Nov. 22, 1949 L. F. JASEPH 2,489,140

ELEVATOR GUIDE DEVICE

Filed Nov. 30, 1946 2 Sheets-Sheet 1

Fig. 8.

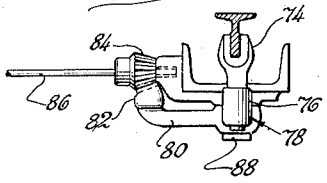


Fig. 1.

Fig. 4.

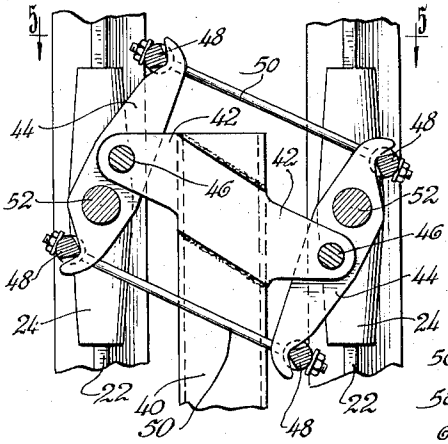


Fig. 6.

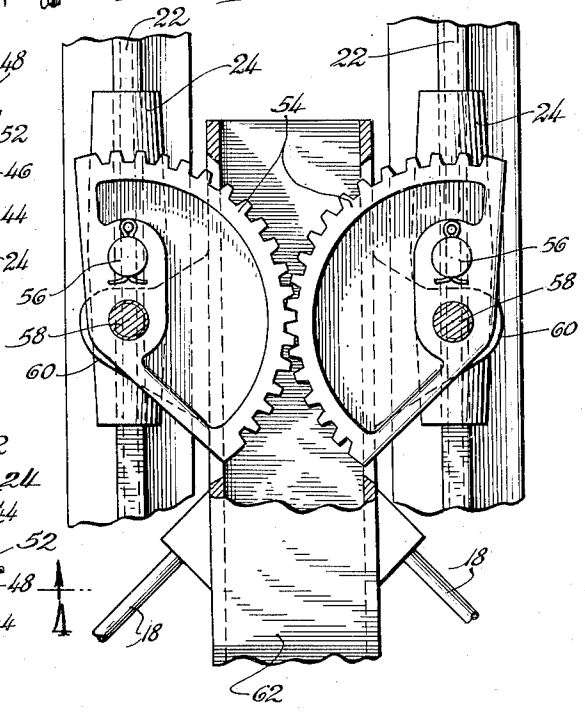
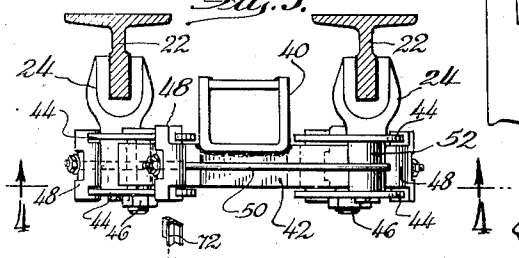


Fig. 5.



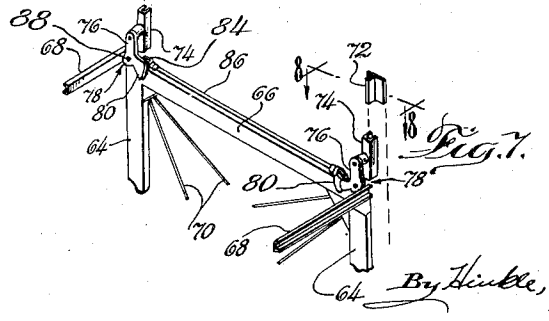


Fig. 7.

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Fig. 2.

