT LANDINGS

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ATTORNEYS.
My invention relates to improvements in load compensators for automatic elevators for making a more perfect landing, and it consists in the combinations, constructions and arrangements hereinafter described and claimed.

In automatic elevators, the floor limit control or selector cuts off the current to the motor actuating the elevator in advance of the floor, and a braking force is applied to the floor-selector, which is designed to slowly bring the elevator to a stop with the floor of the elevator level with the desired floor. This type of a selector will work very satisfactorily if the load in the elevator is the same at all times. Should the load be increased, however, it is evident that the car will not drift a sufficient distance to reach the same level as the floor, if the car were traveling up, and the car would drift past the floor if it were traveling down. A car has been known to stop as much as eighteen inches below the floor when carrying a heavy load.

The principal object of the present invention is to provide an automatic means for adjusting the floor-selector for causing the car to stop level with the floor irrespective of the weight carried by the car. The alteration in the design of a standard automatic elevator, in order to have the selector automatically compensate for the weight carried by the car, is very minor, and the cost is small compared to the benefits obtained.

Other objects and advantages will appear as the specification proceeds, and the novel features will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawings, in which

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Figure 1 is a perspective schematic view of an automatic elevator showing my device operatively applied thereto;

Figure 2 is a top plan view of the elevator sling showing the device disposed in place;

Figure 3 is a side elevation of Figure 2, a portion of the sling being broken away;

Figure 4 is a section along the line 4--4 of Figure 3;

Figure 5 is a section along the line 5--5 of Figure 3; and

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Figure 6 is a diagrammatic view of one type of floor selector.

In carrying out my invention, I make use of an elevator sling 1 having a cage 2 mounted therein, the sling being supported by cables 3 that are passed over a drum or sheave 4, the cables having their free ends secured to weights 5. A motor 6 drives the drum 4, and the drum has a brake wheel 7 against which a brake shoe 8 bears when the current is cut off to the motor 6. A floor selector 9 controls the flow of current through the motor 6 and a solenoid 10, the latter keeping the brake shoe 8 free of the brake drum 7. A cutting off of the current to the motor 6 will also cut off the current to the solenoid 10, and this will permit the spring-actuated brake shoe 8 to clamp against the brake drum 7 and bring the car to a stop.

The floor selector is controlled by a cable 11 that is wrapped around a pulley 12 operatively connected to the floor selector, and a cable 13 that is wrapped around another pulley similar to the pulley 12, and then is passed around a weighted pulley 14 and has its free end connected to the cage 2. The parts thus far described are standard in construction and form no part of my invention except insofar as they cooperate with the parts now to be described.

The standard practice is to connect the cable 11 to the sling 1 or the cage 2. It is further the standard practice to connect the lifting cables 3 to the sling 1. This arrangement provides no means for compensating for different loads. In Figure 3, I show the cables 3 as passing on down through the top of the sling 1 and as being secured to a supporting anchor member 16. The member 15 is relatively long, see Figure 3, and has its outer ends connected to the sling 1 by springs 16 and adjustable springs 17 (see Figure 5). These springs are made heavy enough to carry the cage and the sling and to compress very slightly when a load is placed on the cage. The successful operation of my device depends upon the relative movement of the plate 15 toward and away from the sling 1, this movement being dependent upon the weight carried by the cage.
In order to avert any accident occurring in case of the breakage of the springs 16 and 17, I provide a threaded shank 18 that is secured to the member 15 by nuts 19, and carries spacing nuts 20 that are disposed a slight distance away from a stop member 21 carried by the sling 1 (see Figure 3). In case the springs 16 should break, the cables 3 would pull the member 15 toward the top of the sling until the nuts 20 rested against the stop member 21. This movement will be very slight, and there will be no tendency for the car to break loose from the cables.

I employ the shank 18 for lengthening or shortening the effective length of the cable 11 that leads to the floor selectors, the lengthening and the shortening being used to compensate for the varying loads. The top of the shank 18 is pivotally secured to a lever 22, and the latter is adjustably fulcrumed at 23. The free end of the lever slidably receives a rod 24, and this rod has its upper end pivoted to a lever 25 that extends at right angles to the lever 22 (see Figure 4). The lever 25 carries an adjustable weight 26 at one end, and has its other end operatively connected to a dashpot 27. The cable 11 is connected to the weighted end of the lever 25. Should certain of the cables be a trifle shorter than the others, the springs 16 are disposed far enough away from the cables to prevent too great a tilting of the plate 15, and this prevents binding between the shank 18 and lever 22.

