April 30, 1963 W. H. BRUNS 3,087,583

EXTENDED ROLLER GUIDE FOR ELEVATORS

Filed Oct. 7, 1959

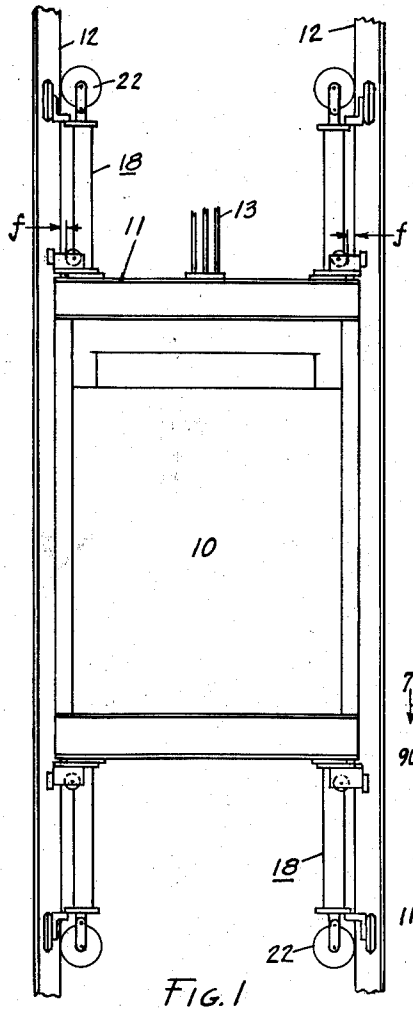


FIG. 1

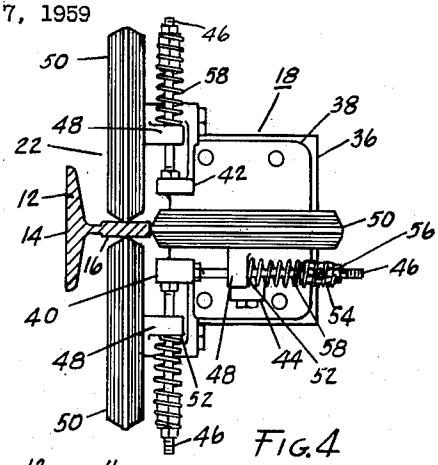


FIG. 4

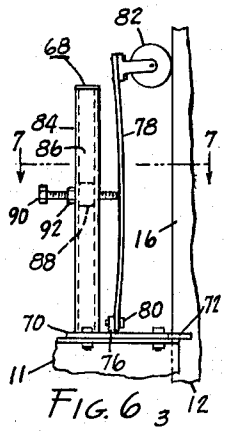
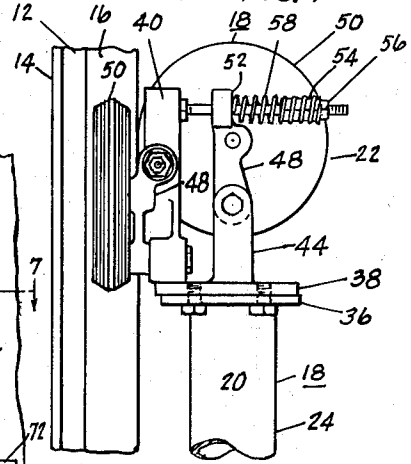


FIG. 6



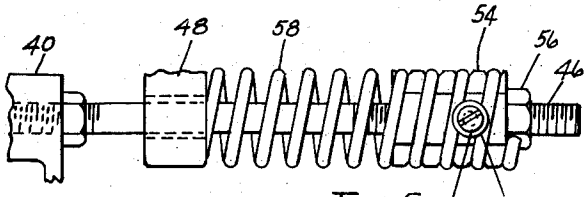


FIG. 5

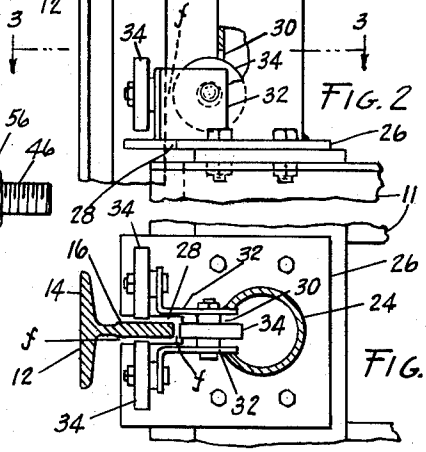


FIG. 2

FIG. 3

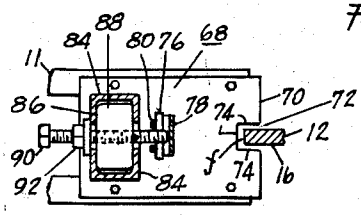


FIG. 7

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EXTENDED ROLLER GUIDE FOR ELEVATORS

