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1,566,491

D. L. LINDQUIST

SAFETY MECHANISM FOR ELEVATORS

Filed Jan. 10, 1924

2 Sheets-Sheet 1

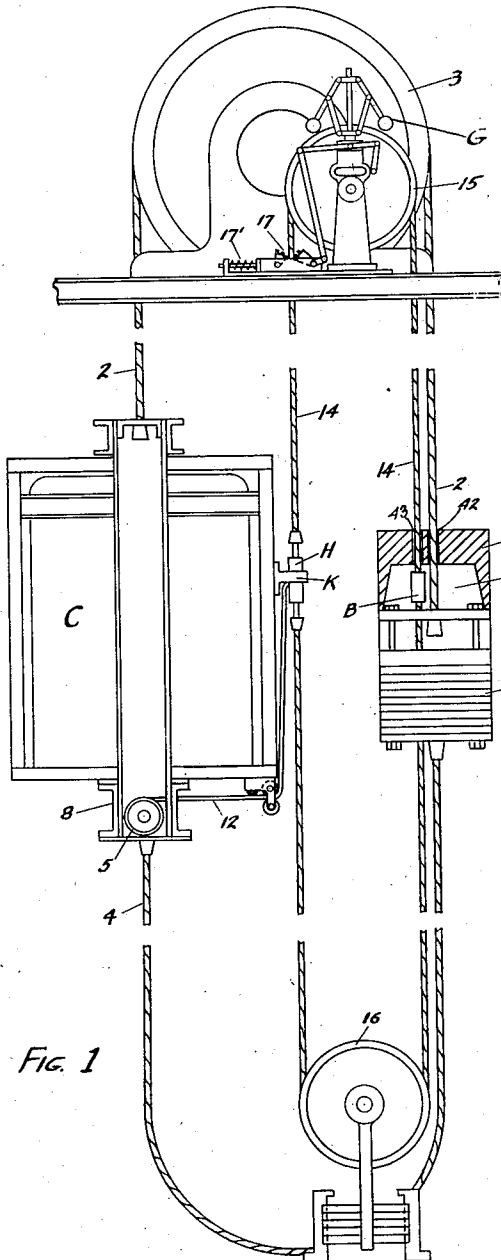


FIG. 1

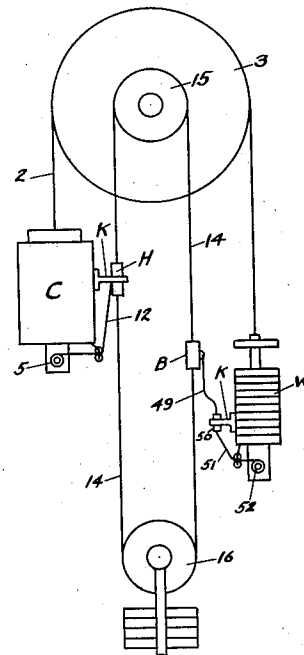


FIG. 10

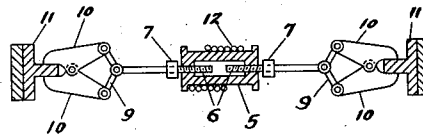


FIG. 2

Inventor
David L. Lindquist
By his Attorney
Mallory & F. Bradley

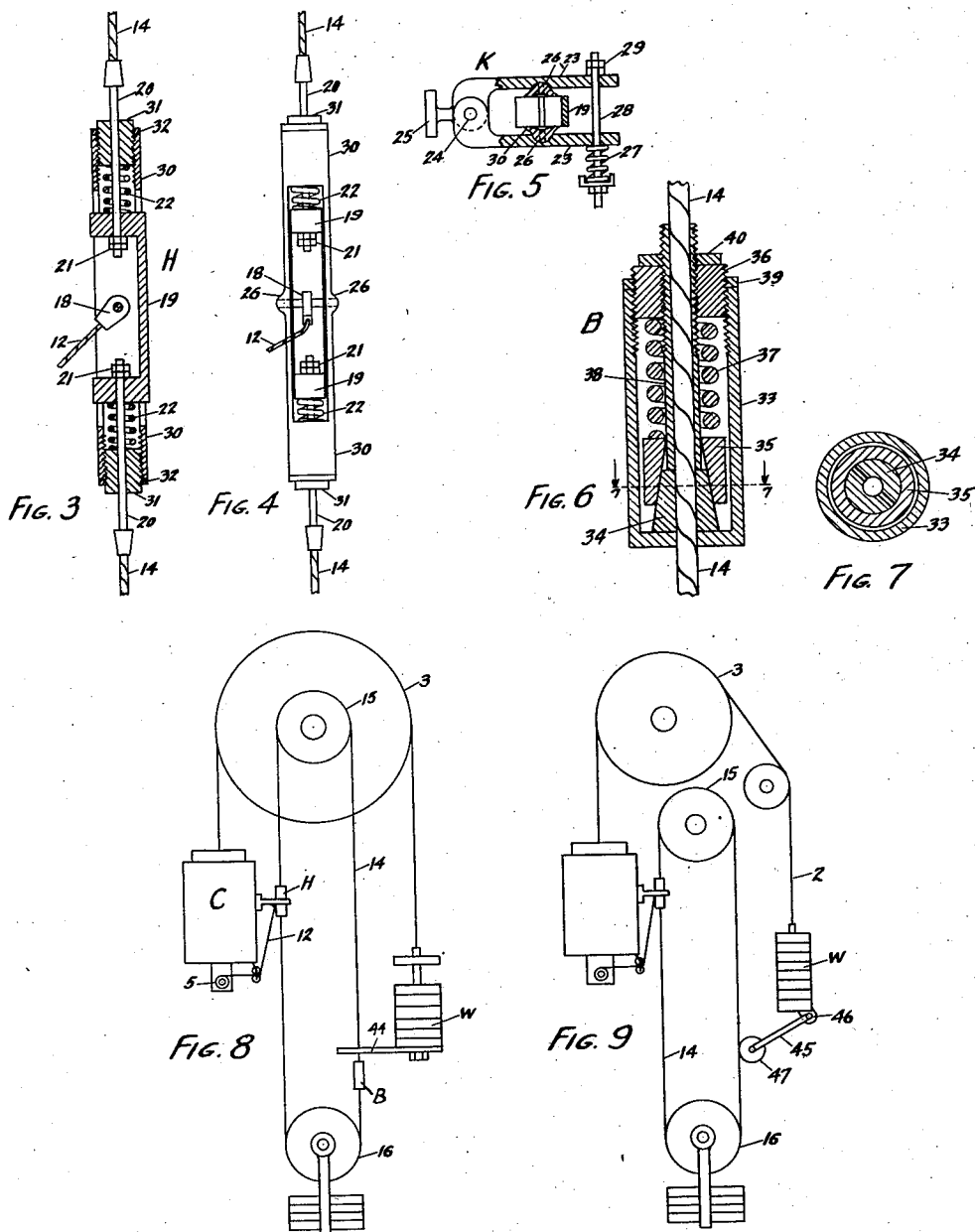
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2 Sheets-Sheet 2



Inventor
David L. Lindquist
By his Attorney
Walter C. Bradley

UNITED STATES PATENT OFFICE.

DAVID L. LINDQUIST, OF HARTSDALE, NEW YORK, ASSIGNOR TO OTIS ELEVATOR COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

SAFETY MECHANISM FOR ELEVATORS.

Application filed January 10, 1924. Serial No. 685,345.

To all whom it may concern:

Be it known that I, DAVID L. LINDQUIST, subject of the King of Sweden, residing at Hartsdale, in the county of Westchester and State of New York, have invented a new and useful Improvement in Safety Mechanism for Elevators, of which the following is a specification.

