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(54) **FIXING MODULE FOR EXTENDED STRUCTURE, PRESTRESSED CANTILEVER INCLUDING SAME, AND EXTENDED STRUCTURE INCLUDING SAME**

(57) Proposed are a fixing module for an extended structure and a prestressed cantilever including the same. Guide rails are provided in a top-bottom direction on a side surface of a base structure on which an extended structure is constructed, a support plate and a movable plate are fitted to the guide rails so as to be movable in the top-bottom direction, such that a position at which

a support structure supporting a deck plate for the traffic of pedestrians is coupled to the base structure is adjusted. The support plate and the movable plate are fixed to the base structure while portions or the entirety of the support plate and the movable plate overlap each other, thereby increasing force by which the deck plate is supported.

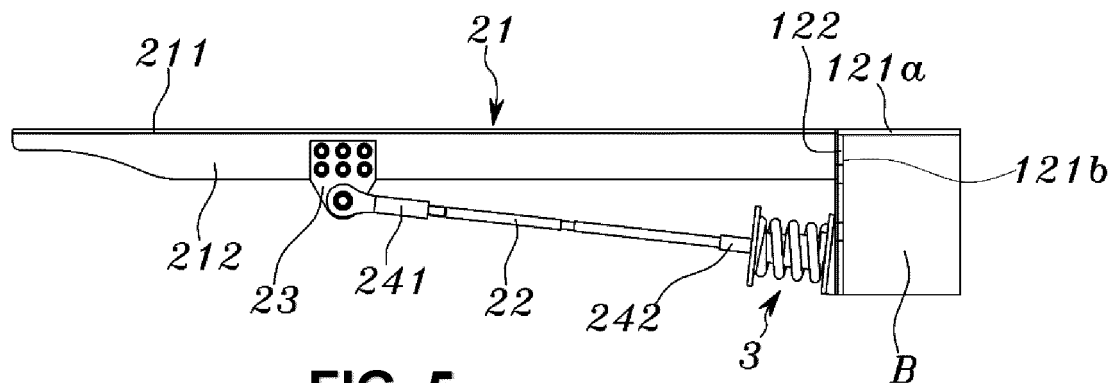


FIG. 5

Description**BACKGROUND OF THE INVENTION****FIELD OF THE INVENTION**

[0001] The present disclosure relates generally to a fixing module for an extended structure and a prestressed cantilever including the same. More particularly, the present disclosure relates to a fixing module for an extended structure and a prestressed cantilever including the same, in which guide rails are provided in a top-bottom direction on a side surface of a base structure on which an extended structure is constructed, a support plate and a movable plate are fitted to the guide rails so as to be movable in the top-bottom direction, such that a position at which a support structure supporting a deck plate for the traffic of pedestrians is coupled to the base structure may be adjusted, and the support plate and the movable plate are fixed to the base structure while portions or the entirety of the support plate and the movable plate overlap each other, thereby increasing force by which the deck plate is supported.

DESCRIPTION OF THE RELATED ART

[0002] Generally, a bridge refers to a construction provided on an area of land, such as a river, a stream, or a valley, having a large difference in elevation, such that people or vehicles may pass thereon. Such bridges are constructed by a variety of methods depending on the surrounding environments of places on which the bridges are to be constructed or the uses of the bridges.

[0003] Such bridges generally include sidewalks simultaneously constructed on both sides thereof. However, in bridges constructed in the past, mainly intended for the traffic of vehicles, no such a sidewalk for the traffic of pedestrians is constructed or only a very narrow sidewalk is constructed in a large number of cases.

[0004] In addition, recently, the traffic of bicycles on bridges is significantly increasing, in addition to the traffic of pedestrians. Therefore, necessity for additional construction of sidewalks is increasing.

[0005] Furthermore, recently, as the population of people enjoying tracking and bicycle riding is increasing, additional sidewalks are constructed in a variety of locations of mountains, rivers, valleys, and the like, and plank roads constructed on cliffs are also increasing.

[0006] In order to construct an extended structure, such as an additional sidewalk on constructed on an existing bridge or a plank road constructed on a cliff, the extended structure must be supported using extended structure brackets, as disclosed in the following patent document. Such an extended structure bracket has an integral structure to be simply coupled to a base structure. Thus, there is a problem in that the extended structure may not be properly used according to a variety of factors, such as the size, the number of users, the material, or the like of the extended structure.

[0007] In addition, in an extended structure, such as a sidewalk or a plank road, added to an existing base structure, such as a bridge, a portion of the extended structure connected to the base structure is subjected to a large load and thus is highly susceptible to fracture or damage. However, the existing extended structure brackets alone may not firmly support the extended structure having a variety of sizes and in a variety of conditions.

[0008] The term "extended structure" used herein refers to a support structure, such as a sidewalk or a plank road, which is constructed on a bridge, a cliff, or the like or constructed on a building using a cantilever. The extended structure may include various shapes of structures supporting people or objects.

[0009] The foregoing is intended merely to aid in the understanding of the background of the present disclosure, and is not intended to mean that the present disclosure falls within the purview of the related art that is already known to those skilled in the art.

DOCUMENTS OF RELATED ART

[0010] (Patent Document 1) Korean Patent Application Publication No. 10-2015-0009379 (January 26, 2015), titled "BRACKET FOR EXTENDED SIDEWALK AND EXTENDED SIDEWALK USING THE SAME".

SUMMARY OF THE INVENTION

[0011] Accordingly, the present disclosure has been made keeping in mind the above problems occurring in the related art, and the present disclosure is intended to propose a fixing module for an extended structure and a prestressed cantilever including the same, the fixing module being able to adjust a position at which a support structure supporting a deck plate is coupled to a base structure and increase force by which the deck plate is supported.

[0012] Also provided are a fixing module for an extended structure and a prestressed cantilever including the same, the fixing module being able to increase coupling force for a base structure.

[0013] Also provided are a fixing module for an extended structure and a prestressed cantilever including the same, in which construction may be performed rapidly and easily without the use of a crane or the like.

[0014] Also provided are a fixing module for an extended structure and a prestressed cantilever including the same, in which a deck plate may be supported in an optimum manner using a shaft, depending on the size, the number of users, user types, or the like of the deck plate.

[0015] Also provided are a fixing module for an extended structure and a prestressed cantilever including the same, in which a shock absorber may be provided between a movable plate and a shaft to support the shaft and absorb the moment of the shaft, moment may be generated on the deck plate from prestress due to the tension of the shock absorber in order to reduce the load of the deck plate and prevent a support structure from sagging, resistance to bending deformation to a shaft or a plate may be increased, and load applied between the support structure and the fixing module may be reduced to prevent the fixing of the support structure from being released and a connecting portion from being fracture, thereby providing structural stability. Also provided are a fixing module for an extended structure and a prestressed cantilever including the same, the fixing module being able to absorb moment in an optimum manner depending on the construction environment.

[0016] Also provided are a fixing module for an extended structure and a prestressed cantilever including the same, in which a support frame may be fitted to a support plate or a movable plate to support the support plate or the movable plate, such that the convenience of construction and structural stability of the extended structure may be improved.

[0017] In order to achieve the above objective, the present disclosure is realized by embodiments having the following configurations.

[0018] According to an embodiment of the present disclosure, provided is a fixing module including: a pair of guide rails provided on a side surface of a base structure, on which an extended structure is to be disposed, in a top-bottom direction while being spaced apart from each other at a predetermined distance; and a plate unit fitted to the guide rails and coupled to a support structure supporting a deck plate. The plate unit may include a support plate fixed to the base structure and a movable plate movable along the guide rails in the top-bottom direction.

[0019] According to another embodiment of the present disclosure, the movable plate and the support plate may be fixed to the base structure while overlapping each other.

[0020] According to another embodiment of the present disclosure, the movable plate may be configured such that an entirety or a portion thereof overlaps the support plate.

[0021] According to another embodiment of the present disclosure, the plate unit may include fastening holes perforated in the support plate and the movable plate and fixing bolts fitted into the fastening holes to be fixed to the base structure. The fastening holes in the support plate may include a plurality of fastening holes included of upper and lower holes, thereby allowing the fixing bolts to be fitted into and extend through the fastening holes in both the support plate and the movable plate when the entirety or the portion of the movable plate overlaps the support plate.

[0022] According to another embodiment of the present disclosure, the support plate may be bent in the shape of a diagonally-mirrored "L" so as to be in close contact with and coupled to an upper portion and the side surface of the base structure.