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This invention relates to guides for bodies movable in a vertical path and more specifically relates to resilient guides for elevator cars operating in hoistways.

Elevator cars usually operate in hoistways in which on two opposite sides thereof there are attached metallic T-shaped guide rails. These cooperate with guides that are affixed to the sides of the car near its top and bottom extremities to control the lateral movement of and to guide the car in its passage through the hoistway. When these guides encounter a misalignment of the guide rails, which misalignment may be a discontinuity between adjacent sections of rail or a bowed or twisted section of one or more rail sections, the car is forced from its intended path with subsequent horizontal forces being exerted on its load or passengers. The magnitude of these forces is a function of the speed of the car and the degree of misalignment of the rails. Thus the effect of misalignment of the rails is generally much more pronounced in relatively high speed elevators than in those of lower speed.

The guides may be either of the sliding shoe type or the rolling wheel type, the latter being termed roller guides. In this latter type, the rolling wheels are resiliently mounted and cooperate with the three guiding surfaces of each rail to constrain the car in its travel path. Guides of this general type are shown in Patents #1,854,976 to F. Brady and #2,100,169 to Clifford Norton. In these types of guides, the wheels are mounted on axles which permit the rim of the wheel to run on the guide rail surface and the wheel assembly is resiliently biased into contact with the guide rail surface by one or more springs. Inasmuch as the clearances between the guide rail surface and adjacent portions of the elevator car are not unlimited, there is associated with each wheel a stop or stud which limits the amount the wheel may be pushed back as the car tends to move laterally.

In addition to the rollers or wheels, the stops and the resilient mountings, these roller guides include a pedestal or standard by which the entire guide assembly is rigidly affixed to the car assembly. Generally, but not necessarily always, these roller guides have been rigidly affixed to the top and bottom of the car sling near the edge of the car such that the rims of the guide wheels contact the respective surfaces of the guide rails with a force that is determined by the stiffness of the resilient spring mounting which urges the wheel forward to its position of engagement.

From what has been said heretofore, it will be evident that the degree of straightness of the guide rails contributes directly to the smoothness of the ride as the elevator car traverses its intended path. To a certain extent the straightness of these guide rails is related to the degree of care taken in their manufacture and in their subsequent handling in being affixed to the hoistway sides. Generally speaking, this care is reflected in cost; the greater the degree of care, the greater the cost of providing the rails. Within bounds, the need for providing perfectly aligned guiding rails can be reduced by using roller guides arranged according to this invention such that the effects of most if not all discontinuities in the rails are masked by the cushioning action of the roller guide.

It is, therefore, an object of this invention to improve the riding quality of elevator cars which use roller guides running on the surfaces of guide rails.

It is also an object of this invention to effect this improvement in riding quality by improving the roller guide unit and without entailing the necessary expense for effecting a corresponding improvement by care of manufacture and installation of the rails.

It is a further object of the invention to achieve these improved riding qualities in the car while at the same time tolerating somewhat greater misalignment of the guide rails than has heretofore been thought to be possible.

The invention is featured by a much larger separation between the axis of rotation of the resiliently mounted guide wheels or rollers and the point of affixing the standard or pedestal to the car or sling.

The invention is also featured by divorcing the roller guide and its associated inflexible stop, with the result that the roller guide may be displaced from its usual position to a considerably greater degree than has heretofore been possible with prior art guides.

The invention is further distinguished by the provision of means for optionally changing or optimally adjusting the constant of deformation, which will hereafter be referred to as the spring constant, of the spring which resiliently urges each wheel into contact with its conjugate rail surface. In this arrangement, changes in the spring constant can be made with or independently of changes in the pressure with which the spring biases its associated rolling wheel.

