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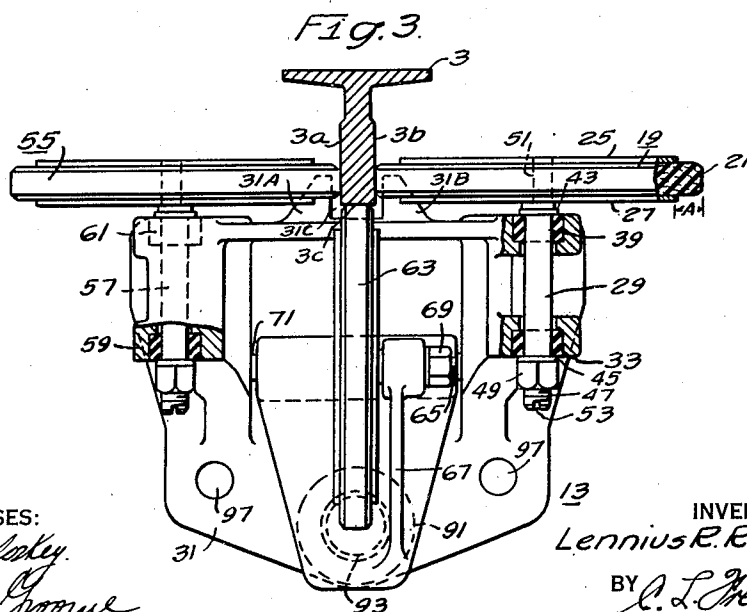
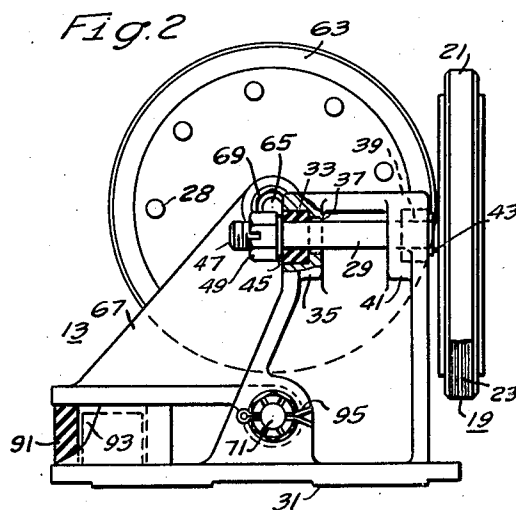
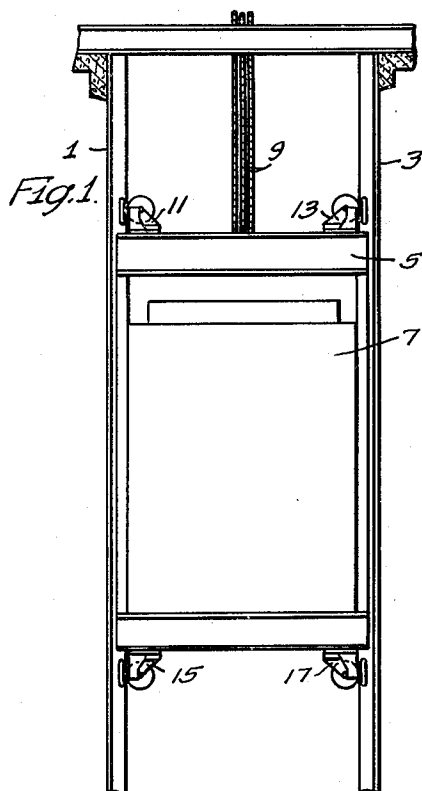
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2,498,299

ROLLER GUIDE SHOE FOR ELEVATORS

Filed May 22, 1948

2 Sheets-Sheet 1



WITNESSES:

