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(54) **HIGH-RISE BUILDING AND MAINTENANCE METHOD THEREFOR**

(57) To ensure maintenance operations for an architectural structure using a mast climber without any limitation on the stability of a mast and locations where a mast can be erected.

An architectural structure 100 has a side wall 101 to which a number of connector pegs 110 are attached. A required number of connector pegs 110 are positioned so as to allow stable support of a mast 200 of a mast climber once the mast 200 is erected at its intended position. To perform maintenance operations for the architectural structure 100 using the mast climber, the upright mast 200 is connected to the connector pegs 110 via respective joint members 300. A climbing work platform 210 that travels up and down the mast 200 is fixed to the mast 200. A worker performs maintenance operations on the climbing work platform 210.

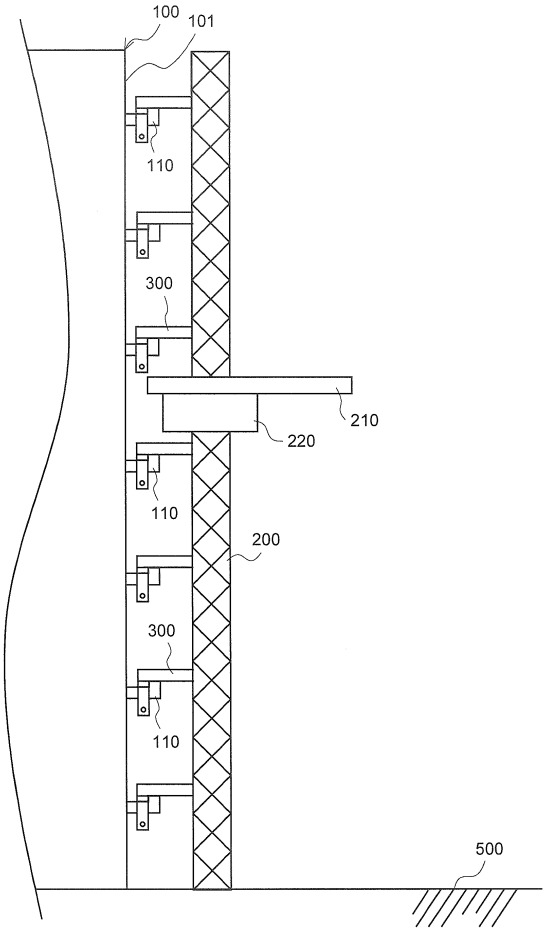

FIG. 3

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Description

Technical field

[0001] The present invention relates to maintenance methods for high-rise architectural structures. As used herein, the term "architectural structure" in "high-rise architectural structure" includes not only buildings, which are expected to accommodate people who enter them for their intended use, but also chimneys and bridges, which people are not expected to enter during normal service. In addition, as used herein, the term "high-rise" in "high-rise architectural structure" refers to a height at which technical difficulties would arise in the maintenance of the exterior walls of the architectural structure, at least 20 m or higher.

Background art

[0002] High-rise architectural structures are often particularly difficult to maintain when it comes to, for example, the inspection, cleaning, and re-application of paint, to their exterior walls and so on, though, which is not necessarily a problem inherent in high-rise architectural structures.

[0003] For architectural structures other than high rises, scaffolds such as Beatty frame scaffolds are erected along the exterior walls of the architectural structure with the scaffolding secured (if necessary) to an exterior wall of the architectural structure. A worker stands on the work platform to perform maintenance operations. However, this approach is difficult to use for taller architectural structures because the effort to assemble the scaffolding becomes excessive or construction of the high-rise scaffolding itself may be impossible.

[0004] For these reasons, the maintenance of a high-rise architectural structure is usually performed by a worker in a gondola suspended from its topmost part. For example, maintenance might be performed by a worker in a gondola suspended from winches installed on the rooftop of a building.

Summary of the invention

Problems to be solved by the invention

[0005] Although it is common to provide maintenance of an architectural structure by a worker in a gondola, as described above, some challenges remain: the number of places from which a gondola can be suspended is limited and the operations performed by a worker in a gondola tends to cause vibration, which can weaken his foothold and increase the level of danger.

[0006] Recently, mast climbers have sometimes been applied for the maintenance of architectural structures, which include one or more tall masts and a climbing work platform that can travel up and down along the mast (s). This allows a worker on the platform to perform operations including maintenance operations. Unlike Beatty frame scaffolds, which should normally be set up along the entire exterior wall of the architectural structure, mast climbers involve lower costs and less effort because it can be ready for use simply by erecting the required number of mast(s) to support the climbing work platform and attaching it to the mast(s). Foothold stability is better on the climbing work platform than in a gondola suspended in the air; thus, it is easier to ensure worker safety for those who perform maintenance operations for an architectural structure as compared to cases where a gondola is used.

[0007] However, once the mast height exceeds a certain limit, it becomes difficult to ensure its stability by supporting it only at the lower end. In contrast, when the upper part of a mast (the term "upper part of a mast" as used herein means a part of the mast other than its lower end; the same applies to the description below) can be secured to an appropriate fixture on the architectural structure, its stability can be increased. The side walls of a typical architectural structure do not have features that allow such secure fixtures. Even if they do, some challenges still remain: the places where the upper part of each mast can be tied to the side wall of the architectural structure are limited; therefore, the locations where a mast can be erected are also limited. In addition, retrofitting certain members might be contemplated to allow masts to be fixed to the side wall of the architectural structure (in fact, some techniques are practically used to connect a scaffold such as a Beatty frame scaffold to a side wall of an architectural structure using a first set of metal fixtures that are attached later to the architectural structure and a second set of metal fixtures each having one end to be secured to the first fixtures and the other end to be secured to the scaffold) ; however, it is difficult to ensure connections of sufficient strength between the members and the architectural structure. Furthermore, such members cannot always be attached to the desired positions on the side walls of the architectural structure. More than anything, the owner of an architectural structure usually dislikes possible damage that would be caused by such measures.

[0008] A direct object of the present invention is to provide a technique with which a desired portion of the side wall of a high-rise architectural structure and an upper part of a mast can be securely fixed to each other. An indirect object of the present invention is to achieve maintenance of an architectural structure using a mast climber without any conventional problems associated with the stability of the mast as well as positions where the mast (s) is/are set.

Means to solve the problems

[0009] In order to solve the aforementioned problems, the present inventor proposes the following inventions.

[0010] The present inventor provides a high-rise architectural structure comprising a connector peg or pegs for

being connected to at least one mast expected to be set along a side wall of the architectural structure, the connector peg(s) being secured to the side wall at position(s) enabling stable support of the at least one mast by the connector peg(s) once the at least one mast is connected to the connector peg(s), the number of the connector peg(s) being sufficient to stably support the at least one mast by the connector peg (s) once the at least one mast is connected to the connector peg(s).

[0011] The architectural structure comprises, as described above, the connector peg(s) that can be connected to the upper part of the mast, on the side wall (s) of the architectural structure from the onset. Accordingly, by using the connector peg (s) of the architectural structure, desired portions of the side wall of the high-rise architectural structure can have the upper part of a mast fixed to it. This allows maintenance of the architectural structure using a mast climber while ensuring the stability of the mast. Furthermore, although positions on the upper part of the mast that are available for fixture are limited to the connector peg locations, the limitation on locations where a mast can be erected can be virtually eliminated by providing connector pegs at the appropriate positions from the onset.

[0012] A mast is expected to be erected or set along the side wall of an architectural structure. The term "along" when used in conjunction with the relative position of a mast and a side wall of the architectural structure does not necessarily mean that they are "in parallel, although a "parallel" relationship exists between them. Consider the example of a mast that is set vertical relative to, for example, the ground. When the upright mast is expected to lie, although not completely, "along" the side wall, the requirement that "the mast is expected to be set along the side wall of the architectural structure" is considered to be satisfied. Thus, even when the side surface of an architectural structure is slightly wavy in its vertical direction and the mast is vertical relative to the ground, the aforementioned requirement that "a mast is expected to be set along the side wall of an architectural structure" is considered to be satisfied.

[0013] A connector peg can have any configuration as long as it can be secured to a mast.

[0014] For example, a proximal end of at least one of connector pegs can be embedded in the side wall of a completed architectural structure. This ensures stronger connections between the connector peg (s) and the side wall of the architectural structure. An anchor can be provided on the proximal end of the connector peg (s) to prevent the connector peg(s) from escaping from the side wall. The anchor can have any shape, as long as it prevents removal of the connector peg from the side wall.

[0015] A proximal end of at least one of connector pegs can be secured to a pillar or a beam of the architectural structure. Securing each connector peg to a pillar or a beam of the architectural structure often provides a stronger connection between the connector peg and the side wall of the architectural structure because a pillar or a beam has greater strength. The proximal end of at least one of the connector pegs can be embedded in the pillar or the beam of the architectural structure. This ensures stronger connections of the connector pegs and the side wall. The proximal ends of the all connector pegs can be secured to the pillar or the beam of the architectural structure. Alternatively, the proximal ends of the all connector pegs may be embedded in the pillar or the beam of the architectural structure.

[0016] As will be described below, the architectural structure can be a building. Some recent buildings may have side walls made up of prefabricated panels (such as panels used for a curtain wall system) made in, for example, a factory. When a side wall of the building is made up of panels, proximal ends of at least some of the connector pegs can be secured to the panel(s). Securing each connector peg to a panel often provides a stronger connection between the connector peg and the side of the architectural structure because a panel has relatively greater strength. The proximal ends of at least some of the connector pegs can be embedded in the panel(s) that make(s) up the outer surface of the side wall of the architectural structure. This allows stronger fixtures of the connector pegs to the side wall. Alternatively, the proximal ends of the all connector pegs can be secured to or embedded in the panel(s).

[0017] When the architectural structure is a building and its side wall is made up of panels, the proximal ends of the all connector pegs can be secured to either the panel (s) making up the outer surface of the side wall of the architectural structure or a pillar or a beam of the architectural structure. When the architectural structure is a building and its side wall is made up of panels, the proximal ends of the all connector pegs can be embedded in either the panel(s) making up the outer surface of the side wall of the architectural structure or a pillar or a beam of the architectural structure. For example, when a panel includes a plate-shaped main body made of concrete, the proximal end of each connector peg can be embedded in the main body.

[0018] Embedding each connector peg in a side wall of an architectural structure can be performed during production of the side wall. For example, when a side wall is made of concrete, the proximal end of a connector peg can be embedded in the concrete during the pour, so that it is already held by the side wall once the concrete has cured. In addition, when the architectural structure is a building and a side wall is made up of panels, the proximal end of a connector peg can be embedded in the panel during production of the panel. Known panels for exterior walls include autoclaved lightweight concrete (ALC) panels composed of lightweight concrete and prestressed concrete (PC) panels composed of high strength concrete. ALC panels typically have a thickness of several hundred millimeters. Accordingly, it is possible to ensure a sufficiently strong connection of a connector peg by embedding its proximal end in the concrete during pour. When the proximal end of the connector peg has an an-

chor, this further strengthens the connection between the panel and the connector peg, in turn, the connection between the side wall of the architectural structure and the connector peg.

[0019] When the architectural structure is a building such as an apartment house, at least one veranda/balcony may be provided on a side wall of the architectural structure. In such a case, at least one of connector pegs can be provided on the at least one veranda/balcony. The veranda/balcony is also a suitable feature on which a connector peg can be provided.

[0020] When the connector peg(s) is/are attached to a veranda/balcony, it/they can be attached to an edge or a lower surface of the veranda/balcony. A veranda/balcony is typically a space where people such as residents can walk. However, no one will walk on the edge or lower surface, and any connector pegs thus provided will not impede the movement of the residents.

[0021] Each secure connection between a connector peg and a mast can be achieved either directly or indirectly via another means such as a different metal fixture. Basically, a secure connection between the mast and each connector peg must be achieved in a removable manner.

[0022] The connector pegs can be a nut. Each connector peg which is a nut is embedded in the side wall at least at its proximal end, with an opening at one end of a threaded inner surface of the connector peg being exposed to the side wall. The other end of the nut may not have an opening (i.e., may be closed). A mast can be stably set without any restrictions on the position where it is set, simply by embedding the aforementioned required number of nuts at the aforementioned required positions on a side wall of an architectural structure.

[0023] Each connector peg can be concealed with a cover that prevents the connector peg from being exposed, the cover being designed so that it can be removed when the connector peg is connected to the mast.

[0024] The connector pegs provided on a side wall of an architectural structure can spoil the esthetic appearance of the architectural structure. Furthermore, an object that is thrown into the air for some reason could be caught on a connector peg located in a high position. The aforementioned cover would prevent such situations. For example, by choosing a cover with an appearance that is compatible with the exterior wall of the architectural structure, it is possible to reduce the possibility of spoiling the appearance of the architectural structure. Such a cover can have either the function of keeping the esthetic appearance of the architectural structure or the function of reducing the possibility of something being caught on a connector peg.

[0025] The cover may be capable of being attached to and removed from the side wall. Such cover can be used repeatedly by removing it when a mast and a connector peg are connected and attaching the cover again once the mast and the connector peg are disconnected.

[0026] The cover or covers can be configured such that the connector peg or pegs inside the cover is/are exposed when the cover is broken (including irreversible removal of the cover). For example, clayey materials such as clay, mortar-like materials such as mortar, or resins such as urethane foam, urethane, and polystyrene foam can be used as a cover material. When one of them is used as a cover material, it is possible to reduce the influence of moisture on the connector peg by preventing rainwater infiltration.

[0027] As described above, a connector peg or pegs is/are positioned on a side wall of a high-rise architectural structure so as to allow stable support of a mast by the connector peg (s) once the mast is connected to the connector peg(s), the number of the connector pegs being sufficient to stably support the mast by the connector peg(s) once the mast is connected to the connector peg(s). The number of the connector pegs may be one or more, as long as the purpose can be achieved.

[0028] For example, at least two connector pegs can be provided along at least one longitudinal line (typically a vertical line) on an outer surface of the side wall. Such arrangements of the connector pegs allow the upper portion of a mast to be connected at two different positions, in addition to the lower end of the mast to securely fix the single mast to the side wall; this is useful for increasing its stability.

[0029] The architectural structure according to the present invention may be a building for office use or for residential use. It is noted that the architectural structure can be the one that is so-called a non-building structure, such as a chimney or a bridge, which people are not expected to enter during normal service.

[0030] The connector pegs are provided on a side wall of an architectural structure. Since it is necessary that each connector peg can be secured to a mast, at least a portion of the connector peg is exposed to the outside when the aforementioned cover or another cover described above is not used.

[0031] At least one of the connector pegs can be provided inside a recess formed in an outer surface of the side wall so that the at least one connector peg is not exposed to the outer surface of the side wall that is a generally flat surface of the side wall. As described above, a cover can be used as a feature to provide the function of keeping the esthetic appearance of an architectural structure or the function of reducing the possibility of something being caught on a connector peg. The recess having the connector peg inside would provide similar functions to those of a cover. It is of course expected that all connector pegs would be inside a recess or recesses.

