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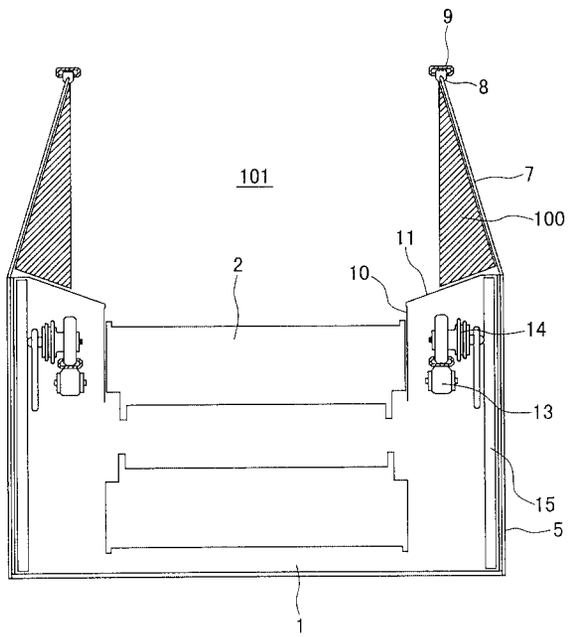
(54) Balustrades for an escalator

(57) In order to provide an escalator having an extended space (100) between the balustrades (7) is provided, balustrades are arranged outside the machine room (1), and a handrail support portion (8) is provided on the side surface of the upper end portion of the balustrade which is arranged so as to, for example, tilt or curve toward the step side from the upper portion of the machine room or so as to vertically stand, and an upper-line track of the handrail is arranged in the top end portion of the support portion. Further, in a mechanism for guiding and moving an endlessly connected handrail (9), the handrail transport roller (13) is arranged in the outer side and the driving unit of the transfer roller is arranged in the step side. By doing so, by making use of a space produced in the machine room, the step tread portion and the riser portion of the step can be extended in the width direction.

FIG.3



EP 1 101 724 A2

Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to an escalator for transporting passengers.

[0002] Japanese Patent Application Laid-Open No. 57-141378 discloses a handrail driving mechanism of a man conveyer that the total width of the man conveyer is decreased to improve the maintainability by forming a part of the conveyer main frame by a support frame of the handrail driving mechanism, and by arranging a coupling mechanism between a driving roller and a motor in the same space facing moving step tread. Japanese Patent Application Laid-Open No.57-141379 discloses a man conveyer that the total width of the man conveyer is decreased to reduce the installation space by separating the man conveyer main frame at a portion of the handrail driving mechanism, and by welding and integrating a support frame of the handrail driving mechanism to and with the separated portion to form a part of the main frame.

[0003] Further, Japanese Patent Application Laid-Open No.51-139082 discloses an escalator that the inner side surface of the balustrade is formed in a convex shape projecting toward the step tread so that a passenger's foot may be kept apart from the skirt guard.

[0004] In a balustrade portion of a passenger escalator, balustrades, each of which is vertically arranged under an endlessly continuous handrail to support the handrail, are arranged in parallel to each other so that the distance between the both balustrades in the vertical direction becomes constant, or are arranged so that the distance between the both balustrades in the lower side of the balustrade is shorter than the distance between the both balustrades at positions near the upper-line tracks of the handrails. Therefore, for example, a passenger carrying baggage with him is sometimes leans against the balustrade due to braking caused by the baggage.

SUMMARY OF THE INVENTION

[0005] An object of the present invention is to provide a passenger escalator which can extend the width of the space between the balustrades.

[0006] Another object of the present invention is to provide a passenger escalator which can widen the width of step tread, and thereby the width of the space between the balustrades can be extended.

[0007] In order to attain the above objects, the present invention can provide a safe passenger escalator in which the balustrades are arranged in the outer side of the machine room, and a hand rail support portion is provided on the side surface of the upper end portion of the balustrade which is arranged so as to, for example, tilt or curve toward the step side from the upper portion of the machine room or so as to vertically stand, and an upper-line track of the handrail is arranged in the top end portion of the support portion. By doing so, a space can be obtained above the inner deck portion. Accordingly, for example, even when a passenger carries baggage with him, the passenger does not lose his balance by being blocked by the baggage.

[0008] Further, in a mechanism for guiding and moving an endlessly connected handrail, the handrail transport roller is arranged in the outer side and the driving unit of the transfer roller is arranged in the step side. By doing so, by making use of a space produced in the machine room, the step tread portion and the riser portion of the step can be extended in the width direction, and the balustrades can be arranged in a state of tilting toward the step side in the upper portion (a state of broadening downward), and accordingly, the space in the lower portion of the passenger's riding space is increased compared to that in the conventional passenger escalator. Therefore, even when a passenger carries baggage with him, the passenger does not lose his balance by being blocked by the baggage. Further, a little child can not mischievously enter the outer deck portion. Thus, a safe passenger escalator can be provided.

[0009] In the mechanism guiding and moving the handrail arranged in a tilting state, in the machine room, there are arranged an upper-line track of the step and a return track of the step below the upper-line track which are for moving to circulate the steps. In a portion further below the upper-line track of the step and the return track of the step, there is arranged a return track of the handrail of which the upper-line track is formed along the upper surface of the balustrade. By doing so, because the space for the inner deck portion becomes unnecessary, the step can be extend in the width direction by that amount, and the balustrades can be arranged in a state of tilting toward the step side in the upper portion (a state of broadening downward), and accordingly, the space in the lower portion of the passenger's riding space is increased compared to that in the conventional passenger escalator. Therefore, for example, when a passenger carries baggage with him, the passenger does not lose his balance by being blocked by the baggage. Further, a little child can not mischievously enter the outer deck portion. Thus, a safe passenger escalator can be provided.

[0010] In detail, the present invention provides the passenger escalator described below.

[0011] The present invention provides a passenger escalator comprising a row of endlessly connected steps which is moved to circulate; decks formed in both sides of the row of steps; balustrades standing along the row of steps; an upper-line track of a handrail formed along each of the balustrades; and a machine room for driving the handrails, wherein a passenger standing space above the step is formed in a shape of a space extended above the deck; balustrades tilting toward the step side above the deck are arranged; a handrail guide is arranged in a top end of each of the balustrades; and

an upper-line track of the handrail is formed along an upper end surface of the handrail guide.

[0012] Further, the present invention provides a passenger escalator, wherein the balustrade is formed of a single sheet of transparent panel tilting in a straight line up to the handrail guide.

[0013] Further, the present invention provides a passenger escalator, wherein the balustrade is formed of a single sheet of transparent panel smoothly curved up to the handrail guide.

[0014] Further, the present invention provides a passenger escalator, wherein the balustrade has a decorative transparent panel in the step side.

[0015] Further, the present invention provides a passenger escalator, wherein an exterior panel is arranged in the outer side of a side outer plate of the machine room; and an end surface of the balustrade is connected to an upper end of said exterior panel.

[0016] The present invention provides a passenger escalator comprising a row of endlessly connected steps which is moved to circulate; decks formed in both sides of the row of steps; balustrades standing along the row of steps; an upper-line track of a handrail formed along each of the balustrades; and a machine room for driving the handrails, wherein a passenger standing space above the step is formed in a shape of a space extended above the deck; balustrades are formed by vertically extending from an upper ends of exterior panel; a handrail guide is arranged in a top end of each of the balustrades; and an upper-line track of the handrail is formed along an upper end surface of the handrail guide.

[0017] Further, the present invention provides a passenger escalator, wherein the balustrade has a decorative transparent panel in the step side.

[0018] The present invention provides a passenger escalator comprising a row of endlessly connected steps which is moved to circulate; decks formed in both sides of the row of steps; balustrades standing along the row of steps; an upper-line track of a handrail formed along each of the balustrades; and a machine room for driving the handrails, wherein in said machine room, there are arranged an upper-line track of the step and a return track of the step below the upper-line track which are for moving to circulate the steps; and a handrail driving mechanism and a return track of the handrail further below the upper-line track of the step and the return track of the step.

[0019] Further, the present invention provides a passenger escalator, wherein the handrail driving mechanism is arranged in the side of a side surface of the step moving in the machine room; and a transport roller and a driving roller of the handrail and the handrail driven by the rollers are arranged in the side of an outer plate.

[0020] Further, the present invention provides a passenger escalator, wherein the balustrade is arranged tilting toward the step side.

[0021] The present invention provides a group of juxtaposed passenger escalators, each of the passenger escalators comprising a row of endlessly connected steps which is moved to circulate; decks formed in both sides of the row of steps; balustrades standing along the row of steps; an upper-line track of a handrail formed along each of the balustrades; and a machine room for driving the handrails, wherein a passenger standing space above the step in each of the escalator is formed in a shape of a space extended above the deck; a balustrade common to the adjacent escalators tilting toward each of the step sides above the deck is arranged; a handrail guide of each of the escalators is arranged in a branched top end of the balustrade; and an upper-line track of the handrail is formed along an upper end surface of the handrail guide.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] FIG. 1 is a vertical cross-sectional view showing a first embodiment of a passenger escalator in accordance with the present invention.

[0023] FIG. 2 is a transverse cross-sectional view showing the passenger escalator being taken on the plane of the line E-E of FIG.1.

[0024] FIG. 3 is a view showing a shape under use of the embodiment shown in FIG. 1 and FIG. 2.

[0025] FIG. 4 is a view showing the dimensional relationship of the embodiment shown in FIG. 1 and FIG. 2.

[0026] FIG. 5 is a view showing an example of a modification of the embodiment shown in FIG. 1.

[0027] FIG. 6 is a vertical cross-sectional view showing another example of the first embodiment of the passenger escalator in accordance with the present invention.

[0028] FIG. 7 is a vertical cross-sectional view showing another example of the first embodiment of the passenger escalator in accordance with the present invention.

[0029] FIG. 8(A), FIG. 8(B) and FIG. 8(C) are perspective views each showing a terminal portion of the example shown in FIG. 6.

[0030] FIG. 9 is a vertical cross-sectional view showing a second embodiment of a passenger escalator in accordance with the present invention.