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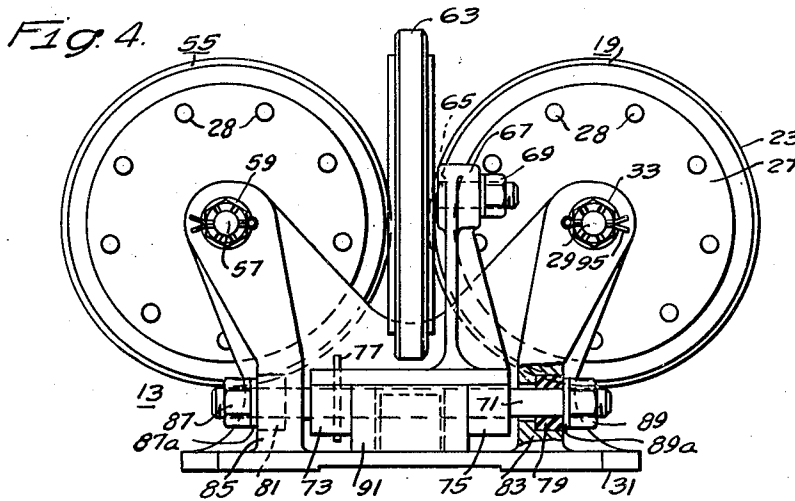
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

2,498,299

ROLLER GUIDE SHOE FOR ELEVATORS

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21 Claims. (Cl. 187-95)

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This invention relates to guide shoes, and it has particular relation to roller guide shoes suitable for elevator systems.

Conventional elevator systems employ a pair of guide rails which guide an elevator car for movement in a vertical direction. The elevator car has guide shoes associated therewith which cooperate with the guide rails for guiding purposes. Similar guide rails and guide shoes are employed for guiding the elevator counterweight for movement in a vertical direction.

An elevator guide shoe of the roller type may employ three rollers for engaging surfaces of the associated guide rail. One of the rollers engages the face surface of the guide rail, whereas the remaining two rollers engage the side surfaces of the rail. It is assumed that a conventional T-shaped guide rail is employed.

In accordance with the invention, an elevator guide shoe includes a base structure. Each roller is mounted on a shaft for rotation relative to a shaft, and the shaft is secured to the base structure through a body constructed of sound-insulating material. If the roller has a sound-insulating rim, the sound-insulating body acts in series with the rim to assure adequate suppression of sound or noise resulting from movement of the elevator car relative to the associated guide rails. Conveniently, two axially-spaced bodies constructed of sound-insulating material may be employed for the shaft of each roller.

Various materials may be employed for sound-insulating purposes. For example, many resins such as phenolic resins have a substantial degree of sound-insulating properties. However, elastomers such as natural or synthetic rubber are particularly suitable for sound-insulating purposes. In a preferred embodiment of the invention, an adjustable compressor is provided for adjustably compressing or tuning the elastomer for optimum noise suppression. The exact tuning required may vary for different elevator installations.

If the axis of rotation of a roller is parallel to and displaced from the axis of its supporting shaft and the shaft is releasably clamped by noise-insulating material to the base structure, the shaft may be rotated to adjust the position of the roller with respect to the associated guide rail surface. Also, an elastomer sound-insulating spring may be employed for resiliently biasing the face roller towards the associated guide rail.

It is, therefore, an object of the invention to provide a guide roller for an elevator system

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which is secured to a base structure through sound-insulating material.

It is a further object of the invention to provide a guide roller for elevator systems which is secured to a base structure through sound-insulating material capable of being adjustably compressed or tuned for optimum noise suppression.

It is an additional object of the invention to provide a guide roller for an elevator system which is mounted eccentrically with respect to a supporting shaft, the shaft being secured releasably to a base structure through an elastomer sound-insulating material.

It is still another object of the invention to provide a guide roller for an elevator system wherein an elastomer sound-insulating spring is employed for biasing the roller against an associated guide surface.

It is also an object of the invention to provide a roller guide shoe for an elevator system wherein a roller having a rim of elastomer sound-insulating material is secured to a base structure through a body constructed of sound-insulating material.

It is a still further object of the invention to provide an elevator system wherein a guide rail has associated therewith a guide shoe comprising two side rollers and a face roller, each provided with a rim of sound-insulating material, and each secured to a base structure through two bodies constructed of sound-insulating material which are spaced in a direction parallel to the axis of the associated roller.

Other objects of the invention will be apparent from the following description taken in conjunction with the accompanying drawings, in which:
Figure 1 is a view in elevation, with parts broken away, of an elevator system embodying the invention;

Fig. 2 is a view in side elevation, with parts broken away, of an elevator guide shoe embodying the invention;

Fig. 3 is a view in top plan, with parts broken away, showing the guide shoe of Fig. 2 associated with a guide rail;

Fig. 4 is a view in rear elevation, with parts broken away, of the guide shoe illustrated in Fig. 2;

Fig. 5 is a view in top plan, with parts broken away, showing a modified roller guide shoe embodying the invention; and

Fig. 6 is a view in side elevation, with parts broken away, of the guide shoe illustrated in Fig. 5.