[0032] As described above, the architectural structure according to this application can be a building. A side wall of the building may be made up of panels. In such a case, a recess having a connector peg or pegs in it can be formed in a panel. When each panel is, for example, a concrete panel such as an ALC panel or a PC panel, the panels typically have a thickness of several hundred

millimeters as described above. Even when a recess is formed in the panel and the proximal end of each connector peg is secured to or embedded in the bottom of the recess, ensuring a sufficiently strong connection between the panel and the connector peg is not a problem.

[0033] When the architectural structure is a building, a gap between panels that make up an outer surface of the side wall of the building can be used as the recess. More specifically, when at least one of the connector pegs is provided inside a recess formed in an outer surface of the side wall so that the at least one connector peg is not exposed to a plane where the outer surface of the side wall is absent, the plane being generally flush with the outer surface of the side wall, the recess can be a gap between panels making up the outer surface of the side wall of the building.

[0034] In any of the aforementioned cases, a cover or covers that conceal (s) the connector peg or pegs respectively can be provided over the recess. In other words, a cover can be provided over the recess formed in the panel. The configuration and the function of the cover are as described above.

[0035] For example, when the panel includes a plate-shaped main body made of concrete, a recess can be formed in an outer surface of the main body, the connector peg (s) being attached to the inside of the recess so that the connector peg (s) is/are not exposed to the outer surface of the side wall that is a generally flat surface of the side wall. Cover (s) that conceal (s) each of the connector peg can be provided over the recess formed in the main body of the panel. The cover may be a plate-like member that conceals an opening of the recess. The plate-like member may be capable of being attached to and removed from the opening of the recess. This allows repeated use of the cover. In order to make an appearance of the cover compatible with the exterior wall of the architectural structure, the outer surface of the cover, which is a plate-like member, can be provided with a material (such as a tile) used to finish the surface of the side wall of the architectural structure. At least the outer surface of the main body can be covered with a plate. In such a case, a part of the plate at a position corresponding to the recess can be separable from the remaining part, with the separable portion functioning as the cover. In this case, the plate may be, for example, a metal plate. The surfaces of the main body except for the back surface, i.e., the outer front, top, bottom, right and left surfaces may be covered with the metal plate or plates.

[0036] The cover can be a filler material that is filled within the recess. The cover in this case can be configured such that the connector peg (s) inside the cover is/are exposed when the cover is broken. For example, clayey materials such as clay, mortar-like materials such as mortar, or resins such as urethane foam, urethane, and polystyrene foam can be filled in the recess as the filler material that serves as the cover.

[0037] In such a case, the recess can have a shape and a size sufficient to provide a connection between a connector peg and a joint member that ties the connector peg and the mast, the connection being achieved in the recess . The connector peg inside the recess would be connected to one end of the joint member, and the mast would be connected to the other end. Consequently, the connector peg and the mast would be securely connected to each other. By using the recess having a shape and a size sufficient to provide a connection between a connector peg and a joint member that ties the connector peg and the mast in the recess (i.e., a shape and a size with a sufficient space for such a connection), it is possible not only to connect the connector peg and the joint member but also to use the connector peg in the recess again once the connector peg and the joint member are disconnected to release the connection between the mast and the connector peg. A cover can be provided again over the recess for such repeated use.

[0038] The present inventor proposes, as an aspect of the present invention, a panel for forming an outer surface of a side wall of a high-rise architectural structure which is a building, the panel having a connector peg or pegs secured to an outer surface thereof, the panel being used to construct, by installing the panel on an expected position of the architectural structure, the architectural structure comprising the connector peg or pegs for being connected to at least one mast expected to be set along a side wall of the architectural structure, the connector peg(s) being secured to the side wall at position (s) enabling stable support of the at least one mast by the connector peg(s) once the at least one mast is connected to the connector peg (s), the number of the connector peg (s) being sufficient to stably support the at least one mast by the connector peg(s) once the at least one mast is connected to the connector peg(s). It is needless to say that a recess can also be formed in this panel and the connector peg can be provided in the recess. Regardless of whether the recess is present or not, a cover that is similar to the one described above or to those described below can be applied to the panel as well.

[0039] Even when the recess is formed in the panel, the recess can have a shape and a size sufficient to provide a connection between a connector peg and a joint member that ties the connector peg and the mast, the connection being achieved in the recess. Advantages obtained with this are similar to those obtained in the cases where no recess is formed in the panel (s) .

[0040] The present inventor also proposes a maintenance method for a high-rise architectural structure.

[0041] The method is the maintenance of a high-rise architectural structure comprising a connector peg or pegs for being connected to at least one mast expected to be set along a side wall of the architectural structure, the connector peg(s) being secured to the side wall at position(s) enabling stable support of the at least one mast by the connector peg(s) once the at least one mast is connected to the connector peg(s), the number of the connector peg(s) being sufficient to stably support the at least one mast by the connector peg (s) once the at least

one mast is connected to the connector peg(s), the method comprising the steps of: setting upright the at least one mast along the side wall of the architectural structure, with the at least one mast being at least connected to at least one connector peg, with the lower end of the at least one mast being fixed; attaching a platform to the at least one mast, the platform being capable of moving up and down the at least one mast to which it is attached; and moving up and down the platform along the at least one mast while a worker on the platform is performing maintenance of the architectural structure.

[0042] This method allows maintenance of the architectural structure using a mast climber while ensuring the stability of the mast and virtually eliminates the limitation on locations where a mast can be erected.

Brief description of the drawings

[0043]

Fig. 1 is a side view schematically showing an entire architectural structure according to a first embodiment of the present invention;

Fig. 2 is a front view showing exemplified arrangements of connector pegs provided on or in a side wall of the architectural structure shown in Fig. 1;

Fig. 3 is a side view schematically showing a state where the architectural structure shown in Fig. 1 is under maintenance;

Fig. 4 is a perspective view showing connection between a connector peg and a joint member shown in Fig. 3;

Fig. 5 is a side cross-sectional view of a connector peg of a modified version 1;

Fig. 6 is a side cross-sectional view of a connector peg of a modified version 2;

Fig. 7 is a side cross-sectional view of another connector peg of the modified version 2;

Fig. 8 is (A) a front view showing a structure of a panel of a modified version 3 and (B) an X-X cross-sectional view of an area near an opening cover provided in the panel;

Fig. 9 is a plan view schematically showing a state where an architectural structure according to a second embodiment of the present invention is under maintenance;

Fig. 10 is a side cross-sectional view of a connector peg of a modified version 6;

Fig. 11 is a side cross-sectional view of the connector peg of the modified version 6 to which an opening cover is applied;

Fig. 12 is a cross-sectional view showing how connector pegs are attached to a side wall of the architectural structure shown in Fig. 1;

Fig. 13 is a plan view schematically showing a state where the architectural structure shown in Fig. 1 is under maintenance;

Fig. 14 is a front view showing arrangement of connector pegs of a modified version 7;

Fig. 15 is (A) a front view showing a structure of a panel of a modified version 4, (B) an X-X cross-sectional view of the panel, and (C) a Y-Y cross-sectional view of the panel;

Fig. 16 is a side view schematically showing an entire architectural structure according to a modified version 5; and

Fig. 17 is a side view, in enlarged scale, of veranda/balconies sticking out from the architectural structure shown in Fig. 16.

Embodiments for carrying out the invention

[0044] First and second preferred embodiments of the present invention are described in detail below with reference to the drawings. It is noted that identical elements in these embodiments and modified versions thereof are designated with the same reference numerals , and redundant description thereof will be omitted, as a case may be.

<<First embodiment>>

[0045] Fig. 1 shows an architectural structure 100 according to a first embodiment.

[0046] The architectural structure 100 is a building. The building, which is the architectural structure 100, may be, for example, an office building or an apartment house. The architectural structure 100 is freestanding on the ground 500. The configuration of the architectural structure 100 is quite typical except for connector pegs described below. While neither entrance nor window is illustrated in Fig. 1, it should be noted that the architectural structure 100 has components to fulfill the functions required for ordinary architectural structures or ordinary buildings.

[0047] The architectural structure 100 is high rise. The architectural structure 100 has a height of 20 m or higher. This is the height that tends to cause troubles in its maintenance. The height of the architectural structure 100 may be several hundred meters or higher.

[0048] Connector pegs 110 are made of metal. As described later, the connector pegs 110 can be connected to an upper portion of a mast (i.e., a portion of the mast except for its lower end). Each connector peg 110 is strong enough to support the mast in a stable manner when it is connected to an upper portion of the mast. As described later, the mast makes up a part of a climbing work platform.

[0049] A side wall 101 of the architectural structure 100 has at least one connector peg 110. A plurality of (more specifically, seven) connector pegs 110 are provided on the side wall 101 of the architectural structure 100 in the example shown in Fig. 1. For the easier understanding, the connector pegs 110 in Fig. 1 are shown on a larger scale than the remaining components.

[0050] The connector pegs 110 are provided at prede-

termined positions on the side wall 101 of the architectural structure 100. Each connector peg 110 is positioned on the side wall 101 so as to provide secure connection between a mast which will be erected and the connector peg 110.

[0051] In other words, the connector pegs 110 are secured to the side wall 101 at positions that allow for stable support of the mast by the connector pegs 110 once the mast is connected to the connector pegs 110, the number of the connector pegs 110 being sufficient to stably support the mast by the connector pegs 110 once the mast is connected to the connector pegs 110.

[0052] When the architectural structure 100 is a generally rectangular parallelepiped building, it has four side walls 101. In such a case, the connector pegs 110 may be provided only on one side wall 101. Alternatively, they may be provided on two or three side walls 101 or on all side walls 101.

[0053] The connector pegs 110 may be distributed over the entire surface of the side wall 101 or only within a certain area of the side wall 101.

[0054] When the connector pegs 110 are distributed within a certain area of the side wall 101, they may be uniformly distributed over the entire area where the connector pegs 110 are provided. Alternatively, they may be distributed densely in one part and sparsely in another part.

[0055] Each connector peg 110 is attached to the side wall 101 as shown in, for example, Fig. 12(A). An anchor 110A is provided at the proximal end of the connector peg 110.

[0056] The anchor 110A of the connector peg 110 is provided during the production of the side wall 101. For example, before pouring the concrete to produce the side wall 101, the anchor 110A is placed in a space where the side wall is to be provided. With this state, the concrete is poured and cured. The anchor 110A of the connector peg 110 is thus embedded in the side wall 101. The anchor 110A has a shape like an open umbrella. This shape serves to prevent the anchor 110A from being fallen off the side wall 101. With the anchor 110A, the connector peg 110 is secured to the side wall 101. The anchor 110A does not necessarily have a shape like an open umbrella as illustrated and it may have any shape as long as slippage of the anchor 110A from the side walls 101 can be prevented. The anchor 110A may have any known shape. The anchor 110A is embedded in the side wall 101 including a pillar or a beam of the architectural structure 100.

[0057] When the architectural structure 100 is a building, the side wall 101 may be made up of sets of panels. Each panel may be, for example, an ALC panel or a PC panel. The panel has, for example, a rectangular plate-like shape. Typically, adjacent panels have the same vertical and lateral dimensions. The panels are arranged in rows and columns to make up the side wall 101. The anchor 110A of the connector peg 110 may be embedded in the panel during the production of the panel. When the panel is made of concrete, then the anchor 110A may be embedded in the panel during production of the panel in a manner similar to the one described in conjunction with the case where the anchor 110A is embedded in the side wall 101 during production of the panel. The panel has a thickness providing sufficient strength of the panel itself and of the connection between the panel and the anchor 110A even after such embedding of the anchor 110A. The thickness is, for example, around 300 mm. When the side wall 101 of the architectural structure 100 is made up of sets of panels, it is not necessary that all panels have the connector peg 110 attached thereto. Alternatively, single panel may have two or more connector pegs 110. Panels are usually fabricated in a factory, rather than on the construction site of the architectural structure 100. Accordingly, in fabricating the panels in the factory, they may be designed in such a manner that the connector pegs 110 will finally be placed at necessary positions once the side wall 101 of the architectural structure 100 is made up by arranging the panels.

[0058] The secure fixing of the connector pegs 110 to the side wall 101 or the panel is not necessarily made by embedding the anchor 110A in the side wall 101 or the panel. For example, as shown in Fig. 12(B), the connector peg 110 may have a plate-shaped base 110B at its proximal end. In such a case, the connector peg 110 may be secured to the side wall 101 or the panel by threadedly inserting screws 110C into the side wall 101 or the panel through bores (not shown) formed in the base 110B, with the base in contacted with the surface of the side wall 101 or the panel.

[0059] The way of fixing the connector pegs to the side wall 101 or the panel is not necessarily identical for all connector pegs 110.

[0060] In this embodiment, the architectural structure 100 is a building having the side walls 101 made up of panels. All connector pegs 110 have their respective anchors 110A, and the anchors 110A of all connector pegs 110 are embedded either in the panel or the pillar or the beam which is a part of the side wall 101, but not necessarily so.

[0061] Fig. 2 shows a front view of one side wall 101. Fig. 2 shows patterns of attaching the connector pegs 110 to the side walls 101.

[0062] The connector pegs 110 in this example are attached to the side wall 101 in four different patterns A to D. Of the connector pegs 110 arranged in different patterns, those aligned on the same longitudinal line on the side wall 101 are used to support the same single mast. All of the patterns A to D include a number of connector pegs 110 aligned along a longitudinal line (typically a vertical line) or in a vertical direction on the side wall 101. A series of connector pegs 110 included in each pattern support the mast in an upright or nearly upright state along the side wall 101 of the architectural structure 100.

[0063] The pattern A is described first. In the pattern A, the connector pegs 110 are aligned in a line at equal intervals in the vertical direction generally along the entire

height of the side wall 101. Although each connector peg 110 can be connected to the mast, not all connector pegs 110 are necessarily connected to the mast. The same applies to the patterns B to D.

[0064] Next, the pattern B is described. In the pattern B, the connector pegs 110 are aligned in a line at different intervals in the vertical direction generally along the entire height of the side wall 101.

[0065] Then, the pattern C is described. In the pattern C, the connector pegs 110 are aligned in a line at equal intervals in the vertical direction along a part of the height of the side wall 101. The connector pegs 110 are not required to be present uniformly in the vertical direction of the side wall 101.

[0066] Finally, the pattern D is described. In the pattern D, the connector pegs 110 are aligned in two lines at equal intervals in the vertical direction generally along the entire height of the side wall 101. In this example, the mast can be fixed more securely by supporting the mast using the pairs of connector pegs 110 arranged side by side.

