Oct. 12, 1965 D. D. TOFANELLI 3,211,259

MONORAIL FOR COUNTERWEIGHT FRAMES

Filed Nov. 9, 1962

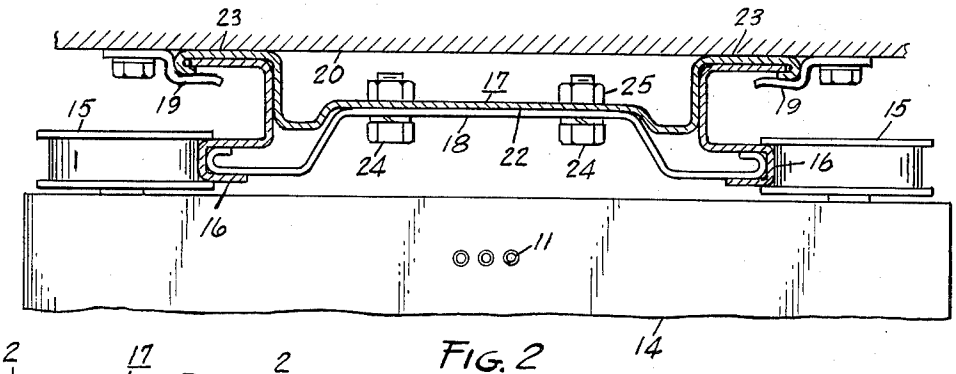


FIG. 2

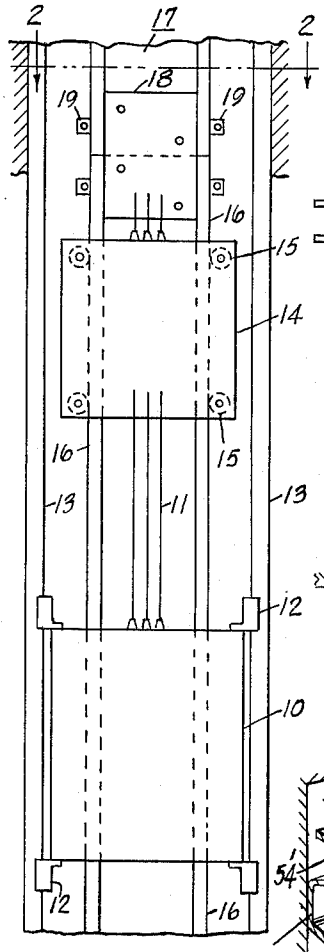


FIG. 1

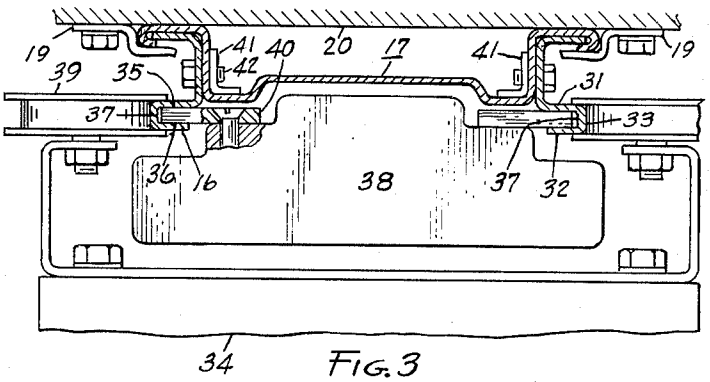


FIG. 3

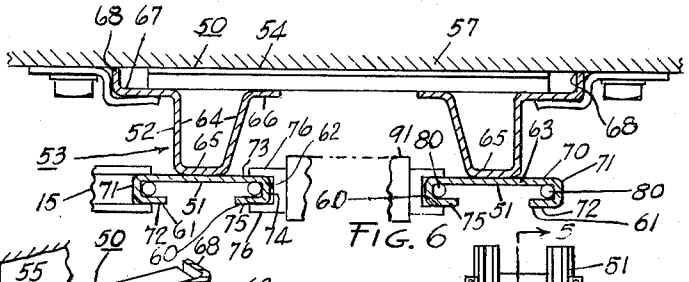


FIG. 6

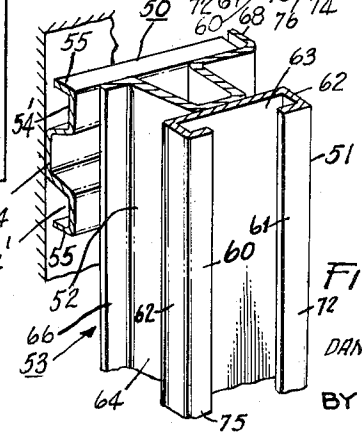


FIG. 5

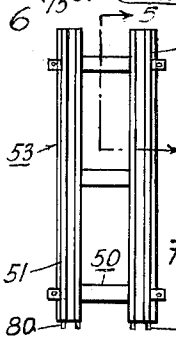


FIG. 4

DANIEL DARIO TOFANELLI INVENTOR

BY J. L. Sharon ATTORNEY

United States Patent Office 3,211,259
Patented Oct. 12, 1965

3,211,259

MONORAIL FOR COUNTERWEIGHT FRAMES

Daniel Dario Tofanelli, Bronxville, N.Y., assignor to Otis Elevator Company, New York, N.Y., a corporation of New Jersey

Filed Nov. 9, 1962, Ser. No. 236,547
9 Claims. (Cl. 187—95)

This invention relates generally to elevators and dumbwaiters and more particularly to means for guiding elevator and dumbwaiter cars and counterweights, and is a continuation-in-part of co-pending application, Serial No. 787,926. More particularly, the invention relates to a composite structural element made of preshaped sheet metal portions to provide a structural section forming the overall vertical guide rail or monorail assembly prefabricated as a unitary structure ready for mounting in the hoistway.

In elevator and dumbwaiter installations it is customary to install vertical guide rails in the hoistway and guides on the cars and counterweights. The guides engage the guide rails and both cooperate to guide the cars and counterweights in their travels up and down the hoistway. It is general practice to provide a pair of rails for the car and another pair for the counterweights. The individual rails of each pair are installed parallel to the other of its pair, and both pairs are installed as nearly vertical as the supporting structure will permit.

For elevators, the guide rails for the car usually are installed one on each of two opposing sides of the hoistway, and the guide rails for the counterweight are both installed usually, though not invariably, on the back wall of the hoistway. In the usual counterweight rail installation, U-shaped brackets are fastened to the rear wall of the hoistway in vertical alignment with their legs projecting into the hoistway, and the flanges of the guide rails are secured to the inside of the opposed legs of the U-shaped bracket. The counterweight operates between the counterweight guide rails and its width is restricted by the distance between the rails which in turn is established by the distance between the legs of the U-shaped brackets. Different sized cars require different sized counterweights, and inasmuch as it is highly desirable to maintain the thickness of the counterweight at a minimum in order to keep the front to back dimension of the hoistway at a minimum, it is necessary to maintain a large stock of U-shaped brackets which vary principally in their width; that is, in the distance between legs.