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Referring to the drawings, Figure 1 shows an elevator system which includes two conventional parallel guide rails 1 and 3. These guide rails are installed in an elevator hatchway or hoistway for the purpose of guiding a sling 5 in a vertical direction. The sling may support a counterweight or an elevator car, as desired, but it will be assumed for the purpose of discussion that the sling 5 is employed to support an elevator car 7. The sling 5 is secured to the end of ropes or cables 9 which have forces applied thereto in a conventional manner for moving the elevator car.

The sling 5 is guided with respect to the guide rails 1 and 3 by means of four guide shoes 11, 13, 15 and 17. Since these guide shoes all are of a similar construction, a discussion of the guide shoe 13 suffices.

As shown in Fig. 3, the guide rail 3 has two side surfaces 3a and 3b and a face surface 3c which is perpendicular to the side surfaces. The guide shoe 13 includes a roller 19 for engaging the side surface 3a. For quiet and smooth performance and for long life, the roller 19 is provided with a resilient rim which may be part of a resilient disc 21. Excellent results have been obtained from a roller employing resilient material similar to that disclosed in my copending application, Serial No. 758,087, filed June 30, 1947. In accordance with the teachings of the foregoing application, the resilient material may be constructed from a cellular matrix or filler such as nylon, silk or rayon. Alternatively, a metal cloth such as a brass cloth could be employed. In a preferred embodiment, the matrix is formed by a plurality of laminations in the form of discs 23 indicated only in Fig. 2 for part of the roller 19 of woven fabric, such as cotton sheeting or canvas. These discs are disposed in side by side relation in alignment and transverse to the axis of the roller.

The layers of cotton sheeting or canvas are bound together by an elastomer. Natural rubber has been found satisfactory for the elastomer, but it is to be understood that other elastomers such as synthetic rubbers are also suitable for binders and a number of such rubbers will be found listed on page 695 of the Handbook of Chemistry by M. A. Lange, 1944, published by Handbook Publishers of Sandusky, Ohio. A chloroprene polymer which is available on the market under the trade name "neoprene" is an example of a suitable synthetic rubber. The elastomer "Buna S" also may be employed and is listed in the aforesaid handbook. A disc wherein the filler represents 50% to 90% of the total weight of the disc has been found satisfactory. Particularly good results are obtained for a disc having a weight of cotton canvas or sheeting approximately 70% of the weight of the complete disc. The elastomer flows through the fabric layers to bond the threads to each other throughout the disc and if of the vulcanizing type may be vulcanized with the woven fabric under pressure. The elastomer may be vulcanized and cured to a hardness of preferably 85 durometer or greater. The procedure may be similar to that employed for manufacturing rubber fabric belting. After vulcanization the disc 21 may be assembled between rigid discs 25 and 27 and secured thereto in any suitable manner by means of rivets 28 (Fig. 4). Good results have been obtained from a disc 21 formed of an elastomer such as natural rubber having a comminuted filler embedded therein. In order to decrease the weight and inertia of the roller, the

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discs 25 and 27 may be constructed of aluminum or other suitable lightweight material.

The disc 21 has a substantial cylindrical surface and is constructed to flatten slightly for the purpose of distributing the load over a substantial portion of the surface 3b of the guide rail. However, the flattening is not such that a bead is formed adjacent the guide rail during rolling of the roller thereover. The edges of the disc may be beveled.

The radial distance A between the circumference of the discs 25 and 27 and that of the disc 21 is important for optimum roller life. As the roller moves over the surfaces of the guide rail, the material of the disc 21 is subjected to local movement as it approaches the guide rail and leaves the guide rail. The discs 25 and 27 are proportioned to confine this local movement to a predetermined portion of the disc or rim represented by the reference character A. For a roller having a diameter of D inches, the dimension A may be of the order of

$$\sqrt{\frac{D}{15}} \text{ inches}$$

The roller 19 is mounted for rotation relative to a shaft 29. In order to reduce friction and simplify lubrication problems, the roller 19 may be provided with a conventional ballbearing. The shaft 29 is secured to a base structure 31 through a body of sound-insulating material 33.