[0067] An area having no connector peg 110 is present between the pattern C and the pattern D. In this way, the connector pegs 110 are also not necessarily distributed uniformly in the lateral direction.

[0068] Fig. 3 shows a mast erected upright or almost upright along the side wall 101 of the architectural structure 100, with the mast being secured by the connector pegs 110.

[0069] As shown in the side view in Fig. 3, a mast 200 can be connected to the connector pegs 110 via respective joint members 300.

[0070] The connector peg 110, a detailed structure of the joint member 300, and how they are joined to each other are described in conjunction with a perspective view in Fig. 4. The joint member 300 in this embodiment is made of a metal. The only requirement for the connector peg 110 and the joint member 300 is that they are capable of being connected to each other in a removable manner. In other words, the configuration of the connector peg 110 and the joint member 300 is merely one of possible configurations.

[0071] The connector peg 110 has a connector shank portion 111 extending at right angles from the side wall 101 and a connector hook portion 112 formed by bending, but not limited to, the connector shank portion 111 upward. The connector shank portion 111 is secured to the side wall 101 at its proximal end (back left in Fig. 4) by an appropriate means. For example, the proximal end of the connector shank portion 111 is secured to the side wall 101 by threadedly engaging, with the side wall 101, a bolt passing through a bore formed in a plate-shaped base provided at the proximal end of the connector shank portion 111; or securing fixing, in the side wall 101, an anchor provided on the proximal end of the connector shank portion 111, the anchor having a profile that prevents it from dropping once it is embedded in the side wall.

[0072] The joint member 300 includes a bar-shaped joint shank portion 301. The joint shank portion 301 can be connected to the mast 200 at its proximal end (front right in Fig. 4) by an appropriate means which is not illustrated nor described in detail. A catcher portion 302 is provided at the distal end of the joint shank portion 301. The catcher portion 302 is for securely fixing the joint shank portion 301 and the connector peg 110. The catcher portion 302 has a rectangular U-shape opened downward. Screw bores which are not shown are formed in the catcher portion 302 at both ends thereof. A cover piece 303, which is a plate-like member, can be attached to the lower end of the catcher portion 302. The cover piece 303 is for closing the lower opening in the catcher portion 302. Bores which are not shown are formed in the catcher portion 302 at both ends thereof. Screw holes which are also not shown are formed in the cover piece 303 at both ends thereof, at positions corresponding to the bores. The cover piece 303 is tightly fixed to the catcher portion 302 by threadedly engaging the bolts 304 passing through the two bores formed at the ends of the catcher portion 302 with the screw holes formed in the cover piece 303 at both ends thereof. In this state, a rectangular bore is formed which is defined by the cover piece 303 on the lower side and the inner surfaces of the catcher portion 302 on the upper, right, and left sides of the bore. The cross-sectional shape and the size of the rectangular bore correspond to those of the connector shank portion 111 of the connector peg 110. In other words, once the cover piece 303 is securely fixed to the catcher portion 302 with two arms of the catcher portion 302 extending on either side of the connector shank portion 111 of the connector peg 110, the connector shank portion 111 does not escape from the aforementioned bore defined by the catcher portion 302 and the cover piece 303 because the free end of the connector shank portion 111 is thicker by the presence of the connector hook portion 112.

[0073] By mutual engagement between (the edge of) the aforementioned rectangular bore and the connector hook portion 112, the connector peg 110 and the joint member 300 can tightly be fixed to each other.

[0074] Next, a maintenance method for the architectural structure 100 having the connector pegs 110 is described.

[0075] For maintenance operations, a mast climber is used. Mast climbers are known in the art and therefore detailed description of them will be omitted because no further description should be required for those in the art. Mast climbers comprise single or twin masts and a climbing work platform that can freely travel up and down along the mast(s). The climbing work platform includes a drive unit. The drive unit is for generating power to move the climbing work platform up and down the mast (s) as well as for holding it on the mast at any appropriate height.

[0076] For maintenance, masts 200 (see, Figs. 3 and 13) are erected at positions suitable for positioning a climbing work platform in order to position the climbing work platform at positions where it is required for main-

tenance operations.

[0077] In this embodiment, the masts 200 are erected at positions near the lateral ends of the side wall 101 of the architectural structure 100. The masts 200 erected at positions near the lateral ends of one side wall 101 hold a climbing work platform 210 having a width generally corresponding to the width of that side wall 101, at positions near both ends of the climbing work platform 210. The climbing work platform 210 next to each side wall 101 is used to provide access to that side wall 101 facing the climbing work platform 210 for maintenance operations. While exemplified arrangements of the connector pegs 110 provided on the side wall 101 are described in conjunction with Fig. 2, a plurality of connector pegs 110 canbeprovided along vertical lines near the lateral ends of the side wall 101, in other words, along areas on the side wall 101 expected to face the masts 200, when the masts 200 are erected at the positions shown in Fig. 13.

[0078] In Fig. 13, pairs of masts 200 are provided for all of the four side walls 101, and the climbing work platforms 210 are fixed to the respective pairs of the masts 200. However, maintenance of the architectural structure 100 is not necessarily performed for all side walls 101 simultaneously. This means that two masts 200 can be erected to which the climbing work platform 210 is fixed only for the side wall(s) 101 subjected to maintenance. For example, in Fig. 13, it is possible to provide maintenance of the left side wall 101 next to the climbing work platform 210 represented by solid line first, and provide maintenance of the remaining three side walls 101 next to the climbing work platforms 210 represented by long dashed double-short dashed line later.

[0079] Each mast 200 is typically made of mast modules having an appropriate length. The mast modules are stacked on top of each other to extend the mast upward to a desired height.

[0080] First, the lower end of a mast module is installed on the ground 500 (see, Fig. 3) using a known technique. Next, the climbing work platform 210 is attached to the mast 200 (the mast module installed on the ground 500) (see, Figs. 3 and 13). As shown in Fig. 3, the climbing work platform 210 has the aforementioned drive unit 220. The climbing work platform 210 is usually provided with components such as guardrail(s) encircling it to ensure that a worker on the climbing work platform 210 is kept safe. These components are not shown herein.

[0081] Next, mast modules to be stacked on top of each other are mounted on the climbing work platform 210, and the climbing work platform 210 is moved closer to the top of the mast module installed on the ground. A mast module on the climbing work platform 210 is then connected to the top of the underlying mast module. This process is repeated to extend the mast 200 upward.

[0082] When a connector peg 110 is present and the mast 200 should be connected to the connector peg 110 to ensure the stability of the mast 200, the connector peg 110 and the mast 200 are connected. The connection procedure for the mast 200 and the connector peg 110 is as described above in which the mast 200 and the joint member 300 are securely fixedto each other and the joint member 300 and the connector peg 110 is connected. It is noted that either of the connection between the mast 200 and the joint member 300 or the connection between the joint member 300 and the connector peg 110 may be made first.

[0083] By repeating the above process, the mast 200 is erected vertically along the side wall 101 as shown in Fig. 3.

[0084] A worker stands on the climbing work platform 210 fixed to the mast 200, moves the platform up and down, and stops the platform at a desired height. The worker can perform maintenance of the architectural structure 100.

[0085] After completion of maintenance, the mast 200 is disassembled back into mast modules by reversing the procedure described above. Finally, the mast modules and the climbing work platform 210 are taken out.

<Modified version 1>

[0086] Next, modified versions of the first embodiment are described.

[0087] The connector pegs 110 in the first embodiment are secured to the side wall 101 and exposed outside. However, in terms of the esthetic features of the architectural structure 100, it is often better that the connector pegs 110 are not exposed. In addition, problems that something is caught on the connector peg(s) 110 can be reduced.

[0088] An architectural structure 100 according to a modified version 1 is generally similar to the architectural structure 100 of the first embodiment. It includes the connector pegs 110 as in the case of the first embodiment. Each connector peg 110 of the modified version 1 is secured to the side wall 101 within a recess 102 formed in the side wall 101 (see, Fig. 5). As a result, the connector peg 110 is not exposed to the outer surface of the side wall 101 that is a generally flat surface of the side wall 101 extending around the recess 102. In the modified version 1, the anchor 110A described in the first embodiment is used to securely fix the connector peg 110 to the side wall 101. This secure fixture is not necessarily achieved by the anchor 110A. The same applies to other embodiment and modified versions described below.

[0089] The recess 102 formed in the architectural structure 100 of the modified version 1 has, but not limited to, a plate-shape opening cover 103 that can removably be attached to the opening of the recess 102. The opening cover 103 may removably be attached to the opening by applying a known method. With the opening cover 103, the connector peg 110 is not fully exposed to the outside. The outer surface of the opening cover 103 is, but not limited to, finished in the same manner as that of the side wall 101. For example, when the outer surface of the side wall 101 is tiled, the outer surface of the open-

ing cover 103 is also tiled with a similar tile or tiles. As a result, the opening cover 103 would be compatible with the appearance of the side wall 101, reducing its influence on the appearance of the architectural structure 100.

[0090] While it is sufficient that the aforementioned design of the connector peg 110 fixed within the recess 102 with the opening cover 103 provided over the opening of the recess 102 is appliedto at least one connectorpeg 110, the modified version 1 employs this design for all connector pegs.

[0091] A maintenance method for the architectural structure 100 according to the modified version 1 is basically identical to the one that is described in the first embodiment. One difference lies in the fact that the opening cover 103 should be removed from the opening of the recess 102 to expose the connector peg 110 outside before connecting the mast 200 and the connector peg 110 via the joint member 300.

[0092] The recess 102 has a shape and a size sufficient to provide a connection between the connector peg 110 and the catcher portion 302 of the joint member 300 in the recess 102. Since the recess 102 isdesignedwithsuchasufficient space, the connector peg 110 and the catcher portion 302 of the joint member 300 can be connected without any trouble within the recess 102.

[0093] Another difference of the modified version 1 from the first embodiment lies in the fact that the opening cover 103 may be re-attached to the opening of the recess 102 when the mast climber is dismantled after completion of maintenance operations. Since the connector peg 110 is completely sunk within the recess 102, it is easy to cover again, with the opening cover 103, the recess 102 having the connector peg 110 inside. The feature of the recess 102 having a shape and a size sufficient to provide a connection between the connector peg 110 and the catcher portion 302 of the joint member 300 in the recess 102 is also applied to the following description.

[0094] In the modified version 1, the connector peg 110 is fixed within the recess 102. However, rather than fixing the connector peg 110 within the recess 102, the connector peg 110 may be attached to the outer surface of the side wall 101 and a cover having a shape of, for example, a box or a dome with one side opened may be attached to the side wall 101 with the connector peg 110 positioned in the cover, thereby to prevent the connector peg 110 from being exposed. This cover also has a shape and a size sufficient to provide a connection between the connector peg 110 and the catcher portion 302 of the joint member 300 in the cover; i.e., has a sufficient space inside. The same applies to covers described below.

<Modified version 2>

[0095] Next, a modified version 2 is described.

[0096] An architectural structure 100 of the modified version 2 is generally identical to the one in the modified version 1.

[0097] As shown in Fig. 6, the connector peg 110 is fixed within the recess 102.

[0098] However, in the modified version 2, the opening cover 103 over the opening of the recess 102 is not present.

[0099] The connector peg 110 fixed within the recess 102 is not exposed to the outside in a different manner from the one using the opening cover 103 in the modified version 1.

[0100] In the modified version 2, the recess 102 is filled with a filler material 104 to prevent the connector peg 110 from being exposed to the outside. The filler material 104 may be a clayey material such as clay, a mortar-like material such as mortar, or a resin such as urethane foam, urethane, and polystyrene foam.

[0101] A maintenance method for the architectural structure 100 according to the modified version 2 is basically identical to the one that is described in the modified version 1. On difference lies in the fact that, instead of removing the opening cover 103 from the opening of the recess 102, the filler material 104 in the recess 102 should be removed or broken and removed to expose the connector peg 110 outside before connecting the mast 200 and the connector peg 110 via the joint member 300. In other words, the connector peg 110 enclosed in the filler material 104 is exposed by breaking the latter.

[0102] It can be said that another difference of the modified version 2 from the modified version 1 lies in the fact that the recess 102 may be re-filled with the filler material 104 instead of re-attaching the opening cover 103 to the opening of the recess 102 when the mast climber is dismantled after completion of maintenance operations. In this modified version 2, it becomes possible to make the appearance of the filler material 104 more compatible with that of the architectural structure 100 by producing better visual combinations of colors and textures of the filler material 104 and the exterior side wall 101.

[0103] In the modified version 2, the connector peg 110 is fixed within the recess 102. However, rather than fixing the connector peg 110 within the recess 102, the connector peg 110 attached to the outer surface of the side wall 101 may be covered with a material similar to the aforementioned filler material 104.

[0104] It is also possible to attach the opening cover 103 similar to the one in the modified version may further be attached to the opening of the recess 102 in the modified version 2 (Fig. 7).

<Modified version 3>

[0105] Next, a modified version 3 is described.

[0106] An architectural structure 100 of the modified version 3 is generally identical to those in the modified versions 1 and 2.

[0107] A side wall 101 of the architectural structure 100 of the modified version 3 is made up of panels 101P (one of which is shown in Fig. 8) arranged in rows and columns. Each panel 101P shown in Fig. 8 is an ALC panel or a

PC panel made of concrete and has a plate-shaped main body 101P1. A recess 102, which is similar to the one described in the modified version 1, is formed in the outer front surface of the main body 101P1. The connector peg 110 is fixed within the recess 102. An opening cover 103 is attached to the opening of the recess 102. In this embodiment, the connector peg 110 is fixed within the recess 102 by, but not limited to, embedding an anchor 110A of the connector peg 110 in the bottom of the recess 102.

[0108] The architectural structure 100 of the modified version 3 using such panels 101P is similar in configuration, including the positions of the recesses 102 and the connector pegs 110, to the architectural structure in the modified version 1 except that each side wall 101 is made up of the panels 101P. Some panels 101P may have no recess 102 (accordingly, have no connector peg 110 nor opening cover 103). In addition, a panel or panels 101P may have two or more recesses 102 (accordingly, have corresponding connector pegs 110 and opening covers 103) . Furthermore, different panels 101P may have the recesses 102 (and the connector pegs 110 and opening covers 103) in their front faces at different positions.

[0109] Other features described in the modified versions 1 and 2 may be applied to the panel 101P of the modified version 3.

<Modified version 4>

[0110] Next, a modified version 4 is described.

[0111] An architectural structure 100 of the modified version 4 is generally identical to the one in the modified version 3.