[0031] FIG. 10 is a vertical cross-sectional view showing a further example of the second embodiment of the passenger escalator in accordance with the present invention.

[0032] FIG. 11 is a vertical cross-sectional view showing a third embodiment of a passenger escalator in accordance with the present invention.

[0033] FIG. 12 is a transverse cross-sectional view showing the passenger escalator being taken on the plane of the line F-F of FIG.10.

[0034] FIG. 13 is a vertical cross-sectional view showing another example of the third embodiment of the passenger escalator in accordance with the present invention.

[0035] FIG. 14 is a transverse cross-sectional view showing another embodiment of the passenger escalator being taken on the plane of the line F-F of FIG.10.

[0036] FIG. 15 is a perspective view showing an example of juxtaposed escalators.

[0037] FIG. 16 is a cross-sectional view showing another embodiment of FIG. 15.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0038] Embodiments of the present invention will be described below, referring to the accompanied figures.

[0039] FIG. 1 to FIG. 4 are views showing the construction of a first embodiment in accordance with the present invention, and FIG. 1 is a vertical cross-sectional view; fig. 2 is a transverse cross-sectional view being taken on the plane of the line E-E of FIG. 1; FIG. 3 is a view showing a shape under use; and FIG. 4 is a view showing the dimensional relationship. Referring to these figures, the reference character 1 is a machine room, the reference character 2 is a step, the reference character 3 is a driving unit, the reference character 4 is a side outer plate, the reference character 6 is a cover plate, the reference character 7 is a balustrade, the reference character 8 is a handrail guide, the reference character 9 is a handrail, the reference character 10 is a skirt guard, the reference character 11 is a deck, the reference character 12 is an exterior deck, the reference character 13 is a transport roller, the reference character 14 is a handrail driving mechanism, the reference character 15 is a frame, the reference character 16 is a guide, the reference character 22 is a chain, and the reference character 26 is a driving roller.

[0040] The balustrades are vertically set to stand in the both sides on the upper surface of the machine room which moves and circulates the row of endlessly connected steps, and an upper-line track of the handrail is formed along the upper surface of each of the balustrades.

[0041] Referring to FIG. 1 to FIG. 4, in the first embodiment, the exterior panel 5 is further attached onto the outer side of the side outer plate 4 of the machine room 1, and the balustrade 7 is arranged from the upper end of the exterior panel 5, and the handrail guide 8 is formed in the top end of the balustrade 7 and the upper-line track of the handrail 9 is endlessly and continuously formed along the upper end of the handrail guide 8. Since the positions of the handrails are equal to positions in a conventional passenger escalator, the upper end portions of the balustrades 7 are formed so as to tilt toward the step 2 side. Since the lower end portions of the balustrades 7 are formed so as to widen toward the lower side, spaces 100 are newly produced in the hatched portions shown in FIG. 3. Even when a passenger gets on or off the escalator carrying baggage with him, the passenger does not lose his balance by being blocked by the baggage. Although the area of the deck 11 is widened, the balustrade is tilted or curved toward the skirt guard 10 side to prevent a foot or baggage from putting them on the deck 11. Since the lower end portion of the balustrade 7 is nearly even with the exterior panel 5, the outer deck is eliminated and accordingly a little child can not mischievously enter the outer deck portion. The material of the balustrade 7 may be glass, metal or wood.

[0042] FIG. 4 shows an example of the dimensional relationship. As shown in the figure, the dimensional relationship is A: 1550 mm. B: 1004 mm, C: 1200 mm, D: 175 mm, and the space 101 is expanded by the space 100 depending on the width of D.

[0043] The balustrade 7 tilting toward the step 2 side above the deck 11 is arranged, and the balustrade 7 forms the space 100 which expands the passenger standing space 101 up to the space above the deck 11. The handrail guide 8 is arranged in the top end of the balustrade 7. The balustrade 7 is sometimes constructed so as to have the decorative transparent panel 21 in the step side, as shown in FIG. 5. Even in such a case, the balustrade 7 capable of expanding the space 101 by the space 100 can be formed. Accordingly, the decorative transparent panel 21 is also tilted toward the step side.

[0044] FIG. 6, FIG. 7 and FIG. 8 show the other examples of the first embodiment.

[0045] In the escalator of FIG. 6, the balustrade 7 is curved from the upper end of the exterior panel 5. Although the shape of the balustrade in the figure is drawn in a single arc, the shape of the balustrade may be a combination of arcs, or may contain a straight line portion. The spaces 100 of the hatched portions shown in FIG. 3 can be widened by curving the balustrades 7. In this case, the space 101 can be expanded up to the space 100 by the shape of the balustrades 7.

[0046] In the escalator of FIG. 7, the exterior panels 5 vertically extending upward are arranged, a handrail support portion 18 is arranged so as to project from the upper end side surface of each of the exterior panels 5, and a handrail 9 is formed along the upper end surface of the handrail support portion 18. Therein, the height of the exterior panel 5 may be up to the level of a handrail guide 8 or lower. In this case, a support 19 for supporting the handrail support portion 18 and the handrail guide 8 is provided in the exterior panel.

[0047] FIG. 8(A), FIG. 8(B) and FIG. 8(C) are perspective views showing terminal portions of the embodiment of FIG. 7. As shown in FIG. 8 (A), the exterior panel 5 may be extended to a point of the cover plate or longer exceeding the position where the handrail enters into the machine room, and is used as a fence.

[0048] The exterior panel 5 may be extended to a point where the handrail enters into the machine room, as shown in FIG. 8 (B), or the exterior panel 5 may be formed so as to match the shape of the handrail entering the machine room as shown in FIG. 8 (C).

[0049] FIG. 9 is a view showing the construction of a

second embodiment of a passenger escalator in accordance with the present invention, and fig. 9 is the vertical view. In this figure, the part corresponding to that in the precedent embodiment is identified by the same reference character, and the explanation will be omitted here in order to avoid repetition.

[0050] Referring to FIG. 9, in the second embodiment, the return track of the handrail is arranged in a position on the extension line of the balustrade 7 below the lower end portion of the balustrade 7, the handrail driving mechanism 14 being arranged in the side of the side surface of the step 2 moving in the machine room 1, a device for driving the transport roller 13 being arranged in the step side, the return track of the handrail 9 and the transport roller 13 for transporting the handrail being arranged in the side outer plate 4 side. Since the return track of the handrail 9 is located in the side of the side outer plate 4, the gripped position of the handrail and the position of the transport roller are not in the vertical positional relationship, but are in a state of tilting the handrail driving mechanism 14 toward the step side, that is, in a state of broadening downward. In this case, a space 102 is formed in a side portion of the handrail driving mechanism. Therefore, the step 2 can be widened in the horizontal direction, and a space 100 can be obtained in the inner side portion of the balustrade. Further, the outer deck can be made smaller compared to that in the conventional escalator, and accordingly a little child can not mischievously enter the outer deck portion. According to this embodiment, the passenger standing space 101 can be extended not only by the space 100 but also by the space 102 which makes it possible to widen the width of the step.

[0051] FIG. 10 shows another example of the second embodiment in accordance with the present invention.

[0052] In the escalator of FIG. 10, there are provided the curved balustrades 7. Although the shape of the balustrade in the figure is drawn in a single arc, the shape of the balustrade may be a combination of arcs, or may contain a straight line portion. The spaces 100 of the hatched portions shown in FIG. 3 can be widened by curving the balustrades 7.

[0053] FIG. 11 and FIG. 12 are views showing the construction of a third embodiment of a passenger escalator in accordance with the present invention, and FIG. 11 is the vertical cross-sectional view. In this figure, the part corresponding to that in the precedent embodiment is identified by the same reference character, and the explanation will be omitted here in order to avoid repetition.

[0054] Referring to FIG. 11, in the third embodiment, in the machine room 1 there are the upper-line track of the step and the return track of the step below the upper-line track, and the handrail drive mechanism 14 and the return track of the handrail are arranged further below the upper-line track and the return track of the step.

[0055] The return track of the handrail is arranged in the lower end portion on the extension of the balustrade, the handrail driving mechanism 14 being arranged in the side of the side surface of the step moving in the machine room 1, the transport roller 13 and the driving roller 6 being arranged in the step side, the return track of the handrail and the transport roller 13 for transporting the handrail being arranged in the side of the outer plate 4.

[0056] Since the return track of the handrail is arranged in a portion further below the steps, as shown in FIG. 12, there is no need to provide a space for the handrail driving mechanism by the side of the side surface of the step, differently from the conventional escalator. Therefore, the width of the step can be widened by that amount. Further, the total width of the machine room itself can be narrowed. Therefore, the space 101 can be extended by increase of the width of the step and by the spaces 100.

[0057] FIG. 13 is a view showing another example of the third embodiment of a passenger escalator in accordance with the present invention, and FIG. 13 is the vertical cross-sectional view.

[0058] Since the handrail driving mechanism 14 is not arranged by the side of the step 2 but arranged below the step, the step can be extended in the width direction and the step can be extended in keeping the width of the conventional machine room constant. Therefore, the space 101 can be widened, and the transporting ability can be improved. Further, since the inner deck can be eliminated and the level of the outer deck 11' can be lowered, the escalator can be formed in a shape similar to a common staircase. That is, since the distance between the balustrades is widened, an operating direction of the passengers escalator can be easily observed from a distant position.

[0059] FIG. 14 shows the third embodiment of the passenger escalator in accordance with the present invention.

[0060] Referring to FIG. 14, by arranging the handrail driving mechanism at a position shown in the figure, the height of the machine room can be reduced to a value nearly equal to the height of the conventional machine room.

[0061] FIG. 15 shows an example of juxtaposing the embodiment of the escalators in accordance with the present invention.

[0062] The space for extending the passenger standing apace above the step in each of the escalators 110, 111 to the position above each of the decks is formed. A sheet of common balustrade 70 tilting toward the sides of the steps above the decks is provided, and handrail guides of the escalators 110, 111 are arranged in the top ends of the branched balustrade to form the upper-line tracks of the handrails along the upper end surfaces of the handrail guides. Thereby, the balustrade common to the both escalators can be formed, and the escalators become visually slim.