As previously pointed out, the sound-insulating material may comprise a resin, such as a phenolic resin. Preferably, however, the material is an elastomer, such as natural or synthetic rubber. Synthetic rubbers similar to those listed in the aforesaid handbook may be employed, but good results have been obtained from natural rubber. The body 33 may be adhesively bonded to the shaft 29 and to the base structure 31 but in a preferred embodiment of the invention, the body is adjustably compressed between the shaft and the base structure. The body 33 may take the form of a bushing which is slipped over the shaft 29. This bushing is snugly received within a cup 35 which is formed in the base structure 31. The cup has an end wall which is provided with an aperture 37 permitting passage of the shaft there-through.

Although a single body 33 may be employed for the shaft 29, it has been found advantageous to provide a second sound-insulating body 39 which is similar to the body 33. The body 39 is snugly received within a cup 41 formed in the base structure 31. The cups 35 and 41 are similar in construction but have their end walls adjacent each other. The spaced bodies 33 and 39 permit the utilization of small bodies which adequately support the shaft 29 and which may be readily compressed.

The compression of the bodies 33 and 39 is effected by means of two collars 43 and 45. The collar 43 may be rigidly secured to the shaft 29, whereas the collar 45 is movable with respect to the shaft. The collar 45 conveniently may take the form of a washer. The end of the shaft 29 is provided with threads 47 for threaded reception of a nut 49. By actuation of the nut 49, the bodies 33 and 39 may be compressed adjustably to the desired value.

It has been found that the noise or sound suppressing properties of the bodies 33 and 39 depend on the compression thereof. By proper adjustment of the nut 49 over a suitable range, the bodies 33 and 39 may be adjusted to provide opti-

mum sound suppression for any desired elevator system. The degree of compression may vary for different elevator systems.

It will be understood that the base structure 31 has clearance from the shaft 29 and from the collars 43 and 45. The only connection between the shaft 29 and the base structure is through the sound-insulating bodies 33 and 39. These bodies act in series with the sound insulating disc 21 between the elevator car and the guide rails to provide effective suppression of vibration, sound or noise, resulting from the movement of the elevator car with respect to the associated guide rails. If constructed from elastomers the resulting resilience of the bodies and the disc facilitate good tracking of the roller on a rail having irregularities. Also the dampening properties of elastomers such as rubber help to reduce rapidly the amplitude of any vibration.

It will be observed that the shaft 29 is in effect releasably clamped to the base structure 31 by manipulation of the nut 49. This permits a simple adjustment of the roller 19 with respect to the guide rail. By reference to Fig. 3, it will be observed that the roller 19 is mounted for rotation about a pin 51 which projects from one end of the shaft 29. The axis of the pin and shaft are parallel but spaced from each other. Because of this eccentric mounting of the pin with respect to the shaft, rotation of the shaft forces the roller 19 to approach or recede from the guide rail 3. Consequently, the shaft 29 may be rotated in any suitable manner as by a screw driver inserted in the slot 53 to adjust the position of the roller with respect to the guide rail prior to the compression of the bodies 33 and 39.

The guide shoe includes a second roller 55 for engaging the side surface 3a of the guide rail. This roller is mounted on a shaft 57 which is secured to the base structure 31 through sound-insulating bushings 59 and 61. The roller 55 is similar in construction to the roller 19, it is mounted on the shaft 57 in the same manner whereby the roller 19 is mounted on the shaft 29, and the shaft 57 is secured to the base structure 31 in the same manner whereby the shaft 29 is secured to the base structure. A further discussion of the roller 55 and its associated parts is believed to be unnecessary. It will be observed that the shafts 29 and 57 have axes which are parallel to each other and to the side surfaces 3a and 3b. These axes are perpendicular to the direction of travel of the guide shoe in the elevator hatch.

A face roller 63 is provided for engaging the face surface 3c of the guide rail. This face roller is similar in construction to the rollers 55 and 19. The roller 63 is mounted for rotation with respect to a shaft 65 which is secured to one end of a bell-crank lever 67 in any suitable manner, as by a nut 69 which engages the threaded end of the shaft. The bell-crank lever 67 is mounted for pivotal movement with respect to the base structure 31 about the axis of a rod 71. The lever is secured to the rod in any suitable manner as by providing the lever with spaced apertured lugs 73 and 75 (Fig. 4) for receiving the rod. The lever may be releasably secured to the rod 71 by means of a removable key 77 which is a press fit within aligned openings provided in the lever and the rod.