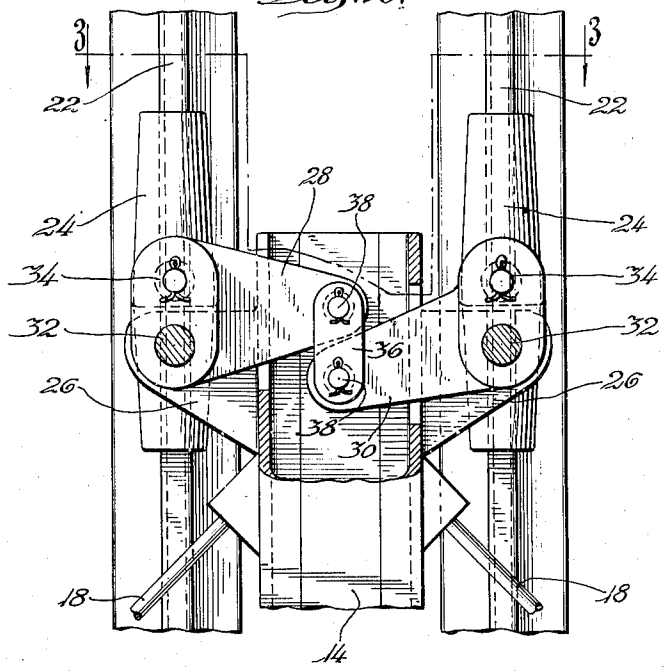
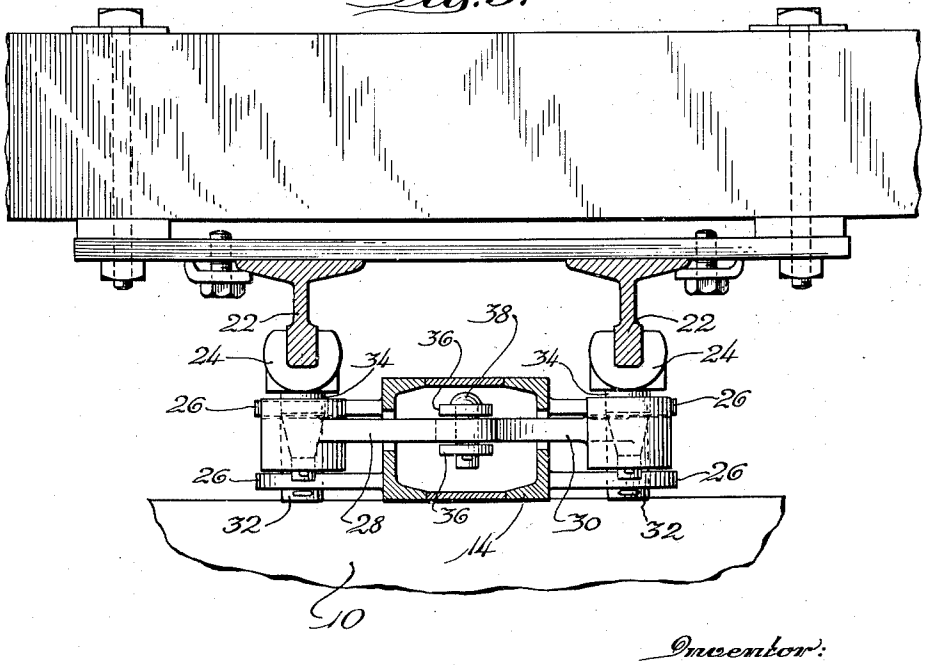


Fig. 3.



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ELEVATOR GUIDE DEVICE

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Application November 30, 1946, Serial No. 713,373

10 Claims. (Cl. 187—87)

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This invention relates to elevator guides and particularly to the guide means carried by the elevator car itself for engagement with guide rails at the sides of the car. The invention has been developed for application to elevators designed for loads too large and with platforms too long to be safely guided by a single pair of rails of the heaviest standard weight. Heretofore in such cases two pairs of rails have been employed to supply adequate support to such elevators but, when both the elevator structure and the means supporting the guide rails were made rigid, it was found practically impossible to distribute the pressure of the guide shoes on the rails equally between the two pairs. Furthermore it was found difficult to align the two rails of each pair accurately enough so that the car would travel freely even without load. The present invention provides equalizing means which permits relative motion between the two shoes engaging the two rails of the pair at each side of the car so that even when the rails are not quite parallel the shoes will not bind and the bearing pressure will be distributed equally between them.

It is, therefore, an object of this invention to provide new and improved guide means for an elevator car designed to cooperate with a pair of guide rails disposed in substantially parallel relation at one side of the car and adapted to distribute the bearing pressure equally between the two rails.

Another object of the invention is to provide a pair of elevator guide shoes for engagement respectively with a pair of guide rails disposed in substantially parallel relation and means interconnecting the guide shoes for simultaneous movement in opposite directions to compensate for any inaccuracy in the spacing of the guide rails.