Further and additional characteristics and advantages of the invention will be gained from the following explanation of a preferred embodiment of the invention when taken in conjunction with the drawings in which:

FIGURE 1 is a schematic view of an elevator installation showing an elevator car equipped with the guiding means of the present invention;

FIGURE 2 is a partially enlarged side elevation of the upper left guide means illustrated in FIGURE 1;

FIGURE 3 is a sectional view of FIGURE 2 taken along line 3—3;

FIGURE 4 is a plan view of FIGURE 2;

FIGURE 5 is an enlargement of a guide spring assembly;

FIGURE 6 is a schematic side elevation showing another embodiment of the invention; and

FIGURE 7 is a section taken along line 7—7 of FIGURE 6.

Referring to FIGURE 1, an elevator car **10** is shown supported by a car sling **11** to which roping **13** is secured for raising and lowering the car in the hoistway. Guide rails **12** having a base **14** and stem **16** are provided on each side of the hoistway. The guide rails are T-shaped in cross section and have side surfaces and an end surface on the stem **16** for cooperation with roller guides designated as a unit by numeral **18** mounted on the upper and lower cross members of car sling **11**. As the roller guide units **18** are of identical construction, only a single guide and the operation thereof will be described in detail.

Referring to FIGURE 2, the roller guide **18** according to the preferred construction, comprises a guide stand **20** adapted to mount, as by bolting, a guide roller assembly **22**.

The guide stand **20** comprises an elongate member **24** vertically mounted on a base **26**. The guide stand is secured to the car sling **11** as by bolts through bolt holes in the base. An aperture **28** extends horizontally into the base for receiving the guide rail stem **16** (see FIGURE 3).

Referring to FIGURES 2 and 3, the elongate member **24** is provided with a vertical slot **30** to accommodate the back portion of the roller stop **34** that contacts the end guide surface of rail stem **16**. Right angle brackets **32** are secured, as by welding, to the base **26** and along the sides of slot **30** to the vertical member **24**. Roller

stops 34, one for each guide surface of guide rail stem 16, are inflexibly mounted on the brackets 22 in eccentric mountings. A roller stop extends into slot 30 and all roller stops extend into aperture 28. Each roller stop is adapted for adjustment on its eccentric mounting to the permissible float distance "*f*" (FIGURE 1) from the associated guide surface. The float distance "*f*" is the horizontal distance to which the transverse movement of the car is limited in order to prevent the adjacent parts of the car from sliding or rubbing on the guide rail surfaces.

At the top of the vertical member 24 a capital 36 is provided on which guide roller assembly 22 is mounted.

Referring to FIGURES 2 and 4, the guide roller assembly 22 comprises a base plate 38 which is secured to the capital 36, as by bolts through holes in both plates. On the base plate 38 are formed pedestals 40, 42 and 44. Pedestals 40 and 42 are adjacent the guide rail and are located on opposite sides of stem position 16 and parallel to the base 14 of guide rail 12. Pedestal 44 is to the rear of and adjacent to pedestal 40. The last mentioned two pedestals are in a line parallel to the guide rail stem 16, with pedestal 40 adjacent the guide rail. Oppositely disposed spring guide bolts 46 are horizontally mounted parallel to guide rail base 14 near the tops of pedestals 40 and 42. Pedestal 40 also mounts a spring guide bolt 46 extending towards pedestal 44 parallel to the guide rail stem 16. A rocker arm 48 is pivotally supported at its lower end by each pedestal and carries a guide roller 50 for engaging one of the guiding surfaces of the guide rail stem 16. The upper end of each rocker arm 48 terminates in a spring seat 52 which is pierced to allow the passage of spring guide bolts 46. Spring guide bolts 46 are threaded for most of their lengths and respectively engage spring adjusting nuts 54 and lock nuts 56. Springs 58, intermediate spring seats 52 and spring adjusting nuts 54, bias respective rocker arms 48 thereby bringing the rollers 50, carried by the rocker arms 48, into rolling engagement with the respective guide surfaces of guide rail stem 16.