Sound-insulating bushings 79 and 81 are provided for the rod 71 and these bushings are similar to the bushings 33 and 39 of Fig. 3. The bushings 79 and 81 are positioned within spaced cups

83 and 85 formed in the base structure 31 in exactly the same manner employed for mounting the bushings 33 and 39 in their associated cups. Although a nut may be employed at only one end of the rod 71, preferably both ends of the rod are threaded for reception of separate nuts 87 and 89. Collars 87a and 89a are interposed, respectively, between the nuts 87 and 89 and their associated bushings. These collars may comprise washers having openings snugly and slidably receiving the rod and may have outer diameters slightly less than the outer diameters of their associated sound-insulating bushings. By employing two nuts, the roller 63 may be accurately centered with respect to the face surface of the guide rail.

It will be understood that the bushings 79 and 81 are compressed by manipulation of the nuts 87 and 89. Since the rotation of the rod 71 with respect to the base structure need not be large, such rotation is effected without any sliding movement between the rod 71 and its associated bushings 79 and 81 or between the bushings and the base structure 31. Rotation of the rod 71 with respect to the base structure merely torsionally flexes or changes the stress in the bushings.

The roller 63 is further resiliently biased against its associated face surface 3c of the guide rail by means of a spring 91 acting between an end of the bell-crank 67 and the base structure 31. If this spring were constructed of a sound-transmitting material such as steel, it would establish a sound-conducting path which would bypass the bushings 79 and 81. For this and other reasons, the spring 91 is constructed of a sound-insulating material which may be similar to that employed for the bushings 79 and 81. In a specific embodiment illustrated in Figs. 2, 3 and 4, the spring is in the form of a tube constructed of an elastomer such as natural or synthetic rubber. One end of the tube rests on a platform established by the structure 31 and the remaining end of the tube engages the end of the bell crank 67 which is remote from the roller 63. By inspection of the drawings, it will be clear that the spring 91 resiliently urges the roller 63 toward the guide surface 3c of the guide rail. In order to prevent excessive movement of the roller 63, a rigid stop 93 is introduced between the bell crank and the associated base structure 31. Conveniently, the rigid stop 93 may be constructed as a protuberance which extends from the base structure 31 within the tubular spring 91. The exposed end of the protuberance forming the stop 93 is spaced from the bell crank 67 by a distance such that under normal conditions of operation, the bell crank never touches the protuberance 93.

From the foregoing discussion it is clear that each of the shafts or rods 29, 57 and 71 is completely sound-insulated from the base structure 31. Each of the nuts for compressing the sound-insulating material may be locked in any suitable manner as by means of cotter pins 95.

The provision of the elastomer bushings assures a compact and noise free structure. The elastomer bushings permit eccentric adjustment of the rollers 19 and 55 for the reason that the bushings releasably clamp the shafts 29 and 57. At the same time, the bushings take up all play between the associated parts. By employing elastomer bushings, roller rims and an elastomer spring, the rollers readily follow small irregularities in the guide rails without transmitting appreciable noise or vibration between the elevator car and the guide rails. Moreover, as previously

pointed out, the elastomer material preferably employed acts effectively to damp vibration. Furthermore, the bushings may have their compression adjusted to provide optimum sound insulation for any desired elevator installation. The bushings require no lubrication and little, if any, servicing. The entire guide shoe is unusually compact and trouble free.

It will be understood that the base structure 31 may be secured to the sling 5 in any suitable manner. For example, in Fig. 3 openings 97 are provided in the base structure through which machine screws (not shown) may be introduced for the purpose of attaching the guide shoe to the sling.

Although the same guide shoe may be employed for both the elevator car and for the counterweight, the modified construction of Figs. 5 and 6 has been found suitable for the counterweight. In these figures, a guide shoe 101 is provided which includes two rollers 103 and 105 which correspond in construction and purpose to the rollers 19 and 55 of Figures 2, 3 and 4 and which are mounted in exactly the same manner with respect to the base structure 107 of the guide shoe 101. For example, the roller 105 is provided with a shaft 109 which corresponds to the shaft 57 of Fig. 3, elastomer bushings 111 and 113 which correspond to the bushings 61 and 59 of Fig. 3, and a nut 115 which coacts with suitable collars 121 and 123 for placing the bushings under compression. In some cases it may be unnecessary to provide an eccentric adjustment for the roller 105 and in such cases, the axis of the roller 105 may be the axis of the shaft 109.

