

SPECIFICATION

Elevator guide rail mounting arrangement

- 5 This invention relates to arrangements for mounting the guide rails commonly utilized in elevator installations.

To provide a smooth, stable, straight ride as it ascends and descends in the elevator shaft, the typical elevator car rides on wheels which roll on rails that are rigidly mounted to the walls of the shaft. A new building not uncommonly settles following its construction, and as that happens the elevator shaft also settles. Frequently the shaft shrinks slightly as a result, which can produce substantial compression forces in the rail between the points at which it is fixed to the wall because as the wall shrinks these points are forced closer together, albeit slightly. As a result of these forces, bends and curves can develop in the rail. They can produce a wavy or uneven path for the car and, therefore, an unpleasant ride. The only way to remedy this problem is to relieve or relax the forces by loosening the rails, then retightening them.

The rails are installed in sections, particularly short ones, which are less prone to these effects, principally because the compression force on each section is smaller than it would be in a larger section. A space is provided between sections for accommodating some "inter-section" movement as the shaft settles, to minimize the "intrarail" compression forces, by preventing the rails from touching. That further inhibits the chance that bends and curves will develop, because the compression forces are broken up between rails. The ends of the sections often are tongue and groove to facilitate rail installation and also to prevent major section to section misalignment to avoid sharp changes in rail direction between sections as they shift slightly relative to each other as the shaft settles. Each section is rigidly or non-movably mounted to the wall, and thus as the shaft settles, the rails actually move closer to each other, but there is, however, no movement between an individual rail and its support points on the walls.

The potential for bends and curves nevertheless still exists in these sections, although at a reduced level.

Multisection rails are expensive to fabricate, and their installation can also be expensive, mainly because the sections have to be aligned and plumbed within the shaft. The cost obviously increases as the number of sections increases, since that requires more work during installation. In some instances, moreover, after installation realignment of the sections is needed; there cost also increases with the number of sections, for the same reason. In contrast, rails composed of larger sections obviously are less expensive to fabricate, easier to install and maintain and less prone to misalignment. Furthermore, improved ride quality can result from longer rails, mainly because there is less intersection space, therefore less bumps and jolts. A problem with longer rails, however, is that they are more prone to developing bends and curves.

It is an object of the invention to provide a rail mounting arrangement which minimizes the suscep-

tibility of the rail to develop curves and bends as the shaft shrinks or settles, and to reduce the costs associated with rail fabrication, installation and maintenance.

- 70 According to the present invention there is provided in an elevator shaft, an elevator guide rail mounted to the wall thereof by means of a plurality of clip assemblies attached at spaced apart points on the wall for exerting a hold-down force on a rail surface to urge the rail against the wall, each said clip assembly comprising a substantially rigid retaining member, attached to the wall at each attachment point, wherein the retaining member is generally L-shaped having a main body portion and an arm-like portion which extends over the rail surface in spaced relationship therewith so as to limit rail displacement from the wall to a prescribed maximum distance, said main body portion restraining lateral movements of the rail relative to the clip, and the spacer is constructed of spring steel and is substantially Z-shaped including first and second generally parallel sections, the first spacer section being curved and sandwiched between the arm-like portion and the rail surface so as to be forced against the rail surface and partially flattened by said armlike portion, the second spacer section being secured between the main body portion and the wall, said first spacer section providing a resilient hold-down force to urge the rail against the wall and to permit movement of the rail relative to the clip assembly at least in a longitudinal direction.

In order that the invention may be readily understood, an embodiment thereof will now be described by way of example with reference to the accompanying drawings in which:-

Figure 1 is an exploded perspective view of a clip assembly for holding an elevator guide rail in place;

Figure 2 is an elevation of an elevator shaft wall, illustrating a typical rail section fastened to the shaft wall by utilizing the clip assembly of Figure 1;

Figure 3 is a sectional view along the line 3-3 of Figure 2 showing a cut away section of the clip assembly;

Figure 4 is a magnified view of a portion of the clip assembly illustrating the tensioned spacer member for holding the rail in place;

Figure 5 is a view smaller to Figure 4 of a portion of the clip assembly illustrating the spacer member in its relaxed or untensioned state.

In Figure 1 an embodiment of the invention is shown as a clip assembly 10 hereinafter referred to as a clip, which includes a rigid retainer 12 and a spring spacer 14 having a generally curved or bent section 16. The spacer is generally congruent with the inner contour of the retainer for it to easily conform therewith to hold the rail in place as shown in Figure 3.

In Figures 2 and 3 a typical guide rail section 18 is resiliently held in place on a wall 20 by means of several clip assemblies 10, positioned in pairs, as shown. A threaded stud or bolt 21 is implanted into the wall and passes through holes in the base 22 of the spacer and the base 23 of the retainer. A nut 24 is threaded and tightened onto the stud to hold the rail in place by forcing the retainer against the curved

section of the separator to force a portion 26 thereof against the base 28 of the rail.