From the foregoing description of the various parts of the device, the operation thereof may be readily understood.

When weight is applied to the cage 2, the sling 1 will tend to be lowered and will compress the springs 16 and 17. This will cause a movement of the member 15 relative to the sling 1, and this movement will swing the levers 22 and 25 for causing the cable 11 to be drawn toward the cage 2, which in effect will be a foreshortening of the cable. It should be noted at this point that springs 28 and 29 are mounted above and below the lever 22 and are carried by the rod 24. In this way the lever 22 is yieldingly connected to the lever 25. As a further precaution, I provide the dashpot 27 which prevents the lever 25 from being suddenly moved. This will relieve any undue tension upon the cable 11.

Referring to Figure 6, it will be noted that the floor selector has a drum 30 that carries conductors 31 and 32. Fingers 34 contact with the conductor 31, and fingers 35 contact with the conductor 32. The fingers are held stationary by a fixed support, while the conductors 31 and 32 are carried around by the movement of the drum, the latter being rotated by the cables 11 and 13. If, now, the second floor button 36 shown in Figure 1 is depressed, a circuit will be closed through the second floor finger 34a and the conductor 31. The rotation of the drum will carry the conductor 31 under the finger 34a, and finally the conductor will ride free of the finger. This will instantly break the circuit to the motor 6, and the brake will be applied for bringing the car to a stop. If a heavy load has been placed in the cage 2, the cable 11 will have been drawn toward the cage a slight distance as already explained, and this will rotate the drum for effecting a lag in the floor selector in proportion to the increased load. In other words, the floor selector will disconnect the conductor 31 from the finger 34a when the car is nearer the floor level than it would when the car is empty. The weight in the car will cause it to drift less and will stop level with the floor.

The car in traveling downwardly will have its motor current broken sooner than if the car were traveling empty, and this will permit the car to drift through a greater distance, which will give the brake time to stop the car level with the floor. In other words, there will be a load effect in the floor selector in proportion to the load while traveling in a downward direction.

In Figure 4 it will be noted that a weight upon the elevator will swing the lever 25 downwardly. The greatest movement of the lever 25 for a given movement of the rod 24 takes place when the lever extends at right angles to the rod. When the lever 25 initially extends upwardly at an angle, the first movement of the rod 24 downwardly a given distance will swing the lever a less distance than where the lever is already at right angles to the rod 24 and the rod is moved through the same distance.

It will be seen from this that the lever 25 may be initially disposed at the desired angle so as to pull the end of the cable downwardly a certain distance for a given load and a less or greater distance for double the given load. Although I have shown and described one embodiment of my invention, it is to be understood that the same is susceptible of various changes, and I reserve the right to employ such changes as may come within the scope of the invention as claimed.

I claim:

1. In combination, a floor limit device for elevator cars, an elevator car, operating means for said device including a cable, a lever pivoted on the car, a second lever pivoted on the car and being yieldingly connected to said first lever and connected to said cable, hoisting means for the car and compensating means between the second lever and hoisting means whereby the actuation of the limit device is advanced or delayed as the weight of the load on the car is increased or decreased with respect to a predetermined weight.

2. In combination, a floor limit elevator stopping device, an elevator car and operat-
ing means for said device, including a lever pivoted on said car, a second lever yieldingly connected to the first, and a cable connected to said second lever and operatively connected to said stopping device constructed and arranged to advance or delay the actuation of the device as the weight of the load on the car is decreased from or increased over a predetermined weight, the ratio of the movement between said levers being such as to advance or delay the actuation of the device in different variable ratios to the amount of increased weight.

3. In a load compensating device for elevators, a car, a hoisting line yieldingly connected thereto, a lever swingable when there is a relative movement between said car and hoisting line, a second lever yieldingly connected to the first lever, and a control cable connected to the second lever.

4. In a load compensating device for elevators, a car, a hoisting line yieldingly connected thereto, a lever swingable when there is a relative movement between said car and hoisting line, a second lever yieldingly connected to the first lever, a control cable connected to the second lever, and a dashpot connected to the second lever.

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