My invention relates to safety mechanisms for elevators, and more particularly to means for applying safety devices, such for example as those in which gripping jaws carried by the car are adapted to automatically grip the stationary guide rails or other stationary means and thereby stop the car, when the speed becomes excessive or the hoisting cables part. In certain cases it may be desirable to have an additional safety device carried by the counterweight and adapted to be applied to stop the counterweight when the hoisting cables part.

One object of my invention is to provide means for automatically applying the safety car brake or the like to stop the car when it has exceeded a predetermined speed and an auxiliary means for automatically applying the safety in the event of the parting of the main hoisting cables. Another object is to provide a connection between the safety device on the car and the actuating mechanism, which will prevent the accidental application of the safety during the normal operation of the elevator in starting and stopping. Other objects will appear from the specification and claims.

In a preferred embodiment of my invention I employ a governor driven by a governor cable extending throughout the hatch and resiliently connected at one point to the elevator car by means of a releasing carrier. Whenever the speed of the car exceeds a predetermined amount, the governor trips its jaws, which thereupon grip the governor cable. The governor cable is then detached from the car by disengagement of the releasing carrier and the safety applied. I also employ auxiliary means for gripping the governor cable to apply the safety when the hoisting cables part.

The present invention involves certain structural features disclosed in my patent

on "Appliance for elevator safety devices," Number 1,134,753, dated April 6, 1915.

In the accompanying drawings which illustrate various structures embodying my invention,

Figure 1 is a diagrammatic view of an elevator system to which my invention is applied.

Figure 2 is a diagrammatic view of a safety mechanism adapted to be attached to the bottom of the car.

Figure 3 is a sectional elevation of a hitch or connecting device between the safety actuating cable and the governor rope.

Figure 4 is a side view of the hitch shown in Figure 3.

Figure 5 is a part sectional plan view of a releasing carrier by which said hitch is detachably connected to the car.

Figure 6 is a sectional elevation of a yielding clamp on the governor rope.

Figure 7 is a section on the lines 7—7 of Figure 6.

Figures 8 and 9 are diagrammatic views of elevators embodying modified forms of my invention.

Figure 10 is a diagrammatic view of a modification in which a safety brake is used on the counterweight to arrest its movement in the event of parting of the hoisting cables, in addition to the safety brake on the car.

Referring to Figure 1, the car C is lifted and lowered by means of one or more hoisting cables 2 attached at one end to the car and extending over the traction sheave 3 which is driven from any suitable form of motor. The opposite end of hoisting cable 2 is connected to a counterbalance weight W which, together with a supplemental counterweight W', is usually equal to the weight of the car plus 40% or 50% of a full load on the car. A compensating cable or chain 4 counterbalances the shifting weight of the hoisting cables.

In Figure 2 is shown a safety device comprising a safety drum 5 having a screw threaded connection with a pair of oppositely threaded rods 6. These rods are carried by supports 7 secured to or forming part of a safety plank 8 (Fig. 1) attached to the bottom of the car. The outer ends of

the rods 6 are connected through toggle levers 9 to the clamping jaws 10 which normally move freely over stationary guide rails 11. The drum 5 is adapted to be rotated by means of a cable 12 wound thereon and at its outer end connected through a hitch H to a governor rope 14 (Fig. 1).

The speed governor, G is operated by a governor cable 14 which extends around the governor sheave 15 and a weighted sheave 16. When the speed of the car becomes excessive, the governor operates a pair of jaws 17 to grip the governor rope 14 so that the hitch H is disconnected from the releasing carrier K and the relative movement of the car and governor rope causes the safety drum to rotate and apply the gripping jaws 10 to the guide rails.