[0063] FIG. 16 shows another example of the juxtaposed escalators. This example is composed of the escalators shown in FIG. 7, and the handrail driving mech-

anisms and the return tracks of the handrail are arranged side by side below the upper-line tracks and the return tracks of the steps, respectively. A sheet of the balustrade is commonly used similarly to the above-mentioned example.

[0064] According to the present invention, it is possible to extend the width of step with keeping the total width of the passenger escalator in a value equal to that in the conventional one, and it is possible to provide a safe passenger escalator which can improve the safety that the passenger does not lose his balance by being blocked by the baggage when a passenger carries baggage with him, and that a little child can not mischievously enter the outer deck portion.

Claims

1. A passenger escalator comprising a row of endlessly connected steps (2) which is moved to circulate; decks (11) formed in both sides of the row of steps; balustrades (7) standing along the row of steps; an upper-line track of a handrail (9) formed along each of the balustrades; and a machine room (1) for driving the handrails, wherein

a passenger standing space (101) above the step is formed in a shape of a space (100) extended above the deck (11); balustrades tilting toward the step side above the deck are arranged; a handrail guide (8) is arranged in a top end of each of the balustrades (7); and an upper-line track of the handrail (9) is formed along an upper end surface of the handrail guide (8).

2. A passenger escalator according to claim 1, wherein

said balustrade (7) is formed of a single sheet of transparent panel tilting in a straight line up to the handrail guide (8).

3. A passenger escalator according to claim 1, wherein

said balustrade (7) is formed of a single sheet of transparent panel smoothly curved up to the handrail guide.

4. A passenger escalator according to claim 1, wherein

said balustrade (7) has a decorative transparent panel in the step side.

5. A passenger escalator according to claim 1, wherein

an exterior panel is arranged in the outer side of a side outer plate of the machine room (1); and an end surface of the balustrade (7) is connected to an upper end of said exterior panel.

6. A passenger escalator comprising a row of endlessly connected steps (2) which is moved to circulate; decks (11, 12) formed in both sides of the row of steps; balustrades (7) standing along the row of steps; an upper-line track of a handrail (9) formed along each of the balustrades (7); and a machine room (1) for driving the handrails, wherein

a passenger standing space (101) above the step is formed in a shape of a space (100) extended above the deck (11); balustrades (7) are formed by vertically extending from an upper ends of exterior panel; a handrail guide (8) is arranged in a top end of each of the balustrades; and an upper-line track of the handrail (9) is formed along an upper end surface of the handrail guide (8).

7. A passenger escalator according to claim 6, wherein

said balustrade (7) has a decorative transparent panel in the step side.

8. A passenger escalator comprising a row of endlessly connected steps (2) which is moved to circulate; decks (11, 12) formed in both sides of the row of steps; balustrades (7) standing along the row of steps; an upper-line track of a handrail (9) formed along each of the balustrades (7); and a machine room (1) for driving the handrails, wherein

in said machine room (1), there are arranged an upper-line track of the step and a return track of the step below the upper-line track which are for moving to circulate the steps; and a handrail driving mechanism (14) and a return track of the handrail further below the upper-line track of the step and the return track of the step.

9. A passenger escalator according to claim 8, wherein

the handrail driving mechanism (14) is arranged in the side of a side surface of the step moving in the machine room (1); and a transport roller (13) and a driving roller of the handrail (9) and the handrail driven by the rollers are arranged in the side of an outer plate.

10. A passenger escalator according to any one of claim 8 and claim 9, wherein

said balustrade (7) is arranged tilting toward the step side.

11. A group of juxtaposed passenger escalators, each of the passenger escalators comprising a row of endlessly connected steps which is moved to circulate; decks formed in both sides of the row of steps; balustrades standing along the row of steps; an upper-line track of a handrail formed along each of the balustrades; and a machine room for driving the handrails, wherein

a passenger standing space above the step in each of the escalator is formed in a shape of a space extended above the deck; a balustrade (70) common to the adjacent escalators tilting toward each of the step sides above the deck is arranged; a handrail guide of each of the escalators is arranged in a branched top end of the balustrade; and an upper-line track of the handrail is formed along an upper end surface of the handrail guide.

