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(54) DOOR MECHANISM FOR ELEVATOR

(57) An elevator door device is provided, which includes a hanger case installed on an upper part of an elevator doorway and having a hanger rail for guiding left and right movement of an elevator door; a hanger plate having one end portion to which a roller rotating on the hanger rail is rotatably connected and the other end portion with which the elevator door is engaged; and a pulley bracket to which a driving pulley that transfers a driving force so that the hanger plate can move left and right in a width direction of the elevator doorway is rotatably connected and which is engaged with the hanger case by a first fastening means; wherein the pulley bracket is engaged with the hanger rail so that the pulley bracket is opposite to a direction that is parallel to a rotating shaft direction of the roller by a second fastening means. Accordingly, the hanger case is prevented from being bent, and the elevator door is prevented from being separated from the hanger rail,

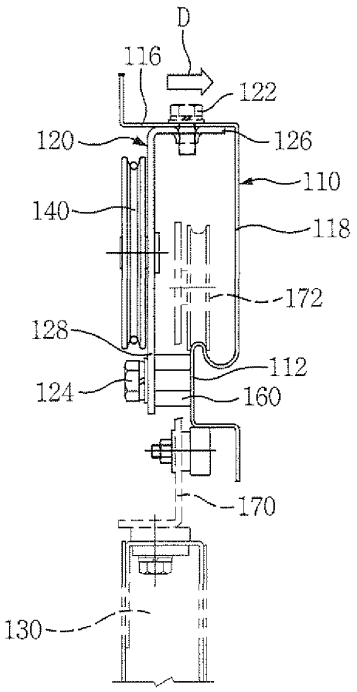

FIG. 3

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Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is based on and claims priority from Korean Patent Application No. 10-2008-0064728, filed on July 04, 2008 in the Korean Intellectual Property Office, the disclosure of which is incorporated herein in its entirety by reference.

BACKGROUND OF THE INVENTION

Field of the invention

[0002] The present invention relates to an elevator door device, and more particularly to an elevator door device, which can prevent bending of a hanger case and separation of en elevator door.

Description of the Prior Art

[0003] According to an elevator door device in the related art, on an upper part of an elevator doorway, a hanger case in which a driving device for driving an elevator door is installed is provided. In addition to the driving device, a hanger rail for guiding the left and right movement of the elevator door is provided in the hanger case. On the hanger rail, a roller which rotates along the hanger rail and moves left and right, i.e. in the width direction of the elevator doorway, is provided. This roller is connected to a hanger plate that is engaged with the elevator door. Through the above-describe structure, the elevator door is movably connected to the hanger rail of the hanger case in the left and right direction by the hanger plate.

[0004] However, since the elevator door device in the related art has a structure in which load of the elevator door is concentrated on the hanger rail via the roller, the hanger case connected to the hanger rail may be bent or drooped in a direction that is parallel to a roller rotating shaft direction. If such bending or drooping occurs, the elevator door cannot perform its own function.

[0005] Also, since the elevator door device in the related art is not provided with a separate member that can limit the movement of the elevator door in the door open direction, the separation of the elevator door from the hanger rail cannot be prevented even if the elevator door gets out of a predetermined stroke cycle region due to abnormality of a driving device or the like.

SUMMARY OF THE INVENTION

[0006] Accordingly, the present invention has been made to solve the above-mentioned problems occurring in the related art while advantages achieved by the related art are maintained intact.

[0007] One subject to be achieved by the present invention is to provide an elevator door device which can prevent a hanger case from being bent or drooped due to the load of an elevator door by preventing the load of the elevator door from being concentrated on the hanger case.

[0008] Another subject of the present invention is to proved an elevator door device, which can prevent an elevator door from being separated from a hanger rail even if abnormality occurs in a driving device or the like by limiting the movement of the elevator door even in the case where the elevator door gets out of a predetermined stroke cycle region.

