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ELEVATOR GUIDE SHOE MOUNTING MEANS

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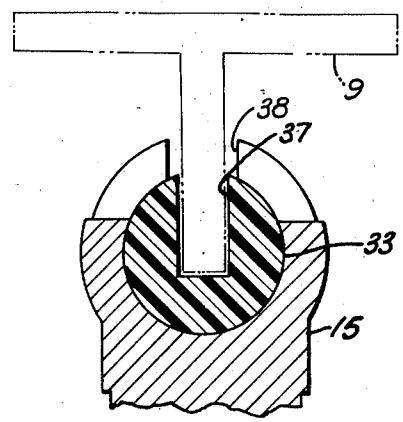


Fig. II

Fig. I

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ELEVATOR GUIDE SHOE MOUNTING MEANS

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This invention relates to elevator guide shoe mounting means and, in particular, to the construction of such means for the damping or reduction of vibrations transmitted to an elevator cab and thus the reduction of noise within the elevator cab and of discomfort to the operator and to the passengers.

A high speed elevator cab operating, as is customary, between a pair of vertically extending, generally parallel, guide rails is subjected to many sources of disagreeable vibrations which, in turn, may be transformed into objectionable noises by a vibration of the panels constituting the elevator cab itself. Some of these vibrations are transmitted to the elevator cab through the means by which it or its framework is guided along the vertical guide rails.

Although the two vertically extending guide rails on which an elevator mechanism slides are intended to be parallel to each other and to extend in substantially the same plane, it is difficult, of course, to construct rails of any length with perfectly flat surfaces and to construct them so that they remain parallel to each other. If there are any irregularities in the surfaces of the rails or if they do not extend perfectly parallel to each other, the passage of guide shoes over the rails creates substantial vibrations in the guide shoes which, if transmitted to the elevator cab, results in objectionable vibration and noise within the cab. While it might be possible to eliminate such sliding and transmitted vibrations by flattening and straightening the guide rails themselves, this operation would be substantially impossible from a practical standpoint both originally and after the guide rails are installed. In order to manufacture the guide rails perfectly true, costly grinding and milling operations would have to be employed. Even if they were manufactured perfectly, certain irregularities would be introduced during their assembly in the building and even if these could be eliminated, the shifting and changing of the building as it settled and grew older would introduce twists and irregularities which could not be avoided.

It is an object of this invention to provide an elevator guide shoe mechanism which automatically will compensate for irregularities in the shape of the guide rails on which it slides and which, in addition, will isolate the noise producing vibration created by sliding over such irregularities from the elevator cab and thus from the operator and passengers riding therein.

These and more specific advantages will be apparent from the drawings in which:

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Figure I is a greatly enlarged, quarter-section, isometric view of elevator guide shoe mounting means embodying the invention.

Figure II is a fragmentary, horizontal, sectional view taken substantially on the line II—II of Figure I.

A conventional elevator cab framework comprises an open frame consisting of vertical channels, top and bottom horizontal channels, a cab base and braces all of which are rigidly welded or otherwise secured to each other to form a strong rigid framework for the cab.

The elevator cab framework travels between a pair of vertically extending, generally parallel guide rails 9 which usually are constructed in the form of T-beams with the cross arms of the T's rigidly attached to the building structural members and the bars extending inwardly toward each other. The cab and framework are usually guided on the guide rails 9 by at least four guide shoes 10 which embrace the bars of the T-shaped rails 9 in sliding engagement. The shoes 10 are mounted upon guide shoe mounting means 11 which usually are fixedly secured to the ends of the upper and lower cross channels of the cab framework.

An elevator guide shoe mounting means 11 embodying the invention may comprise a rigid main body 12 (Figure I) which is shown as having an arched and braced section and a flanged portion 13 by means of which the guide shoe mounting means 11 is mounted on the elevator framework elements. The body 12 has a horizontally extending bored portion 14 forming a tubular sleeve for the reception of elements mounting the guide shoe 10. The guide shoe 10 has a vertically extending elongated portion 15 integrally connected to a horizontally extending, cylindrical tenon 16. The tenon 16 slidably enters the interior of a tubular bearing member 17. The fit between the exterior of the tenon 16 and the interior of the member 17 allows the tenon 16 both to slide and to rotate within the member 17. The member 17 has a radially extending flange 18 which bears against a similar flange 19 formed at one end of one of a pair of vibration damping elements 20 which are interposed between the exterior of the member 17 and the interior of the bored portion 14 of the body 12. The damping elements 20 are constructed from rubber or similar resilient material of relatively low durometer hardness, thus being soft and somewhat "cushiony" when inserted between the member 17 and the bored portion 14. The two damping elements 20 are identical in shape

and are inserted from opposite ends of the bored portion 14 with their flanges 19 adjacent parallel flanges 21 on the bored portion 14. The member 17 is inserted through the outer end of the cylindrical opening in the interior of the damping elements 20 and the several parts are assembled together through the use of a split ring 22 which is engaged in an annular groove 23 cut in the periphery of the member 17, and bearing against a flat washer 24 laid adjacent the inner flange 19 of the innermost one of the dampening elements 20.