FIG.1

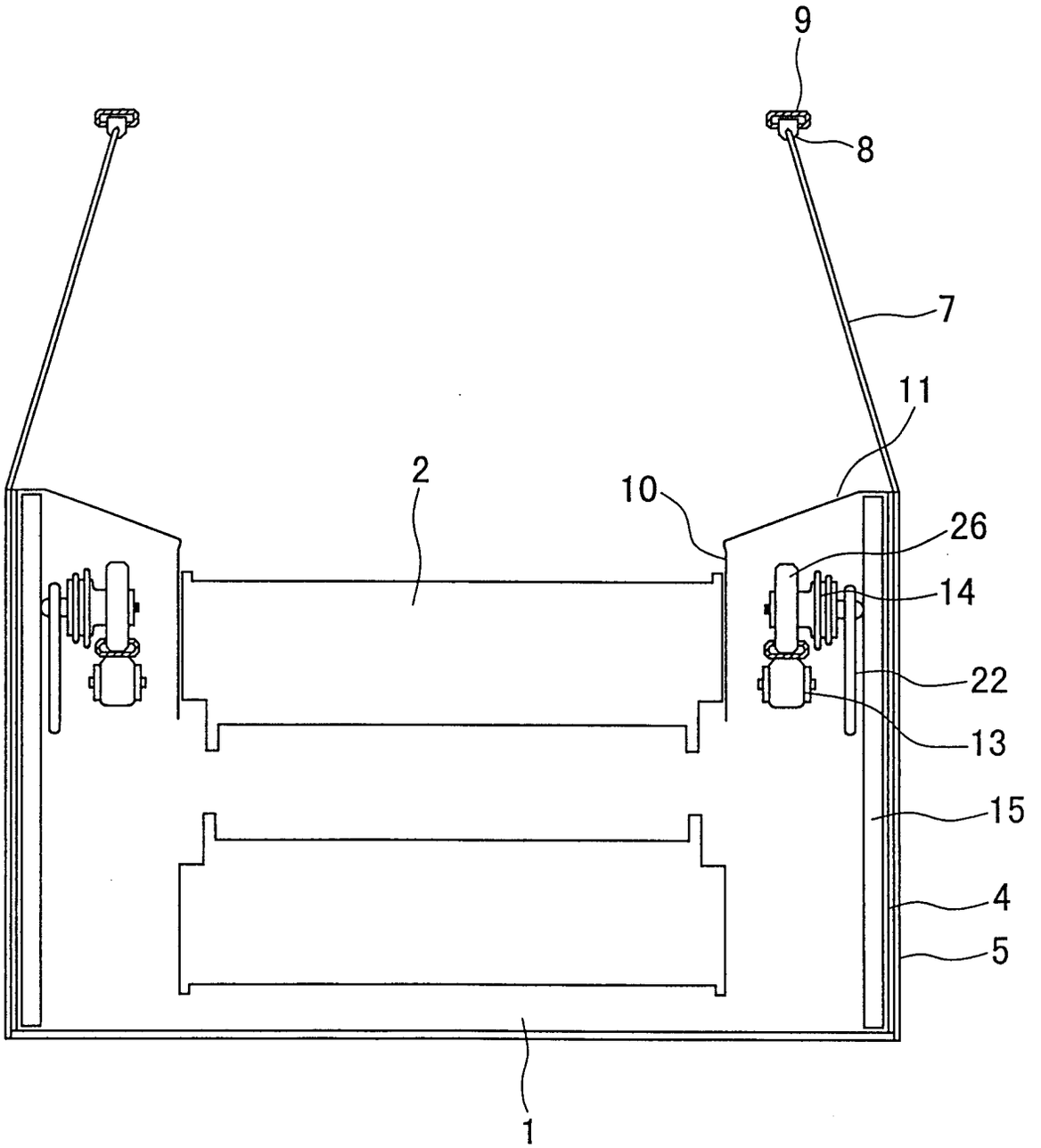


FIG.2

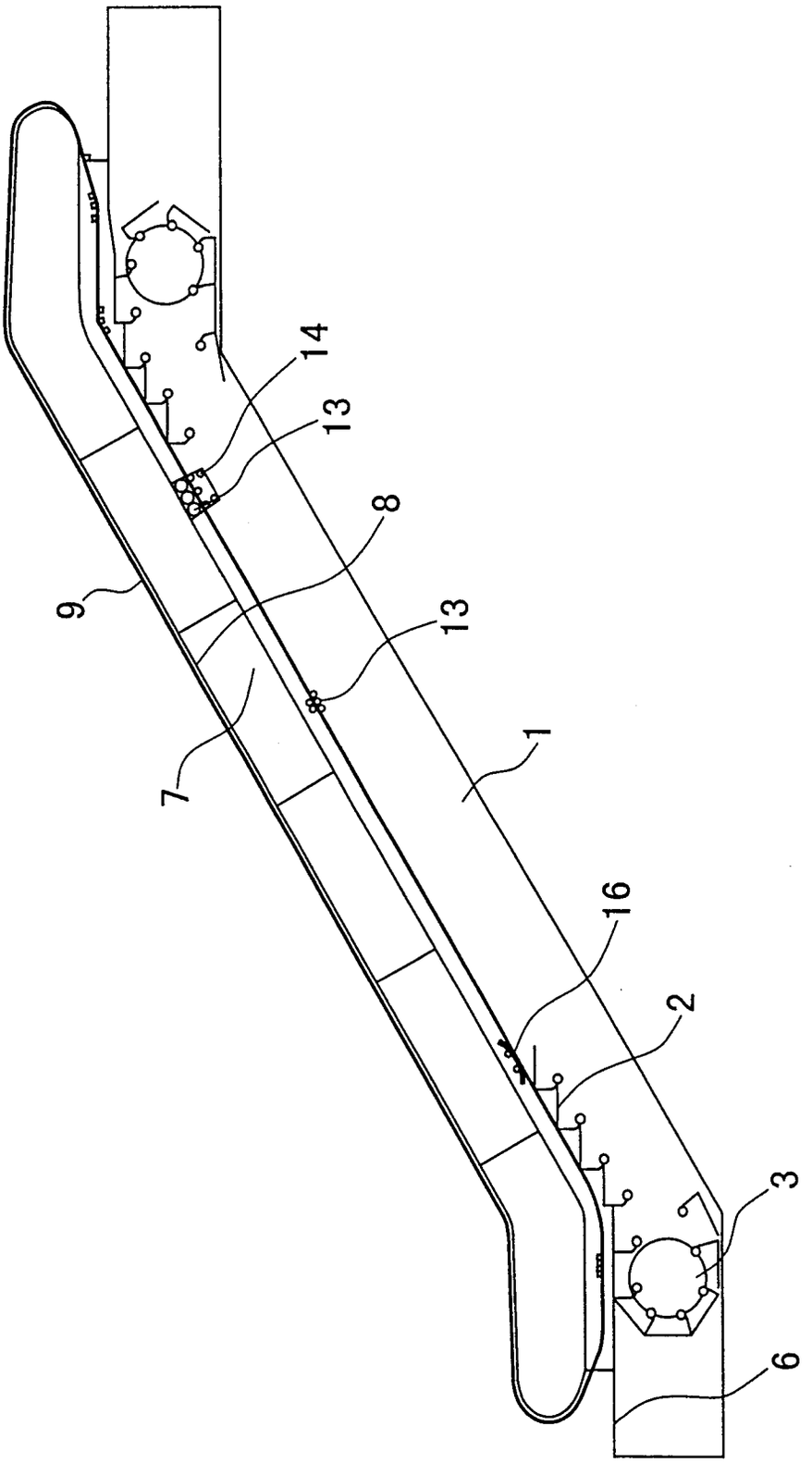


FIG.3

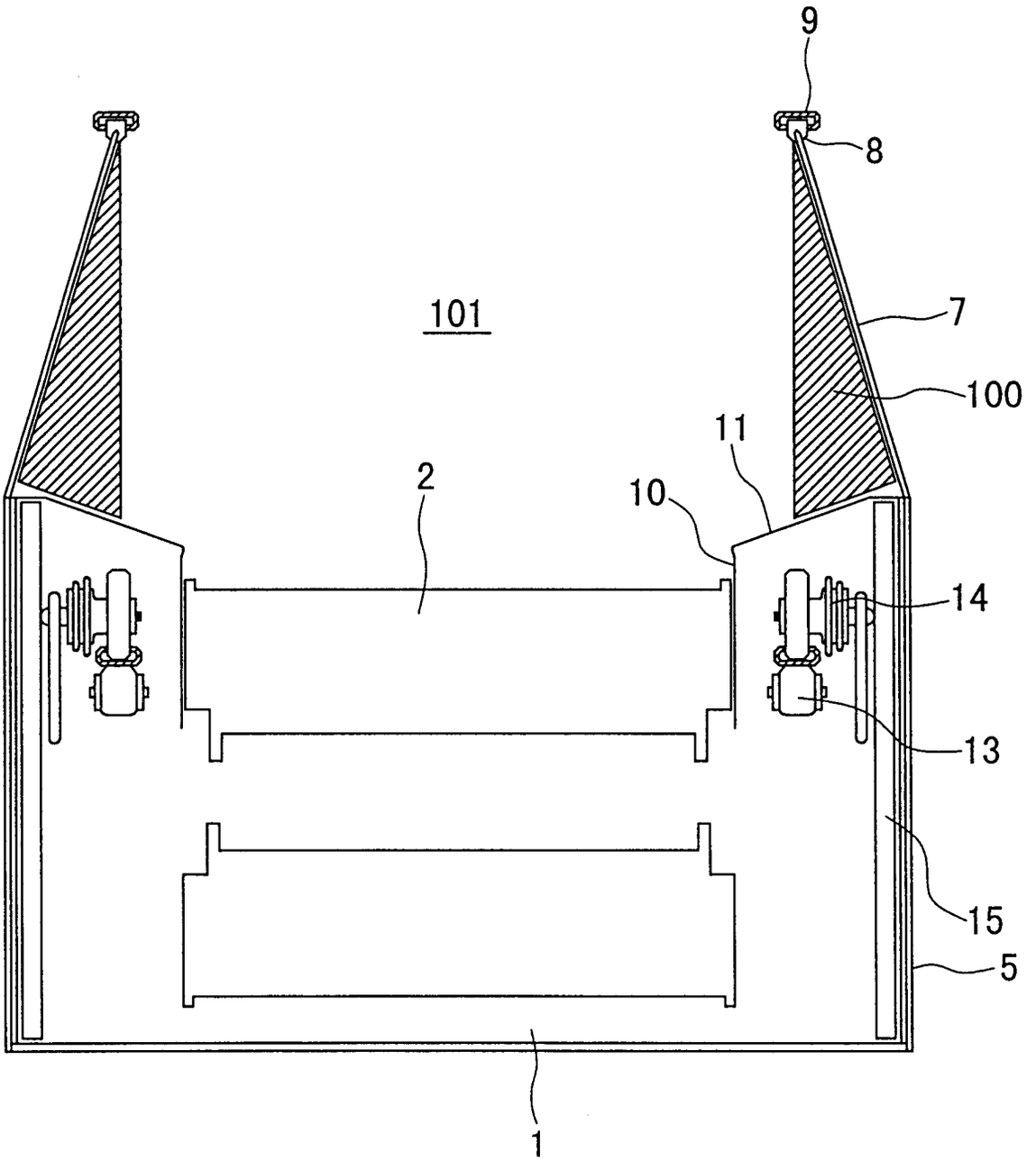


