Aug. 4, 1959 H. E. FALTER ET AL 2,897,920

EMERGENCY BRAKE FOR ELEVATOR CARS

Filed Jan. 28, 1958 3 Sheets-Sheet 1

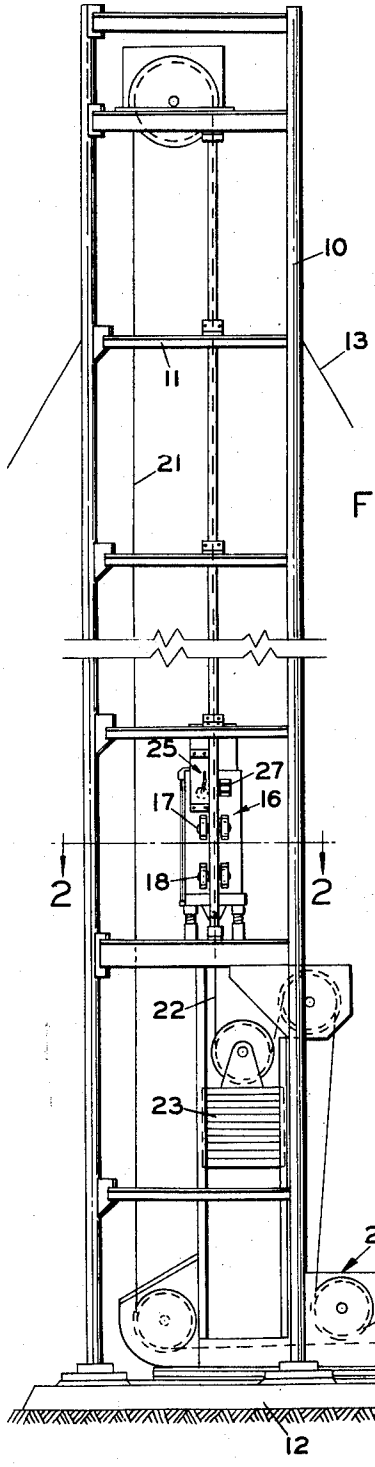
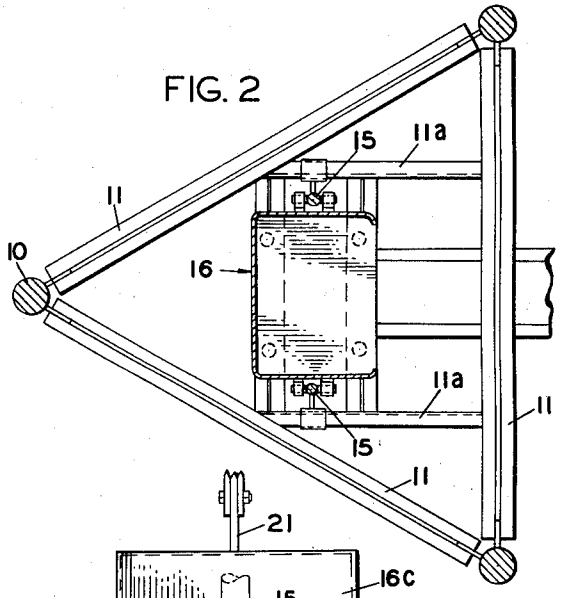


FIG. 1

FIG. 2



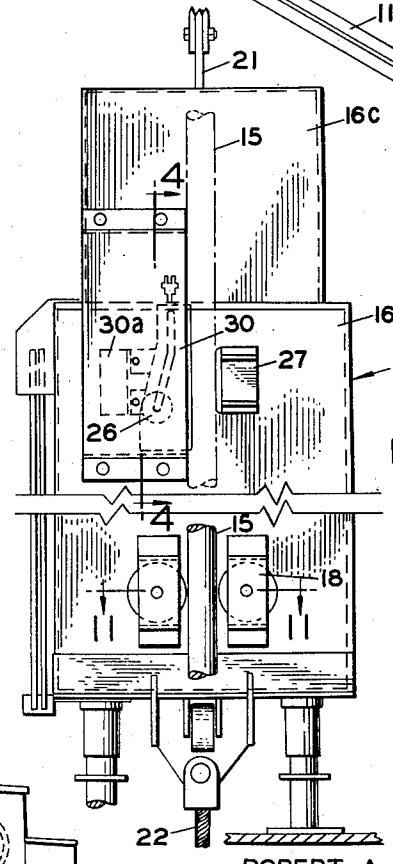


FIG. 3

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EMERGENCY BRAKE FOR ELEVATOR CARS

