United States Patent

Takamura et al.

[15] **3,669,222**

[45] **June 13, 1972**

[54] **GUIDING AND DAMPENING DEVICE**

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[22] Filed: **Aug. 31, 1970**

[21] Appl. No.: **68,385**

Related U.S. Application Data

[62] Division of Ser. No. 697,525, Jan. 12, 1968, Pat. No. 3,554,321.

[52] **U.S. Cl.** **187/95**
[51] **Int. Cl.** **B66b 7/02**
[58] **Field of Search** 187/95

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[57] **ABSTRACT**

A device for guiding an elevator car along a guide rail comprises a plurality of rotatable rollers positioned in symmetrical relationship around a peripheral transverse portion of the guide rail. Each roller is biased into pressure contact with the guide rail by a dampening spring whereby impulsive or vibrational forces applied by the guide rail during movement of the elevator car are effectively absorbed by the dampening spring rather than being transmitted to the elevator car. Means are also employed for rapidly attenuating any vibrational or rocking movement of the elevator car caused by either operation of an elevator door opening-and-closing mechanism or translational movement of the elevator car along the guide rails.

5 Claims, 4 Drawing Figures

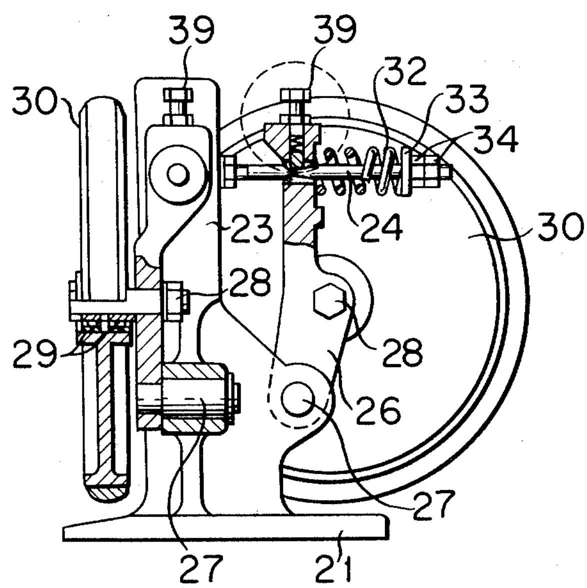

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FIG. 1

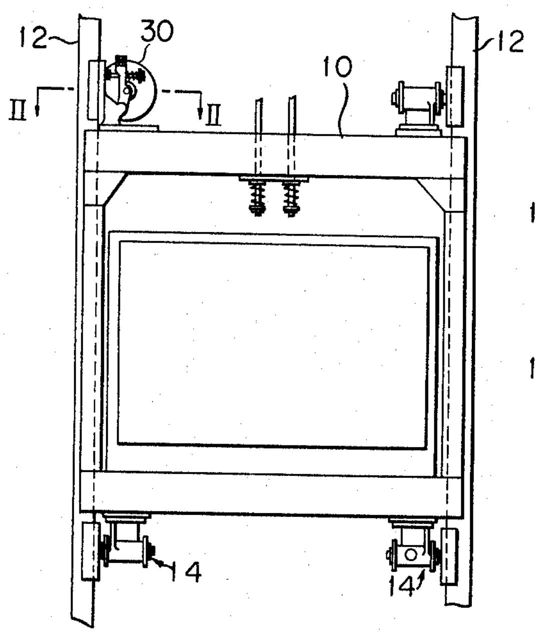


FIG. 2

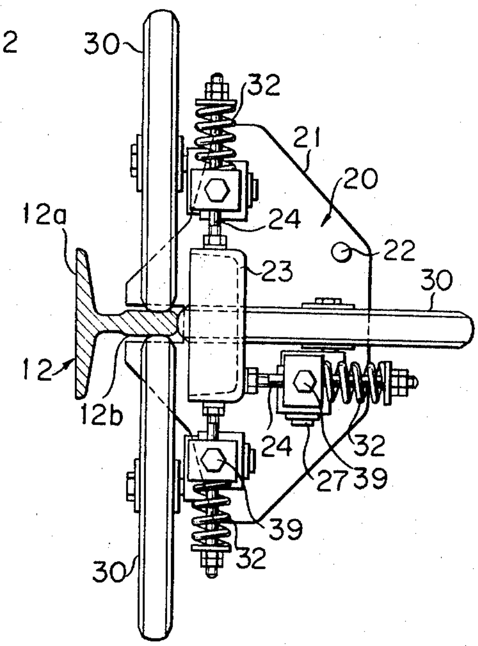


FIG. 3

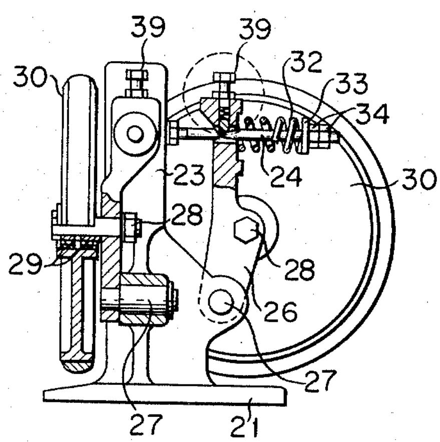
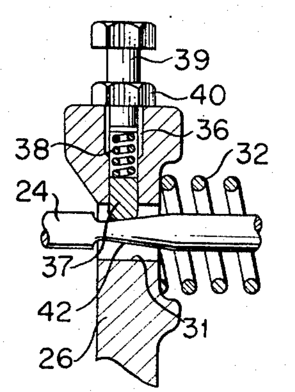


FIG. 4



GUIDING AND DAMPENING DEVICE

The present invention is a divisional of patent application Ser. No. 697,525 filed on Jan. 12, 1968 now U.S. Pat. No. 3,554,321.

The present invention relates in general to a guiding and dampening device and more particularly, to such a device for guiding an elevator car during translational movement along guide rails.

Elevator installations are well known which comprise two longitudinally extending guide rails arranged to define a vertical hoistway and which have an elevator car disposed within the hoistway mounted for translational movement therealong. Guide shoes or other guiding devices are connected to the elevator car to guide same along the rails. Many problems have been encountered with such installations due primarily to surface irregularities on the guide rails themselves.

Often times the individual beams making up the guide rails are not accurately aligned and connected together thereby creating staggered junctions over which the guiding devices must move. In addition, minute curvatures are often formed along the guide rails due to their relative slenderness and high length-to-width ratio and these staggered junctions and curvatures impart impulsive forces and vibrations to the guiding devices during movement of the elevator car. Moreover, operation of the elevator door opening-and-closing mechanism imparts a rocking or swaying motion to the elevator car which is annoying the persons travelling in the elevator car.