[0112] A side wall 101 of the architectural structure 100 of the modified version 4 is made up of panels 101P (one of which is shown in Fig. 15) arranged in rows and columns. A recess 102, which is similar to the one described in the modified version 1, is formed in a panel 101P shown in Fig. 15. The connector peg 110 is fixed within the recess 102. An opening cover 103 is attached to the opening of the recess 102. The difference of the panel 101P of the modified version 4 from the panel 101P of the modified version 3 lies in the fact that the panel 101P of the modified version 4 is covered with a plate or plates (in this embodiment, a metal plate or plates) 101P2 on the outer front, top, bottom, right, and left surfaces of the main body 101P1. A part of one metal plate 101P2 serves as the opening cover 103 similar to the one described in the modified version 3. It can be attached to and removed from that metal plate 101P2, i.e., the panel 101P.

[0113] The architectural structure 100 of the modified version 4 using such panels 101P is similar in configuration to the architectural structure in the modified version 3 except that each side wall 101 is made up of the panels 101P.

<Modified version 5>

[0114] Next, a modified version 5 is described.

[0115] An architectural structure 100 of the modified version 5 is generally identical to the one in the first embodiment.

[0116] The architectural structure 100 of the modified version 5 is a building as in the case of the first embodiment. The architectural structure 100 of the modified version 5 includes veranda/balconies 101B on a side wall 101, level with the ground floor and upper floors, respectively (but not necessarily all floors) as shown in Fig. 16.

[0117] In the architectural structure 100 of the modified version 5, the connector pegs 110 are attached to the veranda/balconies 101B. The connector peg 110 may be attached to the lower surface of each of the veranda/balconies 101B as shown in Fig. 17(A). Alternatively, it may be attached to the facade of each of the veranda/balconies 101B as shown in Fig. 17(B). The connector peg 110 may not necessarily be attached to all of the veranda/balconies 101B. In contrast, two or more connector pegs 110 may be attached to one veranda/balcony 101B.

[0118] The connector pegs 110 may be secured to one or more veranda/balconies 101B using an anchor 110A or not. The connector peg 110 attached to the veranda/balconies 101B may be concealed with a cover that is similar to the one described in the modified version 1.

<Modified version 6>

[0119] Next, a modified version 6 is described.

[0120] An architectural structure 100 of the modified version 6 is generally identical to the one in the first embodiment. The difference of the architectural structure 100 of the modified version 6 from the architectural structure 100 of the first embodiment lies in the configuration of a connector peg 110.

[0121] This connector peg 110 is a nut. The connector peg 110 which is a nut has a threaded hole 117 on the inside. An opening of the threaded hole 117 at one end surrounded by a flange is exposed to the outside, from the side wall 101 of the architectural structure 100. For example, when the side wall 101 is made of concrete, the connector peg 110 which is a nut is embedded in the side wall 101 by positioning the connector peg 110 at a position shown in Fig. 10 and pouring the concrete. An anchor 110A formed as a wide flange is provided at the proximal end of the connector peg 110. With the anchor 110A, the connector peg 110A is less likely to be fallen off the side wall 101.

[0122] While not illustrated, a joint member 300 connected to the connector peg 110 of the modified version 6 includes a bolt at one end thereof. The bolt is capable of threadedly engaging with the threaded hole 117. The joint member 300 is securely fixed to the connector peg 110 by threadedly engaging the bolt with the threaded hole 117.

[0123] The connector peg 110 of the modified version

6 can be said to be embedded in a recess formed in the side wall 101 in a certain sense. Such connector peg 110 may be concealed with an opening cover 103 as in the case of the modified versions 1 and 3. The opening cover 103 can be attached to and removed from the side wall 101 as in the case of the modified versions 1 and 3 (Fig. 11).

<Modified version 7>

[0124] An architectural structure 100 of a modified version 7 has a side wall 101 that is made up of a number of panels 400, as shown in Fig. 14. The adjacent panels 400 are separated from each other with a gap 401. The gap 401 is back from the outer surface of the side wall 101 which corresponds to the surface of the panel 400. In the modified version 7, the gap 401 is used in a manner similar to the case of the recesses 102 of the modified versions 1 and 2.

[0125] The connector pegs 110 may be positioned either in a vertical gap or in a horizontal gap defined by two adjacent panels, or positioned at an intersection where two gaps defined by four panels intersect, as shown in Fig. 14.

[0126] The opening cover 103 of the modified version 1 and the filler material 104 of the modified version 2 may be applied to the modified version 7.

«Second embodiment»

[0127] An architectural structure 100 according to a second embodiment is a so-called non-building structure, more specifically, a chimney. Some chimneys such as those of incinerators are high-rise with a height of more than 20 m.

[0128] A side wall 101 which is an arc-shaped surface of the architectural structure 100 according to the second embodiment has many connector pegs 110 as in the first embodiment.

[0129] The maintenance method for the architectural structure 110 according to the second embodiment is also performed by a worker on a climbing work platform 210 fixed to a mast 200, as in the case of the first embodiment.

[0130] The climbing work platform 210 of the second embodiment is made up of a plurality of platform segments 211. Overlap between the adjacent platform segments 211 can be adjusted and an angle between the adjacent platform segments 211 can be varied. Accordingly, the climbing work platform 210 can be curved to the curvature of the side wall 101 of the architectural structure 100 which is a chimney. Mast climbers having such a climbing work platform with a plurality of platform segments that can be extend and bend have been used practically.

[0131] In the case shown in Fig. 9, the climbing work platform 210 extends generally halfway around the side wall 101. Accordingly, the entire surface of the side wall 101 of the architectural structure 100 can be subjected to maintenance using a mast climber when the connector pegs 110 are aligned in two vertical lines opposed to each other relative to the center of the chimney.

Claims

1. A high-rise architectural structure comprising:

   a connector peg or pegs for being connected to at least one mast expected to be set along a side wall of the architectural structure, the connector peg(s) being secured to the side wall at position(s) enabling stable support of the at least one mast by the connector peg(s) once the at least one mast is connected to the connector peg(s), the number of the connector peg (s) being sufficient to stably support the at least one mast by the connector peg(s) once the at least one mast is connected to the connector peg(s).

2. The architectural structure according to Claim 1, wherein the connector peg or pegs is/are concealed with a cover or covers, respectively that prevents the connector peg from being exposed, the cover being designed so that it can be removed when the connector peg is connected to the mast.

3. The architectural structure according to Claim 2, wherein the cover(s) is/are capable of being attached to and removed from the side wall.

4. The architectural structure according to Claim 2, wherein the cover is configured such that the connector peg(s) inside the cover is/are exposed when the cover is broken.

5. The architectural structure according to Claim 1, wherein the number of the connector pegs is two or more.

6. The architectural structure according to Claim 1, wherein at least two connector pegs are provided along at least one longitudinal line on an outer surface of the side wall.

7. The architectural structure according to Claim 1, wherein the connector peg(s) is/are a nut.

8. The architectural structure according to Claim 7, wherein the connector peg(s) which is/are a nut is/are embedded in the side wall at least at its/their proximal end(s), with an opening at one end of a threaded inner surface of the connector peg(s) being exposed to the side wall.

9. The architectural structure according to Claim 1,

wherein the architectural structure is a building.

10. The architectural structure according to Claim 1, wherein at least one of the connector pegs is provided inside a recess formed in an outer surface of the side wall so that the at least one connector peg is not exposed to the outer surface of the side wall that is a generally flat surface of the side wall.

11. The architectural structure according to Claim 9, wherein at least one of the connector pegs is provided inside a recess formed in an outer surface of the side wall so that the at least one connector peg is not exposed to a plane where the outer surface of the side wall is absent, the plane being generally flush with the outer surface of the side wall,
the recess being a gap between panels making up the outer surface of the side wall of the building.

12. The architectural structure according to Claim 10 or 11, wherein a cover or covers that conceal (s) the connector peg or pegs respectively is/are provided over the recess.

13. The architectural structure according to Claim 12, wherein the cover is a plate that covers an opening of the recess.

14. The architectural structure according to Claim 12, wherein the cover is a filler material that is filled within the recess.

15. The architectural structure according to Claim 1, wherein a proximal end of at least one of the connector pegs has been embedded in the side wall since the construction of the architectural structure was completed.

16. The architectural structure according to Claim 15, wherein an anchor is provided on the proximal end of the connector peg(s) to prevent the connector peg(s) from escaping from the side wall.

17. The architectural structure according to Claim 1, wherein a proximal end of at least one of the connector pegs is secured to a pillar or a beam of the architectural structure.

18. The architectural structure according to Claim 17, wherein the proximal end of at least one of the connector pegs is embedded in the pillar or the beam of the architectural structure.

19. The architectural structure according to Claim 1, wherein the architectural structure is a building, proximal ends of at least some of the connector pegs being secured to a panel or panels that make(s) up an outer surface of the side wall of the architectural structure.

20. The architectural structure according to Claim 19, wherein the architectural structure is a building, the proximal ends of at least some of the connector pegs being embedded in the panel (s) that make (s) up the outer surface of the side wall of the architectural structure.

21. The architectural structure according to Claim 1, wherein the architectural structure is a building, a proximal end of the connector peg (s) being secured to either a panel that makes up an outer surface of the side wall of the architectural structure or a pillar or a beam of the architectural structure.

22. The architectural structure according to Claim 21, wherein the architectural structure is a building, the proximal end of the connector peg(s) being embedded in either the panel that makes up the outer surface of the side wall of the architectural structure or the pillar or the beam of the architectural structure.

23. The architectural structure according to Claim 1, wherein at least one veranda/balcony is provided on the side wall of the architectural structure, at least one of the connector pegs being provided on the at least one veranda/balcony.

24. The architectural structure according to Claim 23, wherein the connector peg(s) is/are attached to an edge or a lower surface of the veranda/balcony.

25. The architectural structure according to any one of Claims 10 to 14, wherein the recess has a shape and a size sufficient to provide a connection between a connector peg and a joint member that ties the connector peg and the mast, the connection being achieved in the recess.

26. A panel for forming an outer surface of a side wall of a high-rise architectural structure which is a building, the panel having a connector peg or pegs secured to an outer surface thereof, the panel being used to construct, by installing the panel on an expected position of the architectural structure, the architectural structure comprising the connector peg or pegs for being connected to at least one mast expected to be set along a side wall of the architectural structure, the connector peg (s) being secured to the side wall at position(s) enabling stable support of the at least one mast by the connector peg(s) once the at least one mast is connected to the connector peg(s), the number of the connector peg (s) being sufficient to stably support the at least one mast by the connector peg(s) once the at least one mast is connected to the connector peg(s).

27. The panel according to Claim 26, wherein the panel includes a plate-shaped main body made of concrete, a proximal end of the connector peg(s) is embedded in the main body.

28. The panel according to Claim 26, wherein a recess is formed in an outer surface of the main body, the connector peg(s) being attached to the inside of the recess so that the connector peg (s) is/are not exposed to the outer surface of the side wall that is a generally flat surface of the side wall.

29. The panel according to Claim 28, wherein a cover or covers that conceal(s) the connector peg or pegs respectively is/are provided over the recess.

30. The panel according to Claim 29, wherein at least the outer surface of the main body is covered with a plate, a part of the plate at a position corresponding to the recess being separable from the remaining part, with the separable portion functioning as the cover.

31. The panel according to any one of Claims 28 to 30, wherein the recess has a shape and a size sufficient to provide a connection between a connector peg and a joint member that ties the connector peg and the mast, the connection being achieved in the recess.

32. A maintenance method for a high-rise architectural structure comprising a connector peg or pegs for being connected to at least one mast expected to be set along a side wall of the architectural structure, the connector peg(s) being secured to the side wall at position (s) enabling stable support of the at least one mast by the connector peg(s) once the at least one mast is connected to the connector peg (s), the number of the connector peg (s) being sufficient to stably support the at least one mast by the connector peg(s) once the at least one mast is connected to the connector peg(s), the method comprising the steps of:

setting upright the at least one mast along the side wall of the architectural structure, with the at least one mast being at least connected to at least one connector peg, with the lower end of the at least one mast being fixed;
attaching a platform to the at least one mast, the platform being capable of moving up and down the at least one mast to which it is attached; and
moving up and down the platform along the at least one mast while a worker on the platform is performing maintenance of the architectural structure.