Referring to FIGURE 5, the spring adjusting nut 54 is grooved exteriorly to engage the helices of spring 58 and is tapped to engage the threads of spring guide bolt 46. The spring adjusting nut 54 by rotation can thus be moved relative to the length of the spring 58 and of the spring guide bolt 46. A lock screw 60 and washer 62 locks the adjusting nut 54 at any point on the spring 58, and lock nut 56 locks the adjusting nut 54 at any point on the spring guide bolt 46. Changing the position of the adjusting nut 54 with respect to the length of the unstressed spring 58 changes the spring's effective length and therefore its spring constant. The spring constant is equal to the ratio of the applied load to the change in deformation or length of the spring caused by the load, provided the load does not exceed the spring's elastic limit. Changing the position of adjusting nut 54 with respect to the spring guide bolt 46, while locked by lock screw 60 and washer 62 to the spring 58, affects the pressure with which the spring, acting through rocker arm 48, biases the guide roller against the guide rail stem 16.

In actual practice, and in several tested embodiments of the invention, elongate member 24 is at least one foot in length. The exact length of this member will be subject to the structural characteristics of a given installation. In one tested embodiment, and because of the structural limitations, the elongate members 24 for the rolling guides on top of the car were each about 24" in length. Those for the bottom guides were each about 36" in length. While the length of these elongate members 24 is not necessarily critical and may vary in one installation from those in another, it is a general rule that the longer this member is made the softer may be guide spring 58 which is used; that is, the lower is the

spring constant of guide spring 58. Thus, a relatively weak or soft spring acting at the end of an elongate member 24 of a given length is equally as effective in holding the car to a predetermined path of movement as would be a relatively hard or stronger spring acting at the end of an elongate member 24 of a shorter length.

The roller stops 32 being mounted substantially adjacent to the top and bottom of car sling 11 operate to limit the transverse excursion of the car to the predetermined float distance "*f*" (FIGURE 2) but permit the springs to be compressed a greater distance than would be the case if the stops were mounted closer to the guide rollers 50. These roller stops 32 are located between their associated guide rollers 50 and the portions of the car which when at rest most closely approach the guide rails 12. Preferably, the stops are placed at or near the part of the car adjacent the door operating mechanism at the top of the car and adjacent the safety brake at the bottom of the car. As a practical matter of convenience they may be located on the top and bottom of the car sling 11, as illustrated in FIGURE 1.

In addition to the foregoing, the invention provides means for optionally adjusting the spring constant of springs 58 by positioning spring adjustment nuts 54 to increase or decrease the spring's effective length. This is in addition to the provision of means for increasing or decreasing the stress in spring 58 and consequently the pressure exerted by it in changing the position of adjusting nut 54 with respect to its guide bolt 46 while locked to the spring by bolt 60 and washer 62.

It has been determined that the energy at a guide roller that jars or shakes the car is directly proportional to the spring constant of that guide roller spring and the square of the displacements of the associated guide rail from alignment. Thus, for any given rail displacement, reducing the spring constant will reduce this energy. However, the spring must be strong enough, i.e., have a spring constant sufficiently high, ordinarily to prevent the car stops 34 from coming into contact with the guide rails. The stops 34, as stated before, mark the limit to which the car is allowed to move transversely with respect to its guide rails and this distance is designated the "float" distance "*f*" (FIGURE 1).

For maximum utility of the invention springs 58 should be adjusted for and maintained at the minimum spring constants and pressures that are sufficient to prevent the car's roller stops 34 from riding the guide rail surfaces under the usual load conditions. This may be accomplished as follows. With no load in the car, the roller stops 34 at the top and bottom of the car should be adjusted by means of their eccentric mountings to the permissible horizontal float distance "*f*." In practice the springs for the guides on the top of the car are adjusted before the springs for the guides on the bottom of the car. It should be noted that the top guide springs 58 are adjusted with the bottom guide springs 58 inoperative and that the bottom guide springs 58 are adjusted with the top springs 58 operative. However, the procedures are the same and therefore only those for adjusting the top guide springs are described.