In order to provide a comfortable ride for persons travelling in the elevator car, it is imperative that these impulsive forces and vibrations be effectively attenuated and dampened. In addition, the elevator car is often eccentrically loaded and such loading causes impulsive rocking of the elevator car during movement along the guide rails and this undesirable movement must also be eliminated to provide a smooth elevator ride.

One attempt to alleviate the above-mentioned problems and provide a smooth ride has been to mount the guide shoe on a shaft which is slidably mounted in a housing. A dampening spring is disposed in the housing and effectively biases the guide shoe into pressure contact with the associated guide rail whereby impulses forces applied by the guide rail to the guide shoe are absorbed by the damping spring and therefore not transmitted to the elevator car.

It has been found that this arrangement is not wholly effective in that the slidable shaft often encounters frictional resistance to sliding movement depending upon the particular direction of application of the impulsive forces and as a result, the shaft binds against the housing and the dampening spring does not effectively dampen the impulsive forces. For example, if an impulsive force is applied to the guide shoe in a lateral direction relative to the guide shoe-shaft assembly, such would tend to pivot the slidable shaft within its housing causing it to bind against the housing wall thereby imparting frictional resistance to sliding movement of the shaft thereby decreasing the effectiveness of the dampening spring.

The present invention is directed at obviating the above-mentioned problems as well as overcoming the disadvantages of the prior art type guiding and dampening devices. According to the present invention, the guiding and dampening device comprises a support assembly connectable to an elevator car or the like and rolling means mounted on the support assembly to effect guiding of the support assembly (as well as the elevator car or the like to which the device is connected) along a guide rail as well as dampening of any impulsive forces imparted by the guide rail. The rolling means comprises a plurality of rotatably mounted rollers mounted for pivotal movement towards and away from the guide rail to effect guidance of the support assembly and a plurality of dampening springs biasing each roller into continuous rolling contact with the guide rail to accomplish dampening and attenuation of impulsive forces applied by the guide rail due to surface irregularities existing on the guide rail.

It is therefore a primary object of the present invention to provide a guiding and dampening device for use with elevator cars and the like which rapidly attenuates and dampens external forces applied thereto to provide a comfortable ride for persons in the elevator car.