For dumbwaiters, the guide rails of both the car and the counterweight are generally installed on one wall of the hoistway in spaced parallel relation. This combined car and counterweight rail installation comprises U brackets the bases of which are fastened to the hoistway in vertical alignment. The rails are secured to the inside and outside of the opposed legs of the U bracket that project into the hoistway. The oppositely disposed rails are fastened to the outside of the legs and act in guiding the car, and the opposing rails are fastened to the inside of the legs and act in guiding the counterweight. For the same reasons given in the preceding paragraph, a large inventory of various sizes of U brackets is carried for dumbwaiters.

It is desirable in elevator and dumbwaiter installations to reduce to a minimum the front to back space in the hoistway required for the rails and counterweight; to reduce to a minimum the number, size and weight of the constituent parts; to standardize the constituent parts where possible, and to simplify as much as possible the tedious, laborious and expensive process of installing the rails in parallel and vertical alignment in the hoistway. Accomplishing the first desirable feature permits either

a larger car for equal hoistway area or less hoistway area for the same elevator car. A saving in hoistway area provides more rental space on each floor of the building in which the hoistway is located. Co-pending application, Serial No. 752,092, now Patent No. 3,065,826 (also assigned to the assignee of this application), provides for saving space in the front of the hoistway. This application provides for saving space in the back of the hoistway. Accomplishing the remaining desirable features reduces the cost of parts and the time and expense of installation.

It is therefore an object of the invention to provide a guide rail that reduces to a minimum the space required in a hoistway for an elevator installation of a given capacity.

Another object of the invention is to provide a minimum weight guide rail for elevators and dumbwaiters with no diminution of adequacy and durability.

Another object of the invention is to provide a unitary composite guide rail having two guide members separated by a standard distance for use with various sizes of elevator and dumbwaiter cars and counterweights.

Another object of the invention is to provide a guide rail for elevators and dumbwaiters requiring a minimum of time and labor to install in a hoistway.