[0023] According to another embodiment of the present disclosure, provided is a prestressed cantilever including: a fixing module fixed to a position on a base structure at which an extended structure is to be constructed; and a support structure, a portion of which is fixed to the fixing module, and which supports a bottom portion of a deck plate for traffic of pedestrians. The support structure may include a support frame fixed to the fixing module so as to be parallel to a flatland, with a top portion thereof being in contact with and supporting a deck plate, and a shaft arranged at a predetermined angle with respect to the support frame, with both ends of the shaft being connected to the fixing module and a point of a bottom portion of the support frame.

[0024] According to another embodiment of the present disclosure, the shaft may be connected to the movable plate such that a position at which the shaft is coupled to the fixing module is changed depending on movement of the movable plate in a top-bottom direction.

[0025] According to another embodiment of the present disclosure, the prestressed cantilever may further include a shock absorber provided between the movable plate and the shaft to absorb moment applied to the shaft.

[0026] According to another embodiment of the present disclosure, the shock absorber may include: an elastic member absorbing the moment using elasticity thereof; a fixing unit fixed to the movable plate to support one portion of the elastic member; and an elasticity-adjusting unit connected to the shaft and supporting the other portion of the elastic member to adjust a degree of compression of the elastic member.

[0027] According to another embodiment of the present disclosure, the fixing unit may include: a fixing pad in close contact with and fixed to the movable plate and supporting one end of the elastic member; and a receiver pipe protruding perpendicularly from the fixing pad toward an adjustment pad. The elasticity-adjusting unit may include: the adjustment pad fixed to the shaft and supporting the other end of the elastic member; and an insert pipe protruding from the adjustment pad toward the fixing pad and inserted into the receiver pipe. The degree of compression of the elastic member may be adjusted in response to movement of the insert pipe along the receiver pipe.

[0028] According to another embodiment of the present disclosure, the fixing unit may further include a support panel provided between the fixing pad and the receiver pipe, with one end of the elastic member being fitted thereto. The elasticity-adjusting unit may further include a support plate provided between the adjustment pad and the insert pipe, with the other end of the elastic member being fitted thereto.

[0029] According to another embodiment of the present disclosure, the shock absorber may further include an angle-adjusting unit adjusting an angle of disposition of the shock absorber.

[0030] According to another embodiment of the present disclosure, the angle-adjusting unit may further include an angle bracket inserted between the fixing pad and the movable plate to cause an inclination to the shock absorber.

[0031] According to another embodiment of the present disclosure, the support frame may include: a top support panel in contact with and supporting the deck plate; a T-shaped bent panel protruding vertically downward along a central portion of the top support panel; a side support panel perpendicularly provided on side ends of the top support panel and the T-shaped bent panel and supporting a side surface of the support frame. The support plate or the movable plate may include: a front plate provided on the support frame and having a T-shaped hole in a top end thereof; and a rear plate in close contact with the front plate to be fixed to the base structure and having an insertion hole into which the side support panel is fitted. The support frame may be fitted to and supported by the support plate or the movable plate.

[0032] The present disclosure may obtain the following effects due to the above-described features, configurations to be described later, and combinations and relations of use thereof.

[0033] In the present disclosure, the guide rails are provided in a top-bottom direction on a side surface of a base structure on which an extended structure is constructed, the support plate and the movable plate are fitted to the guide rails so as to be movable in the top-bottom direction, such that a position at which the support structure supporting a deck plate for the traffic of pedestrians is coupled to the base structure may be adjusted.

[0034] The support plate and the movable plate are fixed to the base structure while portions or the entirety of the support plate and the movable plate overlap each other, thereby increasing force by which the deck plate is supported.

[0035] The support plate may have the shape of a diagonally-mirrored "L" so as to increase coupling force to the base structure.

[0036] Since the support structure is coupled to the fixing module and the base structure in a situation in which the fixing module is fixed to the base structure, the construction may be performed rapidly and easily without using a crane or the like.

[0037] Since the support frame is fixed to the support plate and the shaft is fixed to the movable plate, the deck plate may be optimally supported using the shape, depending on the size, the number of users, user types, or the like of the deck plate.

[0038] The shock absorber provided between the movable plate and the shaft to may support the shaft and absorb the moment of the shaft. Moment may be generated on the deck plate from prestress due to the tension of the shock absorber in order to reduce the load of the deck plate and prevent a support structure from sagging, resistance to bending deformation to a shaft or a plate may be increased. Load applied between the support structure and the fixing module may be reduced to prevent the fixing of the support structure from being released and a connecting portion from being fracture. Accordingly, structural stability may be obtained.

[0039] The degree of compression of the elastic member absorbing the moment of the shaft may be adjusted such that moment may be optimally absorbed depending on the construction environment.

[0040] The degree of disposition of the shock absorber may be adjusted depending on the degree of disposition of the shaft such that the shock absorber may effectively absorb moment.

[0041] The support frame may be supported by being fitted to the support plate or the movable plate, thereby improving the convenience of construction and structural stability.

BRIEF DESCRIPTION OF THE DRAWINGS

[0042] The above and other objectives, features, and other advantages of the present disclosure will be more clearly understood from the following detailed description when taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a view illustrating the configuration of a fixing module for an expansible structure according to an embodiment of the present disclosure;

FIGS. 2A and 2B are reference views illustrating examples in which the base module illustrated in FIG. 1 is installed;

FIGS. 3A and 3B are reference views illustrating applications of the base module illustrated in FIGS. 2A and 2B;

FIG. 4 is a cross-sectional view illustrating an example in which a prestressed cantilever including the fixing module for an extended structure according to an embodiment of the present disclosure is constructed;

FIG. 5 is a side view illustrating the prestressed cantilever including the fixing module for an extended structure according to an embodiment of the present disclosure;

FIG. 6 is a plan view illustrating the prestressed cantilever including the fixing module for an extended structure according to an embodiment of the present disclosure;

FIG. 7 is a perspective view illustrating the support plate including a front plate and a rear plate;

FIGS. 8A to 8C are cross-sectional views illustrating components of the support plate illustrated in FIG. 7;

FIGS. 9A is a perspective view illustrating the movable plate including a front plate and a rear plate;

FIGS. 9B and 9C are cross-sectional views illustrating components of the support plate illustrated in FIG. 9A;

FIG. 10 is a front view illustrating the support frame;

FIGS. 11A and 11B are a front view and a rear view illustrating the prestressed cantilever including the fixing module for an extended structure according to an embodiment of the present disclosure;

FIG. 12 is a side cross-sectional view illustrating the shock absorber;

FIG. 13 is a reference view illustrating an assembled state of the shock absorber;

FIGS. 14A and 14B are reference views illustrating other examples in which prestressed cantilevers respectively including the fixing module for an extended structure according to an embodiment of the present disclosure are constructed;

FIG. 15 is a reference view illustrating a function and an effect of the prestressed cantilever;

FIG. 16 is a reference view illustrating an example in which prestressed cantilevers are constructed; and

FIG. 17 is a side view illustrating a prestressed cantilever according to another embodiment of the present disclosure.

Description of Reference Numerals

1: fixing module	11: guide rail	12: plate unit
121: support plates	121a: top plate	
121b: vertical plate	121b-1: front plate	
121b-11: T-shaped hole	121b-2: rear plate	
121b-21: insertion hole	122: movable plate	
122a: front plate	122a-1: T-shaped hole	
122b: rear plate	122b-1: insertion hole	
123: fastening holes	123a: first fastening holes	
123b: second fastening holes	123c: third fastening holes	
124: fixing bolts	2: support structure	
21: support frame	211: top support panel	
212: T-shaped bent panel	213: side support panel	
22: shaft	23: fixing bracket	24: connector
241: first connector	242: second connector	
3: shock absorber	31: elastic member	
32: fixing unit	321: fixing pad	
322: support panel	323: receiver pipe	
33: elasticity-adjusting unit	331: adjustment pad	
332: support plate	333: insert pipe	
34: angle-adjusting unit	341: angle bracket	

(continued)

4: length-adjusting unit	41: first shaft	
411: first male thread	42: second shaft	
421: second male thread	43: length-adjusting member	
431: first female thread	432: second first female thread	
D: deck plate	B: base structure	C: bridge
S: sky road	T: plank road	

DETAILED DESCRIPTION OF THE INVENTION

[0043] Hereinafter, exemplary embodiments of a fixing module for an extended structure, a prestressed cantilever including the same, and an extended structure including the same according to the present disclosure will be described in detail with reference to the accompanying drawings. In the following description of the present disclosure, detailed descriptions of known functions and components incorporated into the present disclosure will be omitted in a situation in which the subject matter of the present disclosure may be rendered unclear thereby. Throughout the specification, it will be understood that the terms "comprise", "include", "have", and any variations thereof used herein are intended to cover non-exclusive inclusions unless explicitly described to the contrary.