The inner end of the member 17 is reduced in internal diameter and threaded to receive an exteriorly threaded bearing 25 in which is slidably engaged a rod 26. The rod 26 is threaded at both ends, its outer end being inserted in a threaded bore 27 cut in the tenon 16 coaxially with the tenon and with an enlarged and tapered bore 28 also cut in the tenon 16. The inner end of the rod 26 extends through the bearing 25 and receives a pair of locking nuts 29. A helical spring 30 is located within the bore 28 and extends between a radial bottom 31 of the bore 28 and the outer end of the tubular bearing 25. The tubular bearing 25 is locked in a selected position within the end of the member 17 by a radially extending set screw 32.

After the member 17 is inserted in the interior of the damping elements 20 and locked in place by the split ring 23, the tubular bearing 25 is threaded into its reduced diameter inner end. The rod 26 is then threaded tightly into the bore 27 in the tenon 16, the spring 30 is slipped over the end of the rod and dropped into the bore 28. These elements are then inserted through the member 17 from its outer end and the inner end of the rod 26 projects through the bearing 25. The nuts 29 are threaded on the inner end of the rod 26 and tightened until the spring 30 is compressed to a desired degree between the bottom 31 of the bore 28 and the outer end of the bearing 25. By rotating the bearing 25 it is so positioned in the reduced diameter end of the member 17 to properly position the shoe 10 relatively to the rail on which it is to ride. The set screw 32 is then locked in place holding the shoe in a position determined by the setting of the bearing 25 and the lock nuts 29.

The vertically extending elongated portion 15 of the shoe 10 is bored vertically with a cylindrical interior and the side of the shoe opposite the tenon 16 is slotted vertically to receive the bar flange of one of the guide rails 9. A gib 33 having a cylindrical exterior is inserted into the cylindrically bored interior of the portion 15 and is held in place therein by a pair of notched transversely extending locking plates 34, one of which is secured at each end of the portion 15 by bolts 35. A notch 36 cut in each of the plates 34 is in line with a slot 37 which is milled through the gib 33 and is, in turn, in line with slots 38 formed in the upper and lower ends of the portion 15 of the shoe 10. The bar flange of the rail 9 extends inwardly through the slots 38 which are substantially wider than the thickness of the rail flange and into the slot 37 of the gib 33 which fits the flange quite snugly.

As the elevator cab moves vertically between the guide rails, every variation in the surface of the rails relative to the cab is compensated for by the several types of movement permitted to the gib or the guide shoe in the guide shoe mounting means constituting the invention. For example, if the guide rails 9 are not spaced equidistantly apart (i. e., they approach or depart from each other horizontally), this variation in position is compensated for by horizontal movement of the guide shoe 10 as a whole, the tenon 16 being either pushed farther into the member 17 compressing the coil spring 30 and extending the rod 26 farther through the bearing 25 or, conversely, the shoe 10 is moved outwardly by action of the coil spring 30 until the nuts 29 engage the inner end of the bearing 25. If the bar flanges of the rails are wavy and thus do not lie in a vertical plane extending between the rails, this variation is compensated for by the joint action of the shoe 10 rotating on its tenon 16 in the member 17 on a horizontal axis, and the rotation of the gib 33 on a vertical axis in the bore of the vertically extending portion 15 of the shoe 10.

It has been found that a nylon gib greatly reduces the resistance of the passage of the shoe over the rail and, since it is relatively loosely mounted within the shoe, assists in damping out many of the objectionable vibrations which otherwise would be transmitted from the rail to the shoe or created by the passage of the shoe over the rail. The selection of nylon, which is a very resilient synthetic resin, and its use in combination with the damping elements 20 which are interposed in damping relation between the body 12 and the member 17, results in damping out almost all of the otherwise objectionable vibrations which, without the damping means, would be transmitted directly to the framework and thence to the cab 6 where they would vibrate the panels from which the cab is constructed, creating objectionable noise within the cab.

An elevator guide shoe mounting means embodying the invention thus is adapted to slidingly engage vertically extending elevator guide rails, to compensate for major variations in the planes of the engaged surfaces of the guide rails and to damp out vibrations created by the sliding engagement with the rails. These cooperative results accruing from the invention are the result of the constructions and operations as set forth in the following claims.