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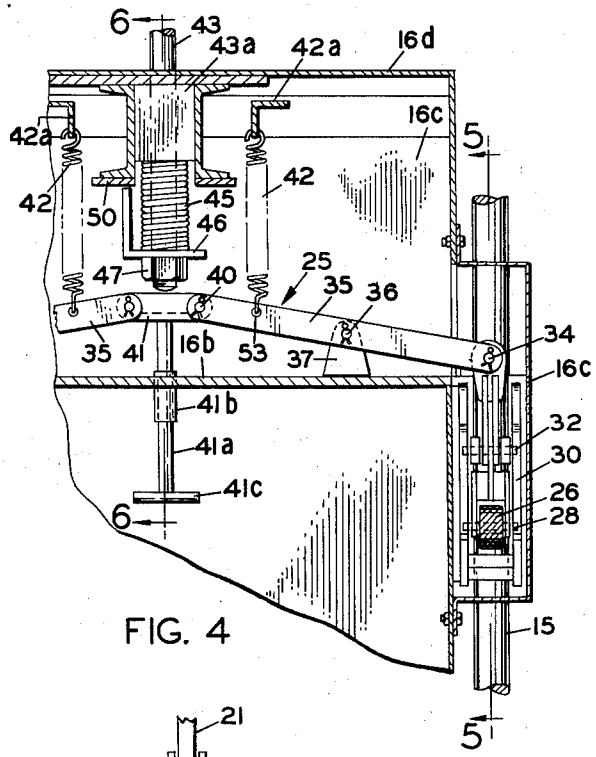