[0009] In one aspect of the present invention, there is provided an elevator door device, which includes a hanger case installed on an upper part of an elevator doorway and having a hanger rail for guiding left and right movement of an elevator door; a hanger plate having one end portion to which a roller rotating on the hanger rail is rotatably connected and the other end portion with which the elevator door is engaged; and a pulley bracket to which a driving pulley that transfers a driving force so that the hanger plate can move left and right in a width direction of the elevator doorway is rotatably connected and which is engaged with the hanger case by a first fastening means; wherein the pulley bracket is engaged with the hanger rail so that the pulley bracket is opposite to a direction that is parallel to a rotating shaft direction of the roller by a second fastening means. Through the above-described construction, the elevator door device according to an embodiment of the present invention can prevent the hanger case from being drooped by dispersing the load of the elevator door to the pulley bracket and the hanger case.

[0010] On the other hand, the pulley bracket may include a horizontal plate horizontally formed in the direction that is parallel to the rotating shaft direction of the roller and engaged with the hanger case by the first fastening means; and a vertical plate vertically extending from the horizontal plate and engaged with the hanger rail by the second fastening means. As the pulley bracket is constructed as above, the pulley bracket is less affected by the drooping or the like even if the drooping occurs in a vertical portion of the hanger case due to the load of the elevator door. Also, the above-described structure is more effective in dispersing the load of the elevator door.

[0011] Also, in order to correspond to the horizontal plate, the hanger case may include a horizontal portion horizontally formed in the direction that is parallel to the rotating shaft direction of the roller; and a vertical portion vertically extending from the horizontal portion to face the vertical plate and having an end portion that is connected to the hanger rail.

[0012] In addition, the elevator door device according to an embodiment of the present invention may further include a support member provided between the pulley bracket and the hanger rail to constantly maintain a gap between the pulley bracket and the hanger rail; wherein the second fastening means penetrates the support member and makes the pulley bracket and the hanger rail engaged with each other. At this time, the second

fastening means may be constructed to penetrate the support member and make the pulley bracket and the hanger rail engaged with each other.

[0013] On the other hand, one surface of the hanger plate may be arranged in a direction that is opposite to the pulley bracket, the other surface of the hanger plate may be connected to the roller, and the second fastening means may make the pulley bracket and the hanger rail engaged with each other in the end portion in the width direction of the hanger rail. Thus, according to the elevator door device according to an embodiment of the present invention, the movement of the hanger plate is hindered by the second fastening means even if the elevator door gets out of a predetermined stroke cycle region, and thus the separation of the elevator door from the hanger rail can be prevented.

[0014] Also, in the elevator door device according to an embodiment of the present invention, the vertical plate may include a first side surface that has a convex shape projecting in an elevator door closing direction from a center portion of the driving pulley; and a second side surface that has a concave shape being recessed in a direction of the center portion of the driving pulley to correspond to the first side surface. Accordingly, the vertical plate according to an embodiment of the present invention forms the first side surface as a portion that receives a large force and forms the second side surface as a portion that receives a relatively small force, so that materials required to manufacture the pulley bracket can be reduced with the strength of the pulley bracket secured.

[0015] In the elevator door device according to an embodiment of the present invention, since the second fastening means for making the hanger rail and the pulley bracket engaged with each other is additionally provided, the load of the elevator door is dispersed even to the pulley bracket, and thus the occurrence of the drooping or bending of the hanger case can be stably prevented.

[0016] Also, since the elevator door device according to an embodiment of the present invention has the structure in which the pulley bracket includes the horizontal plate and the vertical plate and the horizontal plate is engaged with the hanger plate, the pulley bracket is less affected by the drooping or the like even if the drooping occurs in the vertical portion of the hanger case, and the above-described structure is more effective in dispersing the load of the elevator door.

[0017] In addition, according to the elevator door device according to an embodiment of the present invention, since the second fastening means crosses a space between the pulley bracket and the hanger rail in the end portion of the hanger rail and makes the pulley bracket and the hanger rail engaged with each other, the elevator door is prevented from being separated from the hanger rail.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The above and other objects, features and advantages of the present invention will be more apparent from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a front view illustrating an elevator door device according to embodiment 1 of the present invention;
FIG. 2 is an enlarged view of a portion "A" in FIG. 1;
FIG. 3 is a side view of FIG. 1; and
FIG. 4 is a front view illustrating an elevator door device according to embodiment 2 of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0019] Hereinafter, preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings. However, the present invention is not limited to the embodiments thereof. For reference, the same reference numerals are used for the same elements across various figures. Under the above-described rules, explanation may be made referring to the contents described in other drawings, and the contents which are determined to be apparent to those skilled in the art or which are duplicated may be omitted.