FIG.4

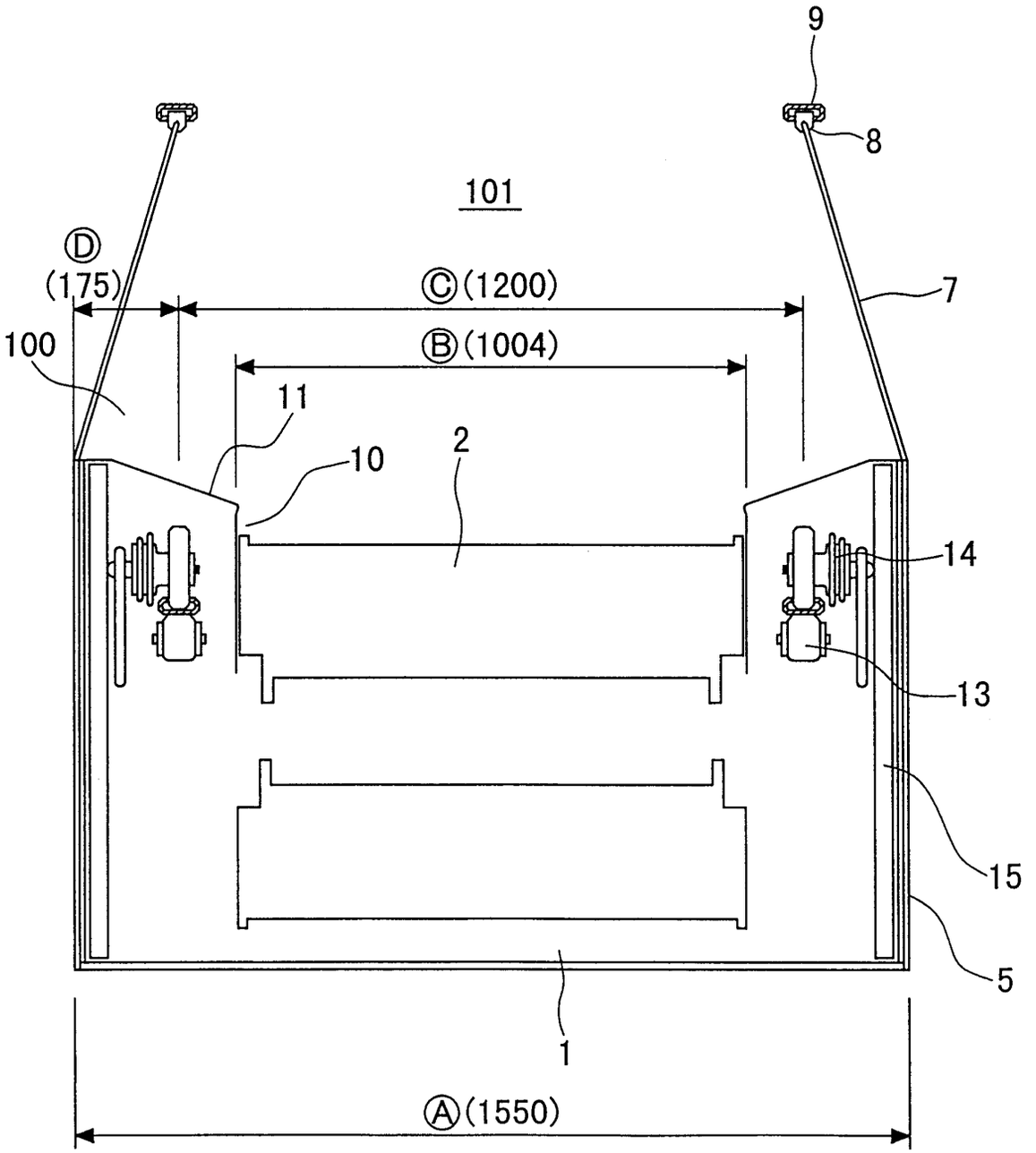


FIG.5

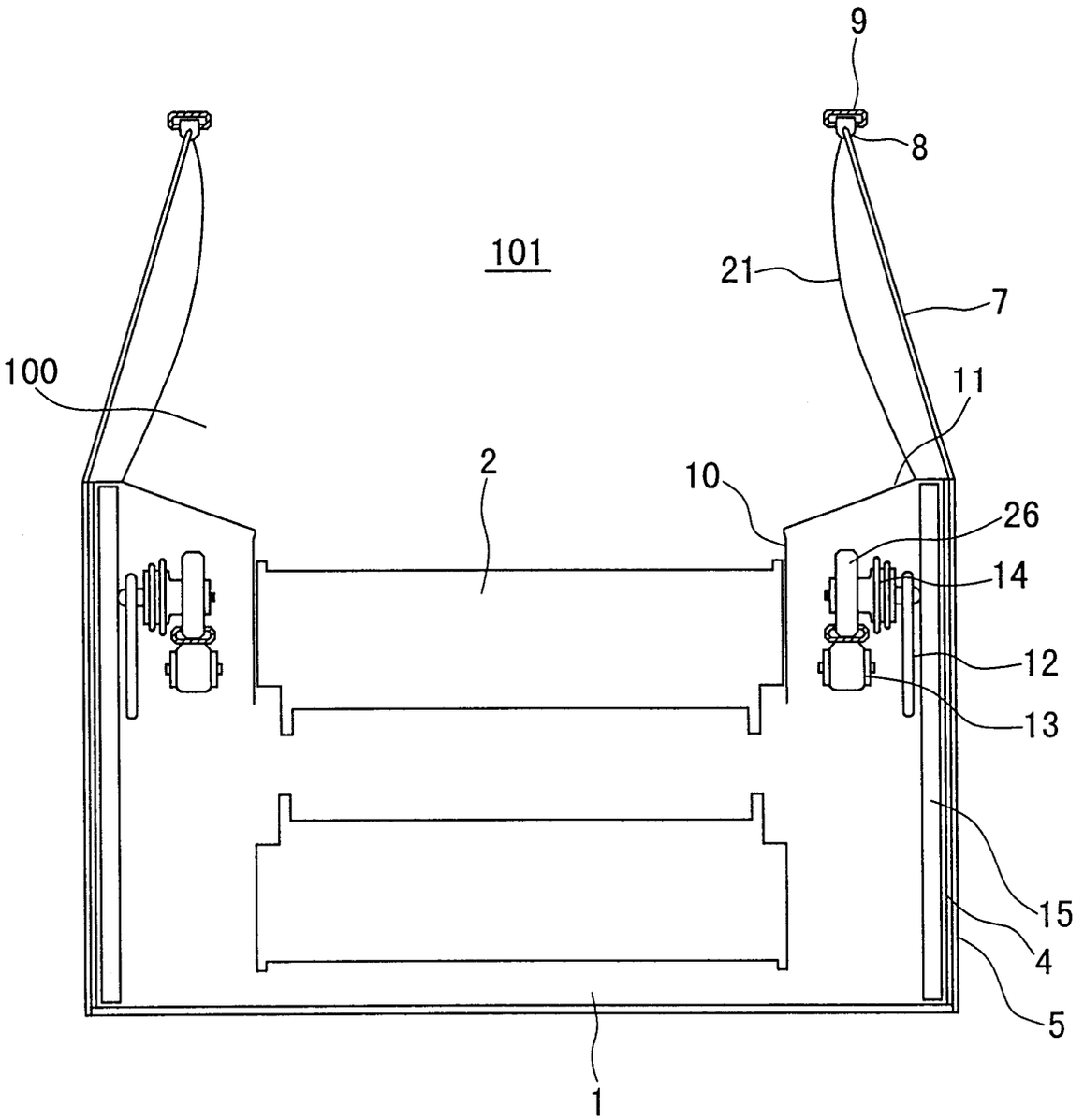


FIG.6

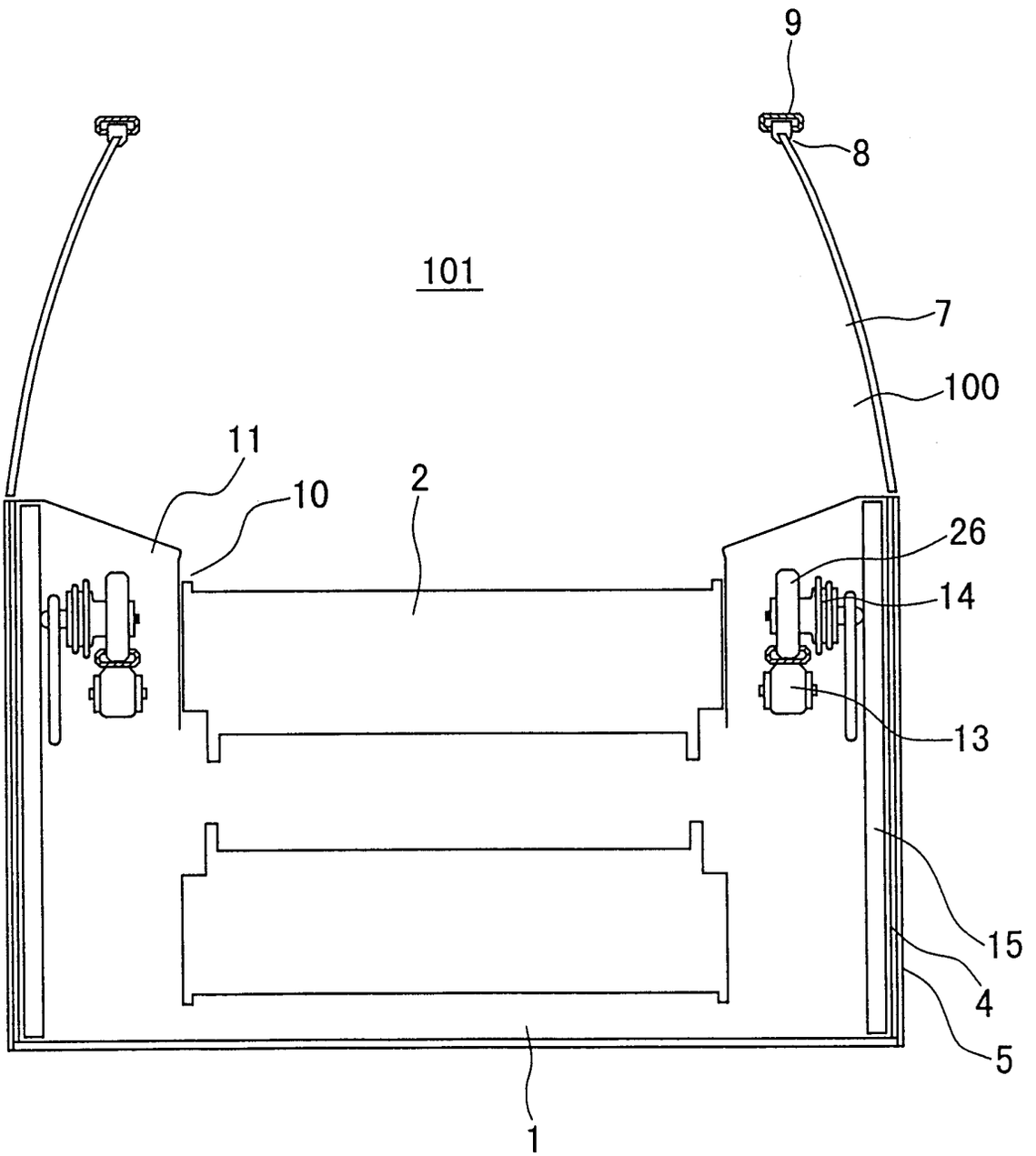