More specifically the invention provides an elevator guide device for use with a pair of guide rails disposed in substantially parallel relation, the guide device including a pair of guide shoes to engage the rails respectively and lever elements to which the guide shoes are attached and which are interconnected for simultaneous movement in opposite direction about their respective fulcrums so as to equalize the bearing pressure of the guide shoes on the rails, notwithstanding slight inaccuracies in the spacing of the rails.

Other objects and advantages of the invention will appear from the following description taken in connection with the drawings, in which:

Fig. 1 is a vertical sectional view of an elevator car showing a pair of guide rails at one side of the

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car and guide devices engaging said rails in accordance with this invention;

Fig. 2 is a detail elevation partly in section on a larger scale showing one of the guide devices;

Fig. 3 is a horizontal sectional view taken as indicated at line 3—3 on Fig. 2;

Fig. 4 is a detail elevation partly in section showing a modified form of guide device embodying the invention;

Fig. 5 is a transverse section taken as indicated at line 5—5 on Fig. 4;

Fig. 6 is a detail elevation showing another modified form of the invention;

Fig. 7 is a fragmentary perspective view showing portions of an elevator car frame and guide rails therefor, and illustrating a further modification of the invention; and

Fig. 8 is a horizontal detail section taken as indicated at line 8—8 on Fig. 7.

Fig. 1 illustrates a typical elevator car construction in which the platform 10 is supported by a sling consisting of a cross beam 12 attached to vertically extending side members or stiles 14 which are connected at their upper ends to a cross head or beam 16. The platform is braced and steadied by diagonal tie rods 18 and it will be understood that such an elevator car may be either suspended and operated by cables 20, as shown in Fig. 1, or may be carried upon a hydraulic plunger extending downwardly from the cross beam 12. The parallel guide rails 22, 22 of T-shaped cross section are mounted at each side of the elevator car, and near the upper and lower ends of the stiles 14 the car is provided with guide devices to engage these rails.

As shown more clearly in Figs. 2 and 3, each guide device includes a pair of grooved shoes 24 which respectively engage the rails 22 by embracing them as shown in Fig. 3 so that said shoes slidably follow the contour of the rails as the elevator travels up or down. The stile 14 is provided with bracket means shown in the form of ears 26 extending from opposite sides of the stile in pairs spaced apart with lever elements 28 and 30 fulcrumed between them on pivots 32. The levers 28 and 30 are in the nature of bell cranks and, as shown, the shorter arm of each of said levers is pivotally engaged with a trunnion 34 extending from one of the shoes 24. The longer arms of the levers are connected by a pair of similar links 36 and pivots 38.

With this arrangement it will be seen that if at any point either of the guide rails is deflected toward or from the other rail so as to cause a

slight variation in the spacing between them, the guide shoe **24**, in following the deflection of the rail, can move freely toward or from the other guide shoe without cramping or binding of the guide shoes against the rails. The movement of one shoe toward the other, causing one of the lever arms, **28** or **30**, to be rocked about its fulcrum **32**, will be accompanied by an equal and opposite movement of the other lever about its fulcrum. If at this point the other guide rail is perfectly straight, the final effect of the deflection of the one guide rail will be a shifting of the stile **14** of the elevator car by half the amount of the deflection of the guide rail. This slight lateral movement of the car during its vertical travel is unimportant; the primary advantage of the floating arrangement of the guide shoes with respect to the car is the equal division of bearing pressure against the two guide rails at all times and the prevention of tightness or binding which would result if the shoes were spaced apart by a fixed distance and could not yield to slight variations in the spacing of the rails.

Figures 4 and 5 present a variation of the equalizing mechanism in which the stile member **40** is provided with lugs or ears **42** on which the levers **44** are fulcrummed by pivots **46**. Each of the levers **44** consists of two members, as shown in Fig. 5, with notched ends and knife-edged blocks **48** engaged in their notches. Tie links in the form of rods **50** connect the blocks **48** so that the levers **44** and links **50** form a parallelogram which permits the levers **44** to swing about their fulcrums **46** but requires them to move together and by equal angular amounts.