FIG. 4

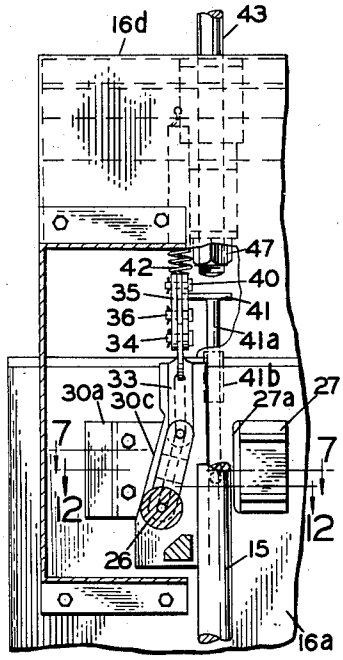


FIG. 5

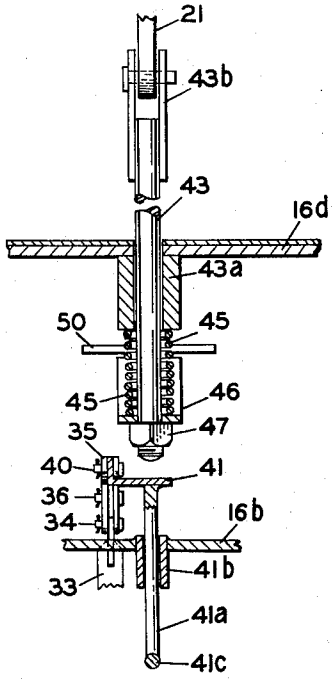


FIG. 6

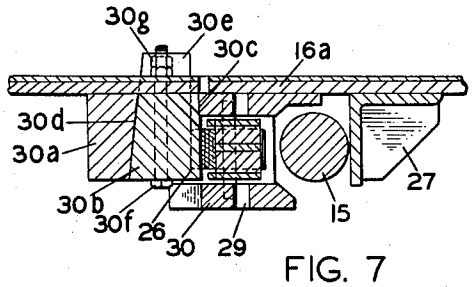


FIG. 7

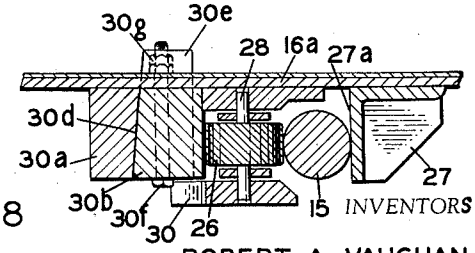


FIG. 8

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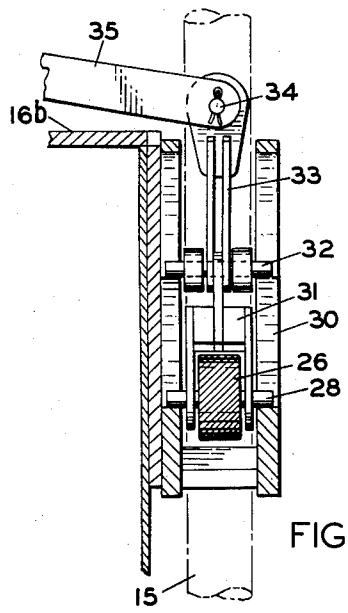


FIG. 9

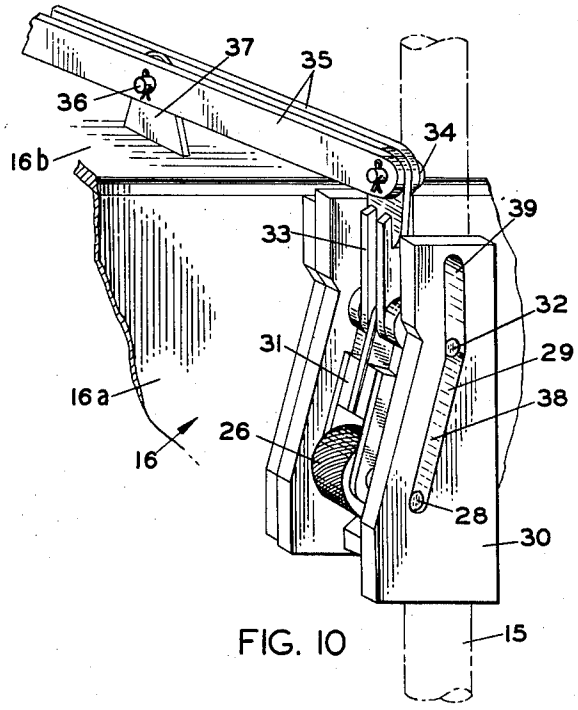


FIG. 10

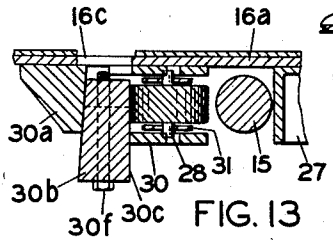


FIG. 13

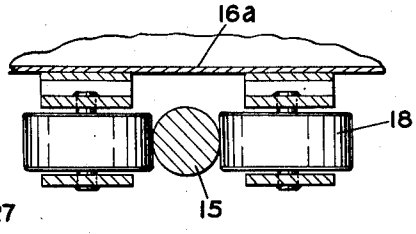


FIG. 11

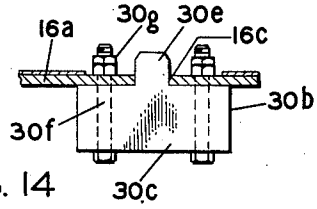


FIG. 14

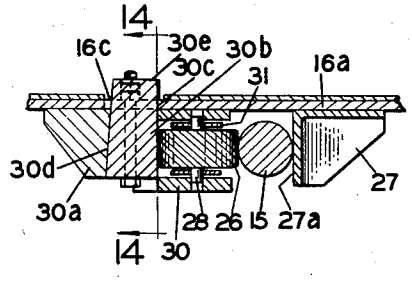


FIG. 12

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2,897,920

EMERGENCY BRAKE FOR ELEVATOR CARS

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Application January 28, 1958, Serial No. 711,692

8 Claims. (Cl. 187—88)

This invention relates to an emergency brake for elevator cars. It has to do, more particularly, with an emergency brake for use on elevator cars of the one or two-man type commonly used in connection with antenna or similar towers.