[0044] A fixing module for an extended structure according to an embodiment of the present disclosure will be described with reference to FIGS. 1 to 3. The fixing module 1 includes a pair of guide rails 11 and a plate unit 12. The guide rails 11 are provided on a side surface of a base structure B, on which an extended structure is to be disposed, in the top-bottom direction while being spaced apart from each other at a predetermined distance. The plate unit 12 is fitted to the guide rails 11, and a support structure 2 supporting a deck plate D is coupled to the plate unit 12.

[0045] The term "extended structure" used herein refers to not only various types of footbridges respectively supported at one end thereof, such as a footbridge extended from one side of an existing bridge C as illustrated in FIG. 4, a sky road S disposed above an existing bridge or road as illustrated in 14A, a plank road T provided on a cliff or the like as illustrated in FIG. 14B, but also various types of structures supporting people or objects, such as a balcony or a drone landing platform, disposed on a building or the like as illustrated in FIG. 16.

[0046] The extended structure added to an existing base structure, such as a bridge, is configured such that the extended structure protrudes from one side of the existing bridge C, as illustrated in FIG. 4. In the related art, a bracket for supporting the deck plate D is integrally provided, as described above in the Description of the Related Art section. Thus, it has been impossible to effectively support the deck plate D, due to various sizes, numbers of users, user types, and the like of the deck plate D. In order to construct the deck plate D, the base structure B must be installed after transporting the bracket using a crane so that the bracket is supported. Thus, the construction has been complicated and time-consuming.

[0047] In this regard, in the present disclosure, in order to construct the cantilever on the base structure B, the fixing module 1 separately fabricated is disposed on the base structure B. The fixing module 1 is comprised of a support plate 121 and a movable plate 122 such that the movable plate 122 is movable in the top-bottom direction. Due to this configuration, a position at which the support structure 2 supporting the deck plate D is fixed may be adjusted depending on the size of the deck plate D or the like. Accordingly, in the present disclosure, the position at which the support structure 2 is fixed to the base structure B may be adjusted in the top-bottom direction, depending on the size, the number of users, and user types of the deck plate D so that the deck plate D may be firmly supported. At the same time, since the support structure 2 is fixed to the fixing module 1 in a situation in which the fixing module 1 is fixed to the base structure B, the construction may be performed rapidly and easily.

[0048] The fixing module 1 is fixed to a position on the base structure B at which a walking bridge is constructed. After the fixing module 1 is assembled, the support structure 2 allows the fixing module 1 to be coupled to the base structure B. A plurality of fixing modules 1 may be provided to be spaced apart from each other at predetermined distances such that the support structures 2 may support the deck plate D at a plurality of positions.

[0049] The pair of guide rails 11 is provided on a side surface of the base structure B at a predetermined distance from each other while extending in the top-bottom direction. The guide rails 11 are configured such that the plate unit 12 may be inserted between the guide rails 11 so as to be fitted thereto. In particular, a movable plate 122 of the plate unit 12 is fitted to the guide rails 11 so as to be movable in the top-bottom direction. A shaft 22 of a prestressed cantilever to be described later is connected to the movable plate 122, such that a position at which the shaft 22 is fixed (hereinafter, referred to as the fixing position of the shaft 22) may be adjusted in the top-bottom direction. In addition, since the guide rails 11 are fixed to the base structure B and the plate unit 12 is fitted to the guide rails 11, the guide rails 11 may increase the supporting force of the fixing module 1 to the support structure 2.

[0050] The plate unit 12 is a component that is fitted to the guide rails 11 and fixed to the base structure B. When the

plate unit 12 is fixed to the base structure B, the support structure 2 is connected to the plate unit 12 such that the plate unit 12 may support the deck plate D. As described above, the plate unit 12 includes the support plates 121 fixed to the base structure B and the movable plate 122 movable along the guide rails 11 in the top-bottom direction. Due to this configuration, the support plates 121 and the movable plate 122 may be fixed to the base structure B, with portions or the entirety thereof overlapping. Thus, the plate unit 12 always has a double-plate structure so as to be able to firmly support the support structure 2 even when the deck plate D has a large size or is made of a heavy material, a large number of pedestrians uses the footbridge, or heavy objects, such as vehicles, are passing the deck plate D. In addition, since the shaft 22 (to be described later) of the support structure 2 is fixed in a situation in which the movable plate 122 is movable along the guide rails 11 in the top-bottom direction, the position, angle, or the like at which the shaft 22 is fixed to the fixing module 1 may be changed in order to ensure that the deck plate D is firmly fixed.

[0051] The support plates 121 are components that are fitted to the guide rails 11 to be in close contact with the base structure B. The support plates 121 may be bent into the shape of a diagonally-mirrored "L" and be coupled to the base structure B using fixing bolts 124. Thus, the support plates 121 may remain in a firmly supported state by being fixed to the base structure B in the shape of the diagonally-mirrored "L". Since the support plates 121 are fitted to the guide rails 11, the supporting force thereof may be further increased. In this regard, the support plates 121 may include a top plate 121a in close contact with the top portion of the base structure B and a vertical plate 121b in close contact with a side surface of the base structure B. Fastening holes 123 may be formed in the top plate 121a and the vertical plate 121b, thereby allowing the top plate 121a and the vertical plate 121b to be fixed using the fixing bolts 124 fitted thereinto.

[0052] The top plate 121a is formed to be parallel to the ground surface so as to be in close contact with and coupled to the top portion of the base structure B. The top plate 121a has a plurality of first fastening holes 123a and is fixed to the base structure B using the fixing bolts 124 fitted into the first fastening holes 123a.

[0053] The vertical plate 121b is a component that is perpendicularly bent from a distal end of the top plate 121a so as to be in close contact with a side surface of the base structure B. The vertical plate 121b is fitted to the guide rails 11. The vertical plate 121b has a plurality of second fastening holes 123b to which the fastening bolts 124 are to be coupled. In particular, the vertical plate 121b is coupled to a second support frame 21 of the support structure 2 through the second fastening holes 123b. In addition, since the vertical plate 121b is fixed to the base structure B by overlapping the movable plate 122, at least portions of the second fastening holes 123b may communicate with at least portions of third fastening holes 123c of the movable plate 122 such that the fastening bolts 124 may be fitted into both the second fastening holes 123b and the third fastening holes 123c.

[0054] The movable plate 122 is a component that is fitted to the guide rails 11 so as to be movable in the top-bottom direction. The movable plate 122 is fixed to the base structure B in a position in which at least a portion thereof overlaps the support plates 121, more particularly, the vertical plate 121b. Thus, as illustrated in FIG. 2A, the movable plate 122 may be fitted to the guide rails 11 so as to entirely overlap the vertical plate 121b of the support plates 121, thereby serving to reinforce the supporting force of the support plates 121. As illustrated in FIG. 2B, a portion of the movable plate 122 may overlap the vertical plate 121b such that the position of the movable plate 122 is moved downwards. The shaft 22 (to be described later) of the support structure 2 is connected and fixed to the movable plate 122. A shock absorber 3 may be provided on the movable plate 122 to connect the movable plate 122 to the shaft 22. Thus, the fixing position of the shaft 22 may be changed depending on the top-down movement of the movable plate 122. In some cases, a plurality of movable plates 122 overlapping each other may be fitted to the guide rails 11, thereby allowing the position at which the shaft 22 is connected to the movable plate 122 to be moved further downward. The third fastening holes 123c are formed in the movable plate 122 so as to be face the second fastening holes 123b of the vertical plate 121b and the fixing bolts 124 extend through the vertical plate 121b and the movable plate 122, such that the support plates 121 and the movable plate 122 may be fixed to the base structure B while overlapping each other.

[0055] The fastening holes 123 are components perforated in the support plates 121 and the movable plate 122, such that the fixing bolts 124 may be fitted thereinto. The fastening holes 123 may include the first fastening holes 123a formed in the top plate 121a, the second fastening holes 123b formed in the vertical plate 121b, and the third fastening holes 123c formed in the movable plate 122. As described above, the movable plate 122 is coupled to the base structure B in a position in which a portion or the entirety thereof overlaps the support plates 121. Thus, when the third fastening holes 123c overlap the second fastening holes 123b, for example, when the second fastening holes 123b consist of a pair of upper fastening holes and a pair of lower fastening holes, the fixing bolts 124 may be fitted into the third fastening holes 123c overlapping the pair of upper fastening holes 123b and the pair of lower fastening holes 123b.