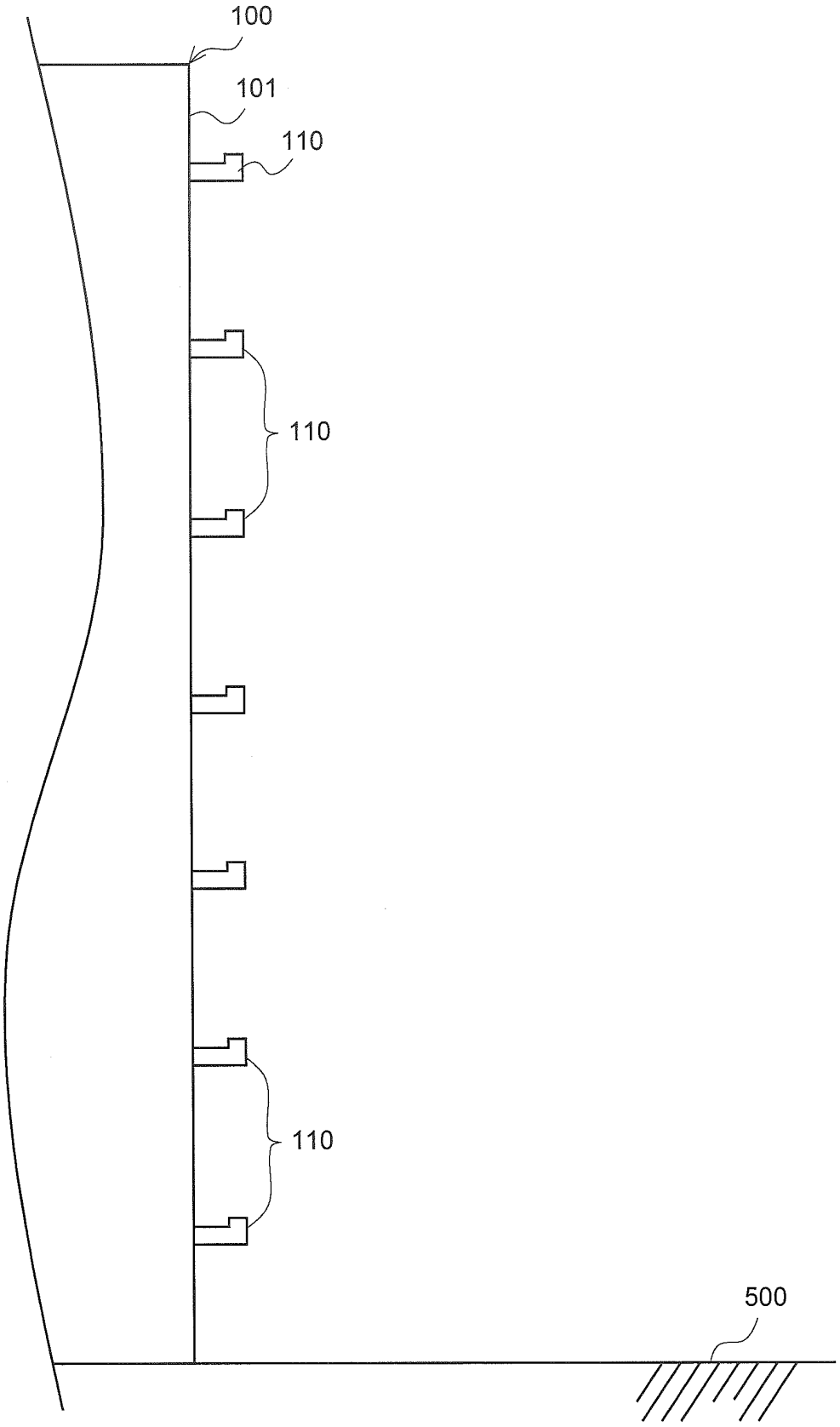


FIG. 1

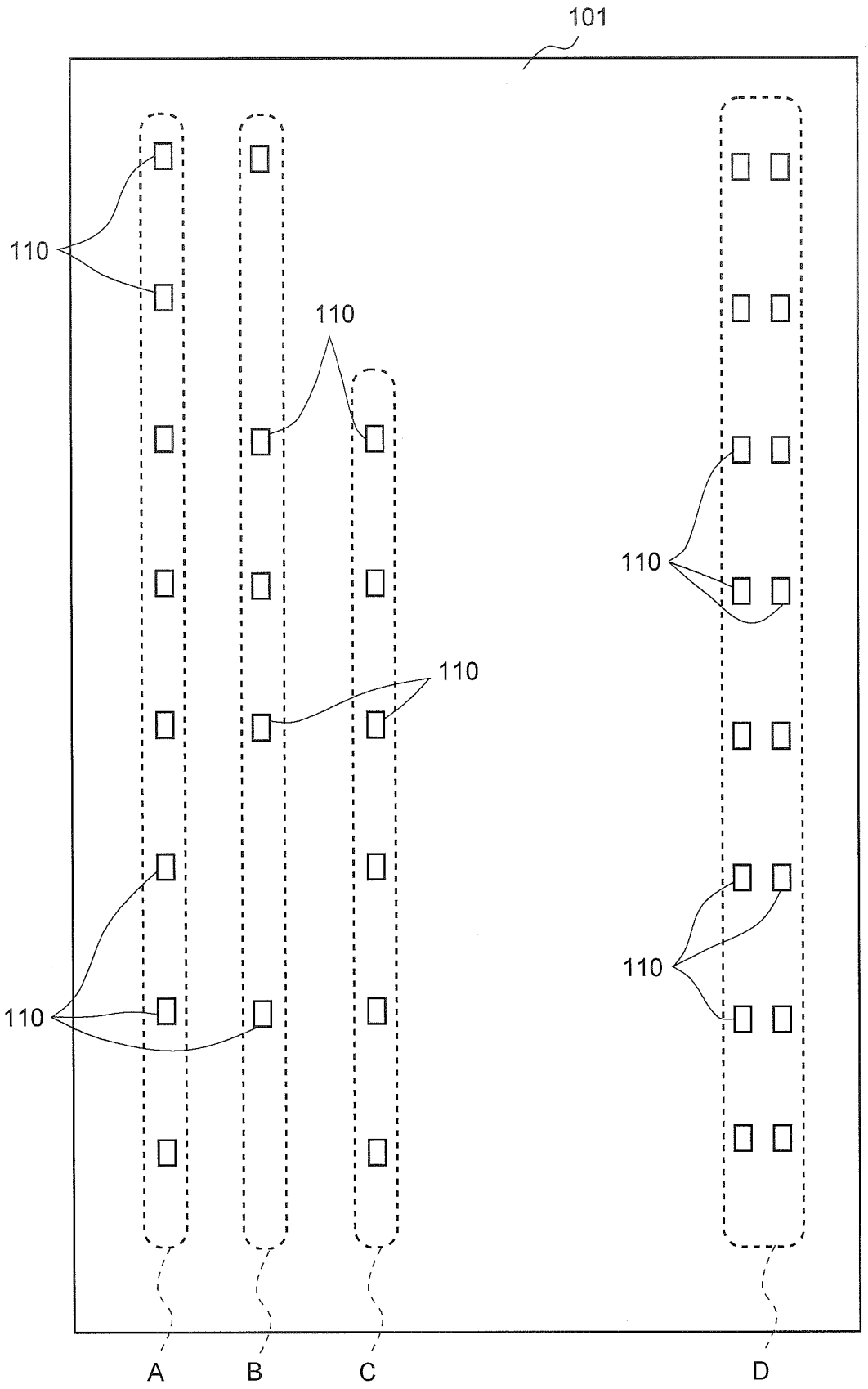


FIG. 2

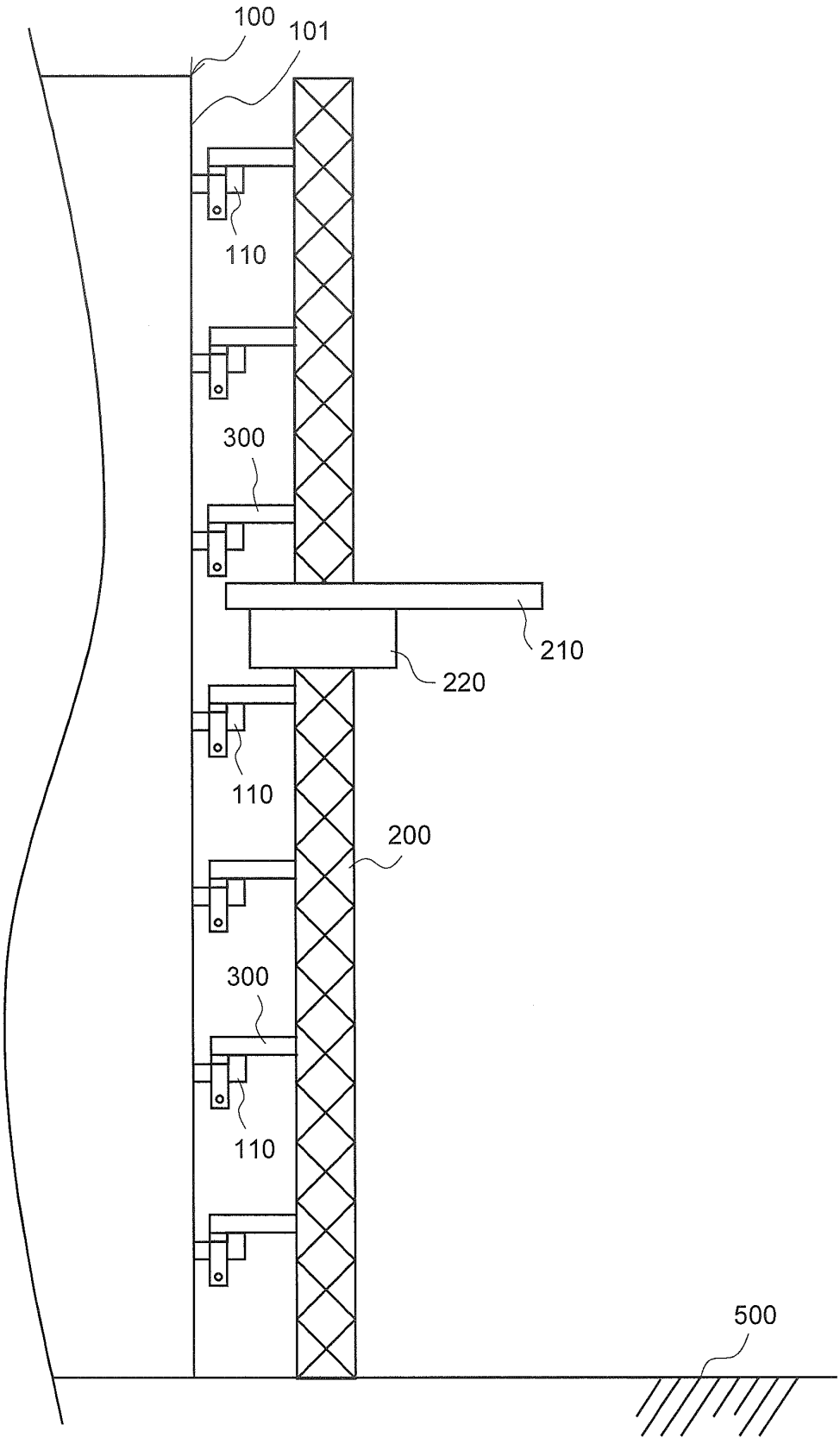


FIG. 3

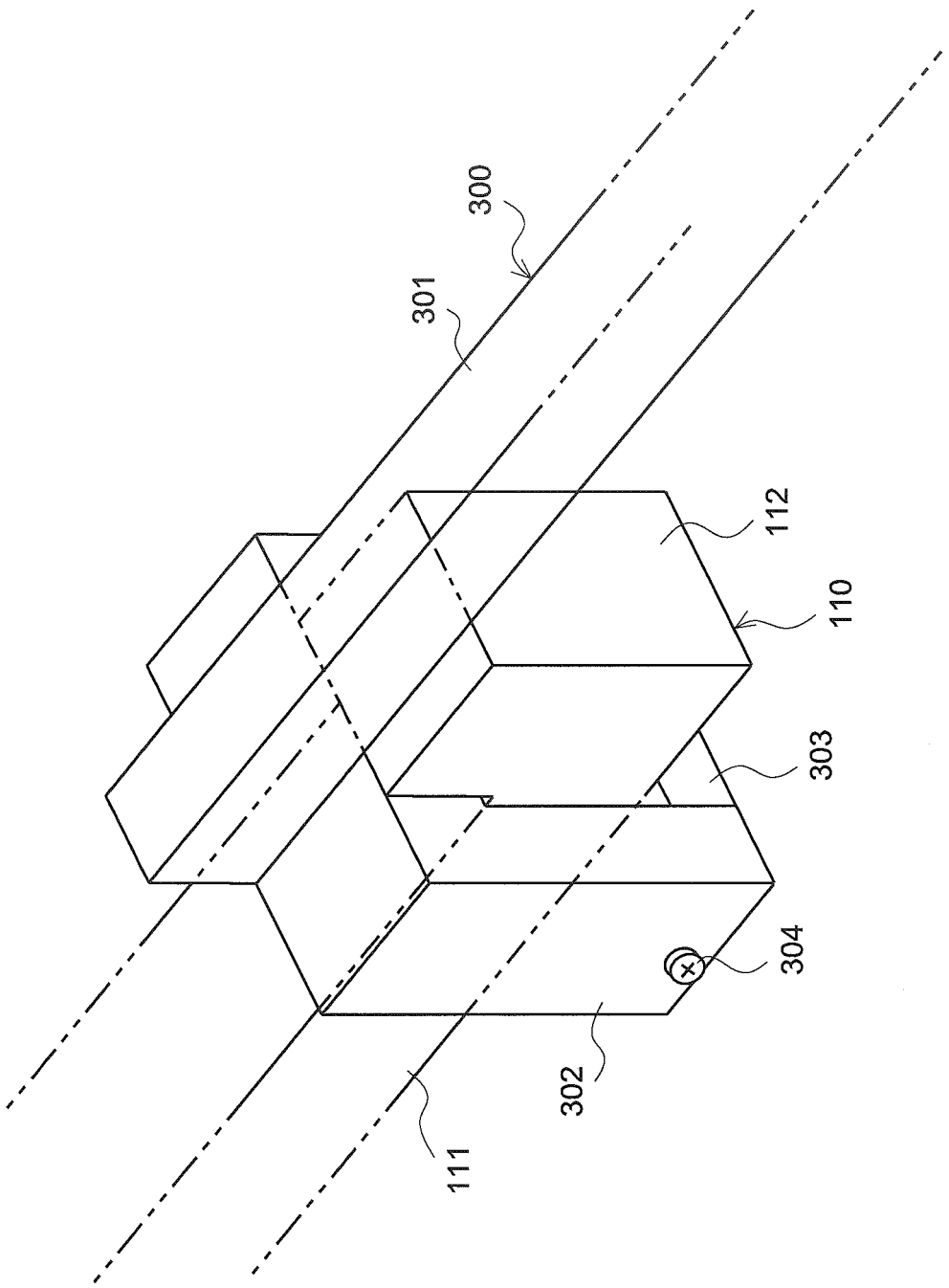


FIG. 4

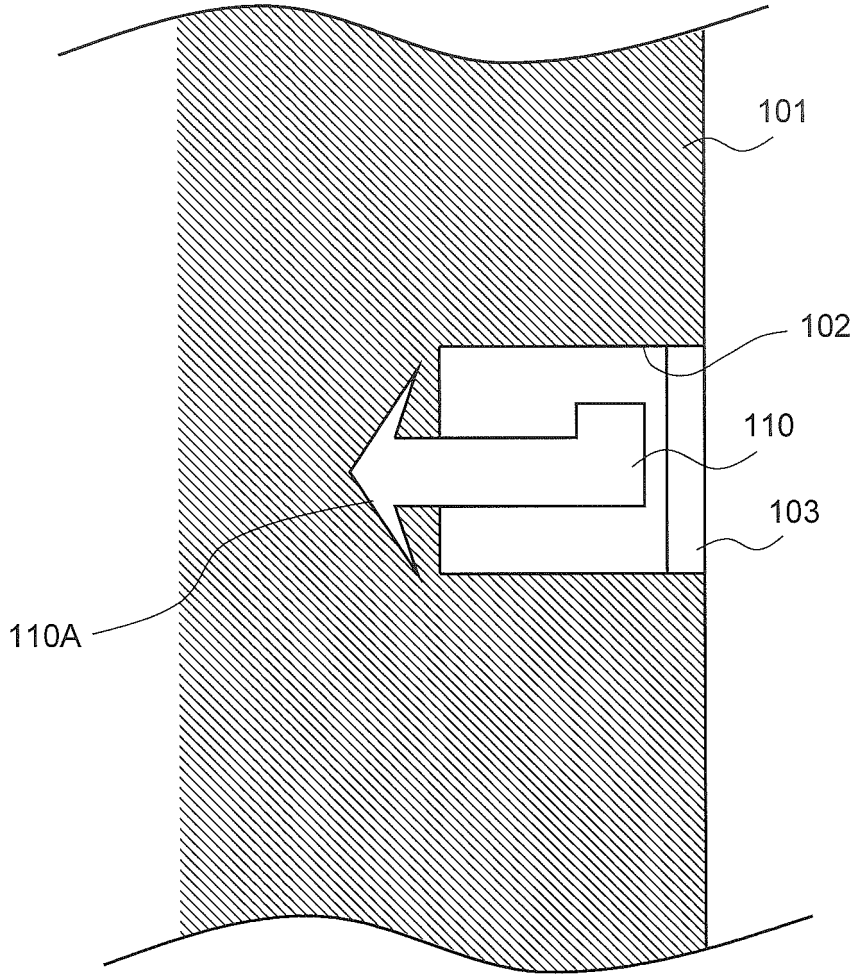


FIG. 5

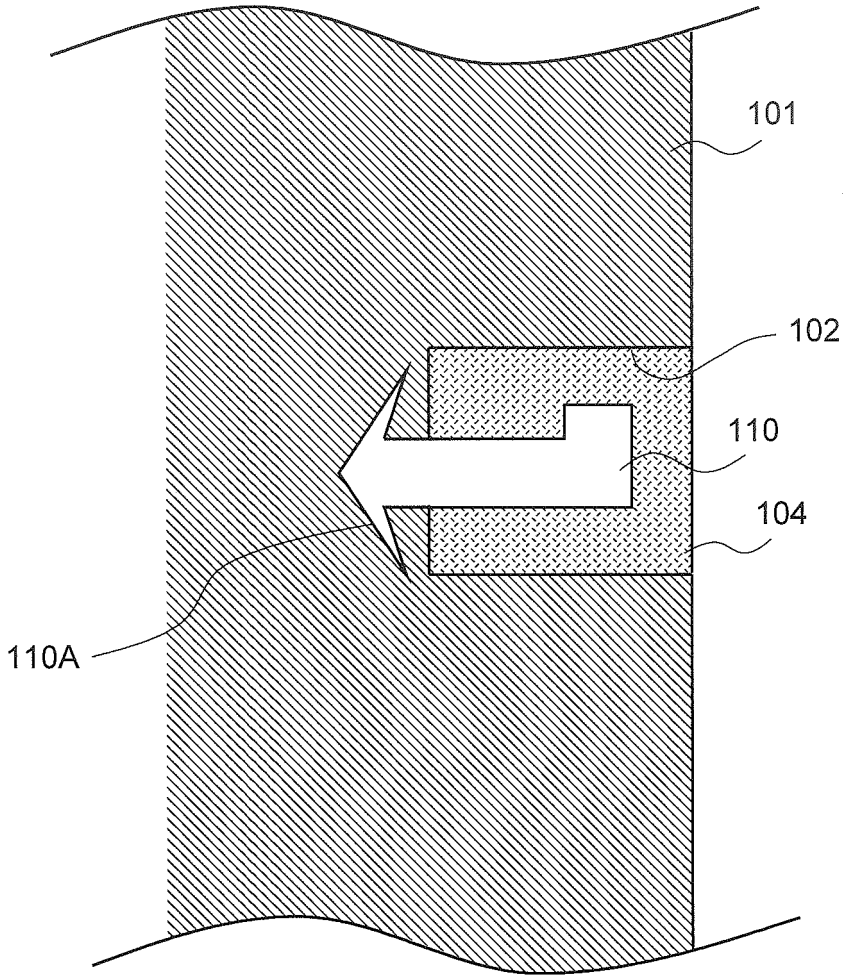


FIG. 6