Having described the invention, I claim:

1. Means for guiding an elevator cab framework between a pair of spaced, parallel, vertically extending rails, said means comprising a body having a horizontally extending bore and flanged elements for mounting said body on the framework with the axis of the bore extending outwardly toward one of said rails, a tubular element extending through the bore, a resilient element interposed between the inner surface of the bore and the exterior of said tubular element, a vertically extending channel-shaped shoe, means for slidably mounting said shoe on said tubular element, and a gib mounted on said shoe in sliding contact with one of said rails.

2. Means for guiding an elevator cab framework between a pair of spaced, parallel, vertically extending rails, said means comprising a body having a horizontally extending bore and flanged elements for mounting said body on the framework with the axis of the bore extending outwardly toward one of said rails, a tubular element extending through the bore, a resilient element interposed between the inner surface of the bore and the exterior of said tubular element, a vertically extending shoe having rail engaging elements and a cylindrical tenon, and resilient means for mounting said tenon slidably within the bore and tending to urge said tenon and said

shoe outwardly thereby maintaining contact with one of said rails.

3. Means for guiding an elevator cab framework between a pair of spaced, parallel, vertically extending rails, said means comprising a body having a horizontally extending bore and flanged elements for mounting said body on the framework with the axis of the bore extending outwardly toward one of said rails, a tubular element extending through the bore, a resilient element interposed between the inner surface of the bore and the exterior of said tubular element, a vertically extending channel-shaped shoe having a laterally extending cylindrical tenon, resilient means for mounting said tenon slidably within the bore and tending to urge said tenon and said shoe outwardly, and a gib mounted in the channel portion of said shoe and closely embracing in sliding contact one of said rails.

4. Means for guiding an elevator cab framework between a pair of spaced, parallel, vertically extending rails, said means comprising a body having a horizontally extending bore and flanged elements for mounting said body on the framework with the axis of the bore extending outwardly toward one of said rails, a tubular element extending through the bore, a resilient element interposed between the inner surface of the bore and the exterior of said tubular element, a vertically extending channel-shaped shoe having a laterally extending cylindrical tenon, resilient means for mounting said tenon slidably within said bore and tending to urge said tenon and said shoe outwardly, and a nylon gib mounted in the channel-shaped portion of said shoe for free rotative movement around a vertically extending axis and closely embracing in sliding contact one of said rails.

5. Means for guiding an elevator cab framework between a pair of spaced, parallel, vertically extending rails, said means comprising a body having flanges for securing said body to said framework and a horizontally extending guideway, a shoe mounting element, resilient vibration absorbing means interposed in vibration absorbing relationship between said body and said element, a rail engaging shoe slidably mounted in the element mounted in said body and having an elongated vertically extending, channel-like portion, an elongated gib mounted for rotation on a vertical axis in said channel-like portion and having a slot adapted to closely embrace one of said rails in sliding relationship, and resilient means acting between said element and said shoe for urging said shoe outwardly in engagement with one of said rails as said elevator cab and framework travels therealong.

6. Means for guiding an elevator cab framework between a pair of spaced, parallel, vertically extending rails, said means comprising a body having flanges for securing said body to said framework and a horizontally extending guideway, a shoe mounting element, resilient vibration absorbing means interposed in vibration absorbing relationship between said body and said element, a rail engaging shoe slidably mounted in the element mounted in said body and having an elongated vertically extending, channel-like portion, an elongated nylon gib mounted for rotation on a vertical axis in said channel-like portion and having a slot adapted to closely embrace one of said rails in sliding relationship, and resilient means acting between said element and said shoe for urging said shoe outwardly in engagement with one of said rails as said elevator cab and framework travels therealong.

7. Vibration damping means for an elevator cab having a framework that is movable vertically between a pair of spaced, vertical, generally parallel guide rails, said means comprising, in combination, a horizontally bored body mounted on said framework, a shoe having a vertically extending, channel-shaped portion and a transversely extending, cylindrical tenon, a tubular shoe mounting member having an inner diameter adapted to slidingly receive said tenon, and an exterior diameter smaller than the diameter of the bore in said body, a resilient sleeve interposed between the exterior of said tubular shoe mounting element and said body and within said bore, means for slidably and rotatably mounting said tenon in said tubular member and for urging said tenon outwardly, the axes of said tenon and said tubular member lying in the median plane of one of said rails, and a low friction slotted gib mounted in said channel-shaped portion of said shoe for rotation on a vertical axis and closely embracing that one of said rails in sliding contact.

8. An elevator cab guide shoe assembly comprising, in combination, a shoe having a vertically elongated slotted portion, a main body, a structure for mounting said shoe on said body for translation horizontally toward and away from a vertically extending elevator guide rail and for rotation on a horizontal axis, a vertically extending, slotted, rail-engaging gib mounted in said shoe for rotation on a vertical axis, the aforementioned horizontal and vertical axes both lying in the vertical median plane of the guide rail, and resilient vibration damping means interposed between said structure and said main body for isolating vibrations in said gib and shoe transmitted from and caused by engagement with the guide rail.

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