Referring to FIGURE 5, the springs 58 are adjusted for their minimum constants and pressures, i.e., the spring adjusting nuts 54 are locked at the ends of the spring guide bolts 46 and at the ends of the springs 58. An eccentric load sufficient to bring the roller stops 34 hard against the guide rails 12 is introduced first on one side of the car and then on the other. The pressures of the spring 58 are increased if necessary to keep their respective associated and opposed guide rollers 50 in contact wtih the guide rail 12 for the entire length of travel of the car in its hoistway. The procedure is repeated with the eccentric load in the front of the car and then in the rear in order to adjust the pressures of the remaining opposing top springs for keeping their respective guide rollers 50 in contact with the guide rail surfaces. In each case spring

pressures are increased by rotating on guide bolts **46** the respective spring adjusting nut **54** while locked to spring **58** by means of lock screw **60** and washer **62**. Spring adjusting nut **54** is locked in position on guide bolt **46** by means of lock nut **56**. The eccentric load sufficient to bring the roller stops hard against the guide rails is now replaced by an expected eccentric load which is introduced first on one side and then on the other side of the car. If the car rides its stops **34** on one side only, the opposing springs **58** may be strong enough, i.e., the constant sufficiently high, but the spring pressure must be increased on the stop riding side of the car **10** until the car rides just clear of the stops **34** on that side. The load is then shifted to the other side of the car and if the car rides just clear of its associated stop **34** on that side, the adjustments for these springs are completed. If the car does not clear the stop **34**, then the spring constant may be increased or if the car more than rides just clear, the spring constants may be decreased. The constant of a spring **58** is changed by rotating the associated spring adjusting nut **54** with respect to the spring **58**, that is rotating it with the lock screw **60** and the lock washer **62** loose and lock nut **56** unengaged. The spring adjusting nut **54** under these circumstances moves along the helices of the spring **58** and adds or subtracts turns to the effective length of the spring **58**, depending on the direction of rotation. The spring constant is decreased when turns are added and increased when turns are subtracted from the effective length of the spring. Constants are corrected, either added or subtracted, and pressure is adjusted until the car **10** travels just clear of the stops **34** with the expected eccentric load on one side then on the other side of the car. After any change of spring constant the car **10** is deflected to its associated opposing stops **34** and spring pressure adjusted to keep the associated rollers **50** in contact with their respective guide rail surfaces on guide rail stem **16**.

If the car **10** rides the stops **34** on both sides, the associated springs **58** are too weak and their constants are increased by moving their adjusting nuts **54** nearer the middle of the unstressed springs **58** and resetting the spring pressures as before. This is done as previously explained and the spring constants and pressures are readjusted until the car **10** rides clear of the stops **34** on both sides of the car **10** with the expected eccentric load on one side and then on the other.

This procedure is repeated with the expected eccentric load in the front and then in the back of the car to determine and set the spring constants and pressures of the springs for the rollers engaging the side surfaces of the guide rail stem **16**.

The top guide springs **58** are now adjusted to minimum spring constant and pressure and a minimum amount of energy is available to shake or jar the car as its guides travel over the misaligned guide rails. The bottom guide springs **58** are adjusted in the same manner to complete the adjustment for the car.

FIGURES 6 and 7 illustrate a portion of another embodiment of the invention. The guide stand **68** as a whole comprises a base **70** which bolts to the car sling **11**. The base **70** has a slot **72** to receive the guiding surfaces of the guide rail stem **16**. The sides and end of slot **72** act as stops **74**, said sides and end being the allowable float distance "*f*" from the guiding surfaces. The pedestal **76** on the base **70** is adjacent the slot **72** and in the same vertical plane as the guide rail stem **16** and slot **72**. The flexible upright member **78** is fastened to the pedestal **76** as by bolts **80**. The guide roller **82** is secured to the free end of the flexible member **78** and is adapted to engage rotatively one surface of the guide rail stem **16**. Two vertical channel members **84** are welded to the base **70** adjacent pedestal **76** which is intermediate the channel members **84** and the slot **72**. The channel members **84** are symmetrically arranged to form a partial enclosure **86** with channels parallel and facing across a vertical plane that bisects the guide rail stem **16**, the roller **82**, the flexible upright member **78** and the slot **72**. The adjusting block **88** is enclosed by the channel members **84** and adapted to slide between them. The adjusting block is horizontally center tapped to receive the biasing head bolt **90**, the ends of which extend beyond the block **88** and between and beyond the channel members **84** which were left separated for the purpose. Lock nut **92** is carried by bolt **90** intermediate the bolt head **94** and the channel members **84** and serves to lock the bolt **90** at any point of its length and also serves to lock the block **88** at any point on the channel members **84**. The end of bolt **90** biases the flexible member **78** to bring the guide roller **82** into contact with the guide rail stem **16**. The spring constant of the flexible upright member **78** is adjustable by moving the block **88** up or down between the channel members **84**. The spring pressure is adjustable by rotating bolt **90** in block **88** to increase or decrease the bias on the flexible member **78**. Stationary stops or rolling ones similar to stops **34** in the preferred embodiment can alternatively be incorporated in the base **70** of the guide stand **68**.