In carrying out the invention according to the arrangement which will be described, a section of convenient length of guide monorail is rolled, formed and fabricated from sheet metal into a unitary structure having parallel guide members that are separated by an appreciable distance, parallel fastening flanges which are separated by approximately the same distance and a metal web connecting the guide members and fastening flanges; the ends being adapted to being joined congruently with the ends of similar sections to form any desired over-all length of guide monorail.

Features of the invention are that with no diminution of adequacy and durability, guide rail space in the hoistway is reduced by about one fourth, guide rail weight is reduced by approximately half, guide rail material cost is reduced proportionately, the time previously required for securing parallel alignment of the paired guide rails is eliminated, thereby reducing guide rail installation time to approximately half, and no inventory of guide rail brackets need be carried.

Other objects and features and a more complete understanding of the invention will appear from the following description and drawings in which:

FIGURE 1 is a partial sectional view of a hoistway showing an elevator and its counterweight installed for operation in accordance with the invention;

FIGURE 2 is a plan view section taken along line 2—2 of FIGURE 1;

FIGURE 3 is a plan view of the invention installed in a hoistway as a guide monorail for a dumbwaiter car and counterweight, and showing fishplate means of congruently joining the ends of two rail sections to form one continuous rail;

FIGURE 4 is a front elevation of a modification of the invention;

FIGURE 5 is a perspective view of a portion of the monorail taken generally along lines 5—5 of FIGURE 4; and

FIGURE 6 is a plan view, partly in section of the modification of the invention.

Referring to FIGURE 1, an elevator car **10** is shown suspended by ropes **11** in a hoistway and guided therein by the conventional arrangement of guides **12** cooperating with guide rails **13** on opposing sides of the hoistway. The counterweight **14** is suspended in the hoistway at the other ends of ropes **11** which pass over a sheave (not

shown) intermediate to the car and counterweight. The counterweight **14** is guided in the hoistway by guide rollers **15** cooperating with the guide members **16** of the guide monorail **17**. Sections of monorail **17** are joined by means of fishplates **18** into a continous strip extending for the length of the hoistway and are fastened by rail clips **19** to the back wall **20** of the hoistway.

Referring to FIGURE 2, the invention when particularly adapted for elevators is shown attached to a hoistway wall **20** by rail clips **19**. As is illustrated, the invention is in the form of a monorail formed from sheet metal. Eleven gauge steel sheet has been found satisfactory for one tested embodiment of elevator service having a gross load of 2,500 pounds traveling at 250 feet per minute.

The metal sheet is bent to form a central web **22**, which is offset forwardly from two fastening flanges **23**, on opposite sides of the sheet or metal web **22**. Either by the same forming process or by separate processes the guide members **16** are bent of this same stock and are arranged parallel to and in front of the conjugate fastening flanges. Although this forming process can, if desired, be carried out on a single sheet of sheet metal, for ease and economy of production the guide portions or guide members **16** may each be produced separately and fastened to the conjugate fastening flange section as by welding. It will be noted from an inspection of FIGURE 2 that the guide members **16** are on opposite sides of the monorail and lie in substantially the same vertical plane. Each one is open ended and has three exterior and three interior surfaces which are available for use as guide surfaces in manners to be later described. The fastening flanges **23** are in back of the guide members **16** on opposite sides of the central web **22**, and also lie in a common vertical plane parallel to the common plane of the guide members.

In one tested embodiment the central web was found to be suitably about 6½" to 7" in which with each fastening flange section being about 1½" in width. Guide members **16** were offset in front of their corresponding flange sections by approximately 2", and themselves were both about ⅝" thick. The central web **22** was about 1" forward of the back surface of the fastening flanges **23**.

The guide members **16** and fastening flanges **23** are continuous for the length of the elongated rectangular metal sheet from which the monorail may be formed. The ends of each monorail section can be butted to additional sections of monorail with similar parts in alignment to form any desired length of monorail. At the butts the sections are joined by a fishplate **18** extending a short distance in both directions beyond the joint and fastened to both sections by bolts **24** and nuts **25**, the latter of which are welded to the backs of the monorail section. Each vertical side of fishplate **18** is formed into a flanged section, these being properly proportioned and offset from the central web section such that they fit snugly into the open end of the corresponding guide member **16**.