It is another object of the present invention to provide means for rapidly attenuating the rocking of an elevator car caused by operation of the elevator door opening-and-closing mechanism.

It is still another object of the present invention to provide an efficient yet inexpensive guiding and dampening device for rapidly attenuating vibrators of an elevator car during translational movement of same along guide rails.

Other features and advantages of the guiding and dampening device in accordance with the present invention will be better understood upon a reading of the following specification and appended claims when read in conjunction with the following drawings in which:

FIG. 1 is a front elevational view of an elevator installation employing the guiding and dampening device of the present invention;

FIG. 2 is a plan view of the guiding and dampening device according to the present invention;

FIG. 3 is a side elevational view, partly in section, of the guiding and dampening device shown in FIG. 2; and

FIG. 4 is an enlarged view of a portion of the device shown in a dotted circle in FIG. 3.

An elevator installation is shown in FIG. 1 and comprises an elevator car **10** positioned within a vertical hoistway composed of two longitudinally extending guide rails **12**. The guide rails **12** are arranged in a rectangular array defining the vertical hoistway and the elevator car is mounted for translational movement along these guide rails. During operation, the elevator car is translated along the guide rails by a well-known drive mechanism which is not shown and which forms no part of the present invention.

On opposed side walls of the elevator car is disposed a guiding and dampening device **14**. Each guiding and dampening device includes means for guiding the elevator car along the guide rail **12** as well as means for dampening and attenuating impulsive forces applied by the guide rails to the devices **14** to ensure that these forces are not transmitted to the elevator car itself.

The guiding and dampening device **14** of the present invention is shown in more detail in FIGS. **2** and **3** and comprises a support assembly **20** and a plurality of rollers **30** mounted for rotational movement on the support assembly. The support assembly **20** comprises a support plate member **21** having a plurality of apertures **22** therein by which the device **14** may be fastened to an elevator car **10** or a like device which is to be guided along guide rails. A support block **23** is attached to the support plate member **21** and has projecting outwardly therefrom a plurality of supporting rods or projections **24** equal in number to the number of rollers **30**.

As most clearly shown in FIG. 3, mounting means are employed for mounting each roller **30** for both rotational movement and pivotal movement relative to the support plate member **21**. The mounting means for each roller comprises a lever **26** mounted on a pivot pin **27** for pivotal movement on the support block **23** and a bolt **28** which forms a support shaft upon which the roller **30** is rotatably mounted. Bearings **29** are disposed between the bolt shaft **28** and the roller **30** whereby the roller **30** is rotatably mounted on the lever **26** and the lever itself is pivotally mounted on the support block **23**.

Each lever **26** is provided with an aperture **31** through which one of the projections **24** extends. Spring means are positioned around an exterior portion of each projection **24** and biases the lever and therefore the associated roller **30** into continuous pressure contact with one of the guide rails **12**. Each spring means comprises a compression spring **32** mounted under compression between an end portion of the projection **24** and a side surface of its related lever **26**. The parameters of the compression spring **32** are choosen such that the spring will effectively dampen impulsive forces applied by the guide rail to its associated roller to ensure that these forces are not transmitted to the support assembly **20** and hence, to the elevator car. It should be noted that the spring means individually biases each roller into pressure contact with the guide rail and thus each roller can individually be pivoted towards and away from the guide rail to individually absorb vibrations caused by irregularities of the guide rail surfaces depending upon the particular direction in which the impulsive forces are applied.

Means are also employed for variably setting the compression of each compression spring **32** and such comprises a washer **33** and threaded nuts **34** which are threaded onto the distal end of each projection **24**. To variably set the spring compression, the outer nut **34** is loosened and then the inner nut **34** is either threaded on or off of the projection **24** to effect either more or less compression of the spring **32**. After the desired spring compression is set, the outer nut **34** is threaded into engagement with the inner nut to effectively lock the inner nut in position.

Means are also employed for selectively applying friction between the projections **24** and their related levers **26** to thereby selectively oppose pivotal movement of the corresponding rollers **30** relative to the guide rails **12**. This friction applying means operates to rapidly attenuate any rocking or swaying motion of the support assembly caused by operation of the elevator door opening-and-closing mechanism and includes a bore **36** formed in one end of each of the levers **26** terminating and opening into its associated aperture **31**. A friction member **37** is slidably disposed in each bore and spring biasing means **38–40** are employed for biasing each friction member into frictional contact with its associated projection **24**. The spring biasing means comprises a bolt **39** threaded into each of the bores **36** and a compression spring **38** disposed in each bore between the bolt **39** and the friction member **37**.