[0056] The fixing bolts 124 are components that fix the support plates 121 and the movable plate 122 to the base structure B. The fixing bolts 124 may be implemented as anchor bolts. The fixing bolts 124 are fitted into, while extending through, the first fastening holes 123a, the second fastening holes 123b, and the third fastening holes 123c.

[0057] The prestressed cantilever including the fixing module for the extended structure according to an embodiment of the present disclosure will be described with reference to FIGS. 1 to 16. The prestressed cantilever may include the fixing module 1 fixed to a position on the base structure B at which a walking bridge is to be constructed; the support structure 2 supporting the bottom of the deck plate D for the traffic of pedestrians in a position in which one side of the

support structure 2 is fixed to the fixing module 1; and the shock absorber 3 absorbing moment applied to the support structure 2.

[0058] The prestressed cantilever may be safely and rapidly constructed without the use of a crane by coupling the support structure 2 to the fixing module 1 in a situation in which the above-described fixing module 1 is fixed to the base structure B. The support structure 2 includes the support frame 21 in parallel to the flatland and the shaft 22 inclined to the support frame 21. With this configuration, the prestressed cantilever may firmly support the deck plate D. In addition, the shaft 22 is connected to the movable plate 122 of the fixing module 1, such that the fixing position of the shaft 22 is adjustable in the top-bottom direction. By the adjustment of the angle of disposition, the length, or the like of the shaft 22, the deck plate D may be optimally constructed depending on the size, the number of users, or the like of the deck plate D. In addition, the shock absorber 3 is provided between the shaft 22 and the movable plate 122 so as to be effectively resist moment occurring in the shaft 22, so that the deck plate D may be more firmly supported.

[0059] The term "prestress" used herein means increasing resistance to bending deformation of the shaft 22 and generating moment to the deck plate D using the tension of the shock absorber 3, thereby reducing the load of the deck plate D and preventing the support structure 2 from sagging, as illustrated in FIG. 15. In addition, the present disclosure may reduce load applied to the joint between the fixing module 1 and the support structure 2 by absorbing the load using the shock absorber 3 so as to prevent the joint of the support structure 2 from being fractured or the decoupling of bolts or the like, thereby providing the reliability of the structure.

[0060] The fixing module 1 includes the top plate 121a and the vertical plate 121b, as described above, in which the vertical plate 121b is fixed while overlapping the movable plate 122. In addition, the support frame 21 and the shaft 22 are coupled and fixed to the fixing module 1. The shaft 22 is fixed to the movable plate 122 such that the fixing position of the shaft 22 is adjustable in the top-bottom direction. Thus, the angle, length, or the like of the shaft 22 may be adjusted. Hereinafter, for the sake of brevity, an example in which the vertical plate 121b and the movable plate 122 are fixed while entirely overlapping each other will be described.

[0061] In addition, the fixing module 1 may be configured such that the vertical plate 121b or the movable plate 122 includes a front plate 121b-1 or 122a and a rear plate 121b-2 or 122b such that the support frame 21 is firmly and easily fixed. As illustrated in FIG. 3A, the support frame 21 may be fixedly coupled to the movable plate 122 when the vertical plate 121b entirely overlaps the movable plate 122. As illustrated in FIG. 3B, when the movable plate 122 is moved downward so as to partially overlap the movable plate 122, the support frame 21 may be coupled to the vertical plate 121b. Thus, as illustrated in FIGS. 7 to 9, the vertical plate 121b or the movable plate 122 may be entirely implemented as the front plate 121b-1 or 122a and the rear plate 121b-2 or 122b such that the support frame 21 may be coupled to the vertical plate 121b or the movable plate 122.

[0062] The front plate 121b-1 or 122a is a component of the vertical plate 121b or the movable plate 122 provided in relation to the support frame 21. A T-shaped hole 121b-11 and 122a-1 is formed in the top end of the front plate 121b-1 or 122a such that a T-shaped bent panel 212 to be described later may be inserted therein. Thus, the front plate 121b-1 or 122a may allow the support frame 21 to be fitted to the vertical plate 121b or the movable plate 122 in an inserting manner, thereby facilitating the mounting of the support frame 21 on the fixing module 1. After fitted to the support frame 21, the front plate 121b-1 or 122a may support a side support panel 213 of the support frame 21 so as to be more firmly fixed.

[0063] The rear plate 121b-2 or 122b is a component of the vertical plate 121b or the movable plate 122 provided in relation to the base structure B. The rear plate 121b-2 or 122b is in close contact with and fixed to the base structure B and is provided integrally with the front plate 121b-1 or 122a. In particular, an insertion hole 121b-21 or 122b-1 is formed in the top portion of the rear plate 121b-2 or 122b. The insertion hole 121b-21 or 122b-1 has a size allowing the side support panel 213 of the support frame 21 to be fitted therein. Thus, the rear plate 121b-2 or 122b may allow the side support panel 213 to be fitted therein and supported thereby. The side support panel 213 fitted into the rear plate 121b-2 or 122b may be supported by the front plate 121b-1 or 122a only having the T-shaped hole 121b-11 and 122a-1 so as to be firmly fixed.

[0064] The support structure 2 is a component, one portion of which is fixed to the fixing module 1, and which supports the bottom of the deck plate D for the traffic of pedestrians. A plurality of support structures 2 may be arranged at predetermined distances to support the deck plate D. In particular, the support structure 2 is configured such that the support frame 21 is provided in parallel to the flatland to support, while being in close contact with, the deck plate D and the shaft 22 located below the support frame 21 is inclined to further support the support frame 21. Here, the shaft 22 is fixed to the movable plate 122. The shock absorber 3 is provided between the shaft 22 and the movable plate 122 to elastically support the shaft 22, thereby absorbing moment occurring in the shaft 22. In addition, the shaft 22 may be fixed to the support frame 21 using a fixing bracket 23. A connector 24 may be provided to connect the shaft 22 to the fixing bracket 23 and the shock absorber 3.

[0065] The support frame 21 is a component that is in contact with the bottom portion of the deck plate D to support the deck plate D. The support frame 21 may be implemented as a T-shaped section steel (e.g. a T-shaped steel beam). Accordingly, the support frame 21 may include a top support panel 211 having a predetermined width on a top portion

thereof and the T-shaped bent panel 212 protruding perpendicularly downward from the top support panel 211 along the centerline of the top support panel 211. A side support panel 213 is provided on a distal end of the support frame 21 to close the corresponding side surface of the support frame 21. With this configuration, the support frame 21 may be fitted into and coupled to the fixing module 1.

[0066] As illustrated in FIG. 6, the top support panel 211 may have a predetermined width and a predetermined length and be configured to be in contact with the deck plate D so as to be firmly support the deck plate D.

[0067] The T-shaped bent panel 212 is a component that protrudes vertically downward along the centerline of the top support panel 211. One end of the T-shaped bent panel 212 is fitted to the vertical plate 121b or movable plate 122, and the shaft 22 is connected to a predetermined point of the lower portion of the T-shaped bent panel 212 so as to support the support frame 21.

[0068] The side support panel 213 is configured to be bent perpendicularly from the top support panel 211 and have a predetermined width so as to close a distal end of the support frame 21, more particularly, the distal end coupled to the fixing module 1. The side support panel 213 is fitted into and coupled to the insertion hole 121b-21 or 122b-1 of the rear plate 121b-2 or 122b, and is coupled to the vertical plate 121 b, the movable plate 122, and the base structure B using the fixing bolts 124 penetrating therethrough. In addition, since the side support panel 213 is supported by the front plate 121b-1 or 122a in a position in which the side support panel 213 is fitted into the insertion hole 121b-21 or 122b-1, the insertion and fixing of the fixing bolts 124 may be more easily and rapidly performed.

[0069] The shaft 22 is a component that further supports the support frame 21, with one end thereof being fixed to the fixing module 1 and the other end thereof being fixed to the support frame 21. The shaft 22 may have a predetermined degree of inclination to the support frame 21 so as to more firmly support the support frame 21. More particularly, one end of the shaft 22 may be coupled to the shock absorber 3 fixed to the movable plate 122, and the other end of the shaft 22 may be coupled to the fixing bracket 23 coupled to the T-shaped bent panel 212 of the support frame 21. The shaft 22 may be configured to enable the shock absorber 3 to more effectively absorb moment. While both ends of the shaft 22 may be coupled to the shock absorber 3 and the support frame 21 by a variety of coupling methods, the shaft 22 may have threads engaging with the connector 24 provided on the shock absorber 3 or the support frame 21.