Embodiment 1

[0020] FIG. 1 is a front view illustrating an elevator door device according to embodiment 1 of the present invention. FIG. 2 is an enlarged view of a portion "A" in FIG. 1, and FIG. 3 is a side view of FIG. 1.

[0021] As illustrated in FIGS. 1 to 3, an elevator door device according to a first embodiment of the present invention includes a hanger case 110, a hanger plate 170, and a pulley bracket 120.

[0022] On an upper portion of an elevator hoistway-side or partition-side doorway (hereinafter referred to as an "elevator doorway" in all), the hanger case 110 is installed. In the hanger case 110, a driving device (not illustrated) for providing a driving force for opening/closing an elevator hoistway-side or partition-side door (hereinafter referred to as an "elevator door" in all) and a hanger rail 112 for guiding left and right movement of the elevator door 130 in a width direction are provided.

[0023] The driving device generally includes a driving device main body including a motor, a rotating shaft rotating by the driving force of the driving device main body, a driving pulley 140 fixed to the rotating shaft to rotate in association with the rotating shaft, and an endless interlocking rope 129 wound on the driving pulley 140 to perform an orbital movement by the rotation of the driving pulley 140. The hanger plate 170 connected to the interlocking rope 129 moves in the width direction, i.e. in the left/right direction, of the elevator doorway 150 in response to the orbital movement of the interlocking rope 129, and thus the elevator door 130 engaged with the

hanger plate 170 can open/close the elevator doorway 150.

[0024] As described above, the driving pulley 140, which transfers the driving force generated by the main body of the driving device to the hanger plate 170 via the interlocking rope 129, is rotatably connected to the pulley bracket 120 engaged with the hanger case 110 by the first fastening means 122. Here, the first fastening means may be separately provided with additional constructions such as bolts and nuts, and generally include a means for engaging two constructions. However, the first fastening means may include a means for engaging the two constructions by welding or the like without additional constructions. On the other hand, the detailed engagement structure of the hanger case 110 and the pulley bracket 120 will be described later.

[0025] The hanger rail 112 is formed in the width direction of the elevator doorway 150 to guide the movement of a roller 172 connected to the hanger plate 170 and to support the hanger plate 170 engaged with the elevator door 130 via the roller 172. The hanger rail may be manufactured separately from the hanger case and may be engaged with the hanger case or may be manufactured integrally with the hanger case. In this embodiment of the present invention, the hanger rail 112 integrally manufactured with the hanger case 110 is illustrated.

[0026] On the other hand, the hanger plate 170 not only connects the elevator door 130 and the hanger rail 112 via the roller 172 but also serves to transfer the driving force of the driving device to the elevator door 130. That is, the driving force generated by the driving device main body rotates the driving pulley 140, and the rotation of the driving pulley 140 causes the interlocking rope 129 wound on the driving pulley 140 to perform the orbital movement. By the orbital movement of the interlocking rope 129, the hanger plate 170 can move in the left/right direction, and by the left/right movement of the hanger plate 170, the elevator door 130 engaged with the hanger plate 170 can open/close the elevator doorway 150.

[0027] Also, the hanger plate 170 may be connected to the roller 172 rotating on the hanger rail 112 to make the left and right movement of the hanger plate 170 smooth and to make the hanger plate 170 stably move on a predetermined path. It is general that two rollers 172 are provided on upper both sides of the hanger plate 170 around the center line that halves the center line of the hanger plate 170 in the width direction.

[0028] As described above, the upper part of the elevator door 130 is supported by the hanger case 110 via the hanger plate 170, and the lower part of the elevator door 130 is guided by the guide rail (not illustrated) via a door shoe (not illustrated), so that the elevator door 130 can stably move in the left/right direction, i.e. in the width direction of the elevator doorway 150.

[0029] With reference to FIGS. 2 and 3, the engagement structure of the hanger case and the pulley bracket in the elevator door device according to this embodiment of the present invention will be described.

[0030] The hanger case 110 may include a horizontal plate 116 horizontally formed in the direction D that is parallel to the rotating shaft direction of the roller 172 and a vertical portion 118 vertically extending from the horizontal portion 116 and engaged with the hanger rail 112 in the end portion thereof. The pulley bracket 120 may be engaged with the hanger case 110 by the first fastening means 122. Here, the direction D that is parallel to the rotating shaft direction of the roller 172 means the horizontal direction based on the side view of the elevator door device as indicated by an arrow in FIG. 3.