As many changes can be made in the above described construction and many apparently different embodiments of this invention can be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown on the accompanying drawings be interpreted as illustrative only and not in a limiting sense.

What is claimed is:

1. A roller guide adapted for mounting on an elevator car for use with a vertically positioned guide rail having guiding surfaces to guide the elevator car in its hoistway, said guide comprising; a mounting member having a base and an elongated vertical section, said base being adapted for rigid connection to a structural member of said car adjacent said rail in such manner as to receive the guiding surfaces of said rail within its confines; a plurality of guide rollers, one each for normal engagement with each guide surface of said rail, each said guide roller being rotatably and pivotally mounted on said elongated member; a spring for each of said guide rollers, each said spring being positioned so as to bring its associated roller in rolling contact with a respective guide surface when said guide rail is normally positioned within the confines of said base inflexibly mounted stops, one for each guide surface, mounted on said base and adapted to prevent contact between said guide rail and base; and means associated with each said spring for adjusting the pressure with which said guide roller bears on its respective guide surface, each of said guide rollers being separated from said mounting base and its associated inflexibly mounted stop by a vertical linear distance in excess of twelve inches.

2. A roller guide adapted for mounting on an elevator car for use with a vertically positioned guide rail having three guiding surfaces for guiding the elevator car in its hoistway, said guide comprising; a mounting member having a base and an elongated stand mounted on said base, said base being adapted for rigid connection to a structural member of said car adjacent said rail and being apertured to receive the guide surface portions of said rail within its boundaries; a plurality of guide rollers pivotally mounted on said stand, one for normal engagement with each guide surface in a rolling contact when engaging said surface; a spring connected to each said guide roller urging said roller into contact with its respective guide surface; and a plurality of inflexible stops, one for each guide roller, mounted intermediate the respective guide roller and said car and adapted to limit the displacement of said guide roller, each said stop being displaced vertically from the axis of rotation of its respective guide roller by a distance in excess of one foot.

3. A roller guide for use with an elevator car and a guide rail having a plurality of guide surfaces, said roller guide comprising; a base adapted for rigidly attaching said roller guide to said elevator car structure adjacent

said guide rail; an elongate member vertically supported by said base; a plurality of guide rollers pivotally mounted on said member, each said guide roller being adapted to engage a respective one of said guide surfaces rotatably when displaced to it about its pivot; a plurality of inflexible stops mounted between said guide rollers and said car and adapted to limit the displacement of said guide rollers; a spring adapted to displace flexibly each said guide roller about its pivot to engage the respective guide surface; and means for adjusting the constant of deformation of each of said springs to be inversely related to the distance between its associated stop and guide roller, said associated stop and guide roller being separated substantially one foot.

4. A roller guide for use with elevator cars and guide rails having a plurality of guide surfaces, said roller guide comprising; a base for rigidly attaching said roller guide to said elevator car structure adjacent said guide rail; an elongate member vertically supported by said base; a plurality of guide rollers pivotally mounted on said member, said guide rollers being adapted to engage said guide rail surfaces rotatably when displaced toward them about said pivots, a plurality of inflexible stops one each mounted intermediate each pivoted guide roller mounting and said car structure and adapted to limit displacement of its associated guide roller; and a spring individual to each guide roller adapted flexibly to displace said roller about its pivot to engage its respective guide rail surface; each said spring including means for increasing or decreasing its effective length and each said associated stop and guide roller pivot being separated not less than one foot.