The guide shoe 101 also includes a face roller 125 which corresponds to the face roller 63 of Fig. 3 and which is similarly constructed. Since more space usually is available adjacent the counterweight for the face roller 125, this roller may be larger in diameter than the rollers 103 and 105.

For the counterweight the provision of a biased lever for the face roller 125 generally is not required. Consequently, the roller 125 may be mounted on the base structure 107 in substantially the same manner by which the rollers 103 and 105 are mounted on the base structure. Referring to Fig. 5, it will be observed that the roller 125 is mounted for rotation about a shaft 129 which has axially-spaced sound-insulating bushings 131 and 133 associated therewith. These bushings are received in cups 135 and 137 formed in the base structure 101 in the same manner whereby the bushings 111 and 113 are received in their associated cups. The shaft 129 is threaded at each end for reception of nuts 139 and 141 which may be actuated to force collars or washers 143 and 145 against the bushings to compress the bushings. By employing two nuts, the roller 125 may be accurately centered with respect to the associated face surface of the guide rail 3A.

It will be understood that the base structure 107 is secured to the sling of the counterweight in a position to hold the face roller 125 securely against the associated face surface of the guide rail 3A.

As a general rule, it is desirable to provide additional limit stops for the roller guide shoes. For example, in Fig. 3, it will be observed that the base structure 31 is provided with lips 31A and 31B which define a notch 31C for reception of a portion of the guide rail 3. Under normal conditions of operation, the guide rail never touches the

bounding surfaces of the notch. However, should damage occur to one or more of the roller assemblies, the maximum movement of the guide shoe 13 with respect to the guide rail 3 is limited by the clearance between the bounding surfaces of the notch 31C for each roller guide shoe and the associated guide rail. A similar notch 107C is provided for the embodiment of Figs. 5 and 6.

Although the invention has been described with respect to certain specific embodiments thereof, numerous modifications falling within the spirit and scope of the invention are possible.

I claim as my invention:

1. In a roller guide assembly for elevator systems, a support member, a roller mounted on the support member for rotation relative thereto, a base structure, and a fastener securing the support member to the base structure, the fastener including a sound-insulating elastomer body, said support member, sound-insulating body and base structure being nested together with the body intermediate the member and the structure to impede transmission of noise therebetween, the axes of the roller and the noise-insulating body being substantially parallel.

2. A guide assembly as defined in claim 1 wherein the axes are spaced from each other, and an element constructed of a sound-insulating elastomer for yieldably biasing the roller in a predetermined direction about the axis of the sound-insulating body.

3. In a guide assembly for elevator systems, a base structure, an elastomer body, an elevator guide shoe secured to the base structure through said elastomer body, and an adjustable compressor operable for adjusting the compression of the elastomer body.

4. In a roller guide assembly for elevator systems, a support member including a shaft, a roller mounted on the support member for rotation relative to the support member about a first axis displaced from the shaft axis, said axes being substantially parallel, a base structure, a fastener for securing the support member to the base structure, said fastener comprising a sound-insulating body for receiving the shaft and insulating the shaft from the base structure, and an adjustable compressor for compressing the elastomer to secure releasably the shaft in the elastomer, said compressor being adjustable for varying the compression of the elastomer over a substantial range.

5. In a roller guide assembly for elevator systems, a support member, a roller having a rim constructed of a sound-insulating material, said roller being mounted on the support member for rotation relative to the support member, a base structure, securing mechanism for securing the support member to the base structure, said securing mechanism comprising a body of a sound-insulating elastomer material interposed between the support member and the base structure and insulating the support member from the base structure.

6. A roller guide assembly as defined in claim 5 wherein the securing mechanism includes an adjuster for adjusting the compression of the body, whereby the sound insulation of the body may be adjusted to an optimum value for a particular installation of the guide assembly.

7. A roller guide assembly for elevator systems comprising a support member, a roller mounted on the support member for rotation with respect thereto, a base structure, and a fastener including a pair of elastomer bodies

spaced along an axis parallel to the axis of rotation of the roller for securing the support member to the base structure.

8. A roller guide assembly as defined in claim 7 in combination with an adjustable compressor operable for adjusting the compression of the elastomer bodies over a substantial range.