[0031] On the other hand, the first fastening means may engage the pulley bracket with the vertical portion 118 of the hanger case 110, but it is more preferable to engage the pulley bracket with the horizontal portion 116 of the hanger case 110. The reason is as follows. The load of the elevator door 130 is most transferred to the hanger rail 112 through the roller 172 that performs an orbital movement on the hanger rail 112. Accordingly, the load of the elevator door 130 may be concentrated on the vertical portion 118 of the hanger case 110 that is connected to the hanger rail 112. Due to such concentration of the load, the vertical portion 118 may be bent or drooped in the direction D that is parallel to the rotating shaft direction of the roller 172. If the bending or drooping occurs in the vertical direction in a state where the pulley bracket is engaged with the vertical portion 118 by the first fastening means, the pulley bracket may be separated from the original position due to the drooping or the like.

[0032] Accordingly, it is preferable that the first fastening means 122 engages the pulley bracket 120 with the horizontal portion 116 of the hanger case which is less affected by the drooping or bending. Also, the engagement of the pulley bracket 120 with the horizontal portion 116 of the hanger case 110 to be described later is more effective in dispersing the load of the elevator door 130 in the case where the pulley bracket 120 is composed of the horizontal plate 126 and the vertical plate 128.

[0033] As described above, in order to engage the pulley bracket 120 with the horizontal portion 116 of the hanger case 110, the pulley bracket 120 according to this embodiment of the present invention may include a horizontal plate 126 and a vertical plate 128.

[0034] The horizontal plate 126 may be horizontally formed in the direction D that is parallel to the rotating shaft direction of the roller 172 so as to correspond to the horizontal portion 116 of the hanger case 110, and the vertical plate 128 may be formed to vertically extend from the horizontal plate 120 so as to face the vertical portion 118 of the hanger case 110. As the pulley bracket 120 has the above-described structure, the horizontal plate 126 of the pulley bracket 120 can be engaged with the horizontal portion 116 of the hanger case 110 by the first fastening means 122.

[0035] On the other hand, in order to suppress the occurrence of the drooping or bending of the hanger case

110 due to the load of the elevator door 130, according to the elevator door device according to this embodiment of the present invention, the pulley bracket 120 can be engaged with the hanger rail 112 by a second fastening means 124 separately provided. That is, as illustrated in FIG. 3, the horizontal plate 126 of the pulley bracket 120 and the horizontal portion 116 of the hanger case 110 are engaged with each other by the first fastening means 122, and the vertical plate 128 of the pulley bracket 120 and the hanger rail 112 are engaged with each other by the second fastening means 124. By the second fastening means 124, the pulley bracket 120 and the hanger rail 112 are engaged with each other to face each other in the direction D that is parallel to the rotating shaft direction of the roller 172.

[0036] The fastening means may generally include a means for engaging two constructions through additional constructions such as bolts and nuts, or may include a means for engaging the two constructions by welding or the like without the additional constructions. However, since a predetermined gap is typically maintained between the vertical plate 128 and the hanger rail 112, the engagement structure according to this embodiment of the present invention may use the typical fastening means such as bolts as the second fastening means 124.

[0037] As the elevator door device according to this embodiment of the present invention has the above-described engagement structure, the load of the elevator door 130 can be dispersed to not only the hanger rail 112 but also the pulley bracket 120, and thus the occurrence of the drooping or the bending of the hanger case 110 can be prevented more stably.

[0038] On the other hand, as described above, the elevator door 130 may move left and right along the hanger rail 112 typically via the hanger plate 170. That is, since one end portion of the hanger plate 170 is engaged with the elevator door 130 and the other end portion is rotatably connected to the roller 172 that performs an orbital movement on the hanger rail 112, the elevator door 130 can move left and right in the width direction of the elevator doorway 150 together with the hanger plate 170 when the roller 172 performs the orbital movement on the hanger rail 112.

[0039] In relation to the left and right movement of the hanger plate, the elevator door device in the related art is not provided with a construction that can limit the movement of the hanger plate between the stroke cycle regions of the hanger plate. Accordingly, if the hanger plate moves over a necessary distance in an elevator door opening direction P (refer to an arrow indicated in FIG. 1) due to the abnormality of the driving device or the like, the elevator door may be separated from the hanger rail.