[0070] The fixing bracket 23 is a component that fixes the shaft 22 to the support frame 21. The fixing bracket 23 may be fixed to the T-shaped bent panel 212 of the support frame 21. The connector 24 may be provided on the fixing bracket 23 to connect the shaft 22 to the fixing bracket 23 such that the shaft 22 may further support the support frame 21.

[0071] The connector 24 is a component that may fix both ends of the shaft 22 to the shock absorber 3 and the support frame 21. The connector 24 may include a first connector 241 connected to the support frame 21 and a second connector 242 provided on the shock absorber 3. The connectors 241 and 242 may have threads on the inner portions thereof to engage with the threads provided on the both ends of the shaft 22. The first connector 241 may be coupled to one end of the support frame 21, while the second connector 242 may be fixed to an adjustment pad 331 of the shock absorber 3.

[0072] The shock absorber 3 is a component provided between the shaft 22 and the fixing module 1 to absorb moment occurring in the shaft 22. Due to the configuration of the shock absorber 3, the deck plate D may be more firmly fixed. The shock absorber 3 may be configured to be fixed to the movable plate 122. As illustrated in FIGS. 12 and 13, the shock absorber 3 may include an elastic member 31 absorbing moment, a fixing unit 32 fixing the elastic member 31 to the movable plate 122, an elasticity-adjusting unit 33 adjusting a length by which the elastic member 31 is compressed, and an angle-adjusting unit 34 adjusting the angle of the shock absorber 3.

[0073] The elastic member 31 is a component that is inserted between shaft 22 and the movable plate 122 to elastically resist moment. The elastic member 31 may absorb generated by load applied to the deck plate D so that the deck plate D may be firmly supported. The elastic member 31 may be implemented as a high-strength compression spring. One end of the elastic member 31 may be supported on the fixing unit 32 and the other end of the elastic member 31 may be supported on the elasticity-adjusting unit 33, such that the elastic member 31 may remain in a compressed state. The length by which the elastic member 31 is compressed may be adjusted so as to adjust the degree of resistance to the moment.

[0074] The fixing unit 32 is a component that fixes the elastic member 31 to the movable plate 122. The fixing unit 32 may include a fixing pad 321, a support panel 322, and a receiver pipe 323. The fixing pad 321 is fixed to the movable plate 122. The support panel 322 protrudes from the fixing pad 321 such that the elastic member 31 is fitted thereto. The receiver pipe 323 protrudes perpendicularly from the support panel 322 such that an insert pipe 333 (to be described later) of the elasticity-adjusting unit 33 is inserted thereto.

[0075] The fixing pad 321 has the shape of a plate having a predetermined width and is fixed to the movable plate 122. The fixing pad 321 supports one end of the elastic member 31 such that the elastic member 31 remains in a compressed state.

[0076] The support panel 322 is a component that protrudes perpendicularly from the fixing pad 321 toward the adjustment pad 331. Particularly, the support panel 322 may be circular shaped such that the elastic member 31 is fitted to the outer peripheral portion thereof. Thus, the support panel 322 may enable the elastic member 31 to be compressed and stretched while being firmly supported so that the elastic member 31 may effectively absorb moment.

[0077] The receiver pipe 323 is a component that protrudes perpendicularly from the support panel 322 to the adjustment pad 331. The receiver pipe 323 has the shape of a hollow cylinder such that the insert pipe 333 of the elasticity-adjusting unit 33 may be inserted into the receiver pipe 323. Thus, the insert pipe 333 may be inserted into and move within the receiver pipe 323. The degree of compression of the elastic member 31 may be adjusted depending on the movement of the insert pipe 333 along the receiver pipe 323. In this regard, the receiver pipe 323 has threads therein engaging with the threads of the insert pipe 333 such that the receiver pipe 323 may be rotatably coupled to the insert pipe 333. When the insert pipe 333 is rotated, the insert pipe 333 may move along the receiver pipe 323, thereby adjusting the degree of compression of the elastic member 31.

[0078] The elasticity-adjusting unit 33 is a component able to adjust the degree of absorption of moment by adjusting the length by which the elastic member 31 is compressed. The elasticity-adjusting unit 33 may adjust the length, by which the elastic member 31 is compressed, depending on the size, the number of users, user types, or the like of the extended structure. The elasticity-adjusting unit 33 may adjust the length of the elastic member 31 by moving the adjustment pad 331, allow the elastic member 31 to be fitted on a support plate 332, and adjust the length, by which the elastic member 31 is compressed, in response to movement of the insert pipe 333 along the receiver pipe 323.

[0079] The adjustment pad 331 is a component that is provided in a position opposite to the fixing pad 321 to support the other end of the elastic member 31. The length of the elastic member 31 is adjusted depending on the distance to the adjustment pad 331. The adjustment pad 331 may have the shape of a plate, such as the fixing pad 321, having a predetermined width. The adjustment pad 331 may be configured such that the support plate 332 protrudes from one side thereof such that the elastic member 31 is fitted on the support plate 332 and the second connector 242 is provided on the other side thereof such that the shaft 22 is connected to the second connector 242.

[0080] The support plate 332 is a component that protrudes perpendicularly from the center of the adjustment pad 331 toward the fixing pad 321 such that the elastic member 31 is fitted on the support plate 332. Thus, the elastic member 31 may be compressed in a position in which both ends thereof are fitted on and firmly fixed by the support panel 322 and the support plate 332.

[0081] The insert pipe 333 protrudes from the support plate 332 toward the fixing pad 321, is fitted into the receiver pipe 323, and moves along the receiver pipe 323. Threads may be provided on the outer peripheral portion of the insert pipe 333 to engage with the threads on the inner portion of the receiver pipe 323 and allow the insert pipe 333 to move forward and backward along the receiver pipe 323. The adjustment pad 331 may move along with the movement of the insert pipe 333 along the receiver pipe 323, thereby adjusting the degree of compression of the elastic member 31.

[0082] The angle-adjusting unit 34 is a component that adjusts the angle of the shock absorber 3. The angle-adjusting unit 34 may adjust the angle of the shock absorber 3, depending on an angle of inclination at which the shaft 22 is disposed. The inclination at which the shaft 22 is fixed to the fixing module 1 and the support frame 21 may be adjusted variously, depending on the size, the number of users, user types, a variety of construction environments, or the like of the deck plate D. The angle-adjusting unit 34 may adjust the angle of the shock absorber 3, more particularly, the angle of the elastic member 31 such that the elastic member 31 is collinear with the shaft 22 so that resistance to moment may be effectively performed. As illustrated in FIG. 12, the angle-adjusting unit 34 may be implemented as an angle bracket 341. The angle bracket 341 may be provided as an inclined plate inserted between the movable plate 122 and the fixing pad 321 so as to adjust an angle at which the fixing pad 321 is disposed so that the angle of the elastic member 31 may be adjusted.

[0083] A prestressed cantilever according to another embodiment of the present disclosure will be described with reference to FIG. 17. The prestressed cantilever may further include a length-adjusting unit 4 adjusting the length of the shaft 22. Since the fixing module 1, the support structure 2, and the shock absorber 3 of the prestressed cantilever are the same as those of the former embodiment, the length-adjusting unit 4 will only be described.

[0084] The length-adjusting unit 4 is a component adjusting the length of the shaft 22. The length-adjusting unit 4 may adjust the length of the shaft 22 depending on the construction environment so that the deck plate D may be firmly fixed by the shaft 22 and the shock absorber 3 may effectively absorb moment. Since the shaft 22 is required to support the support frame 21 in a variety of positions of disposition and at a variety of lengths, depending on the size, the number of users, user types, or the like of the deck plate D, the length of the shaft 22 may be simply adjusted using the length-adjusting unit 4 so that the shaft 22 may be rapidly constructed in a variety of environments. Due to the length-adjusting unit 4, the shaft 22 may be comprised of a first shaft 41 and a second shaft 42. A length-adjusting member 43 is provided between the first shaft 41 and the second shaft 42 such that the length of the entire shaft 22 may be adjusted by the rotation of the length-adjusting member 43.

[0085] One end of the first shaft 41 is coupled to a portion of the movable plate 122, more particularly, the second connector 242 provided on the adjustment pad 331, and the other end of the first shaft 41 is inserted into and coupled to the length-adjusting member 43. A first male thread 411 may be provided on the other end of the first shaft 41 so as to engage with a first female thread provided on the inner portion of the length-adjusting member 43.

[0086] One end of the second shaft 42 is coupled to a portion of the support frame 21, more particularly, the first connector 241 provided on the support frame 21, while the other end of the second shaft 42 is inserted into and coupled

to the length-adjusting member 43. A second male thread 421 may be provided on the other end of the second shaft 42 so as to engage a second female thread 432 provided on the inner portion of the length-adjusting member 43.