The hitch H as shown in Figures 3 and 4 comprises an outer member 30 in the form of a tube provided with internal screw threads to receive screw-threaded plugs 31 and an inner member 19 adapted to move longitudinally within the outer member 30. Rods 20 connected to the ends of the governor rope extend freely through the plugs 31 and the ends of member 19 and are held against withdrawal by nuts 21. Coil springs 22 surround the rods 20 and are interposed between the plugs 31 and the ends of member 19. The plugs 31 permit the adjustment of the tension of springs 22. Locking nuts 32 hold the plugs 31 in the adjusted position. This construction permits a limited movement of the member 19 relative to the member 30 in either direction for a purpose that will be explained later. The rope 12 is connected by a clevis 18 to the member 30.

The hitch H is connected to the car through the medium of a releasing carrier K (Figure 5). This carrier comprises a pair of arms 23 connected by a pivot 24 to a bracket 25, the latter being rigidly attached to the car. The arms 23 are recessed to receive bosses or spherical projections 26 formed on the hitch member 30. A coil spring 27 mounted on a rod 28 extended through the arms 23, serves to clamp the hitch H with a yielding pressure regulated by adjusting nuts 29. The purpose of the resilient connection between the car and the governor cable 14 is to overcome the tendency of the hitch H to become disconnected from the carrier K during the normal starting and stopping of the car, owing to the inertia of the governor cable. This feature of my invention is of special value on the modern high speed, high rise elevators. The mass of the governor rope in such elevators is considerable and resists the sudden changes in speed due to the quick starting and stopping of the car, so that it is necessary with the usual form of releasing carrier to clamp the governor rope or hitch so tightly as to prevent

or at least render uncertain the release of the hitch when the governor operates. In the present construction the pull of the car on the governor cable is transmitted through the springs 22 so that any sudden change in the speed of the car will compress one of the springs, allowing the governor cable to gradually but quickly take the speed of the car without any undue strain on the cable and without danger of jerking the hitch loose from the releasing carrier K. This feature of my invention is especially valuable with safety apparatus like that herein disclosed in which the governor clamp 17 is adapted to permit the governor cable to slip after the gripping jaws on the car have been operated with sufficient power to effect the stopping of the car under normal load conditions. With such a construction the gripping power of the governor clamp is limited and therefore the gripping power of the releasing carrier K must be correspondingly limited, so that the resilient connection in the hitch H becomes important in preventing untimely operation of the safety device.

In Figures 6 and 7 is illustrated a friction hitch or clamp B applied to the governor cable and adapted to apply the safety under certain conditions as hereinafter noted. The clamp B comprises a cylindrical casing or tube 33. Within this tube is a split bushing 34 comprising two members adapted to grip the governor rope. The outer surface of this bushing is flared or tapered as shown. Fitted over this bushing is a one piece ring or bushing 35 having its inner surface correspondingly flared. An adjustable plug 36 is threaded into the upper end of the tube 33. A coil spring 37 under compression between the plug and the ring 35 causes the bushing 34 to grip the cable 14 with a predetermined pressure. A sleeve 38 surrounds the cable and bears at its lower end against the bushing 34. The sleeve extends through the plug 36 and has a screw-threaded connecting therewith. The purpose of this sleeve is to prevent the bushing 34 from being moved upwardly upon the cable and jamming the latter against movement therethrough. Lock-nuts 39 and 40 serve to hold the plug 36 and sleeve 38 respectively in adjusted position.

The clamp B as shown in Figure 1 may be located in a recess 41 formed in the counterweight W' which rests on the main counterweight W. The hoisting cables 2 and governor cable 14 may extend through openings 42 and 43 respectively formed in the counterweight W'. The clamp B is spaced vertically from the counterweight W' to permit a limited unobstructed relative movement between clamp B and the counterweight, due to stretching of the hoisting cables, without operating the safety mechanism.