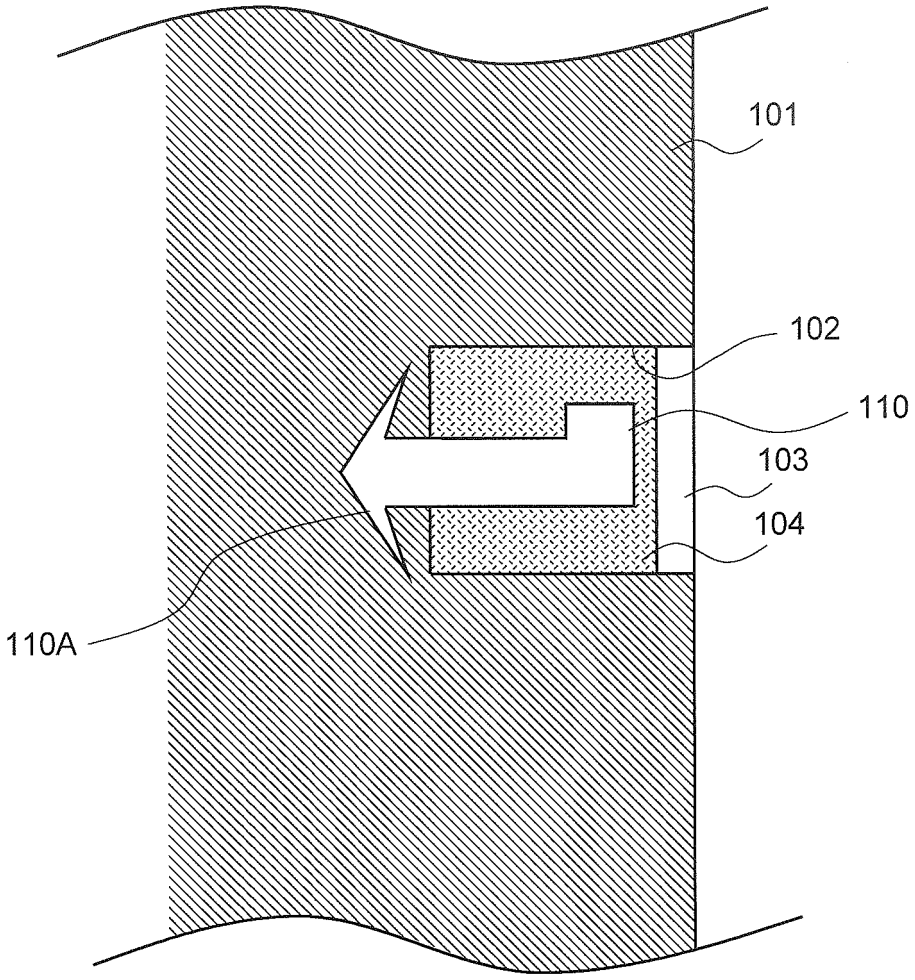


FIG. 7

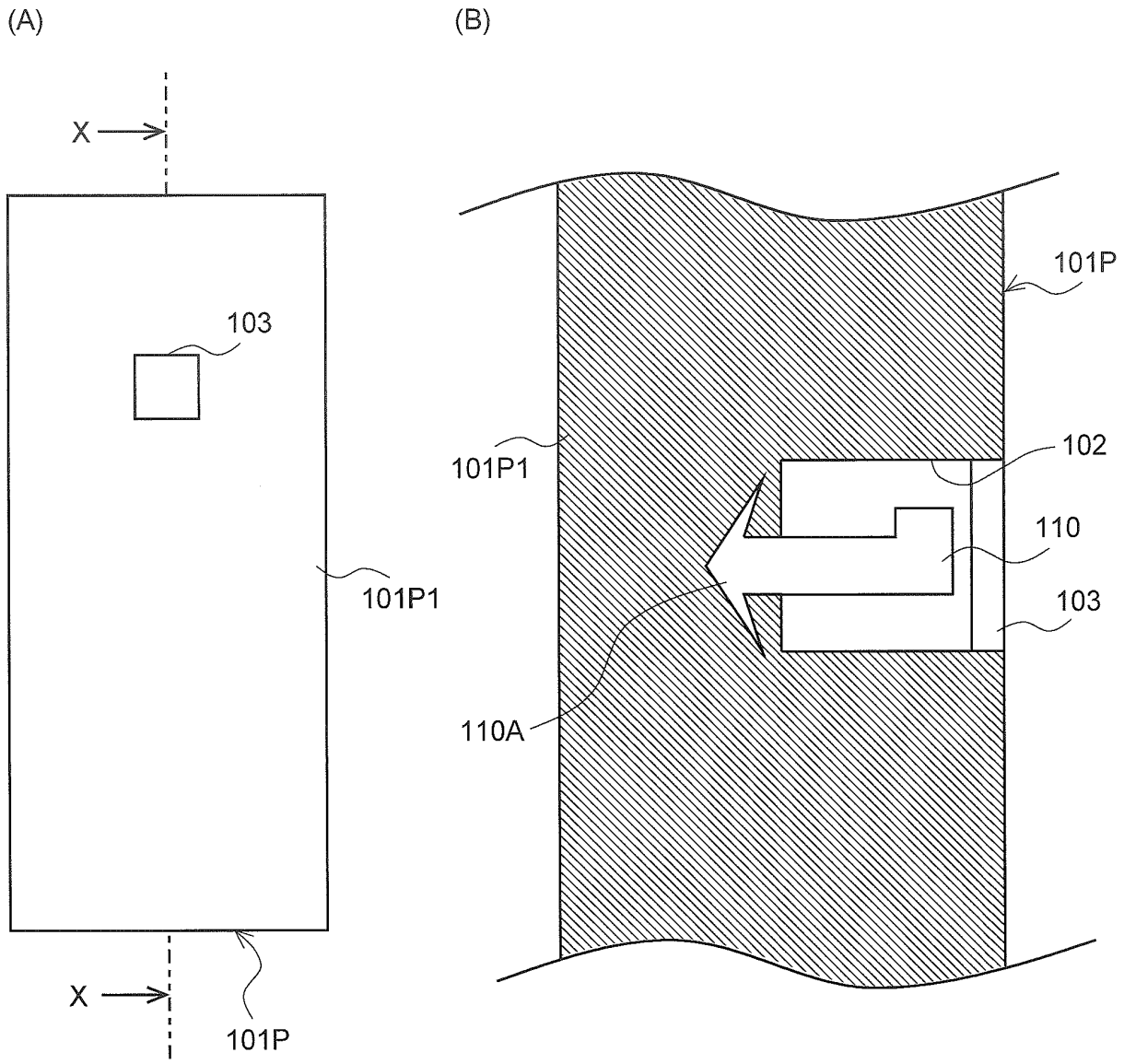


FIG. 8

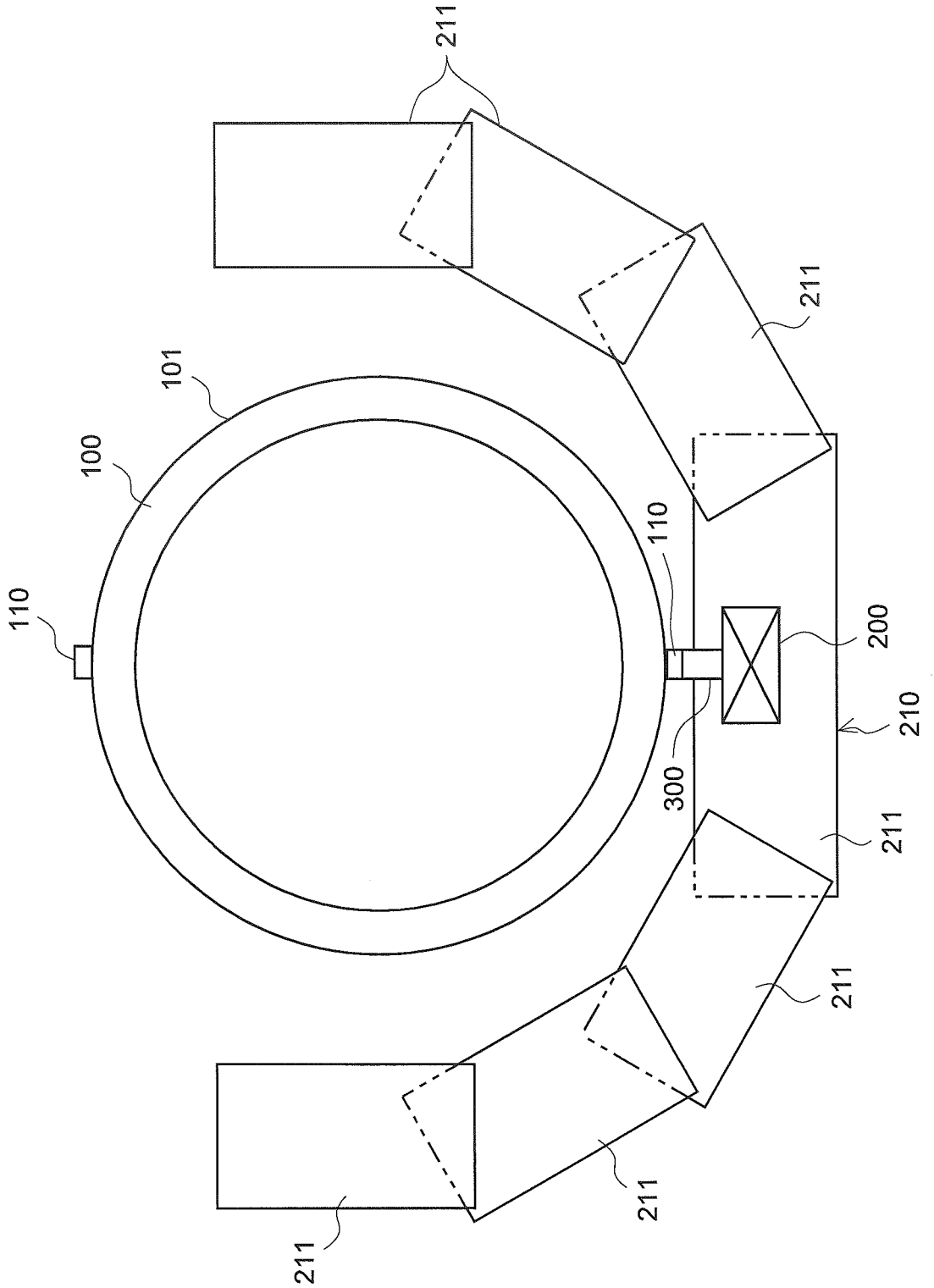


FIG. 9

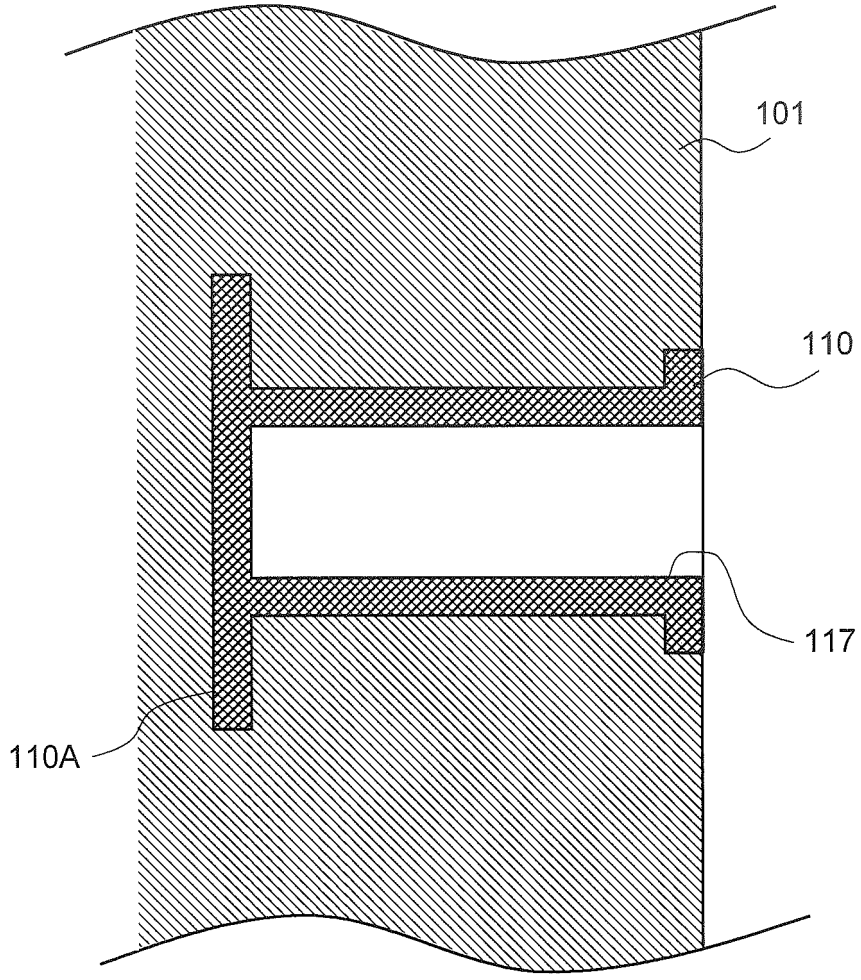


FIG. 10

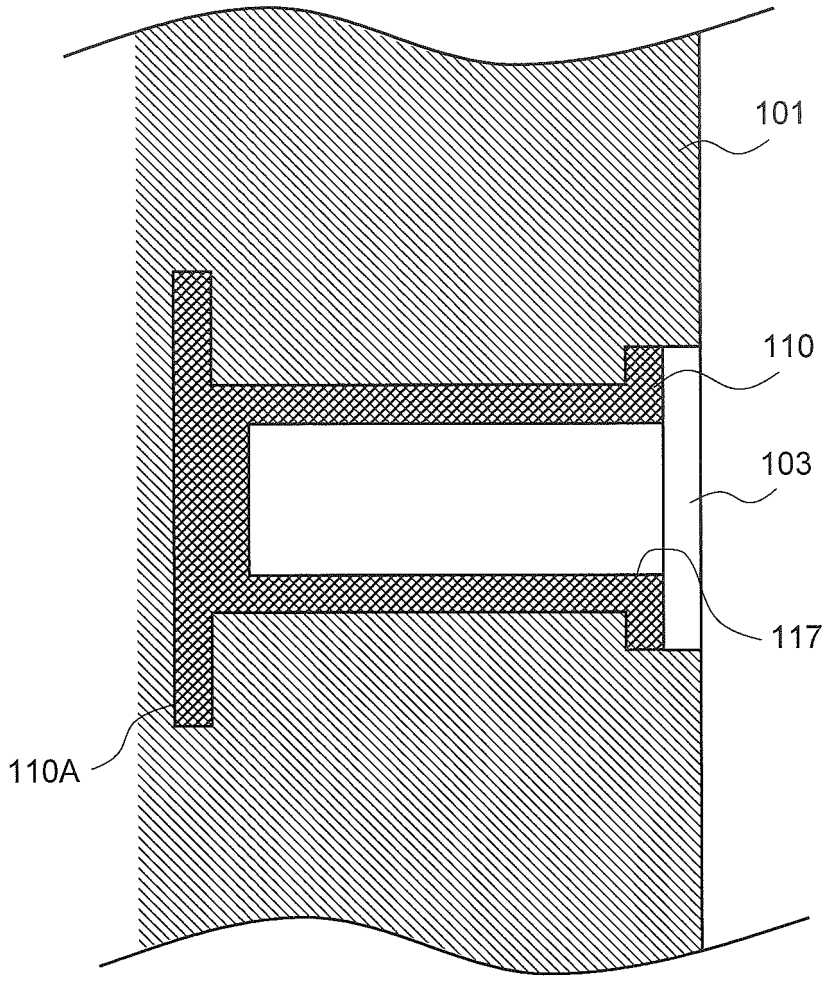
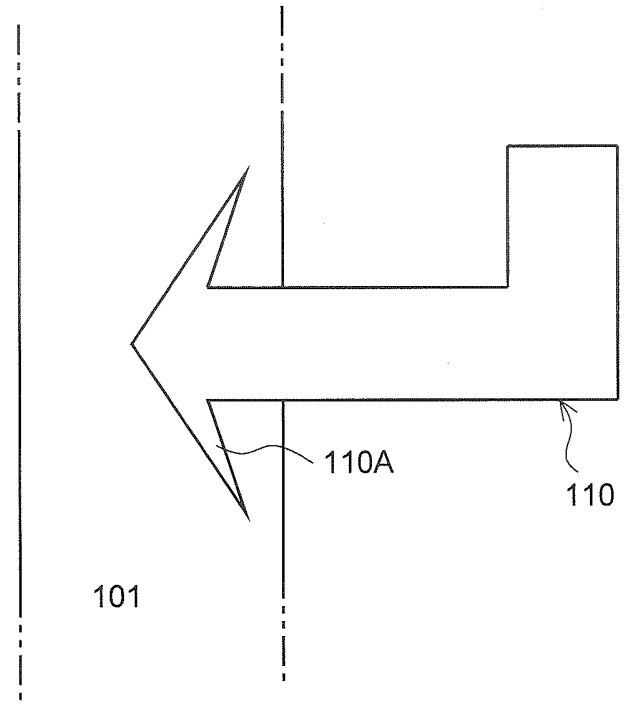


FIG. 11

(A)



(B)