[0087] The length-adjusting member 43 is a component provided between the first shaft 41 and the second shaft 42 to adjust the length of the entire shaft. The first female thread 431 and the second first female thread 432 are provided on both ends of the length-adjusting member 43 so as to be fastened with the first male thread 411 and the second male thread 421. Here, the first male thread 411 and the second male thread 421 may extend in the opposite directions. Thus, when the length-adjusting member 43 is rotated, the first shaft 41 and the second shaft 42 may rotate in the opposite directions to be simultaneously inserted into the length-adjusting member 43 or simultaneously withdrawn from the length-adjusting member 43. Accordingly, the length of the entire shaft may be reduced or increased by only rotating the length-adjusting member 43.

[0088] Although the exemplary embodiments of the present disclosure have been described for illustrative purposes, those skilled in the art will appreciate that various modifications, additions, and substitutions are possible, without departing from the scope and spirit of the present disclosure as disclosed in the accompanying claims.

Claims

1. A fixing module comprising: a pair of guide rails provided on a side surface of a base structure, on which an extended structure is to be disposed, in a top-bottom direction while being spaced apart from each other at a predetermined distance; and a plate unit fitted to the guide rails and coupled to a support structure supporting a deck plate, wherein the plate unit comprises a support plate fixed to the base structure and a movable plate movable along the guide rails in the top-bottom direction.
2. The fixing module according to claim 1, wherein the movable plate and the support plate are fixed to the base structure while overlapping each other.
3. The fixing module according to claim 2, wherein the movable plate is configured such that an entirety or a portion thereof overlaps the support plate.
4. The fixing module according to claim 3, wherein the plate unit comprises fastening holes perforated in the support plate and the movable plate and fixing bolts fitted into the fastening holes to be fixed to the base structure, wherein the fastening holes in the support plate comprises a plurality of fastening holes comprised of upper and lower holes, thereby allowing the fixing bolts to be fitted into and extend through the fastening holes in both the support plate and the movable plate when the entirety or the portion of the movable plate overlaps the support plate.
5. The fixing module according to claim 1, wherein the support plate is bent in a shape of a diagonally-mirrored "L" so as to be in close contact with and coupled to an upper portion and the side surface of the base structure.
6. A prestressed cantilever comprising: a fixing module fixed to a position on a base structure at which an extended structure is to be constructed; and a support structure, a portion of which is fixed to the fixing module, and which supports a bottom portion of a deck plate for traffic of pedestrians, wherein the support structure comprises a support frame fixed to the fixing module so as to be parallel to a flatland, with a top portion thereof being in contact with and supporting a deck plate, and a shaft arranged at a predetermined angle with respect to the support frame, with both ends of the shaft being connected to the fixing module and a point of a bottom portion of the support frame, wherein the fixing module is the fixing module according to any one of claims 1 to 5.
7. The prestressed cantilever according to claim 6, wherein the shaft is connected to a movable plate such that a position at which the shaft is coupled to the fixing module is changed depending on movement of the movable plate in a top-bottom direction.
8. The prestressed cantilever according to claim 7, further comprising a shock absorber provided between the movable plate and the shaft to absorb moment applied to the shaft.
9. The prestressed cantilever according to claim 8, wherein the shock absorber comprises: an elastic member absorbing the moment using elasticity thereof; a fixing unit fixed to the movable plate to support one portion of the elastic member; and an elasticity-adjusting unit connected to the shaft and supporting the other portion of the elastic member to adjust a degree of compression of the elastic member.

10. The prestressed cantilever according to claim 9, wherein the fixing unit comprises:

a fixing pad in close contact with and fixed to the movable plate and supporting one end of the elastic member; and a receiver pipe protruding perpendicularly from the fixing pad toward an adjustment pad, and the elasticity-adjusting unit comprises: the adjustment pad fixed to the shaft and supporting the other end of the elastic member; and an insert pipe protruding from the adjustment pad toward the fixing pad and inserted into the receiver pipe, wherein the degree of compression of the elastic member is adjusted in response to movement of the insert pipe along the receiver pipe.

11. The prestressed cantilever according to claim 10, wherein the fixing unit further comprises a support panel provided between the fixing pad and the receiver pipe, with one end of the elastic member being fitted thereto, and the elasticity-adjusting unit further comprises a support plate provided between the adjustment pad and the insert pipe, with the other end of the elastic member being fitted thereto.

12. The prestressed cantilever according to claim 10, wherein the shock absorber further comprises an angle-adjusting unit adjusting an angle of disposition of the shock absorber.

13. The prestressed cantilever according to claim 12, wherein the angle-adjusting unit further comprises an angle bracket inserted between the fixing pad and the movable plate to cause an inclination to the shock absorber.

14. The prestressed cantilever according to claim 7, wherein the support frame comprises: a top support panel in contact with and supporting the deck plate; a T-shaped bent panel protruding vertically downward along a central portion of the top support panel; and a side support panel perpendicularly provided on side ends of the top support panel and the T-shaped bent panel and supporting a side surface of the support frame, the support plate or the movable plate comprises: a front plate provided on the support frame and having a T-shaped hole in a top end thereof; and a rear plate in close contact with the front plate to be fixed to the base structure and having an insertion hole into which the side support panel is fitted, wherein the support frame is fitted to and supported by the support plate or the movable plate.

15. An extended structure comprising the fixing module according to any one of claims 1 to 5.

16. An extended structure comprising the prestressed cantilever according to any one of claims 6 to 14.

FIG. 1

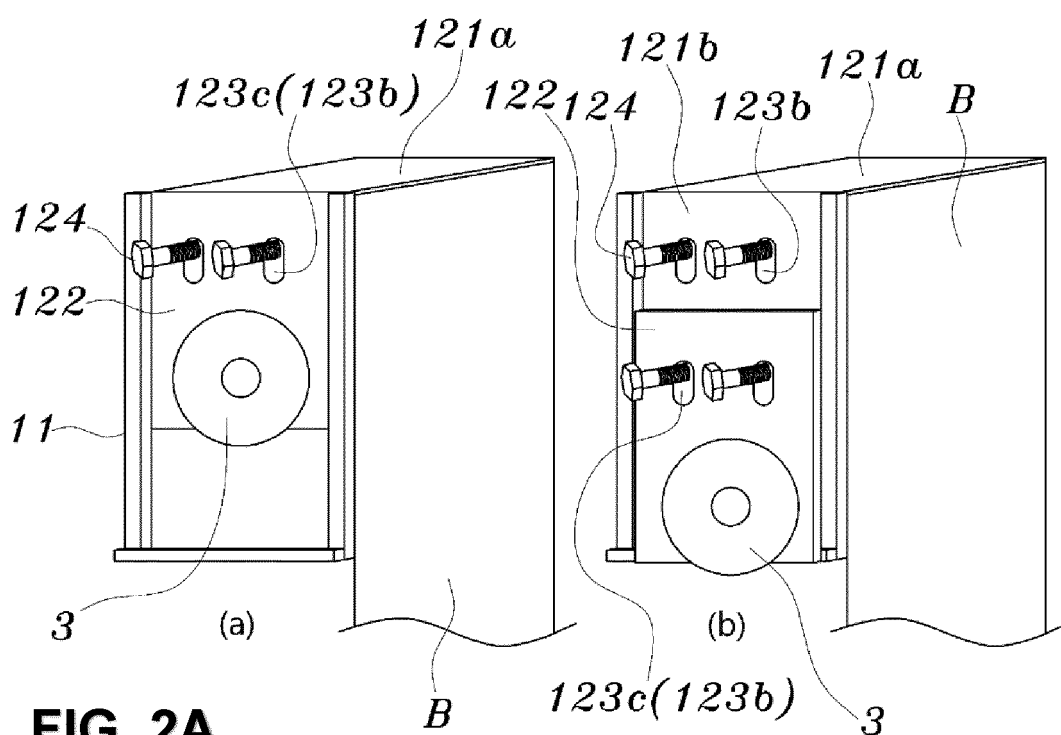
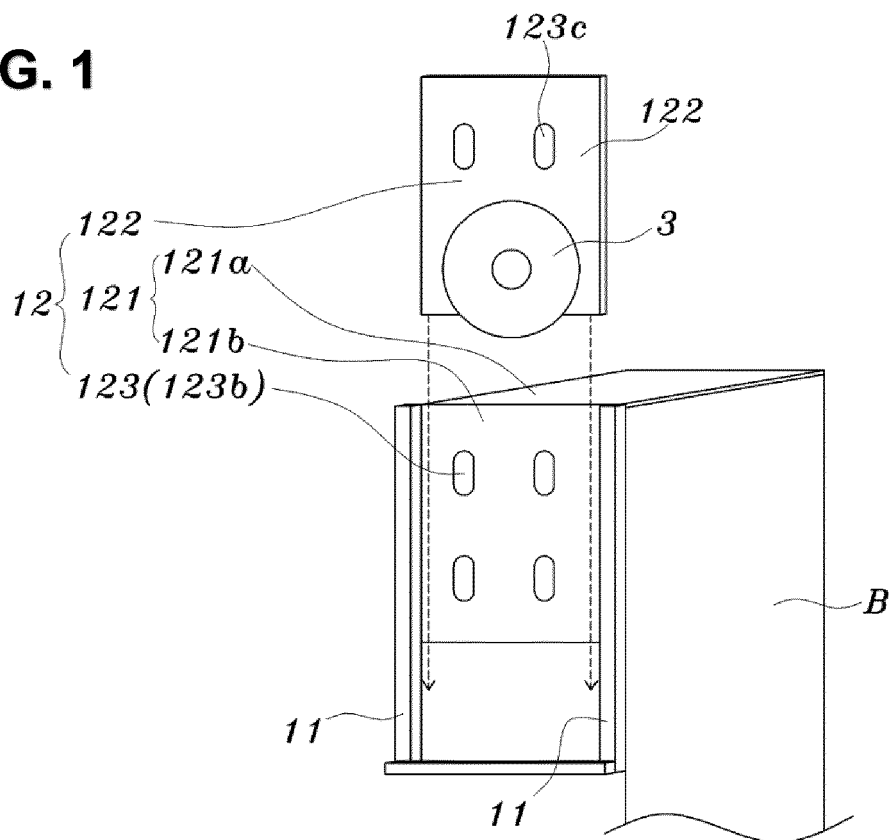


