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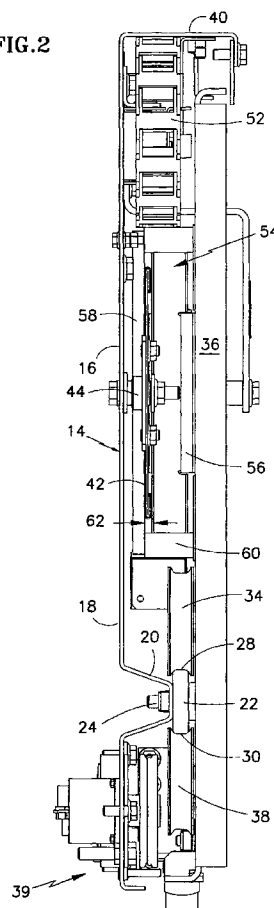
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(54) Housing for elevator car door operating system

(57) A multi-functional system housing (14) for an elevator car door (12) operating system includes an upper housing portion (16) and a lower housing portion (18) integrally formed with the upper housing portion. The upper housing portion houses a motor secondary (42) of a linear motor driving the elevator car doors. The lower housing portion supports a track (22) for a plurality of hanger rollers (34,38) of a door hanger (36) to ride on.

FIG.2



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Description

The present invention relates to elevator car door operating systems and, more particularly, to means for supporting and housing the same.

In conventional elevator systems, elevator car doors are selectively opened and closed by a rotary electric motor driving a mechanical assembly, which typically includes a plurality of moving parts such as gear boxes, a set of drive arms, linkages and cams. The rotary electric motor is typically enclosed in a motor housing and secured to the elevator car by means of a flange or mounting feet. A major drawback in existing elevator car door systems is their susceptibility to misalignments, which require frequent adjustments that result in high maintenance costs. Also, the misalignments degrade the performance of the system such that door opening and closing functions are not consistently smooth.

A linear motor driven door system provides an alternative to the existing electro-mechanical system. However, packaging linear motor driven systems is challenging. A typical linear motor for driving elevator car doors includes either a motor secondary or a motor primary that extends the length of the elevator car door travel. Housing and supporting such long motor parts becomes expensive and adds significant weight to the moving elevator car.

Another problem encountered in the use of linear motors on elevator car doors is misalignment between the moving and stationary parts of the linear motor. Maintaining a constant clearance between the parts of the motor is critical to the performance and efficiency of the motor. Usually, a housing of the moving part of the motor is fixed to the elevator car door and moves therewith and a housing of the stationary part of the motor is attached to the elevator car by means of a first bracket. The door, with the moving part of the motor attached thereto, is movably supported by a second bracket. In order to maintain proper clearances between the moving and stationary parts of the motor, precise tolerances must be maintained between the first bracket securing the stationary part of the motor to the elevator car and the second bracket which affects the position of the door having the moving part of the motor secured thereon.

Viewed from one aspect the present invention provides an elevator car door operating system for driving an elevator car door, comprising:

- a door hanger suspending said elevator car door therefrom, said door hanger having a plurality of rollers attached thereto;
- a linear motor primary fixedly attached to said door hanger;
- a motor secondary extending the length of the door travel; and
- a system housing supporting and housing said motor secondary and including a track for said rollers to ride on.

The system housing may also support a termination box with moving flexible cables, and a positioning and synchronization system.

An embodiment of the invention will now be described by way of example and with reference to the accompanying drawings, in which:-

FIG. 1 is a cut-away schematic perspective view of an elevator car door system supported by a multi-functional system housing, according to the present invention; and

FIG. 2 is a schematic cross-sectional side view of the system of FIG. 1, taken along the line 2-2.

Referring to FIG. 1, an elevator car door operating system 10 for opening and closing a pair of elevator car doors 12 includes a multi-functional system housing 14 that houses and supports all parts of the elevator car door operating system. The system housing 14 comprises integrally formed upper and lower housing portions 16 and 18. The lower housing portion 18 includes a protruding bend portion 20 to support a track 22. The track 22 extends the length of the door travel and is bolted to the protruding bend 20 by means of bolts 24. The track includes an upper roller surface 28 and a lower roller surface 30.

Referring to FIG. 2, a plurality of hanger rollers 34, that are attached to each door hanger 36, come into contact with the upper roller surface 28. A plurality of up-thrust rollers 38, that are also attached to each door hanger 36, have a minimal clearance from the lower roller surface 30. The lower housing portion also supports a synchronization and positioning system 39.

The upper housing portion 16 includes an integrally formed top flange 40, and houses a linear motor secondary 42. The motor secondary 42 is attached to the housing 16 by means of a plurality of joints 44. Each joint 44 includes a standoff to provide spacing between the housing 16 and the motor secondary, and a swivel to allow flexibility of the motor secondary 42 about each joint 44.

The upper housing portion 16 also houses a termination box 50 with a pair of moving flexible cables 52, as best seen in FIG. 1. The termination box 50 is mounted centrally, underneath the top flange 40, with each flexible cable 52 originating from the termination box 50 and terminating at a respective motor primary 54. Each motor primary 54 is fixedly attached to a respective one of the door hangers 36. Each motor primary includes a primary winding 56 and a backiron 58 spaced apart by a plurality of spacers 60 to define a magnetic air gap 62 therebetween.