It has been common to provide small elevators or lifts in connection with towers of this type so as to provide speedy means for access to the top of the tower for servicing the antenna or other equipment at the top. These elevators are usually guided by vertically extending guide rails secured to the tower framework and with which guide rollers, carried by the car, cooperate. The elevator is suspended in the tower by means of hoist mechanism including a lift cable. Obviously, it would be desirable to provide a safety brake for preventing dropping of the car in case the cable breaks or the lifting force thereon is eliminated by some break-down in the hoist mechanism.

It is the main object of this invention to provide a simple and effective emergency brake associated with the guide structure of an elevator car of the type indicated which will prevent dropping of the car in case of failure of the lift cable or mechanism.

Another object of this invention is to provide an emergency brake will operate automatically to prevent dropping of the car if the lifting force is released from the car but which can also be operated manually from within the car if desirable or necessary.

Another object of this invention is to provide an emergency brake which is so designed that maximum braking effect will be obtained.

A further object of this invention is to provide an emergency brake of the type indicated which can be released from inside the car after operation.

Various other objects will be apparent.

In the accompanying drawings, one embodiment of this invention is illustrated but it is to be understood that specific details thereof may be varied without departing from the basic principles of this invention.

In the drawings:

Figure 1 is a side elevational view illustrating a tower structure having an elevator mounted thereon with the emergency brake of this invention associated therewith.

Figure 2 is a horizontal sectional view taken along line 2—2 of Figure 1.

Figure 3 is an enlarged side elevational view of the elevator car showing the emergency brake associated therewith.

Figure 4 is a vertical sectional view taken along line 4—4 of Figure 3.

Figure 5 is a vertical sectional view taken along line 5—5 of Figure 4.

Figure 6 is a vertical sectional view taken along line 6—6 of Figure 4.

Figure 7 is a horizontal sectional view taken along line 7—7 of Figure 5 showing the brake released.

Figure 8 is a view similar to Figure 7 but showing the brake applied.

Figure 9 is an enlarged detail in vertical section showing the brake roller and associated parts.

Figure 10 is an isometric view showing the brake roller and associated parts.

Figure 11 is a horizontal sectional view taken along line 11—11 of Figure 3.

Figure 12 is a horizontal sectional view taken along line 12—12 of Figure 5 showing the brake applied.

Figure 13 is a view similar to Figure 12 but showing how the brake can be released from within the car.

Figure 14 is a sectional view taken along line 14—14 of Figure 12.

With reference to the drawings, in Figure 1 there is illustrated a tower of the open framework type which includes the vertically extending supporting rails or posts **10** and the horizontally extending bars or braces **11** which are suitably secured to the rails **10**. As indicated in Figure 2, the tower is of triangular form in horizontal section. The tower is supported on a base **12** and is held upright by the guy-wires **13**. It is to be understood, however, that this invention is applicable to towers of other types and that the one shown is for illustrative purposes only.

At two sides of the tower, there are provided the elevator car guide rails **15** which are attached to the associated horizontally disposed supports **11***a* that are secured to the cross members **11**. The guide rails **15** will usually extend the full height of the tower. Carried by the spaced parallel guide rails **15** is an elevator car **16** of a suitable type having a forward open side for access. The car carries upper and lower sets of rollers **17** and **18**, respectively, at each side for cooperation with the associated guide rail **15**. The rollers and associated guide rails are preferably of the type disclosed in the copending application of Robert A. Vaughan, directed to Elevator Car Guiding System, Serial No. 711,303, filed January 28, 1958.

The elevator car **16** is raised and lowered by means of a cable sheaving system operated by means of a hoist unit **20** provided on the base **12**. This system includes the lift cable **21** attached to the top of the car and the cable tensioning system including the cable **22** attached to the bottom of the car and associated with counterbalance weights **23** mounted for vertical movement at the lower end of the tower.

The present invention relates to an emergency brake mechanism **25** associated with the car **16** adjacent the upper end thereof and adapted to cooperate with the guide rails **15**.

The brake mechanism includes a brake unit disposed at each side of the elevator car **16**. Each unit comprises a brake roller **26** and a spaced brake shoe **27** which will be on opposite sides of the associated guide rail **15** which is illustrated as being a cylindrical rod. The shoe **27** is fixed to the side **16***a* of the car and provides a vertically disposed flange **27***a* which faces towards the guide **15** to serve as an elongated flat frictional surface for contact with the guide **15**.