The operation of my invention may be re-

viewed as follows: if the speed of the car becomes excessive, the hoisting cables remaining intact, the governor operates the clamp 17 to grip the governor cable with a certain pressure dependent on the adjustment of the spring 17'. The governor rope is therefore stopped, and the movement of the car causes the hitch H to be pulled free from the releasing carrier K and the rope 12 to be drawn out to rotate the safety drum 5 and apply the gripping jaws to the guide rails. When the jaws encounter the guide rails, further rotation of the safety drum is prevented and the governor rope is then drawn through the clamp 17 until the car is stopped. I prefer to adjust the governor so that the clamp 17 grips the governor cable with a pressure that will cause the safety device to retard the car with full load at the maximum rate allowable consistent with the safety of the passengers.

When the hoisting cables break or become disconnected from the car or counterweight, the latter no longer moves in unison with the car, but drops, thus almost immediately engaging clamp B. A pull is then exerted on governor rope 14 through clamp B to detach hitch H from releasing carrier K and apply the safety. The degree of power with which the safety is applied may be regulated in this case by properly selecting the mass of weight W' and by the adjustment of the clamping action of clamp B. It will be noted that the pull exerted between rope 14 and clamp B is limited by the gripping action of the jaws 34, so that any forces resulting from the inertia of W' will not result in an excess pull or possible breakage of the governor rope 14.

It is apparent that the safety may be applied with different degrees of power depending upon whether it is actuated by governor G or by counterweight W' and clamp B.

The function of the friction clamp B, as well as the use of a supplementary weight W' to operate the governor cable, when the hoisting cables part, is to transfer to the governor cable a predetermined limited portion of the total load of the counterweight, for effecting the application of the safety device. Other constructions for performing this same function are shown in Figures 8 and 9.

Figure 8 illustrates a modification in which the counterweight W is provided with a plate or arm 44 projecting into the path of the clamp B. The operation is similar to that described in connection with Figure 1.

Figure 9 shows a further modification in which an arm 45 is connected by a pivot 46 to the counterweight W. This arm carries a non-rotatable pulley 47 around which the governor cable 14 is wound in one or more

loops. The pulley 47 has the same function as the clamp B in the other figures. If the hoisting cables break, allowing the car and counterweight to fall, the pulley 47 is carried downward and operates the safety mechanism. It will be noted that a limited relative movement between the counterweight W and the governor cable may take place without applying the safety, since pulley 47 may rock about pivot 46. This takes care of variations in stretching of the hoisting and governor cables in the normal operation of the elevator. The power with which the safety gripping jaws are applied is governed by the amount of resistance the governor rope offers to the downward movement of the pulley 47.

In Figure 10 a safety brake 52 similar in construction to that illustrated in Figure 2 is provided on the counterweight W. A friction clamp B on governor rope 14 is connected by cable 49 to hitch 50. Cable 51 connects hitch 50 to the safety brake 52. Cables 49 and 51 constitute the actuating cable for the safety brake 52. Hitch 50 is releasably held in a releasing carrier K on the counterweight. This releasing carrier is similar to that illustrated in Figure 5. The car C has a safety brake with connections to the governor cable as described in connection with Figure 1. In the normal operation of the elevator, any difference in stretching of the hoisting and governor cable is taken care of without danger of applying safety brake 52 by leaving the required amount of slack in cable 49. If the hoisting cables part, both the car C and counterweight W drop. This results in detaching the hitch H from the releasing carrier K on the car and the application of the car safety brake as previously described. The pull on the governor rope 14 to apply the car safety is determined by the pull required to detach the hitch 50 from the releasing carrier K on the counterweight. Consequently the releasing carrier K on the counterweight is so adjusted as to exert a pull on the cable 14 that will apply the safety on the car to give the desired retardation. When the car brake safety has been applied, the hitch 50 is detached from the releasing carrier K on the counterweight. The safety brake 52 on the counterweight is then applied by cable 51, the car C serving as an anchor against which the pull is exerted. The pull on cable 51 is limited by the clamping action of clamp B on governor rope 14. Clamp B is so adjusted that it will slip at a pull somewhat in excess of that required to release hitch 50 from releasing carrier K on the counterweight. Therefore as the application of the counterweight safety nears completion, the car brake safety is more strongly applied until, when both the car and counterweight have come to rest, the

safeties on both are each applied with a pull corresponding to the setting of the clamp B, which, as in the previous embodiments, is a predetermined limited portion of the load of counterweight W.