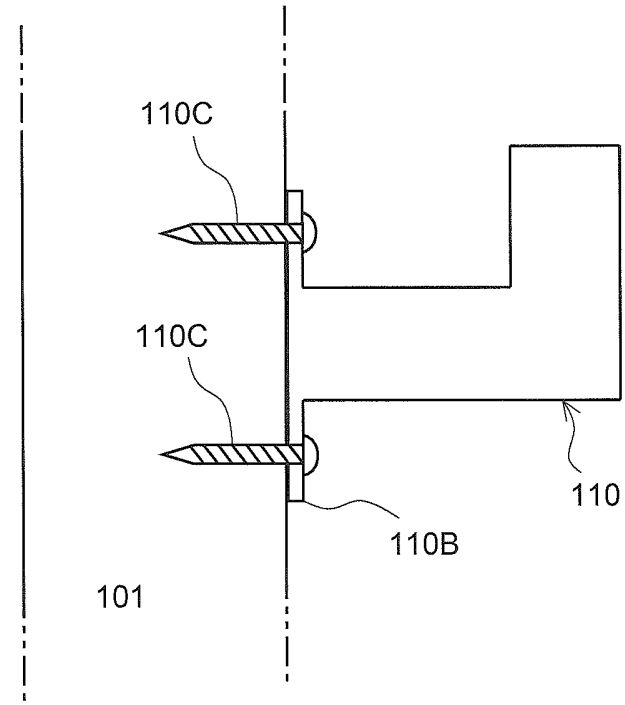


FIG. 12

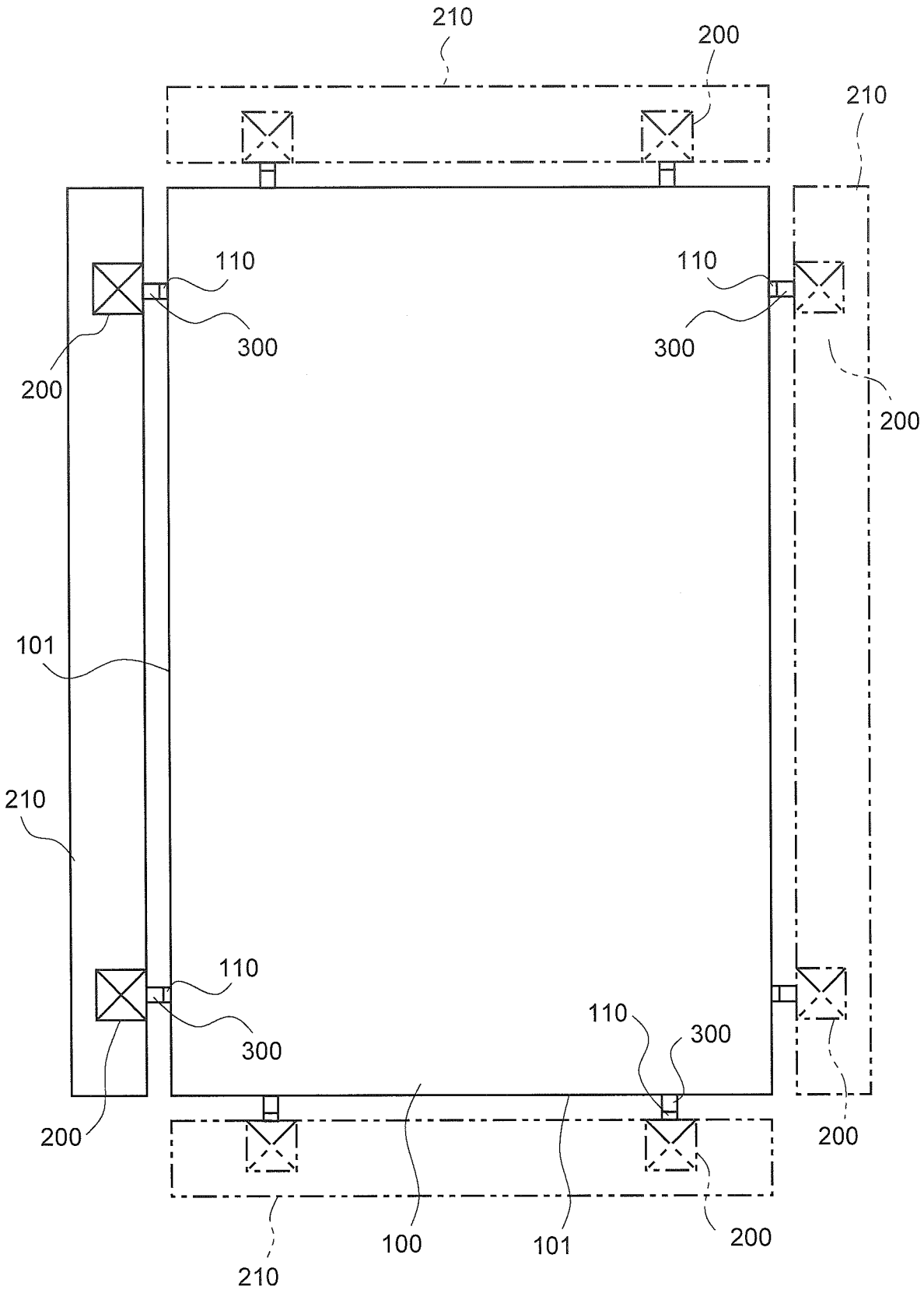

210
200
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FIG. 13

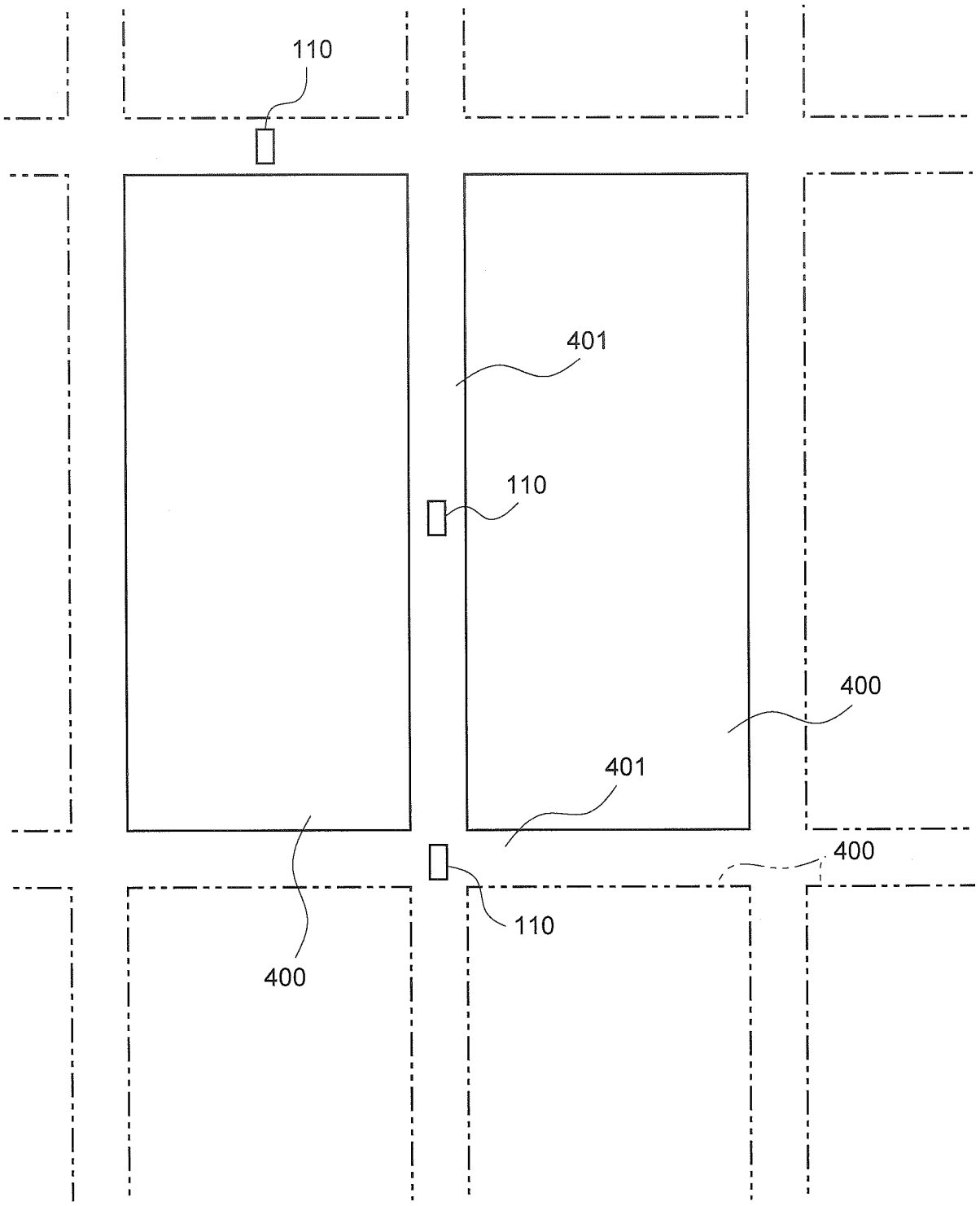

FIG. 14

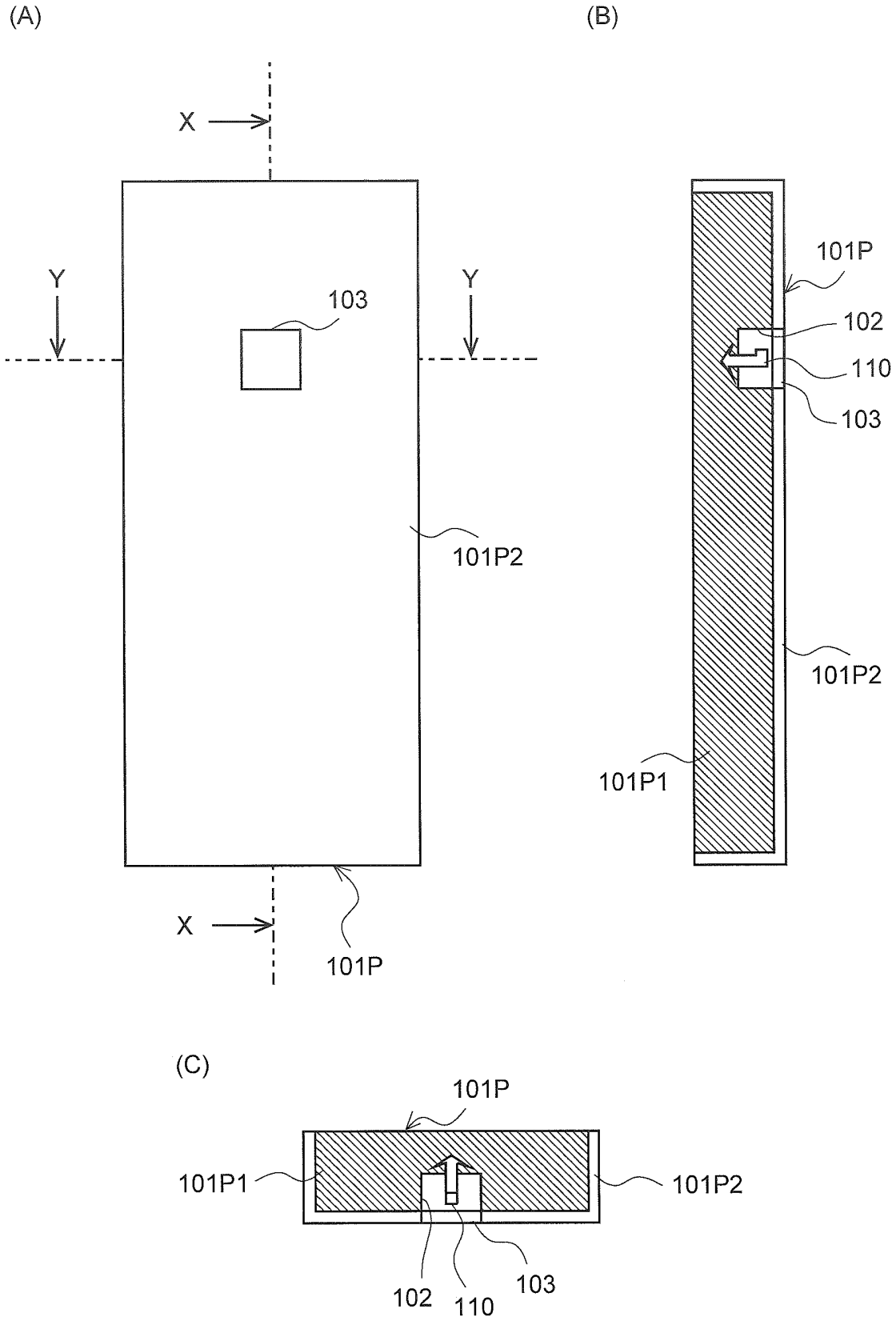
(A)
X
Y
Y
103
101P2
X
101P
(B)
101P
102
110
103
101P2
101P1
(C)
101P
101P1
101P2
102
110
103

FIG. 15

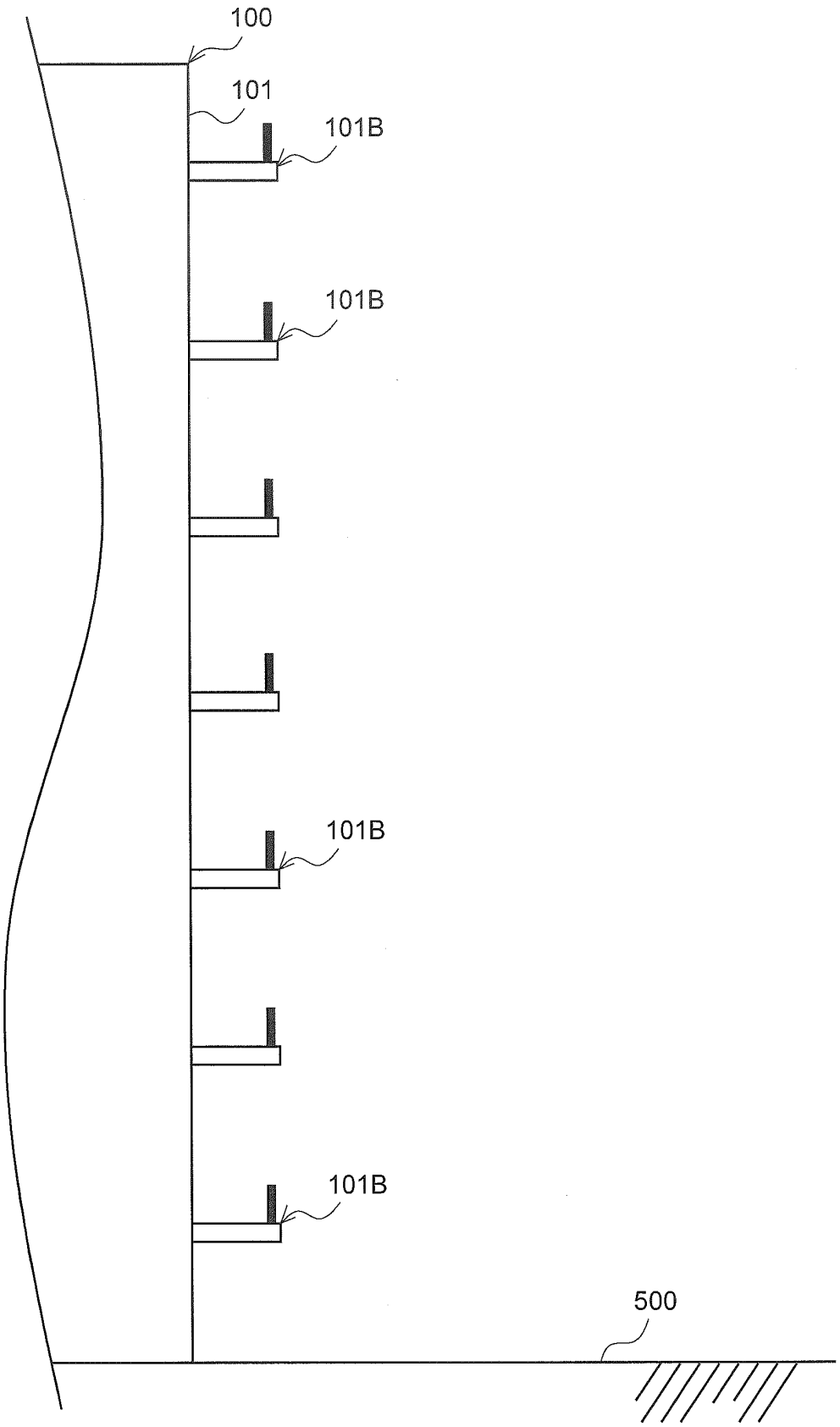

FIG. 16

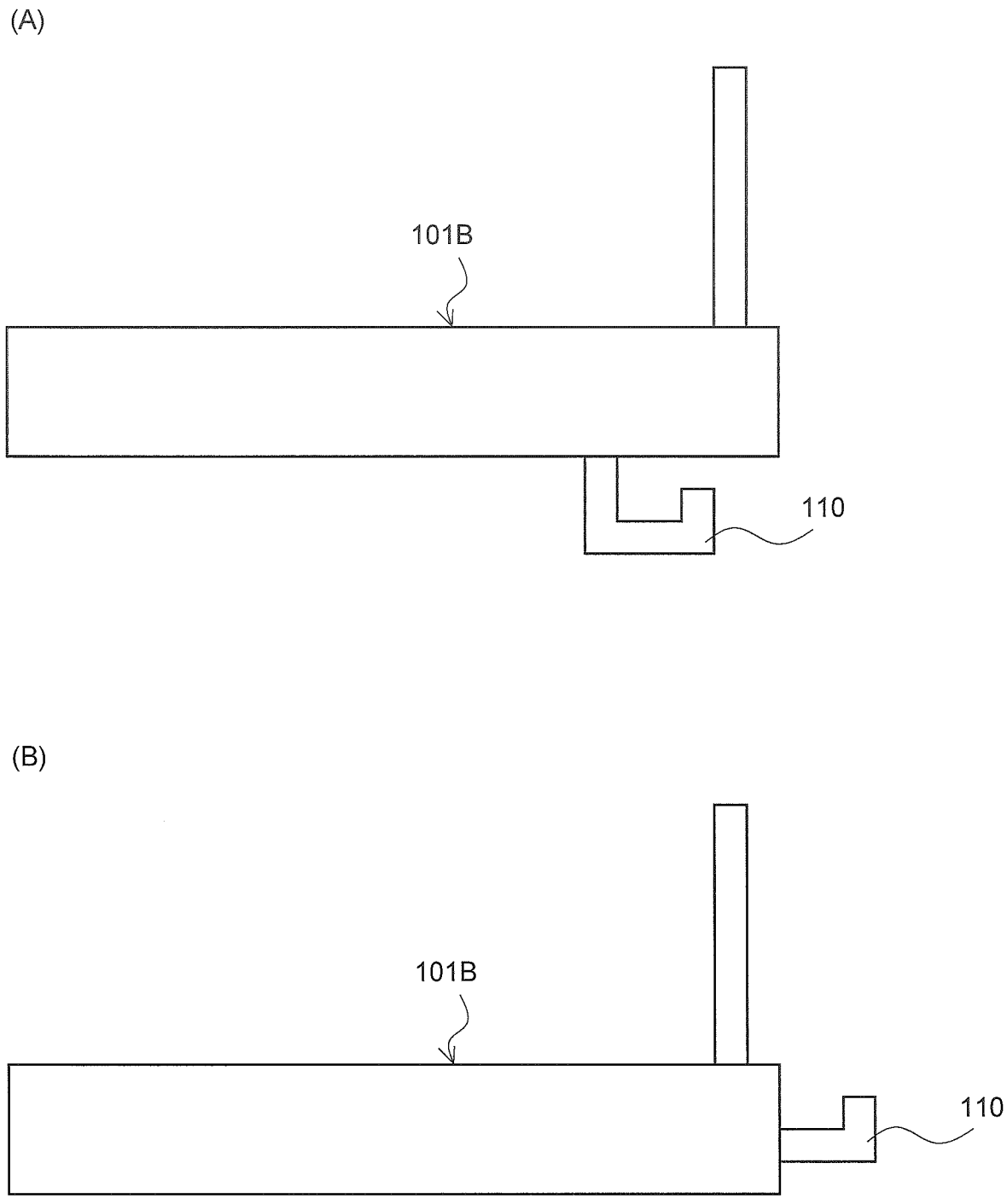

FIG. 17

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2014/063107

A. CLASSIFICATION OF SUBJECT MATTER
E04G5/04(2006.01)i, *E04G3/28*(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E04G5/04, E04G3/28

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2014
Kokai Jitsuyo Shinan Koho	1971-2014	Toroku Jitsuyo Shinan Koho	1994-2014

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	CD-ROM of the specification and drawings annexed to the request of Japanese Utility Model Application No. 49050/1991(Laid-open No. 83183/1993) (Kabushiki Kaisha Kogyo Gijutsu Kenkyusho), 09 November 1993 (09.11.1993), paragraphs [0001], [0009], [0010]; fig. 1, 2, 5 to 8 (Family: none)	1,5-7,9 2-4,8,10-32
X Y	JP 10-317661 A (Kajima Corp.), 02 December 1998 (02.12.1998), paragraphs [0018], [0021], [0026]; fig. 1, 2, 5, 7 (Family: none)	1,5,6,9 2-4,8,10-32

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
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"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 July, 2014 (29.07.14)	12 August, 2014 (12.08.14)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2014/063107

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2011-169034 A (Katsuhiko SAKAMOTO), 01 September 2011 (01.09.2011), paragraphs [0008], [0016], [0040]; fig. 1, 5 (Family: none)	2-4,8,10-18, 25,31-32