The brake roller **26** (Figure 10) is provided with a knurled friction surface for engaging the guide rail **15** at the side opposite the fixed shoe **27** and is carried by a transversely extending cam follower pin **28** which projects in both directions into the cam slots **29** formed in the vertically disposed cam flanges **30** which are formed in spaced parallel relationship on a supporting bracket **30***a* which is rigidly secured to the side wall **16***a* of the elevator car on its outer side. Mounted on the bracket **30***a* at the level of the straight shoe **27** (Figure 5) and directly opposite it is a wedge shoe **30***b* which has a

roller engaging outer surface 30*c* that is inclined outwardly towards its upper end. Thus, the shoe 30*b* is wedge-shaped in a vertical plane, as indicated by a comparison of Figures 7 and 12, but it is also wedge-shaped in a horizontal plane, as shown by these figures. It will be noted that the inner surface 30*d* of the shoe 30*b* is inclined so that the shoe is narrower towards its inner side and that the contacting surface of the bracket 30*a* is reversely angled. The shoe 30*b* is provided with a horizontal lug 30*e*, intermediate its height, which extends inwardly through an opening 16*c* in the wall 16*a* of the car 16. The wedge shoe 30*b* is normally held with the lug 30*e* projecting into the car 16 by means of the bolts 30*f* which project through the wall 16*a* and which carry lock nuts 30*g* that can be loosened from within the car 16.

The brake roller 26 is disposed within the lower end of a yoke 31 which is disposed between the cam flanges 30 and which is pivoted at its lower end to the cam follower pin 28 and at its upper end to a second cam follower pin 32. This pin 32 also projects in both directions and operates in the slots 29 of the flanges 30. Pivoted to the upper end of the yoke 31 at the pin 32 is the lower end of a link 33. This link is pivoted at its upper end by a pivot 34 to a toggle lever 35. The lever 35 is pivoted intermediate its ends by a pivot 36 to an upstanding lug 37 carried by the top wall 16*b* of the car 16. It will be noted that the pivot pin 34 is disposed at right angles to the pivot provided by the pin 32 and that the link 33 projects upwardly above the cam shoes 30 with the pin 28 in the lowermost ends of the slots 29.

Normally, the brake roller 26 will be in the position shown in Figures 7 and 10, where it will be swung away from the guide rail 15, due to the fact that each cam slot 29 is provided with the angled lower end portion 29 which angles outwardly away from the guide rail 15 and is disposed in spaced parallel relationship to the angled surface 30*c* of the wedge shoe 30*b* with which the roller engages. In this position of the roller, the roller itself and the stationary brake shoe 27 will be spaced from the guide rail 15 as shown best in Figure 7. However, if an upward pull is exerted by the link 33 on the roller-carrying yoke 31, the pin 28 will be pulled upwardly in the angled portions 38 of the slots 29 and the pin 32 will be pulled upwardly into the connecting straight upper portions 39 of the slots 29. This will result in positively moving the roller 26 along the inclined shoe surface 30*c* so as to wedge it into engagement with the guide 15 to grip the guide between it and the associated fixed shoe 27, as shown in Figure 8. The slot portions 38 and the shoe surface 30*c* will be of sufficient length and angled inwardly towards the axis of the rail 15 to provide sufficient overrun to insure that the rail 15 will be gripped between the brake roller 26 and the fixed brake shoe 27 substantially before the pin 28 reaches the upper ends of the angled portions 38 of the slots and the roller 26 reaches the upper extent of the shoe surface 30*c*. Thus, an override section of each cam slot and shoe surface is provided to insure adequate engagement of the roller 26 with the guide 15. The upper straight portion 39 of the slots provide for vertical travel of the link 33 and with the brake released, the pin 32 is at the junction of the straight portions 39 with the angled portions 38 of the slots 29, as shown in Figure 10. The straight slot portions 39 are of sufficient height that the pin 32 will never contact with the upper ends thereof and, therefore, will not interfere with firm application of brake roller 26 to the guide rail 15.