My invention may be embodied in various modifications of the structures herein shown, and comprises all structures and arrangements that come within the terms and scope of the appended claims.

I claim:

1. Safety mechanism for elevators comprising the combination with the car and its governor cable, of a member resiliently connected with the governor cable, and a releasing carrier connecting the car with said member.

2. Safety mechanism for elevators comprising in combination with the elevator car, a car brake, a governor cable, a member resiliently connected with said governor cable and having an actuating connection with said car brake, and a releasing carrier moving with said car and releasably connected with said member.

3. Safety mechanism for elevators comprising in combination the elevator car, its hoisting cable, a car brake, a speed governor, a governor cable operated by the car and driving said governor, said governor cable having suitable operating connection with said car brake, means dependent on car speed for operating upon said governor cable to apply the car brake, and means for operating upon said governor cable to apply the car brake upon breaking of said hoisting cable regardless of the movement of the car.

4. Elevator safety mechanism comprising in combination an elevator car, a counterweight, a car brake, brake operating means, a hoisting cable connecting the car and the counterweight, and means operative upon the breaking of said hoisting cable to apply to said brake operating means a predetermined limited portion of the total load of said counterweight to effect the application of said car brake.

5. Elevator safety mechanism comprising in combination an elevator car, a car brake, a brake operating cable, a hoisting cable, a counterweight, and means operative upon the breaking of said hoisting cable to transfer to said brake operating cable a predetermined limited portion of the total load of said counterweight to effect the application of said car brake.

6. Elevator safety mechanism comprising in combination an elevator car, a hoisting cable, a counterweight, a car brake, a brake operating cable normally moving with said hoisting cable and a friction hitch on said

brake operating cable in position to be acted upon by at least a portion of said counterweight to effect application of said car brake upon the breaking of said hoisting cable.

7. Elevator safety mechanism comprising in combination an elevator car, a car brake, a brake operating cable, a hoisting cable, a counterweight, a friction hitch on said brake operating cable in position to normally admit of a limited amount of unobstructed relative movement between itself and said counterweight, but to be acted upon by at least a portion of said counterweight upon the breaking of said hoisting cable, to effect the application of said car brake.

8. Elevator safety mechanism comprising in combination an elevator car, a counterweight, a car brake, brake operating means, a hoisting cable connecting the car and the counterweight, means operative upon the breaking of said hoisting cable to apply to said brake operating means a predetermined limited portion of the total load of said counterweight to effect the application of said car brake, and means for arresting the fall of the counterweight.

9. Elevator safety mechanism comprising in combination an elevator car, a car brake, car brake operating means, a hoisting cable, a counterweight, a counterweight brake, means operative upon the parting of said hoisting cable to apply said car brake with a predetermined strength of application, and means dependent upon such application of the car brake to thereafter apply the counterweight brake.

10. Elevator safety mechanism comprising in combination an elevator car, a car brake, car brake operating means, a hoisting cable, a counterweight, a counterweight brake, means operative upon the parting of said hoisting cable to apply said car brake with a predetermined strength of application, means dependent upon such application of the car brake to thereafter apply the counterweight brake, and means operative upon such application of the counterweight brake to more strongly apply the car brake.

11. Elevator safety mechanism comprising in combination the elevator car, its hoisting cable, a car brake, a counterweight, a counterweight brake, a brake operating cable, a releasing carrier for operatively connecting said car brake with said brake operating cable at a given pull, and a releasing carrier for operatively connecting said counterweight brake with said brake operating cable, at a greater pull.

In testimony whereof, I have signed my name to this specification.

DAVID L. LINDQUIST.