9. A roller guide assembly as defined in claim 7 wherein the support member includes a shaft having portions nested within the respective elastomer bodies, the shaft axis being displaced from and parallel to the axis of rotation of the roller, and a compressor for compressing the elastomer bodies to secure releasably the shaft therein.

10. A roller guide assembly for elevator systems comprising a shaft, a roller mounted on the shaft for rotation relative thereto about an axis parallel to the shaft axis, a pair of sound-insulating, axially-spaced elastomer bushings surrounding said shaft, a base structure having a pair of spaced cups snugly receiving said bushings, said cups having their end walls adjacent each other and apertured to permit passage therethrough of the shaft, a pair of spaced collars disposed on the shaft for engaging the exposed ends of the bushings, one of said collars being adjustable relative to the other of said collar for compressing the bushings to clamp the shaft releasably and resiliently to the base structure.

11. A roller guide assembly as defined in claim 10 wherein the axes of the shaft and of the roller rotation are spaced.

12. A roller guide assembly as defined in claim 11 in combination with an elastomer spring for biasing the roller relative to the base structure in a predetermined direction about the shaft axis.

13. A roller guide assembly as defined in claim 10 wherein the roller has a sound-insulating elastomer rim.

14. An elevator system comprising a guide rail having a face surface and a pair of side surfaces perpendicular to the face surface, an elevator car to be guided along said rail, and an elevator guide shoe comprising a pair of side rollers having elastomer rims respectively engaging said side surfaces for tracking along said surfaces, a separate shaft mounting each of said rollers for rotation about an axis parallel to the shaft axis and to the side surfaces, a face roller having an elastomer rim engaging said face surface for tracking along the face surface, a shaft mounting the face roller for rotation about an axis parallel to the axis of the last-named shaft and the face surface, a separate pair of axially spaced elastomer sound-insulating bushings surrounding each of the shafts, a base structure having a separate portion substantially surrounding each of the bushings, and compressors for compressing the bushings between the base structure and the associated shafts to secure the shafts resiliently to the base structure.

15. An elevator system as defined in claim 14 in combination with an elastomer spring for resiliently urging the face roller about the axis of the shaft supporting the face roller towards the guide rail, the axis of each of the shafts being spaced from the axis of rotation of the associated roller supported by the shaft.

16. In an elevator guide shoe roller, a disc comprising an elastomer, and a rigid disc positioned on each side of the elastomer disc concentrically therewith, said rigid discs being secured to each other, said elastomer disc having a diameter D larger than the diameters of the rigid discs to provide a free rim portion having a radial dimension of substantially

$$\sqrt{\frac{D}{15}}$$

17. A roller guide assembly for elevator systems having a guide rail, said guide assembly comprising a pair of side rollers having spaced, parallel axes, said rollers being disposed in substantially a common plane and being spaced from each other, a face roller disposed substantially on one side of, and substantially perpendicular to, said common plane, each of the rollers having an elastomer rim, said rollers defining a pocket for reception of a guide rail, a separate support for each of the rollers, each of the supports mounting the associated roller for rotation about the axis of such associated roller, a base structure, and securing mechanism comprising sound-insulating elastomer for securing the supports to the base structure, said elastomer insulating the base structure from said supports.

18. A roller guide assembly as claimed in claim 17 wherein the securing mechanism mounts the face roller for rotation about an axis substantially parallel to, and spaced from, the axis of the face roller, said securing mechanism including an elastomer spring for biasing the face roller relative to the base structure towards said pocket, said elastomer spring constituting a substantially non-conductive sound path between the face roller and the base structure.

19. A roller guide assembly as defined in claim 17 wherein each of the supports comprises a shaft, and the sound-insulating elastomer comprises a pair of spaced elastomer bushings surrounding each of said shafts.

20. A roller guide assembly as defined in claim 17 wherein the securing means includes adjustable compressors for adjusting the compression of the elastomer intermediate the supports and the base structure to provide optimum sound suppression of noise of any desired frequency within a substantial range of frequencies.

21. A roller guide assembly as defined in claim 19 wherein at least one of the rollers is eccentrically mounted on the associated shaft, and the securing means includes releasable means for compressing the elastomer bushings for said associated shaft, whereby the associated shaft may be adjusted angularly about its axis to adjust the position of the eccentrically-mounted roller.

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