Each guide member **16** has three exterior guide surfaces that are engaged by the cooperating guide shoe or guide roller. In this described arrangement guide rollers are used and the preimeter and side flanges of flanged guide roller **15** contact these three surfaces. The flanged rollers **15** may be rotatively mounted at the top and bottom of the right and left sides of the back surface of the counterweight **14**. It should be understood that conventional guide shoes having slots to fit the guide members **16** may also be employed as cooperating guides on the counterweight **14**.

If it is desired, both the exterior and interior guide surfaces of guide members **16** can be used simultaneously. Such an arrangement would be especially suited for guiding the car and counterweight of a dumbwaiter, or possibly a small elevator installation of the so-called "wall climber" type. When so used, the exterior guide surfaces of each guide member **16** comprising oppositely disposed surfaces **31** and **32** and surface **33** act in guiding the dumbwaiter car **34**, and the interior guide surfaces of each guide member **16** comprising opposing surfaces **35** and **36** and surface **37** act in guiding the counterweight **38** as is shown in FIGURE 3. The preferred cooperating guides for dumbwaiter car **34** are flanged rollers **39** which may be the same type as the guide rollers **15** previously described for use with the elevator counterweight **11**. However, guide shoes may be used, if desired. The cooperating guides for the dumbwaiter counterweight **38** may be, preferably, counterweight flanges **40** bolted to the back of the counterweight **38** (FIGURE 3) although it may be understood that unflanged guide rollers may also be employed in place of the sliding counterweight flanges **40**.

When the interior surfaces of the guide members **16** are utilized as guide surfaces, the fishplate **18** previously described cannot be used. Sections of monorail are joined at their butted ends by two opposing L-shaped fishplates **41** that extend vertically a short distance above and below the joint. Each fishplate **41** is fastened by bolts **42** screwed into tapped holes in both monorail sections between the guide members **16** and the fastening flanges **23**.

In the modification shown in FIGURES 4, 5 and 6, the composite monorail section embraces three discrete and different structural shapes namely, a central web means **50**, in the form of an elongated plate having a ribbed channel shape or conformation, a guide portion in the form of a lipped channel **51**, and a channelized spacer means **52** for combining the guide portion with the central web means **50**. The three structural shapes **50**, **51** and **52** are combined into the composite monorail unit **53** shown in FIGURE 4.

The central web means **50** has a channel base portion **54** intermediate two longitudinal rib portions **54'** which terminate in edges **55** on opposite sides of central web means **50**, with said edges being preferably slightly spaced from the plane of the base portion **54** so that the edges, in the arrangement shown, do not engage the side wall of the hoistway **57**.

The pair of identical lipped guide portions **51—51** each have a guide portion inner lip **60** and a guide portion outer lip **61** combined with a pair of channel sides **62** and a guide portion channel base **63**. The spacer means **52**, for suitably spacing the guide portions from the central web, has a deep channel shape with converging leg portions **64** terminating in a spacer means base portion **65**, and with one of the leg portions **64** of each spacer means having an angle foot **66**, and the other of each of said spacer means having a footed flange **67** terminating in a flange edge **68**, which edge is spaced from or may be substantially in engagement with the hoistway wall **57**.

The monorail presented in FIGURES 4–6 has identical dual guide portions each with outer and inner contour surfaces. The outer contour surfaces **70**, **71** and **72** are for guiding engagement with respective body guide rollers such as **15**, while the inner contour surfaces **73**, **74** and **75** of each guide portion **51—51** are for guiding engagement with the respective counterweight guide **76**, of which there is one on either side of the counterweight **91**, shown partly broken away, and disposed for operative engagement with and between the pair of inner contour surfaces of the adjacent guide portions.

The central web means **50**, the lipped channel **51** forming the guide portion, and the spacer means **52** are operatively aligned and welded together securely in the relative position shown in the drawings. While the central web means is shown as a discrete elongated plate being relatively narrow in relation to its length, it is to be understood that the depth or height of the cenral web means may vary or the spacing between the central web means may be very close until they are substantially touching. Accordingly, depending upon the arrangement and/or height of the central web means as presented in FIGS. 4–6, the web means may be substantially continuous to provide an arrangement somewhat similar to the con-

tinuous web arrangement as shown in FIGURES 2 and 3.

Accordingly, it will be seen that the left and right dual guide portions may have the outer contour surfaces as shown for operative engagement with guide rollers carried by one body, such as an elevator, and the inner contour surfaces of the opposed guide portions disposed in movable operative engagement with the counterweight guides **76**, which are secured to opposite sides of the counterweight.