[0040] However, according to the elevator door device according to this embodiment of the present invention, since the second fastening means 124 is constructed to engage the pulley bracket 120 with the hanger rail 112 at on end portion in the width direction of the hanger rail 112, i.e. at an end portion in the opening direction P of the elevator door 130, the elevator door 130 is prevented from getting out of the predetermined stroke cycle region and being separated from the hanger rail 112.

[0041] In detail, as illustrated in FIGS. 2 and 3, one surface of the hanger plate 170 may be arranged in a direction opposite to the pulley bracket 120, and the other surface of the hanger plate 170 may be connected to the roller 172. Through this structure, the hanger plate 170 can be arranged so that one surface thereof faces the pulley bracket 120 and the other surface thereof faces the hanger rail 112.

[0042] In addition, in this embodiment of the present invention, since the second fastening means 124, as illustrated in FIGS. 2 and 3, crosses a space between the pulley bracket 120 and the hanger rail 112 in the end portion of the hanger rail 112 (in the end portion in the opening direction P of the elevator door 130) and makes the pulley bracket 120 and the hanger rail 112 engaged with each other, the additional movement of the hanger plate 170 can be compulsorily intercepted in the end portion of the hanger rail 112 even though the elevator door 130 gets out of the predetermined stroke cycle region due to the abnormality of the driving device or the like.

[0043] Consequently, according to the elevator door device according to this embodiment of the present invention, the elevator door 130 is prevented from getting out of the predetermined stroke cycle region and being separated from the hanger rail 112 through the second fastening means 124, and thus the stability of the elevator door 130 can be secured more certainly.

[0044] On the other hand, a support member 160 may be further provided between the pulley bracket 120 and the hanger rail 112 as illustrated in FIG. 3. This support member 160 can constantly maintain the gap between the pulley bracket 120 and the hanger rail 112. In this case, the second fastening means may be constructed to penetrate the support member 160 and to make the pulley bracket 120 and the hanger rail 112 engaged with each other.

[0045] As described above, since the elevator door device according to this embodiment of the present invention is additionally provided with the second fastening means 124 that engages the hanger rail 112 with the pulley bracket 120 in addition to the first fastening means 122 that engages the hanger case 110 with the pulley bracket 120, the load of the elevator door 130 can be dispersed to not only the hanger rail 112 but also the pulley bracket 120, and thus the occurrence of the drooping or bending of the hanger case 110 can be prevented more stably.

[0046] Also, since the elevator door device according to this embodiment of the present invention has the structure in which the pulley bracket 120 includes the horizontal plate 126 that is engaged with the horizontal portion 116 of the hanger case 110 and the vertical plate 128 that is engaged with the hanger rail 112, the pulley bracket 120 is less affected by the drooping or the like even if the drooping occurs in the vertical portion 118 of the

hanger case 118 due to the load of the elevator door 130. Also, the above-described structure is more effective in dispersing the load of the elevator door 130.

[0047] In addition, according to the elevator door device according to this embodiment of the present invention, since the second fastening means 124 crosses the space between the pulley bracket 120 and the hanger rail 112 in the end portion of the hanger rail 112 and makes the pulley bracket 120 and the hanger rail 112 engaged with each other, the elevator door 130 is prevented from getting out of the predetermined stroke region and being separated from the hanger rail 112, and thus the stability of the elevator door 130 can be secured more certainly.

Embodiment 2

[0048] FIG. 4 is a front view illustrating an elevator door device according to embodiment 2 of the present invention. For reference, the same or proper reference numerals are given to the same or proper constituent elements across the figures, and the detailed description thereof will be omitted.

[0049] The main difference between the elevator door device according to the second embodiment and the elevator door device according to the first embodiment is the construction of the vertical plate of the pulley bracket, and hereinafter, the explanation will be made centering around the pulley bracket 220 according to this embodiment of the present invention.