A portion of Figure 2 magnified significantly in Figure 3 illustrates the change brought about in the shape of the spacer, specifically in the curved section 16, as the retainer is bolted down (the nut is tightened); that change being instrumental to the present invention. When the nut is "tight" the retainer is pushed against the spacer along an interface 30 which tensions the curved section slightly, as it is urged towards the base of the rail, "sandwiching" it in the space therebetween. This change can be seen by comparison to Figure 4, wherein the spacer is untensioned or relaxed, not sandwiched, (its condition when the nut is "loose"). In this way, a rail hold-down force is transmitted from the retainer to the base through the spacer, as the nut is tightened, by which the rail is forced against the wall and held thereon.

The curved section is not completely flattened, however, and the mounting is therefore resilient and can accommodate rail movement on the wall, up and down (arrow 32) - even though the retainer 12 remains completely stationary under such circumstances. If the retainer were to be directly fastened to the rail (as in the prior art), the rail could not slide in this manner, at least not without being somewhat loose on the base, which clearly would cause the rail to be loose on the wall. Moreover, due to variations in the base of the rail 18, specifically in its surface smoothness and thickness, a retainer alone pressing on the base would have unpredictable friction characteristics mainly because it is not resilient and, therefore, is unable to compensate for (follow) such variations and hold the rail down with sufficient force at the same time. A retainer alone, obviously, is equivalent to a simple clip found in the prior art.

The utilization of the springly resilient spacer 16 provides a noticeably dynamic hold-down force in as much as it can flex (flatten or expand) to compensate for any surface imperfections and abnormalities, and thereby permit the rail to slide between support points on the wall, comparatively freely, but still apply sufficient force so that the rail is held securely against the wall. Horizontal restraint (arrow 34) is provided by the retainer, as shown in Figure 4, which aids in maintaining alignment between rail sections. The spacer thus provides for movement of the rail relative to the wall without any looseness.

In the typical elevator installation, the clips 10 are fastened to opposite sides of the rail, as depicted, along the shaft at predetermined distances apart. Considering the foregoing, if the wall shrinks slightly the clip pairs move towards each other by sliding on the rail; thus permitting relative motion between the rail and the wall and alleviating any compression forces that might otherwise be established in the rail between the pairs, were they not permitted to move in this fashion.

An obvious feature of the clip is that it is simple to install. Installation involves nothing more than securely bolting the retainer down tightly in the wall. Sepcific torque levels are not necessary in as much as a deliberate special relationship is maintained between the base of the rail and the retainer to allow

for moderate sandwiching of the spacer. Hence, to install the clip the nut only has to be tightened to the point where it securely holds the retainer in place on the wall and simultaneously flattens the curved section 16 enough to apply sufficient hold-down force on the rail base to clamp the rail on the wall.

The clip provides an important safety feature, as well, in that the retainer prevents any extreme rail movement away from the wall. For that reason the retainer is constructed preferably of thick forged steel; not unlike the construction of previous prior art clips of the type directly bolted on the rail. However, in as much as the spacer is deliberately intended to apply resilient force to the rail and bend or flex in the aforementioned manner, it is constructed of spring steel, with a thickness of 18 to 19 gauge, for example. The specific shape (curvature) of the curved section 16 is not critical; the only criteria being that it fill the intended space between the retainer and base and be compressed somewhat, but not fully, as shown in Figure 4, to accommodate the relative rail movement as the wall shrinks. Thus, other spacer configurations may be used: for example, those having multiple curves, split curves or wavy, ripple-like curves.

CLAIMS

1. In an elevator shaft, an elevator guide rail mounted to the wall thereof by means of a plurality of clip assemblies attached at spaced apart points on the wall for exerting a hold-down force on a rail surface to urge the rail against the wall, each said clip assembly comprising a substantially rigid retaining member, attached to the wall at each attachment point, wherein the retaining member is generally L-shaped having a main body portion and an arm-like portion which extends over the rail surface in spaced relationship therewith so as to limit rail displacement from the wall to a prescribed maximum distance, said main body portion restraining lateral movements of the rail relative to the clip, and the spacer is constructed of spring steel and is substantially Z-shaped including first and second generally parallel sections, the first spacer section being curved and sandwiched between the arm-like portion and the rail surface so as to be forced against the rail surface and partially flattened by said arm-like portion, the second spacer section being secured between the main body portion and the wall, said first spacer section providing a resilient hold-down force to urge the rail against the wall and to permit movement of the rail relative to the clip assembly at least in a longitudinal direction.

2. An arrangement according to claim 1 wherein each retaining member is attached to the wall by means of a nut threadedly engaging a bolt or stud embedded in the wall.

3. In an elevator shaft, an elevator guide rail mounted to the wall thereof substantially as hereinbefore described with reference to the accompanying drawings.

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