The guide rails **22** are similar to those previously described and the shoes **24** may be substantially like those of Figs. 2 and 3. At the middle of its length each guide shoe is pivotally attached to one of the levers **44** by means of a trunnion **52**; but, as seen in Fig. 4, one of the trunnions is disposed above the fulcrum **46** of the lever to which it is connected while the other trunnion **52** is disposed below the fulcrum **46** of the other lever. Thus, any lateral movement of one of the guide shoes **24**, due to inaccurate alignment of its guide rail **22**, will result in a slight movement of its connected lever **44** about its fulcrum **46**, and a corresponding change in the distance between the trunnions **52** of the two shoes **24**. The shoes thus accommodate themselves to the variation in spacing between the guide rails **22**, and the bearing pressures are equally distributed between them.

The modification shown in Fig. 6 employs gear segments **54** as the lever elements by which the guide shoes **24** are interconnected. The trunnion **56** of each guide shoe pivotally connects the shoe with one of these lever elements **54** and said elements are fulcrummed on pivots **58** supported by ears or lugs **60** extending from the stile member **62** of the elevator car frame. Lateral movement of one of the guide shoes **24** caused by a misalignment of its guide rail **22** will rock the connected segment or lever element **54** slightly about its fulcrum pivot **58**, thus causing the other segment **54** to be rocked in the opposite direction. The spacing between the guide shoes **24** is thus varied to correspond to the variation in spacing of the rails **22** and the car moves smoothly along the rails without binding or undue friction, while the bearing pressure is divided equally between the two guide shoes **24**.

The fragmentary structure shown in Fig. 7 may be understood as a part of a relatively large elevator car having vertical stiles **64** disposed at or

adjacent the four corners of the car platform—only two of these stiles being shown in the view. They are connected at the upper ends by a beam **66**, and cross beams **68** extend from the stiles at one side of the car to those at the other side. Diagonal tie rods **70** provide additional bracing for this type of frame. With this arrangement the two parallel guide rails for one side of the car are spaced apart more widely than in the forms heretofore described, said rails **72, 72** being located respectively adjacent the stiles **64, 64** of the car frame. Each of the corresponding guide shoes **74** is pivotally attached to the upstanding arm **76** of a bell crank lever **78** while the shorter arm of the lever is in the form of a gear segment **80** having teeth **82**, as shown in Fig. 8, designed to mesh with the teeth of a bevel gear pinion **84**. The pinion **84** which is thus connected to one of the levers **78**, and the pinion **84** which meshes with the segmental portion of the other lever **78** are both rigidly secured to a common shaft **86** journalled on the beam **66** so that the movement of one lever arm **76** about its fulcrum pivot **88** is accompanied by an equal and opposite movement of the arm **76** of the other lever **78**. The guide shoes **74** are thus permitted to accommodate themselves to irregularities in the spacing of the guide rails **72** to prevent undue friction or binding and to permit equal distribution of the bearing pressures against the two rails **72, 72**.

It will be recognized that in all the forms of the invention above described, the structure shown is that associated with only one side of the elevator, and that this structure will be duplicated at the opposite side. In each of the modifications the guide shoes for the two parallel guide rails are mounted upon "lever elements," which term is intended to include the segmental gear **54** of Fig. 6, and in each form of the invention the lever elements are interconnected so as to cause simultaneous movement of the guide shoes laterally of the rails and in opposite directions. Each of the described arrangements permits the connected member of the car frame to be carried midway between the two guide shoes at all times while the spacing between the shoes may vary as they travel along the guide rails, if the rails are not strictly parallel to each other.

While there are shown and described herein several structures embodying the invention, it may be understood that the invention is not limited thereto or thereby but embraces all modifications, variations and equivalents which may come within the scope of the appended claims.

I claim:

1. An elevator guide device for use with and operating between a single pair of guide rails disposed in substantially parallel relation at one side of an elevator car, said device comprising a pair of guide shoes formed to engage and follow said rails respectively, a pair of lever elements fulcrumed on the car at axes respectively adjacent the two guide rails, pivot means connecting one shoe to one arm of one lever element, pivot means connecting the other shoe to one arm of the other lever element, and means interconnecting said lever elements for simultaneous movement in opposite directions about their respective fulcrums.

2. An elevator guide device for use with and operating between a single pair of guide rails disposed in substantially parallel relation at one side of an elevator car, said device comprising a pair of guide shoes formed to engage and follow said rails respectively, a pair of lever elements

fulcrumed on the car at axes respectively adjacent the two guide rails, pivot means connecting one shoe to one arm of one lever element, pivot means connecting the other shoe to one arm of the other lever element, and means interconnecting said lever elements proportioned to insure equal and opposite simultaneous movement of said elements about their respective fulcrums.