In order to selectively vary the frictional contact between the friction member **37** and the projection **24**, the bolt **39** is either threaded further into the bore **36** to further compress the spring **38** or is backed out of the bore to thereby reduce the compressive force applied by the spring on the friction member **37** and by such a construction, the biasing force exerted by the compression springs **38** may be variably set to accordingly control the frictional contact between the friction members **37** and the projections **24**. A lock nut **40** is employed to lock the bolt **39** in position so that it will not back off when the assembly is subjected to vibrations during use.

As shown in enlarged form in FIG. 4, the projections **24** can also be provided with a tapered portion **42** to progressively increase the frictional contact between the friction member **37** and the projection **24** as the roller **30** pivotally moves in a direction away from the guide rail **12** and the tapered portion diverges in a direction away from the guide rail. In other words, as the lever **26** pivots away from the guide rail **12**, the friction member **37** encounters a progressively steeper or more inclined portion of the tapered projection **24** thereby progressively increasing the frictional contact.

The rollers **30** are positioned around a peripheral transverse portion of the guide rail **12** in symmetrical relationship, as best seen in FIG. 2. Each roller is biased into continuous pressure contact with the guide rail **12** and rolls along a discrete longitudinally extending area thereof during movement of the support assembly. The guide rails **12** each comprise a series of connected together beams having a T-shaped cross-section defining a head portion **12a** and a center leg **12*b***. Individual ones of the rollers are continuously maintained in rolling contact with respective ones of the two side surfaces of the center leg **12*b*** as well as with the bottom surface of the center leg. These contact areas are separate from each other and thus three longitudinally extending discrete areas of the guide rail **12** define the paths of travel of respective ones of the rollers **30**.

During operation, the support assembly **20** of each guiding and dampening device **14** is connected to the elevator car **10** or a like object which is to be moved along guide rails and the rollers **30** are spring biased into pressure contact with one of the guide rails **12**. As the elevator car **10** translates along the guide rails **12**, each of the rollers **30** rolls along a longitudinally extending area or track thereon to effectively guide the elevator car **10** and dampen vibrations imparted by the guide rails to the rollers so that these vibrations are not transmitted to the support assembly and hence, to the elevator car itself. As best seen in FIG. **2**, the three rollers **30** associated with each guiding and dampening device **14** individually and independently respond to forces applied by the guide rail **12** depending upon the particular direction of application of the forces and such renders the device more efficient and effective than the prior art type devices heretofore employed.

While the present invention has been illustrated and described with reference to a particular embodiment, it is to be understood that various modifications may be made without departing from the spirit and scope of the invention as hereinafter recited in the appended claims.

What we claim and desire to secure by Letters Patent is:

1. In combination: a longitudinally extending guide rail; a movable support assembly movable along said guide rail; a plurality of levers pivotally mounted on said support assembly in peripherally spaced-apart relationship around a peripheral transverse portion of said guide rail for pivotal movement in a direction towards and away from said guide rail; means defining an aperture through each said lever; a plurality of projections integral with said support assembly and each projecting through one of said apertures and cooperative therewith to permit pivotal movement of its associated lever; a roller rotatably mounted on each said lever to effect guidance of said support assembly along said guide rail; biasing means biasing each said lever towards said guide rail to effect pressure contact of corresponding ones of said rollers with said guide rail to guide said support assembly longitudinally along said guide rail while effectively dampening impulsive forces applied by said guide rail to said rollers during movement thereof along said guide rail to prevent such forces from being transmitted to said support assembly; and friction applying means for selectively applying friction between said projections and their related levers to selectively oppose pivotal movement of said rollers relative to said guide rail and including means coacting with said projections for progressively increasing the degree of friction between said projections and their related levers as said rollers move in a direction away from said guide rails.

2. A combination according to claim **1**; wherein said friction applying means comprises means defining a bore in each said lever opening into its associated aperture, a friction member slidably disposed in each said bore, and spring biasing means biasing each said friction member into frictional contact with associated ones of said projections.

3. A combination according to claim **2**; wherein said means for progressively increasing the degree of friction includes a tapered portion on each said projection in contact with one of said friction members and cooperative therewith to progressively increase said frictional contact as said roller moves in a direction away from said guide rail.

4. A combination according to claim **3**; wherein said tapered portion on each said projection diverges in a direction away from said guide rail.

5. A combination according to claim **3** wherein said friction applying means includes means for variably setting the biasing force exerted by said spring biasing means on each said friction member to accordingly control the frictional contact between said friction member and its associated projection.

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