[0050] The pulley bracket 220 according to this embodiment of the present invention, similar to the pulley bracket 120 according to the first embodiment of the present invention, is horizontally formed in the direction D that is parallel to the rotating shaft direction of the roller, and includes a horizontal plate horizontally formed in the direction D that is parallel to the rotating shaft direction of the roller and engaged with the hanger case 110 by the first fastening means 122, and a vertical plate 228 vertically extending from the horizontal plate and engaged with the hanger rail 112 by the second fastening means 124.

[0051] However, unlike the first embodiment, the vertical plate 228 may include a first side surface 228a and a second side surface 228b. The first side surface 228a, as illustrated in FIG. 4, has a convex shape projecting in the closing direction C of the elevator door 130 from the center portion of the driving pulley 140, and the second side surface 228b has a concave shape being recessed in the direction of the center portion of the driving pulley 140 to correspond to the first side surface 228a.

[0052] Since the vertical plate 228 according to this embodiment of the present invention has the above-described structure, the driving pulley 140 can be supported more stably only with a small amount of material. In detail, the driving pulley 140 is continuously forced by an interlocking rope 129 in the closing direction C of the elevator door 130. This force is transferred to the vertical plate 228 of the pulley bracket 220 through the rotating shaft. Accordingly, the strongest force is applied to the vertical plate 228 in the closing direction C of the elevator door 130 in the center portion of the rotating shaft.

[0053] Accordingly, in order to stably support the driving pulley 140 by preventing the deformation of the vertical plate 228 through proper dispersion of the force, it is preferable that the vertical plate 228 is thickly formed, starting from the center portion of the driving pulley 140 to the closing direction C of the elevator door 130. However, thickly forming the corresponding portion may cause a problem that the amount of material required to manufacture the vertical plate is increased and thus the manufacturing cost is also increased.

[0054] However, according to the vertical plate 228 according to this embodiment of the present invention, by forming a portion that receives a large force as the first side surface 228a and forming a portion that receives a relatively small force as the second side surface 228b, the strength of the pulley bracket can be secured, and the amount of material required to manufacture the pulley bracket can be reduced.

[0055] Although preferred embodiments of the present invention have been described for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

Claims

1. An elevator door device comprising:

a hanger case installed on an upper part of an elevator doorway and having a hanger rail for guiding left and right movement of an elevator door;

a hanger plate having one end portion to which a roller rotating on the hanger rail is rotatably connected and the other end portion with which the elevator door is engaged; and

a pulley bracket to which a driving pulley that transfers a driving force so that the hanger plate can move left and right in a width direction of the elevator doorway is rotatably connected and which is engaged with the hanger case by a first fastening means;

wherein the pulley bracket is engaged with the hanger rail so that the pulley bracket is opposite to a direction that is parallel to a rotating shaft direction of the roller by a second fastening means.

2. The elevator door device according to claim 1, wherein the pulley bracket includes a horizontal plate horizontally formed in the direction that is parallel to the rotating shaft direction of the roller and engaged

with the hanger case by the first fastening means, and a vertical plate vertically extending from the horizontal plate and engaged with the hanger rail by the second fastening means.

3. The elevator door device according to claim 2, wherein the vertical plate includes a first side surface that has a convex shape projecting in an elevator door closing direction from a center portion of the driving pulley, and a second side surface that has a concave shape being recessed in a direction of the center portion of the driving pulley to correspond to the first side surface.

4. The elevator door device according to claim 2, wherein the hanger case includes a horizontal portion horizontally formed in the direction that is parallel to the rotating shaft direction of the roller, and a vertical portion vertically extending from the horizontal portion to face the vertical plate and having an end portion that is connected to the hanger rail.

5. The elevator door device according to claim 1, further comprising a support member provided between the pulley bracket and the hanger rail to constantly maintain a gap between the pulley bracket and the hanger rail;
wherein the second fastening means penetrates the support member and makes the pulley bracket and the hanger rail engaged with each other.

6. The elevator door device according to any one of claims 1 to 5, wherein one surface of the hanger plate is arranged in a direction that is opposite to the pulley bracket, the other surface of the hanger plate is connected to the roller, and the second fastening means makes the pulley bracket and the hanger rail engaged with each other in the end portion in the width direction of the hanger rail.