3. An elevator guide device for use with and operating between a single pair of guide rails disposed in substantially parallel relation at one side of an elevator car, said device comprising a pair of guide shoes formed to engage and follow said rails respectively, a pair of lever elements fulcrumed on the car at axes respectively adjacent the two guide rails, pivot means connecting one shoe to one arm of one lever element, pivot means connecting the other shoe to one arm of the other lever element, and means mechanically interconnecting said lever elements and adapted to vary the pressure of one guide shoe against its rail in response to variations in the pressure of the other guide shoe against the rail which it engages.

4. An elevator guide device for use with and operating between a single pair of guide rails disposed in substantially parallel relation at one side of an elevator car, said device comprising a pair of guide shoes formed to engage and follow said rails respectively, and means mechanically interconnecting said guide shoes for equal and opposite movement simultaneously and transversely of the guide rails, whereby the lateral pressure of the rails against the shoes is equalized independently of variations in the spacing of the rails.

5. An elevator guide device for use with and operating between a single pair of guide rails disposed in substantially parallel relation at one side of an elevator car, said device comprising a pair of guide shoes formed to engage and follow said rails respectively, bracket means attached rigidly to the car, a pair of levers fulcrumed on said bracket means at axes respectively adjacent the two guide rails, pivot means connecting one shoe to one arm of one lever, pivot means connecting the other shoe to one arm of the other lever, and a link connecting the other arms of said levers together for simultaneous movement about their fulcrums.

6. An elevator guide device for use with and operating between a single pair of guide rails disposed in substantially parallel relation at one side of an elevator car, said device comprising a pair of guide shoes formed to engage and follow said rails respectively, a pair of similar levers fulcrumed on the car at axes respectively adjacent the two guide rails, pivot means connecting one shoe to one arm of one lever, pivot means connecting the other shoe to one arm of the other lever, said pivotal connections being at equal distances from the respective lever fulcrums, said levers having additional arms of equal length, and means connecting said other arms together for equal and opposite simultaneous movement about their fulcrums to distribute the pressure of the guide shoes equally between the two rails.

7. An elevator guide device for use with and operating between a single pair of guide rails disposed in substantially parallel relation at one side of an elevator car, said device comprising a pair of guide shoes formed to engage and follow said rails respectively, a pair of levers fulcrumed on the car at axes respectively adjacent the two guide rails, link means connecting said levers and maintaining them in substantially parallel relation to each other, pivot means connecting one of the guide shoes to one of said levers above its fulcrum, and pivot means connecting the other guide shoe to the other lever below its fulcrum to cause said shoes to move simultaneously in opposite directions.

8. An elevator guide device for use with and operating between a single pair of guide rails disposed in substantially parallel relation at one side of an elevator car, said device comprising a pair of guide shoes formed to engage and follow said rails respectively, a pair of levers fulcrumed on the car at axes respectively adjacent the two guide rails, pivot means connecting said guide shoes to said levers respectively, and toothed gearing by which said levers are connected for simultaneous movement about their fulcrums, such movement being adapted to cause movement of the guide shoes in directions to vary the spacing between them.

9. An elevator guide device for use with and operating between a single pair of guide rails disposed in substantially parallel relation at one side of an elevator car, said device comprising a pair of guide shoes formed to engage and follow said rails respectively, a pair of levers fulcrumed on the car at axes respectively adjacent the two guide rails, each lever having an arm extending in a generally vertical direction from its fulcrum, and pivot means connecting the guide shoes to said lever arms respectively, said levers having portions extending toward each other with segmental gear teeth on said portions operatively connecting said levers for simultaneous movement about their fulcrums in opposite directions to vary the spacing between the guide shoes.

10. An elevator guide device for use with and operating between a single pair of guide rails disposed in substantially parallel relation at one side of an elevator car, said device comprising a pair of guide shoes formed to engage and follow said rails respectively, a pair of levers fulcrumed on the car at axes respectively adjacent the two guide rails, each lever having an arm extending in a generally vertical direction from its fulcrum, and pivot means connecting the guide shoes to said lever arms respectively, said levers having mutually meshing segmental gear teeth which interconnect them for simultaneous movement about their fulcrums in opposite directions to distribute the pressure of the guide shoes between the two rails.

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