A pair of spaced aligning pins **80** are shown secured in one end of each of the dual guide portions and are used to engage complemental portions of an adjacent monorail unit for holding the adjacent portions of monorail units or sections in rigid alignment. While pins **80** are shown as one form of guide portion alignment means, it is to be understood a flat plate may be affixed in one end of the guide portion and extend from one channel wall **62** laterally to the other channel wall **62**, and may protrude sufficiently to engage the complemental portion of an adjacent monorail section. The form of the aligning means may be varied as the invention is not restricted to the aligning pins as shown.

FIGURE 5 shows only the right hand spacer means and right hand guide portions. The monorail pair of spacer means and their respective guide portions are mounted vertically parallel having opposed similar portions. However, it is pointed out that while the two guide portions are identical the two spacer means are allochiral, in contradistinction to comparable portions in FIGURES 2 and 3. This is specifically pointed out since the particular cross-sectional configuration of the guide portion may be varied without departing from the basic concept of the monorail invention. Reiterating, it is applicant's belief that it is new in the elevator art to fashion the guide rail structure as a unitary device composed of relatively light gauge sheet metal which has been preformed into the desired profile such that it can be erected as a unit.

As 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 drawing be interpreted as illustrative only and not in a limiting sense.

What is claimed is:

1. A guide element for guiding the vertical passage of a movable body in a hoistway, said element being composed throughout its length and breadth of bent sheet metal, said metal being formed into a pair of oppositely disposed C-shaped guide sections and a pair of flanged fastening sections, each said guide section being forwardly displaced from and supported throughout its length on a conjugate flanged fastening section by a continuous sheet of metal plate, said paired guide and flange sections being supported and braced one from the other a suitable distance by a central web section of sheet metal plate, said central web section being permanently joined along its right and left edge extremities to the guide supporting section intermediate the conjugate flanged and guide sections, said joining being substantially continuous throughout the vertical dimension of the connected web section and at a position more nearly approaching the guide sections than their conjugate flanged sections.

2. A guide device for location in the hoistway structure of an elevator installation; comprising spaced-apart C-shaped guide members with outer contour surfaces having open ends facing each other, each said C-shaped guide member being affixed to and supported throughout its length by a respective formed sheet metal supporting member the opposite rearward edge of which is formed into a footed flange surface adapted to be aligned in abutting relationship against the hoistway structure, securing means supported by said hoistway structure and adapted to receive one of said footed flange surfaces thereunder in clamping relation against said structure, and centrally located spacing and bracing means having right and left edges said means being along each of said edges in permanent fixed attachment to a respective one of said supporting members, whereby said right and left C-shaped guide members are supported in substantially the same vertical plane by said right and left support means which latter means are braced and spaced apart a substantially constant distance by said centrally located spacing and bracing means.

3. A guide device adapted to be affixed to an elevator hoistway structure for guiding a body movable within said hoistway, said device being made of formed sheet metal sections, and including a right and a left C-shaped guide member supported in the same vertical plane, a right and a left support member, each said support member being rigidly affixed to and supporting its conjugate guide member, each said support member having its rearward or backwardly extending portion formed into a footed flange section to be received in abutting relationship against said hoistway structure while supporting said paired guide section vertically, centrally disposed spacing and bracing means having right and left extremities along which a respective one of said flanged supporting sections is attached such that said sections are braced apart a substantially constant distance throughout their entire length while supporting said C-shaped guide members in the same vertical plane with their outer contour surfaces uniformly spaced apart throughout their lengths and a plurality of clamping means adapted for affixation to said hoistway structure and to receive each thereunder the footed flange section of one of said support members to affix said guide device vertically in said hoistway.

4. A guide element for erection vertically in a hoistway to direct the movement of a body therein, said element being formed and composed as a unit from sheet metal stock and presenting along its right and left vertical sides each a formed guide section coextensive in length with said element, each said guide section being substantially C-shaped in tranverse cross-section, a pair of formed sheet metal support members, coextensive in length with said guide sections, each of said support members being permanently and rigidly attached throughout one of its longitudinal dimensions to a corresponding one of said guide sections and having a footed flange section suitable for abutment against the hoistway structure formed along its opposite longitudinal dimension, spacing and bracing means centrally located between said support members and being permanently and rigidly attached thereto along its right and left vertical dimensions, said support members each being so proportioned that its attached guide section resides in the same vertical plane with the oppositely disposed guide section, with the open ends of the C-shaped guides in facing relation and said support members in turn being so spaced and braced by said attached centrally located spacing and bracing means that the outer contour surfaces of said C-shaped guide members are substantially parallel with constant spacing throughout their length.