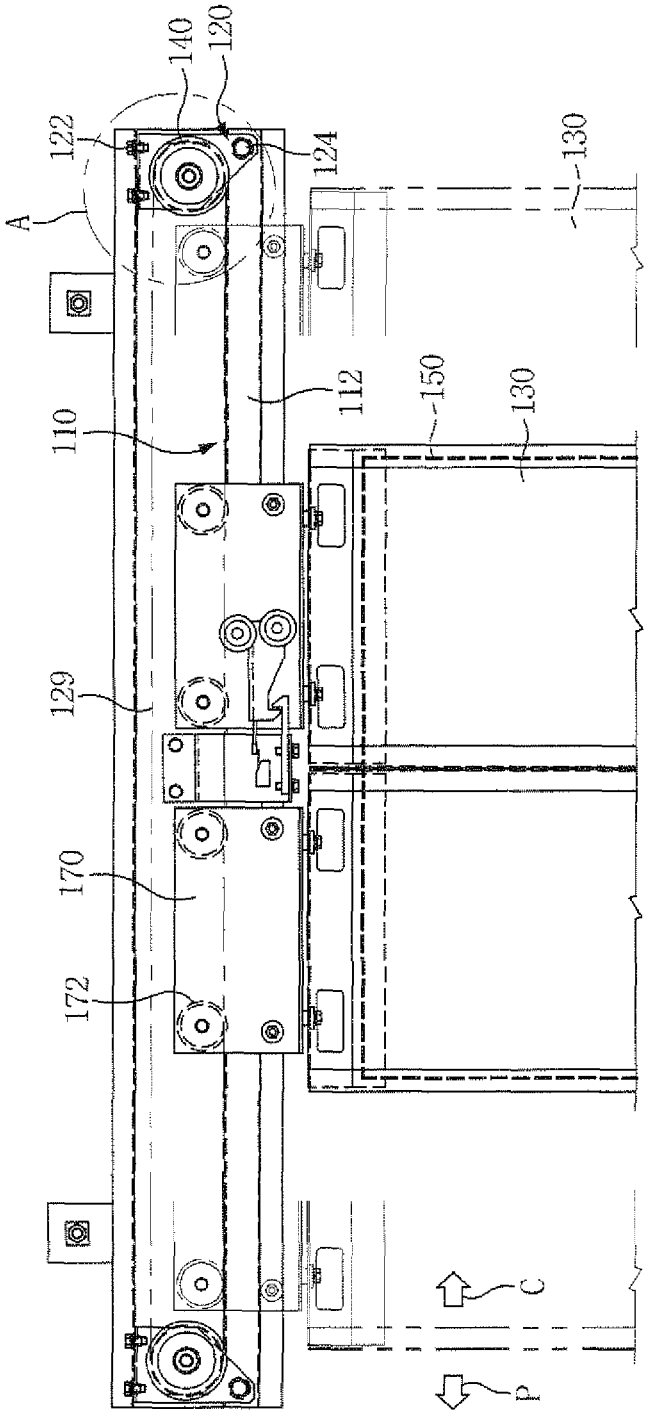

FIG. 1

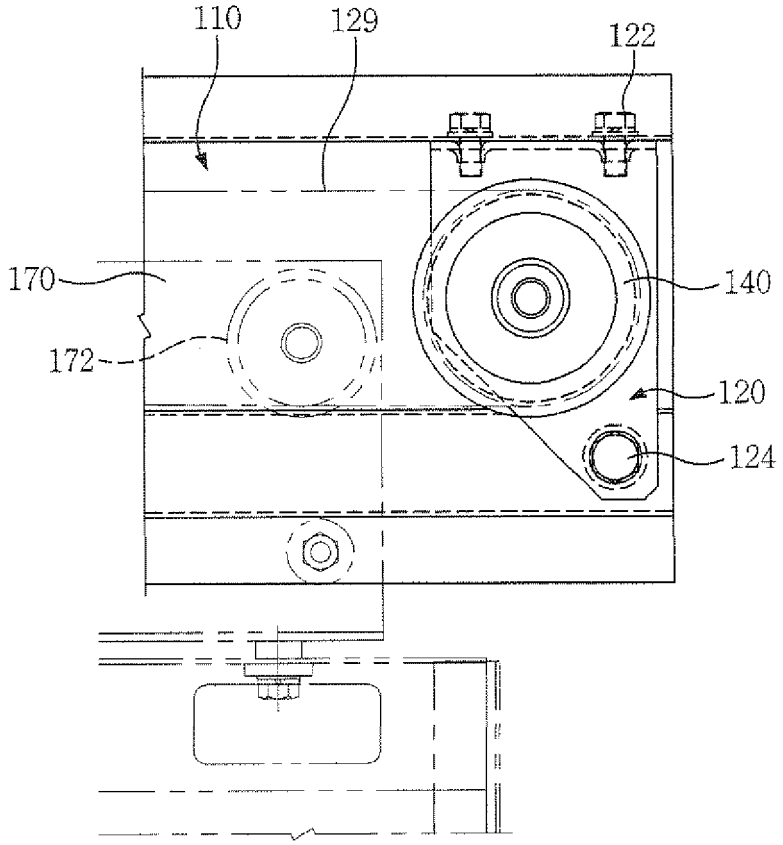

FIG. 2

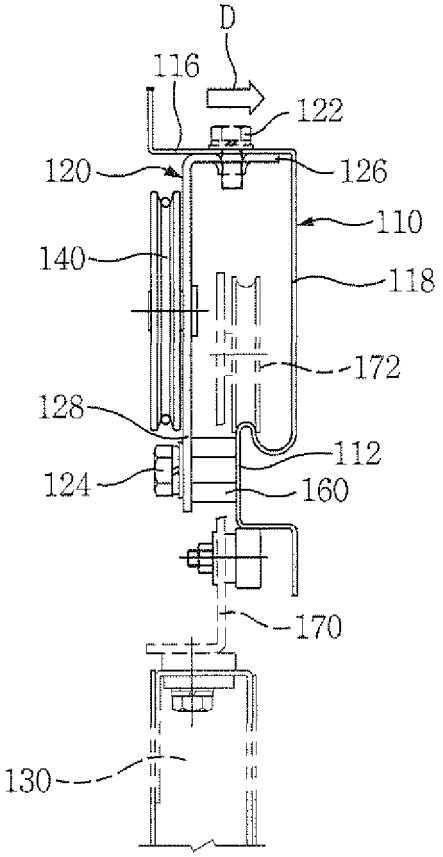

FIG. 3