In operation, the moving flexible cables 52 transmit energy from the termination box 50 to the respective motor primaries 54. As each motor primary 54 travels across, the motor secondary 42 fits within the magnetic air gap 62 of the motor primary 54. The motor primary cooperates with the motor secondary to generate thrust

forces. The thrust forces move the motor primaries and the respective door hangers to which the motor primaries are attached. As the door hangers travel, opening and closing the elevator car doors suspended therefrom, the hanger rollers 34 glide atop the upper roller surface 28 of the track 22. The upthrust rollers 38 come in contact with the lower roller surface 30 of the track 22 in the event the doors are subjected to upward thrust.

The multi-functional system housing 16 of the present embodiment not only supports the rollers of the door hangers, but also functions as an integral housing for the motor secondary. The housing eliminates the need for an additional separate housing to shield and support the motor secondary. The housing provides rigid support to the motor secondary and has the motor secondary flexibly mounted thereto. Also, the housing shields the motor secondary from external elements and includes the top flange to prevent hoistway debris or drippage from reaching the motor secondary. By eliminating the need for a separate motor secondary housing, the present embodiment saves the cost of an additional piece, the time to install it, and the excess weight.

Also the present embodiment, having the housing of the motor secondary integral with the track for the door hangers, reduces the potential for misalignment between the motor primaries and the motor secondary.

The housing also supports the termination box 50 and the positioning and synchronization system 39.

In a preferred embodiment the system housing is formed from steel.

It will thus be seen that the present invention, at least in its preferred forms, provides a high performance operating system for opening and closing elevator car doors; and furthermore ensures proper alignment between parts of a linear motor driving the elevator car door operating system; and furthermore reduces the overall weight of the elevator car door operating system; and furthermore minimizes the number of parts necessary to support the elevator car door operating system.

housing (14) is made of steel.

3. A system housing (14) for an elevator car door operating system for driving an elevator car door between open and closed positions, said system housing comprising:

an upper housing portion (16) supporting and housing a motor secondary (42); and
a lower housing portion (18) integrally formed with said upper housing portion, said lower housing portion including a track (22) to support a plurality of rollers (34,38) mounted on a door hanger (36) for suspending a said door.

4. A system housing according to claim 3, which also supports a synchronization and positioning system.
5. A system housing according to claim 3 or 4, which also supports a termination box (50) and a plurality of moving flexible cables (52).

Claims

1. An elevator car door operating system for driving an elevator car door (12), comprising:

a door hanger (36) suspending said elevator car door therefrom, said door hanger having a plurality of rollers (34,38) attached thereto;
a linear motor primary (54) fixedly attached to said door hanger;
a motor secondary (42) extending the length of the door travel; and
a system housing (14) supporting and housing said motor secondary and including a track (22) for said rollers to ride on.