FIG. 2A

FIG. 2B

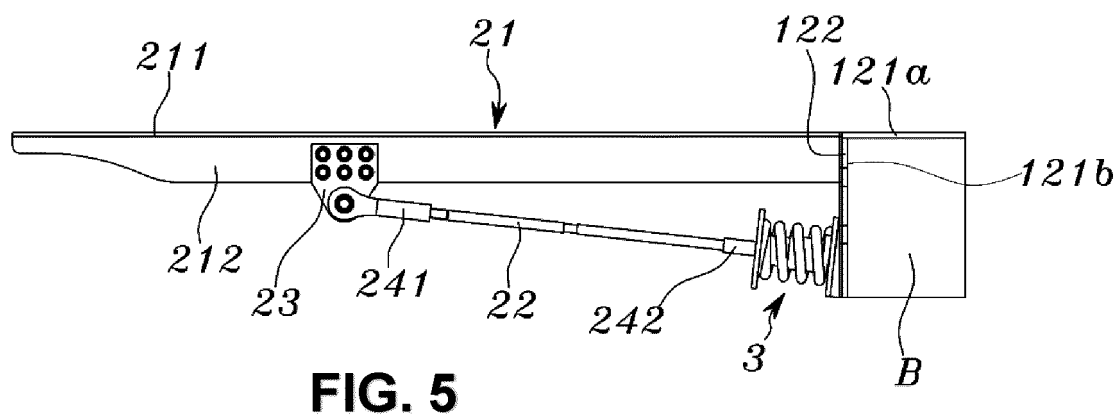
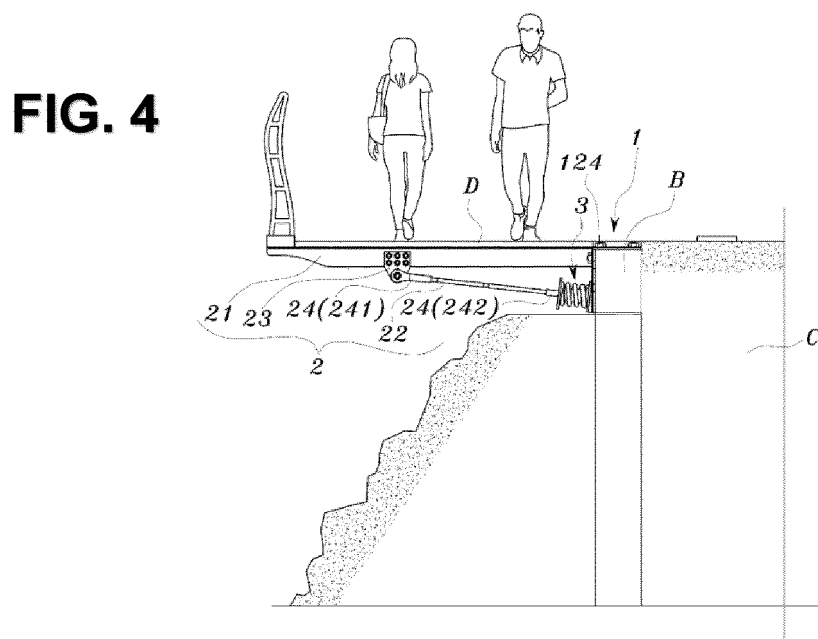
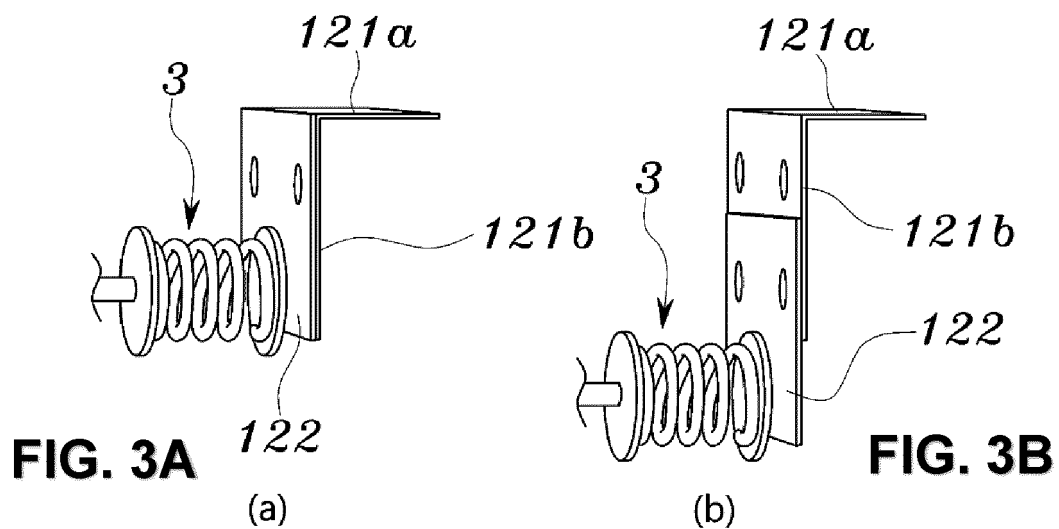