The two levers 35 form part of a toggle mechanism for applying the brake units at each side of the car 16. It will be noted from Figures 4 and 6 that the inner end of each of these levers 35 is pivoted at 40 to the outer end of a crosshead 41. This crosshead 41 is fixed to a depending operating rod 41*a* which is mounted for slidable vertical movement in a sleeve 41*b* secured in the top wall. The rod 41*a* extends down into the elevator car and is provided with a hand grip 41*c*. The inner ends of the levers 35 are normally pulled upwardly by means of the tension springs 42 which have their lower ends connected thereto and their upper ends connected to angles 42*a* which are supported by the housing 16*c* mounted on the upper end of the car 16. These springs normally pull the crosshead 41 upwardly into contact with the lower end of a rod 43 and keep the rollers 26 in their lower or released positions.

The rod 43 is mounted for slidable vertical movement in a sleeve 43*a* which is positioned on the top wall 16*d* of the housing 16*c*. The upper end of this rod 43 is provided with a clevis connection 43*b* (Figure 6) for connecting the car to the suspending lift cable 21.

Upward movement of the rod 43 is resisted by means of a compression spring 45 disposed between the lower end of the sleeve 43*a* and an adjustable stop angle bracket 46 which is associated with a nut 47 threaded on the lower end of the rod 43. The upstanding flange of the angle 46 will contact with a fixed stop member 50 to limit compression of the spring 45. The spring 45 is compressed by the pull exerted by the lift cable 21 on the upper end of the rod 43 and, therefore, normally the lift force will raise the lower end of the rod 43 to such an extent that the inner ends of the toggle levers 35 will be swung upwardly sufficiently by the springs 42 so as to move their outer ends downwardly and thereby move the brake rollers 26 away from the guide rails 15. The brake mechanism can be manually applied by means of the handle 41*c* on the lower end of the rod 41*a*. Thus, a person in the car can apply the brake units if sufficient pull is exerted on the handle 41*c* to overcome the force exerted by the springs 42.

It will be apparent that during normal operation of the car 16 there will be an upward pull exerted by the lift cable 21. This compresses the spring 45 and releases the brake rollers 26 (Figure 7) from the associated guides 15. However, if the upward pull on the rod 42 is released by breaking of the cable 21 or for any other reason, the compressed spring 45 will expand, thereby applying the brake units by positively moving the rollers 26 into engagement with the rails 15 (Figure 8) and gripping the rails between the rollers and the friction surfaces 27*a* of the fixed shoes 27. The weight of the car 16, and any passenger carried thereby, will aid in the application of the brakes, since this weight will tend to move the pin 28 further upwardly and inwardly in the cam slots 29 and the roller 26 further upwardly along shoe surface 30*c* thereby increasing the braking pressure exerted on the guide rail 15 by the roller 26 and the shoe 27. The expanding force of the spring 45 is greater than the combined tension forces exerted by the springs 42 so that the force of the springs 42 will be readily overcome to apply the brake units. However, as the spring 45 is compressed, the springs 42 will release the brake units. If it is desired to apply the brake units manually while the cable 21 is still exerting its lifting action, it is merely necessary to exert a downward pull on the handle 41*c* to overcome the force of the springs 42. Thus, with this brake mechanism it will automatically function as a safety factor to prevent dropping of the car 16 but the brake units can also be applied manually from within the car.

Another important feature of this invention is that the brake can be released, after once being applied, from inside the car. This can be accomplished in the manner evident from a comparison of Figure 12 with Figure 13. The nuts 30*g* of each shoe 30*b* are retracted on the bolts 30*f* from within the car and the lug 30*e* is pounded outwardly. This will move the shoe 30*b* bodily outwardly and, due to its wedge shape, will permit movement of the roller 26 away from the guide 15. Thus, the rollers 26 can be released from within the car to permit lowering of the car, after the lift force is restored, without climbing outside the car.

It will be apparent from the above that the brake unit comprises a first spring unit for normally releasing the brake, as long as there is a lift force applied to the car, and a second spring unit for applying the brake whenever the lift force is not present. The first spring unit for normally releasing the brake unit is controlled by the second spring unit which is compressed by the lift force. This second spring unit normally permits the first spring unit to release the brakes but when the lift force is eliminated and it expands, the second spring unit overcomes the first spring unit to apply the brake. When the lift force is restored the brake can be released temporarily from within the car.