2. A system according to claim 1, wherein said system

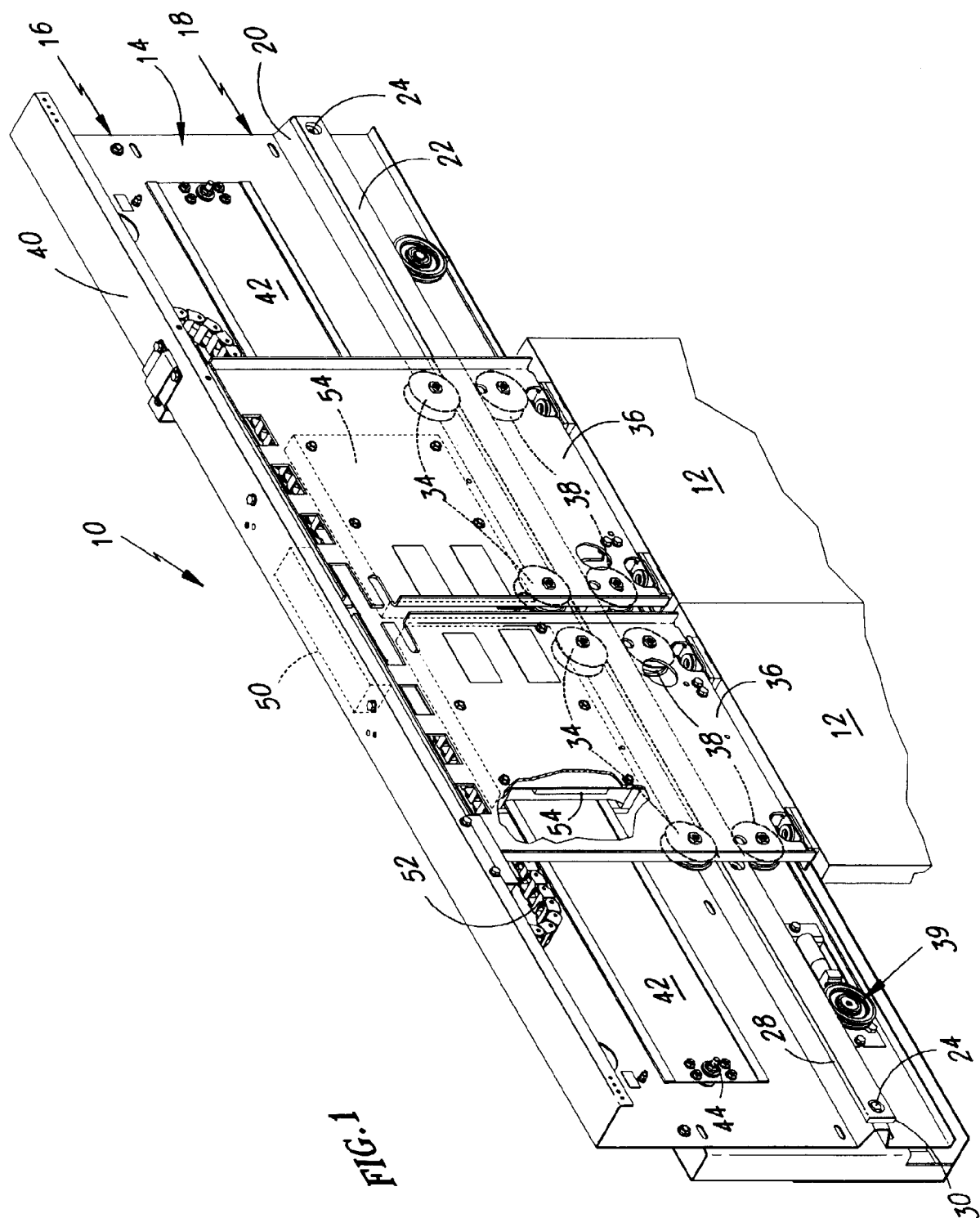
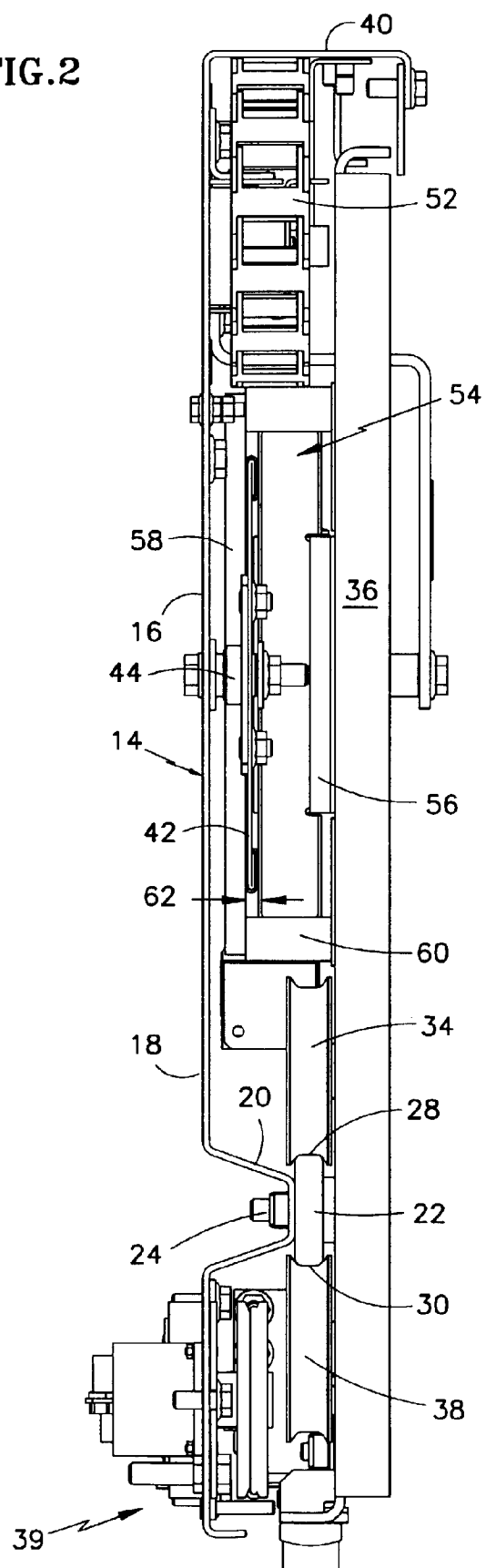


FIG.2





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EUROPEAN SEARCH REPORT

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	PATENT ABSTRACTS OF JAPAN vol. 016, no. 082 (M-1215), 27 February 1992 -& JP 03 264486 A (MITSUBISHI ELECTRIC CORP), 25 November 1991, * abstract *	1,2	B66B13/08 H02K41/02 E05F15/18
Y	---	3	
Y	EP 0 709 337 A (KONE OY) * column 2, line 44 - column 3, line 23; figures 1-4 *	3	
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X	US 5 172 518 A (YOSHINO MITSUJI) * column 2, line 37 - line 57; figures 1-3 *	1,2	
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			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B66B H02K E05F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 29 January 1998	Examiner Sozzi, R
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