5. A guide element for erection vertically in a hoistway to guide a body movable therein, said guide element being formed as a unit from sheet metal stock and comprising two longitudinal guide members and two longitudinal flange members in fixed predetermined spatial relation each to the others, each said guide member being C-shaped in cross-section with its opening facing that of the other guide member and having substantially constant separation therefrom throughout its length in the same vertical plane, a pair of spacing and support members the rearward portion of each of which is formed into a footed flange section along its longitudinal dimension, each said support member being coextensive in length with and permanently rigidly attached to its conjugate guide section along its other longidutinlal dimension opposite said flanged section, and centrally located web means intermediate the two flange supported guide means and serving

through rigid attachment to each supporting means along its longitudinal dimensions to space and brace said supported guide means in position wherein said oppositely disposed guide means are in the same vertical plane and are separated one from another by a substantially constant amount throughout their longitudinal dimensions.

6. A unitary guide rail assembly composed of preshaped sheet metal portions combined as a rigid composite structural element to be mounted in a vertical hoistway for guiding one or more bodies vertically movable therewithin, and including right and left elongated guide portions supported in the same vertical plane, each having a rectangular C-shaped cross-section, right and left support members, each said support member having a generally U-shaped cross-section with a base and two backwardly extending side portions, its base portion being rigidly affixed to and supporting its respective conjugate guide member, each of said support members being substantially coextensive in length with its conjugate guide member and having one of said backwardly extending side portions formed into a footed flange section to be received in substantially contiguous relationship against said hoistway structure while supporting its associated guide portion vertically, centrally disposed spacing and bracing means having right and left end portions to each of which the backwardly extending side portions of a respective one of said support members are rigidly attached such that said flange sections are braced apart a substantially constant distance throughout their entire length while supporting said guide portions in the same vertical plane with their outer contour surfaces uniformly spaced apart throughout their lengths, said outer contour surfaces of each of the guide portions being preshaped to receive complemental guide surfaces carried by one of said vertically movable bodies.

7. A unitary guide rail assembly as set forth in claim 6, wherein inner contour surfaces form part of said right and left guide portions to receive second complemental guide surfaces carried by a second movable body.

8. A unitary guide assembly adapted to be rigidly affixed as a unit to an elevator hoistway structure to guide in a predetermined path a body movable in said hoistway, said assembly comprising right and left spaced elongated sheet metal channel guide members each member having a base and two side sections the extremities of which are bent toward each other as lipped portions forming a generally rectangular C-shaped cross-section, a pair of sheet metal channel shaped support member each being substantially coextensive in length with the guide members and having a base and two side sections, the extremity of one side section of each support member being formed into a footed flange of a dimension suitable for fitting under a conventional elevator rail clip, the base section of each sheet metal support member being rigidly affixed in back-to-back relation to the base section of a respective one of said C-shaped sheet metal guide members throughout their longitudinal dimensions, and a plurality of channel shaped sheet metal web spacing supports positioned transversely of and between said footed flanges of said support members, each side section of said support members being rigidly affixed at its extremity transversely to the upper surface of each of said web spacing supports proximate their opposite ends such that said support members hold said right and left guide members in substantially the same vertical plane with substantially constant spacing between the corresponding side sections thereof throughout their longitudinal dimensions.

9. A unitary guide assembly in accordance with claim 8 wherein the exterior surfaces of each rectangular C-shaped sheet metal guide member forms an inner and an outer contour surface available for guiding a pair of movable bodies in said hoistway, and in which said inner contour surfaces of said paired members are separated a substantially constant distance and said outer contour surfaces of said paired members are separated a different substantially constant distance throughout their longitudinal dimensions.

References Cited by the Examiner

UNITED STATES PATENTS

509,106	11/93	Shannon	187—6
966,769	8/10	Rittenhouse	187—3
1,051,335	1/13	King	187—95
1,083,508	1/14	Schlosses et al.	187—95
1,634,585	7/27	Kreider	187—6
1,702,783	2/29	Kiesling	187—95
1,936,195	11/33	Honeg.	
2,370,546	2/45	Kiesling	187—3 X
2,428,223	9/47	Johnson	187—9 X
2,848,077	8/58	Tofanelli	187—95 X
2,864,656	12/58	Yorinks	308—3.8
2,865,684	12/58	Meyer	308—3.8

FOREIGN PATENTS

804,743	1/59	Great Britain.

SAMUEL F. COLEMAN, *Primary Examiner.*

ANDRES H. NIELSEN, *Examiner.*