According to the provisions of the patent statutes, the principles of this invention have been explained and have been illustrated and described in what is now considered to represent the best embodiment. However, it is to be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

Having thus described this invention, what is claimed is:

1. In combination with an elevator car movable vertically along a guide rail, a brake roller carried by the car for engaging the guide rail, means for moving the roller into engagement with the guide rail, said means comprising a wedge shoe carried by the car on the exterior of one of the vertical walls thereof, said shoe being mounted on a support attached to the wall of the car, said shoe having an angled surface cooperating with a reversely angled surface on said support, said angled surfaces extending outwardly from said car, and means operable from within the car for moving said shoe relative to said support.

2. In combination with an elevator car movable along a guide rail, lift means connected to said car, and an emergency brake unit operable when said lift means fails, said unit comprising a brake member movably carried by the car adjacent the guide rail, first means for normally holding said brake member away from said guide rail, second means operable by the lift means for controlling said first means to permit it to hold said brake member away from said guide rail as long as said lift means functions, and means operable from within the car for releasing the brake member when it is once applied.

3. In combination with an elevator car movable along a guide rail, lift means connected to said car, and an emergency brake unit operable when said lift means fails, said brake unit comprising a brake roller movably mounted on the car and disposed on one side of the guide rail and a brake shoe mounted on the car in fixed position and disposed on the opposite side of the guide rail, the brake roller and the brake shoe cooperating to grip the guide rail therebetween when the lift force is released, an actuating lever connected to said brake roller, a first spring unit acting on the lever for normally holding said brake roller away from said guide rail, a second spring unit for applying said brake unit connected to said lift means so that it will be inoperative until the lift means fails, said second spring unit opposing said first unit when said lift means fails to move said brake roller into contact with said guide rail and comprising a movable stop for engaging said actuating lever to normally permit it to move to brake-releasing position and a spring connected to said lift means for moving said stop means into brake-applying position when the lift means fails, a cam structure for positively moving the roller toward and away from the guide rail upon movement of the roller by said actuating lever, comprising a roller-engaging wedge shoe opposite the fixed shoe and inclined inwardly and upwardly toward said fixed shoe, said wedge shoe being wedge-shaped in a horizontal direction as well as a vertical direction, said wedge shoe having a releasing lug extending into the car, said wedge shoe having its smaller end inwardly and engaging a complemental angled supporting surface on the car.

4. In combination with an elevator car movable along a guide rail, lift means connected to said car, and an emergency brake unit operable when said lift means fails, said brake unit comprising a brake roller movably mounted on the car and disposed on one side of the guide rail and a brake shoe mounted on the car in fixed position and disposed on the opposite side of the guide rail, the brake roller and the brake shoe cooperating to grip the guide rail therebetween when the lift force is released, an actuating lever connected to said brake roller, a first spring unit acting on the lever for normally holding said brake roller away from said guide rail, a second spring unit for applying said brake unit connected to said lift means so that it will be inoperative until the lift means fails, said second spring unit opposing said first unit when said lift means fails to move said brake roller into contact with said guide rail and comprising a movable stop for engaging said actuating lever to normally permit it to move to brake-releasing position and a spring connected to said lift means for moving said stop means into brake-applying position when the lift means fails, a cam structure for positively moving the roller toward and away from the guide rail upon movement of the roller by said actuating lever comprising a roller-engaging wedge shoe opposite the fixed shoe and inclined inwardly and upwardly toward said fixed shoe, said wedge shoe being mounted on the car for release from within the car.

5. The combination of claim 4 in which the second spring unit comprises a compressible spring mounted on a lift rod forming a part of said lift means and compressible by the lift force applied to said rod but expansible upon release thereof to move said roller so as to cause it to positively engage said guide rail.

6. The combination of claim 5 in which the car is guided by guide rails on opposite sides thereof and brake units are provided at both sides of the car for cooperating with said guides, said lift rod being connected to each of said brake units by said actuating lever, the two levers being mounted to provide toggle levers.

7. The combination of claim 6 in which the first unit includes springs connected to the levers for releasing the brake units upon expanding of said compressible spring.

8. The combination of claim 4 in which each brake roller is carried by a pin operating in cam slots formed in said cam structure, said cam slots and said wedge brake shoe being angled relative to the associated guide rail so that the weight of the car will move the brake roller into engagement with said guide rail, said roller being connected to said brake actuating lever for movement thereby to move said pin in said cam slots and move the roller along said wedge brake shoe.

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