FIG.7

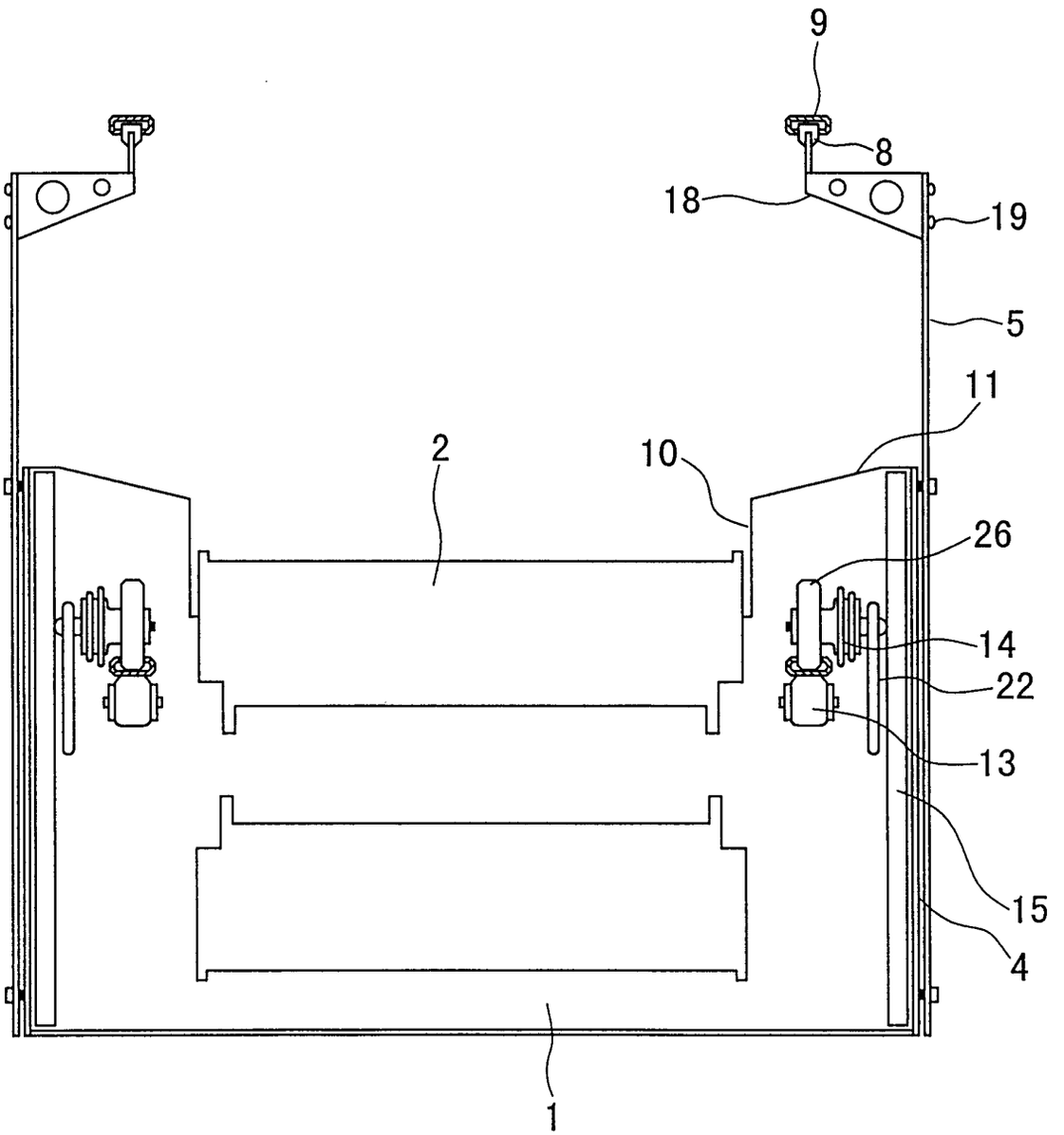
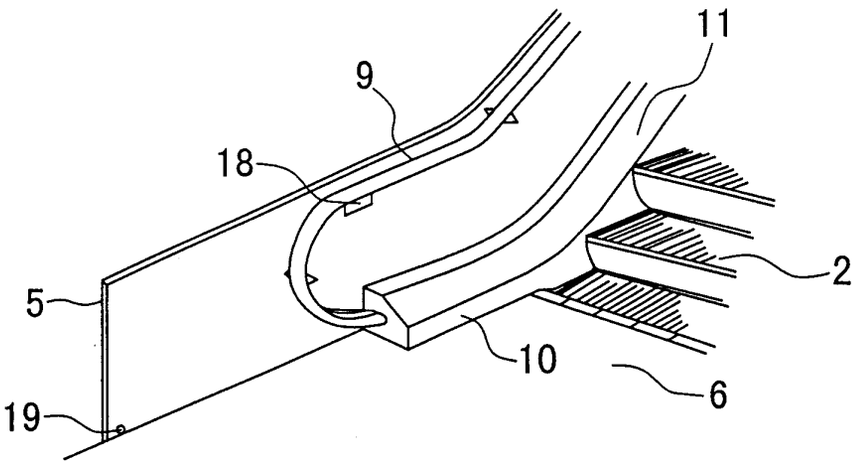
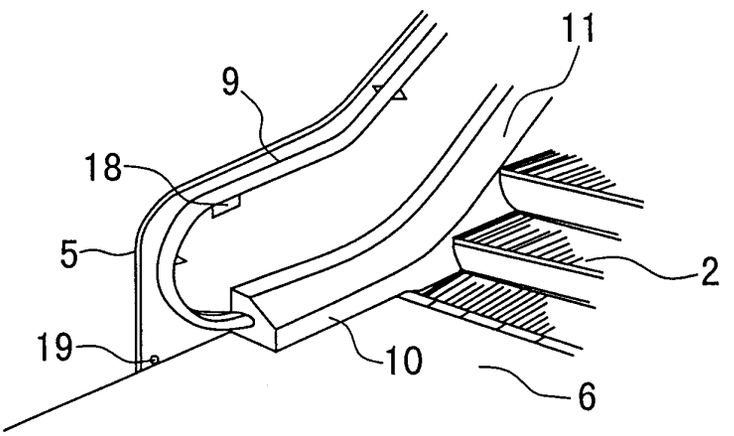