5. A roller guide for use with an elevator car and a guide rail having a plurality of guide surfaces, said roller guide comprising; a base adapted for rigid attachment to said elevator car structure adjacent said guide rail and an elongate member attached to and vertically supported by said base, a plurality of guide rollers pivotally mounted on said elongate member, each said guide roller being adapted rotatably to engage a respective one of said guide surfaces when displaced about its pivot so as to contact said surface, a plurality of springs, one for each guide roller, adapted to move its associated roller into contact with one of said guide surfaces, a plurality of inflexible stops, one each mounted between said base and a respective one of each of said pivotal guide roller mountings, said stops each being in the form of a rotatable wheel inflexibly mounted separately from said guide roller pivotal mounting to engage a respective guiding surface of said rail in rolling engagement as said guide surface deflects its associated guide roller a predetermined amount, the axis of rotation of associated guide rollers and rotatable stops being separated by more than eleven inches.

6. A roller guide for use with elevator cars and guide rails having a plurality of guide surfaces, said roller guide comprising; a base for rigidly attaching said roller guide to said elevator car structure adjacent said guide rail; a vertical stand supported by said base; a plurality of guide rollers pivotally mounted on said stand; a plurality of springs, one for each of said rollers, adapted to move its roller to a forward position about its pivot, said guide rollers being adapted to engage said guide rail surfaces rotatably when so moved; a plurality of inflexible roller stops one each being rotatably mounted intermediate the pivot mounting of each guide roller and said base removed from said pivot substantially one foot or more and respectively adapted to limit the displacement of said guide rollers about their pivots; each of said springs having a spring constant which is adjustable manually to be inversely related to the distance between its guide roller and its associated roller stop as this distance progressively exceeds one foot.

7. A guide for an elevator car adapted for use with a vertically disposed guide rail having a plurality of guide surfaces comprising, a plurality of pivotally mounted rollers, one for each guide surface, a plurality of springs, one for each pivotally mounted roller and mounted to force its roller into yielding rolling engagement with its associated guide surface, a standard adapted to support said spring biased rollers in vertical displacement from the car, said standard having a recessed base adapted for rigid connection to the car structure and to receive said guide surfaces within its recess, and a plurality of unyielding stops, one for each guide surface, mounted adjacent said recess and acting to engage said rail surfaces to prevent their engagement with said base and car structure, said rollers and said stops being vertically separated by a distance greater than 11 inches.

8. A guide for an elevator car adapted for use with a vertically disposed guide rail having a plurality of guide surfaces comprising a pivotally mounted roller contiguous to each surface, a spring individual to each roller and mounted for reaction with its pivoted roller to maintain said roller in yielding rolling engagement with its associated guide surface, each said spring being adapted for manual change of its constant of deformation, a standard adapted to support said spring biased rollers in vertical displacement from the car and being itself adapted for rigid connection to the car structure, a plurality of unyielding stops, one for each guide surface, mounted intermediate said car structure and said pivotally mounted rollers and acting to limit the amount by which said rollers may be deflected by the guide rail, said manually adjustable spring constant means also providing means for varying the pressure with which each said pivotally mounted roller is forced against its conjugate guide surface.

9. An elevator guide in accordance with claim 8 wherein each unyielding stop is a roller mounted for rotation on an axis parallel to the face of its conjugate guide surface.

10. In an elevator installation; a hatchway; a body movable therein; a guide rail for said movable body; a support carried by said movable body; a plurality of rollers, one for each of the guiding surfaces of the guide rail, said rollers rolling upon their respective guiding surfaces to guide said body in its movement in said hatchway; a resilient support for each roller, said supports being mounted on said first named support; and means acting through said supports to maintain their corresponding roller in yielding rolling contact with said guiding surfaces; each of said means being arranged for manual adjustment varying the constant of deformation of the resilient support.

11. In an elevator installation; a hatchway; a body movable therein; a guide rail for said movable body; a support carried by said movable body; a plurality of rollers, one for each of the guiding surfaces of the guide rail, said rollers rolling upon their respective guiding surfaces to guide said body in its movement in said hatchway; a support for each roller, said supports being pivotally mounted on said first named support; and a helical spring for each of said rollers, said springs acting through said supports to maintain their corresponding roller in yielding rolling contact with said guiding surfaces and each of said springs having associated with it an exteriorly grooved nut engaging the helices of said spring and means for adjusting manually the effective length of said spring by adjustment of said nut along the longitudinal dimension of said spring.

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