Y	JP 2009-024340 A (Air Tech Japan Co., Ltd.), 05 February 2009 (05.02.2009), paragraphs [0014], [0018]; fig. 1, 3, 4 (Family: none)	2-4,8,10-18, 25,31-32
Y	JP 2000-179148 A (Tadahiro URYU), 27 June 2000 (27.06.2000), paragraphs [0004], [0014] to [0016]; fig. 1, 2 (Family: none)	2-4,8,10-18, 25,31-32
Y	CD-ROM of the specification and drawings annexed to the request of Japanese Utility Model Application No. 11518/1993(Laid-open No. 71633/1994) (Toda Corp.), 07 October 1994 (07.10.1994), paragraphs [0008], [0011], [0012]; fig. 1, 2 (Family: none)	2-4,8,10-22, 25-32
Y	JP 2007-327287 A (Jipcon Co., Ltd.), 20 December 2007 (20.12.2007), paragraphs [0014], [0017], [0029] to [0031], [0041] to [0044]; fig. 1 to 7 (Family: none)	2-4,8,10-18, 21-25,31-32
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 179028/1983(Laid-open No. 84641/1985) (Kabushiki Kaisha Hasegawa Komuten), 11 June 1985 (11.06.1985), specification, page 4, lines 3 to 9; fig. 1 (Family: none)	2-4,8,10-18, 23-25,31-32
Y	JP 53-54088 Y2 (Kabushiki Kaisha Naka Gijutsu Kenkyusho), 25 December 1978 (25.12.1978), page 1, column 1, line 22 to column 2, line 22; fig. 2 (Family: none)	2-4,8,10-18, 25,31-32
A	US 2006/0144639 A1 (Arnold IACOVIELLO JR.), 06 July 2006 (06.07.2006), paragraphs [0045], [0050]; fig. 1 & WO 2006/073944 A2	1-32

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2014/063107

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2010/0193291 A1 (Jan Martin KLEPPE), 05 August 2010 (05.08.2010), paragraphs [0006], [0016]; fig. 1 to 3 & EP 2059644 A0 & WO 2008/030100 A1 & NO 20063936 A & CN 101617093 A & AU 2007293755 A	1-32

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