FIG.8





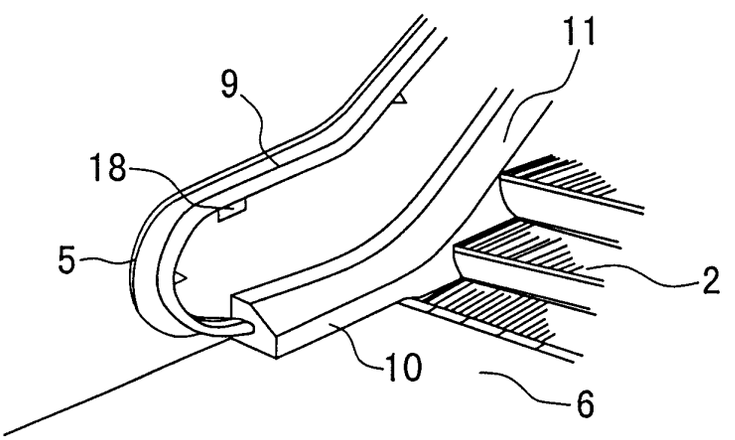


FIG.9

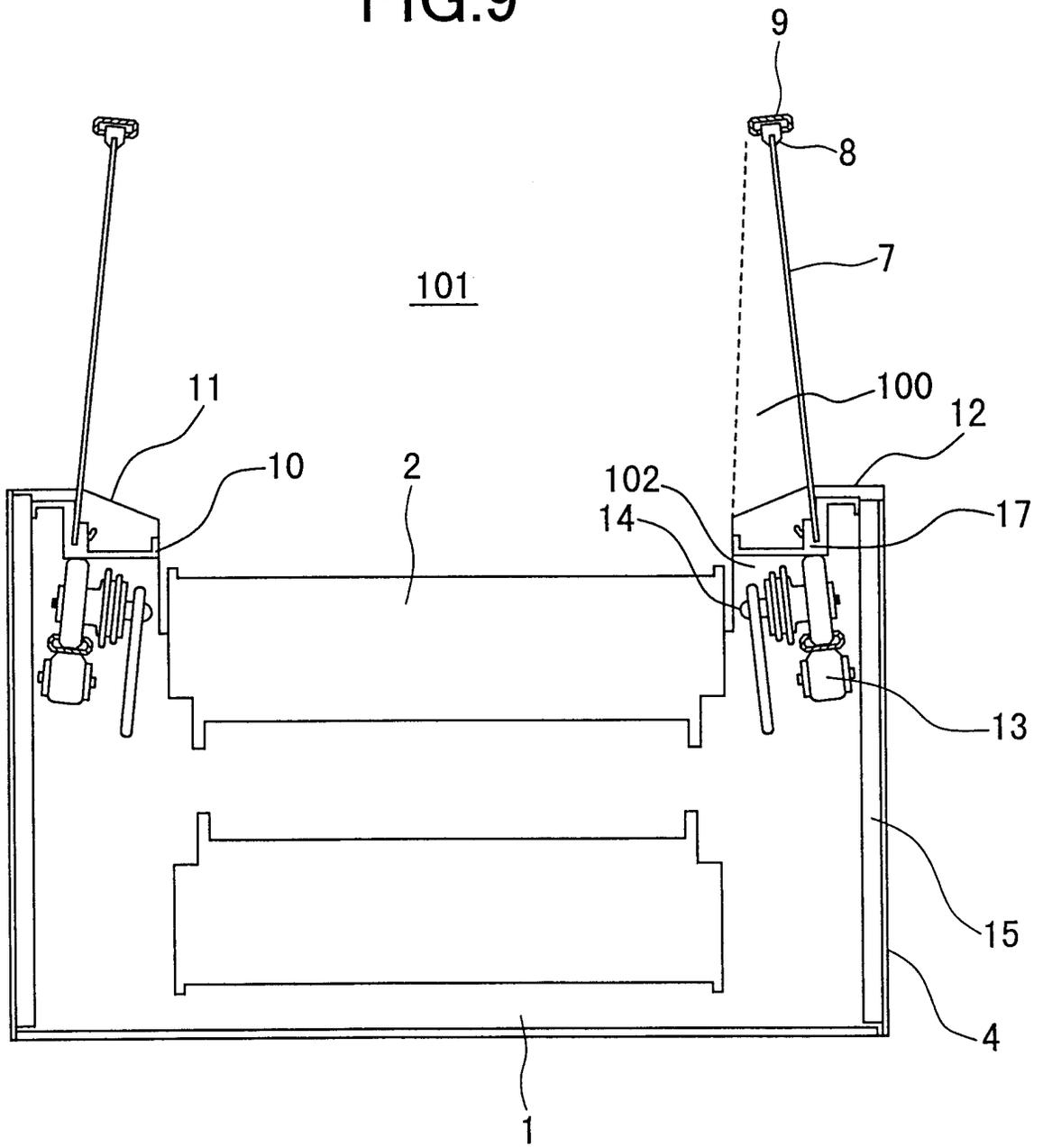


FIG.10

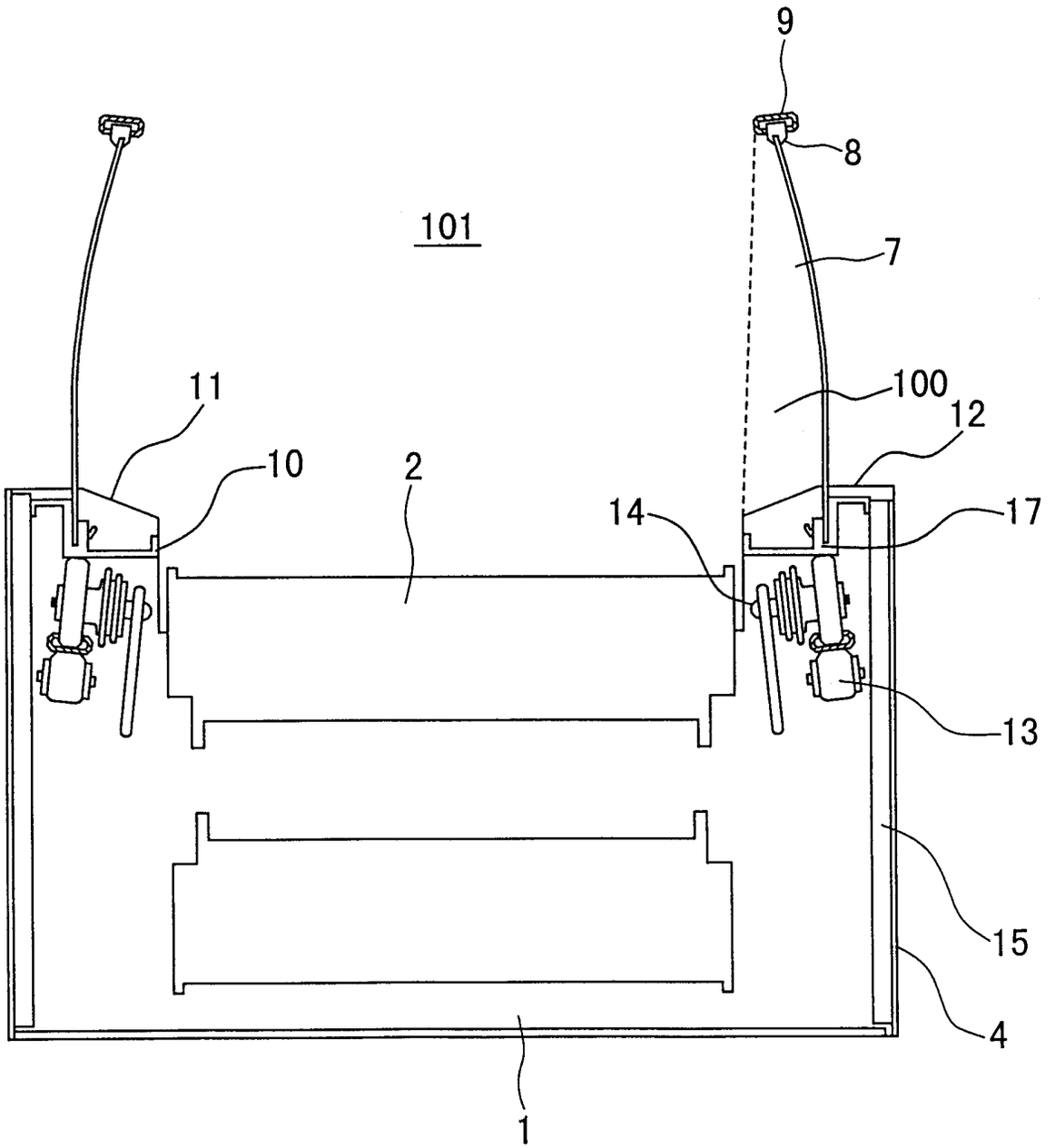


FIG.11

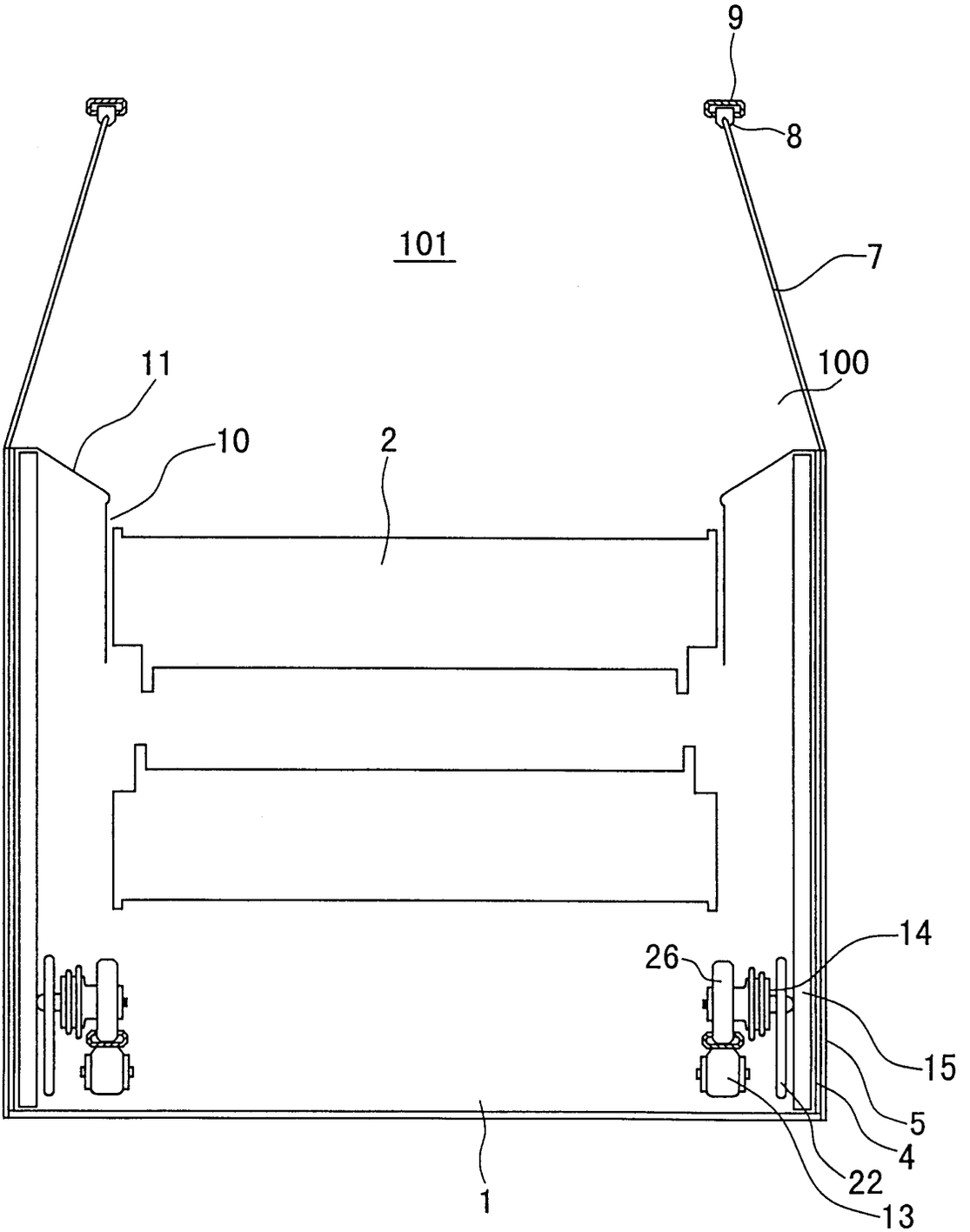