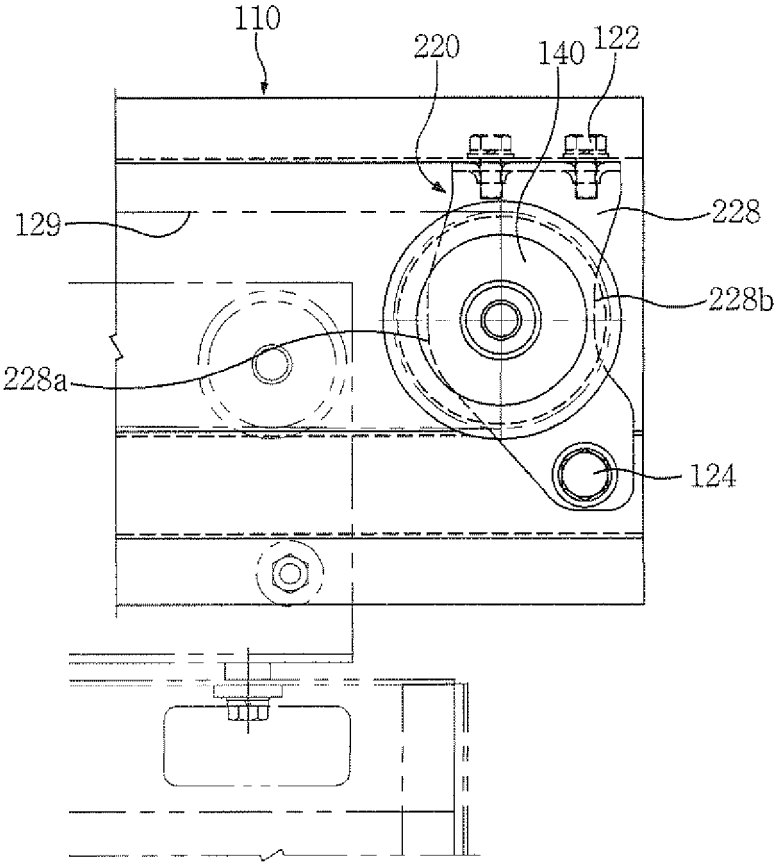

FIG. 4

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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