FIG.12

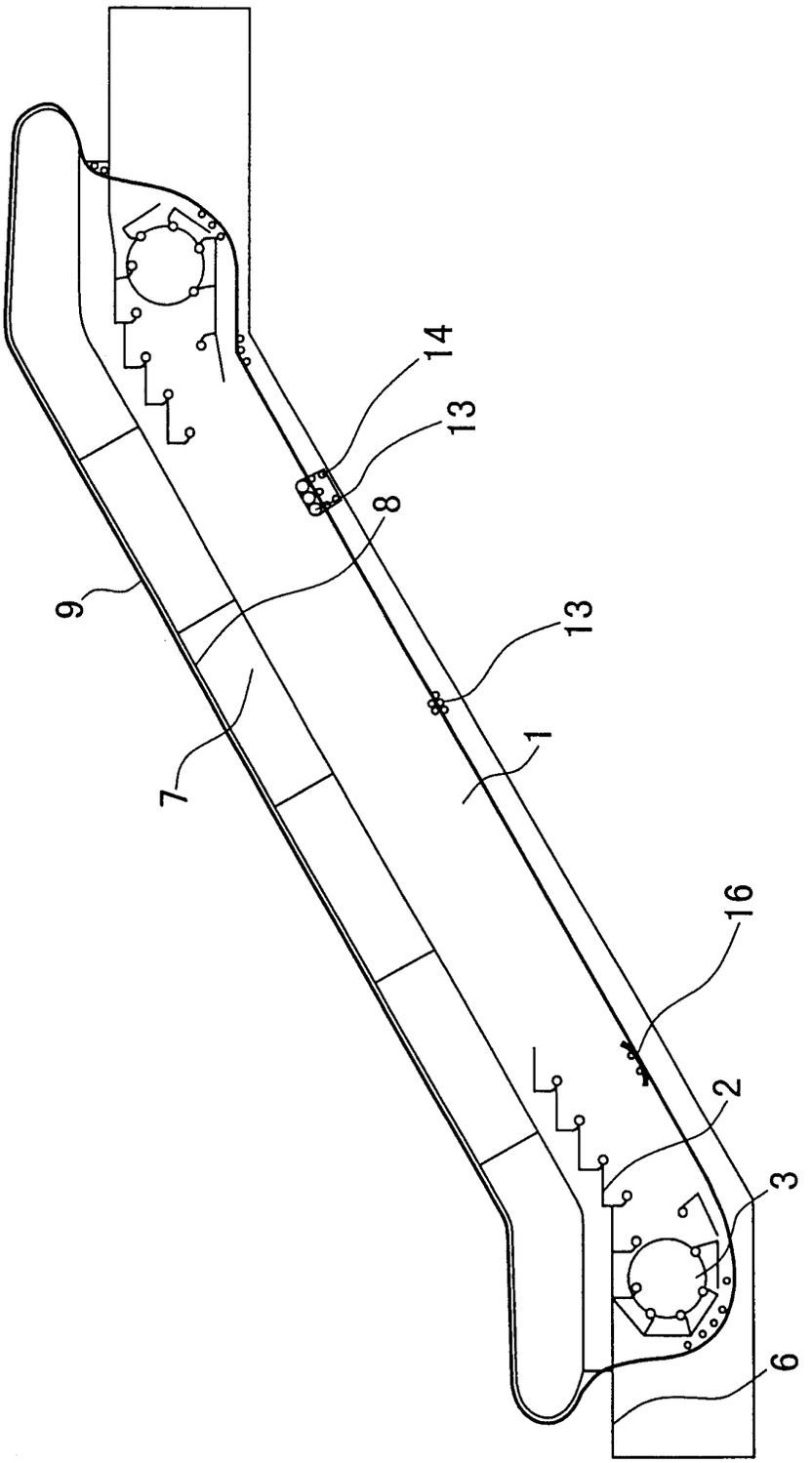


FIG.13

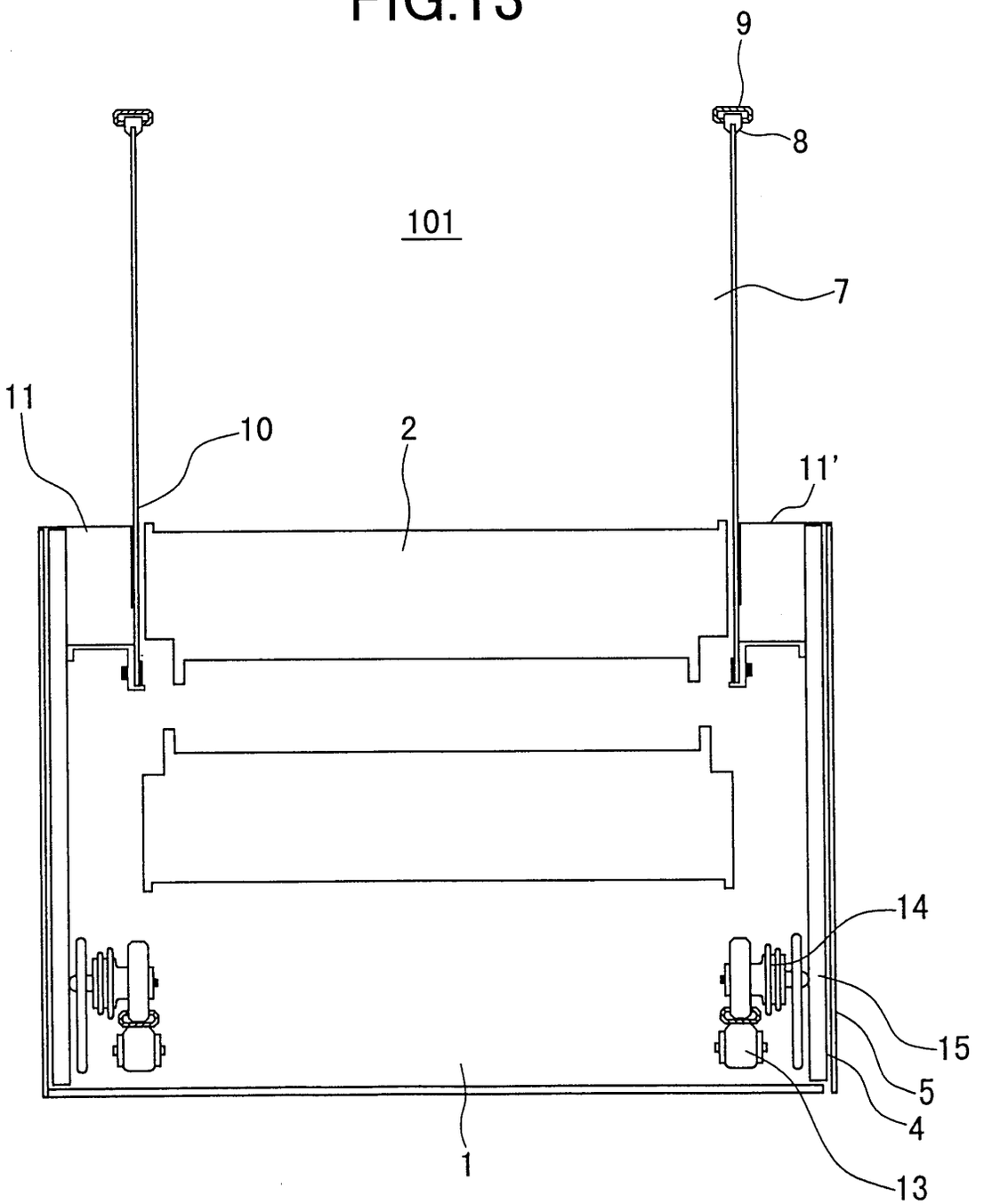


FIG.14

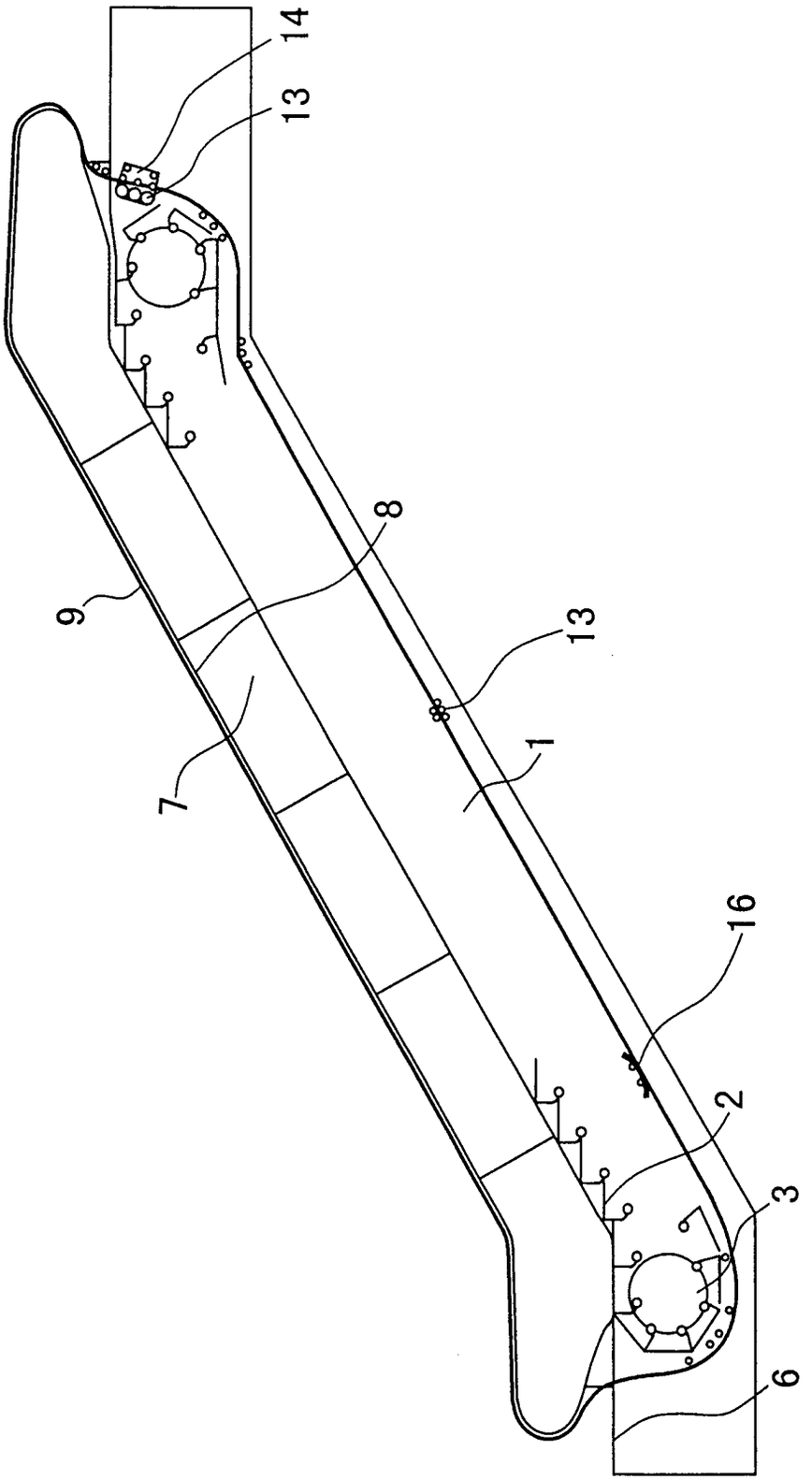


FIG.15

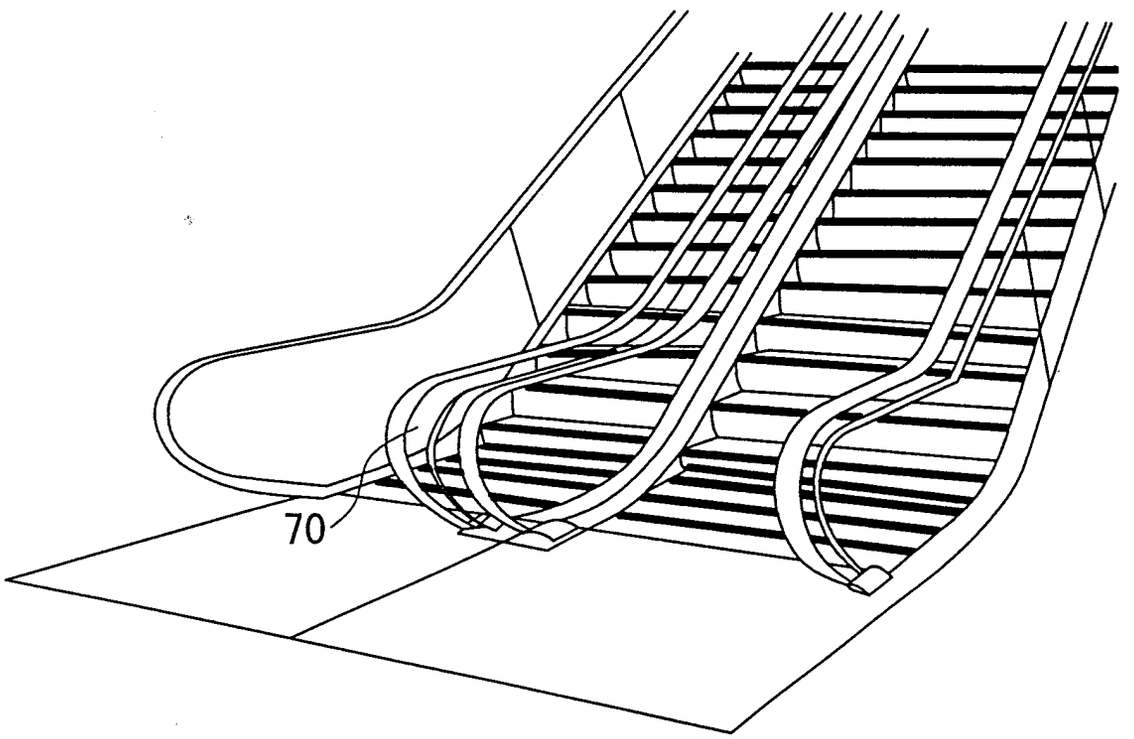


FIG.16