FIG. 6

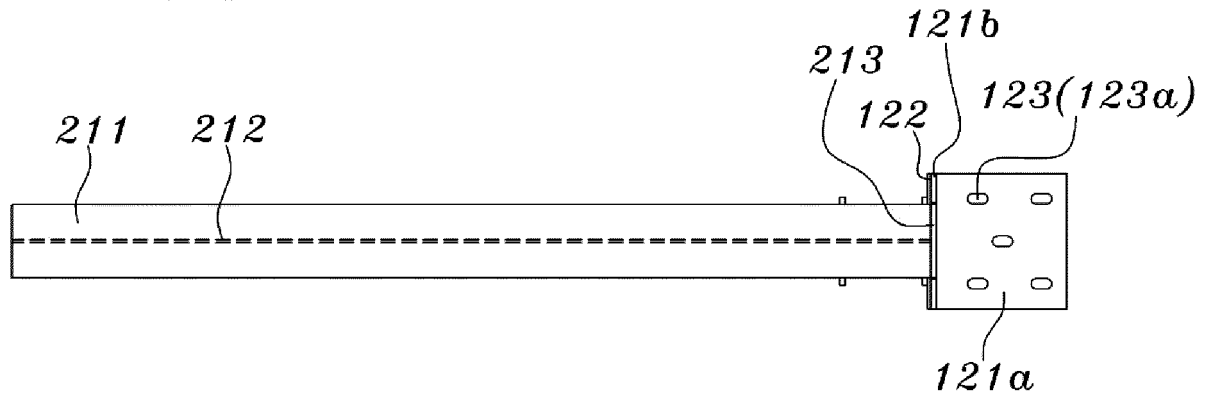
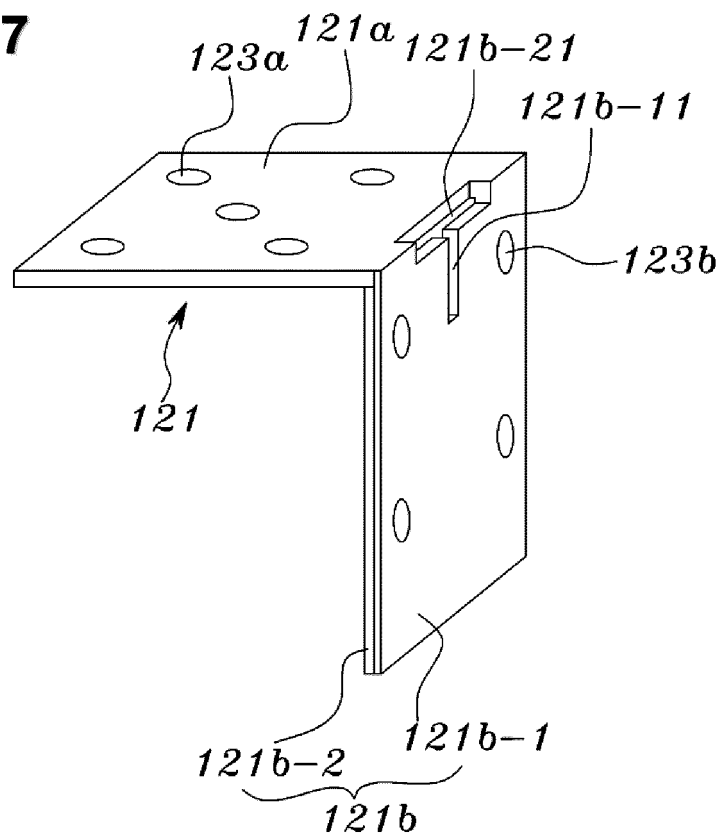
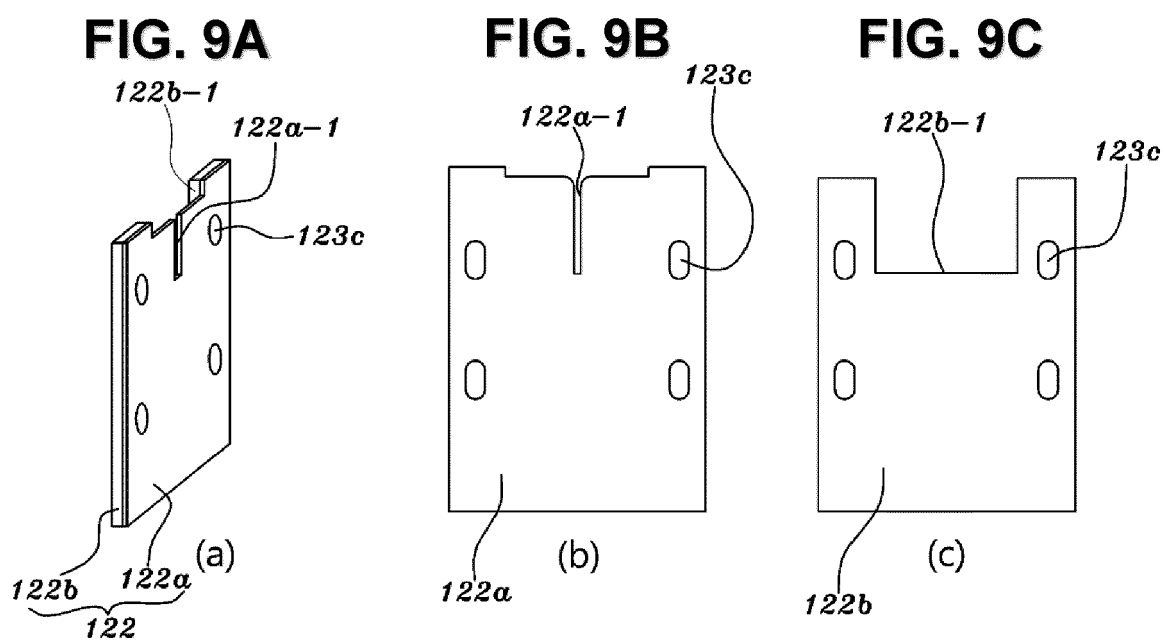
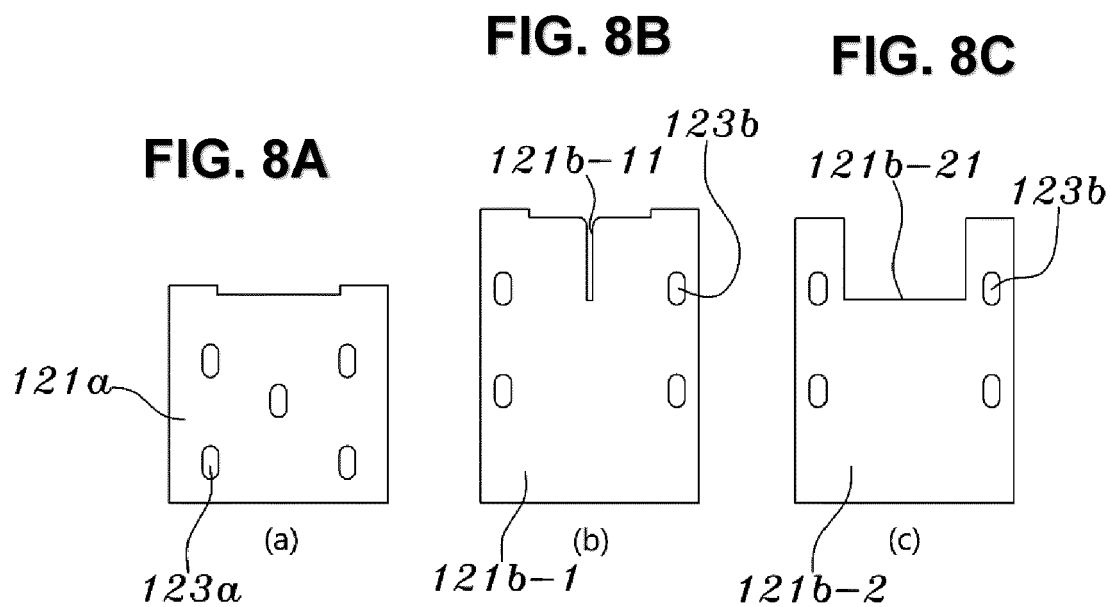
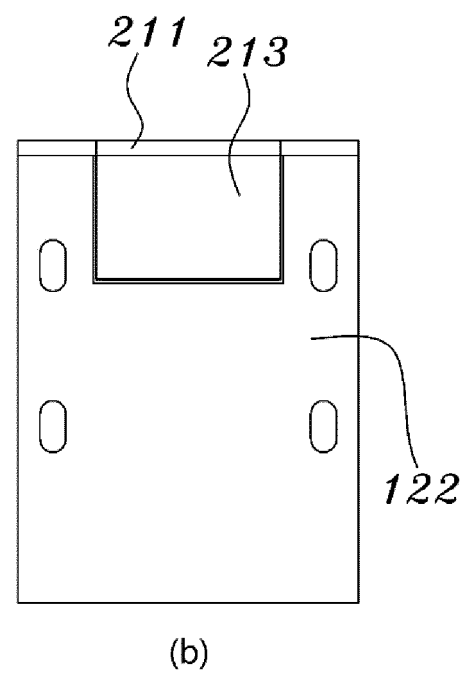
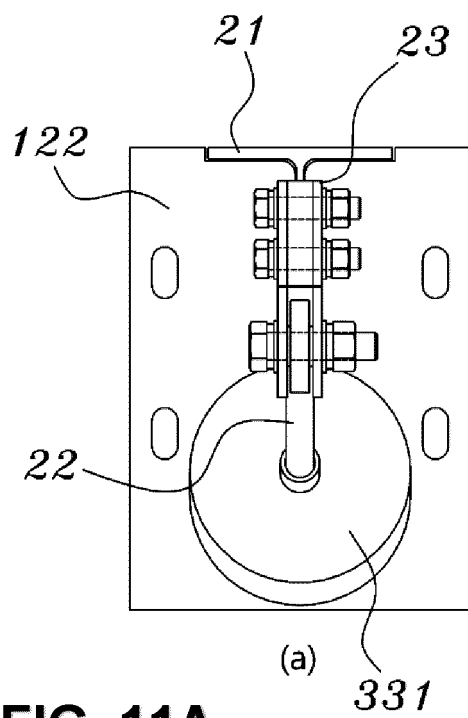
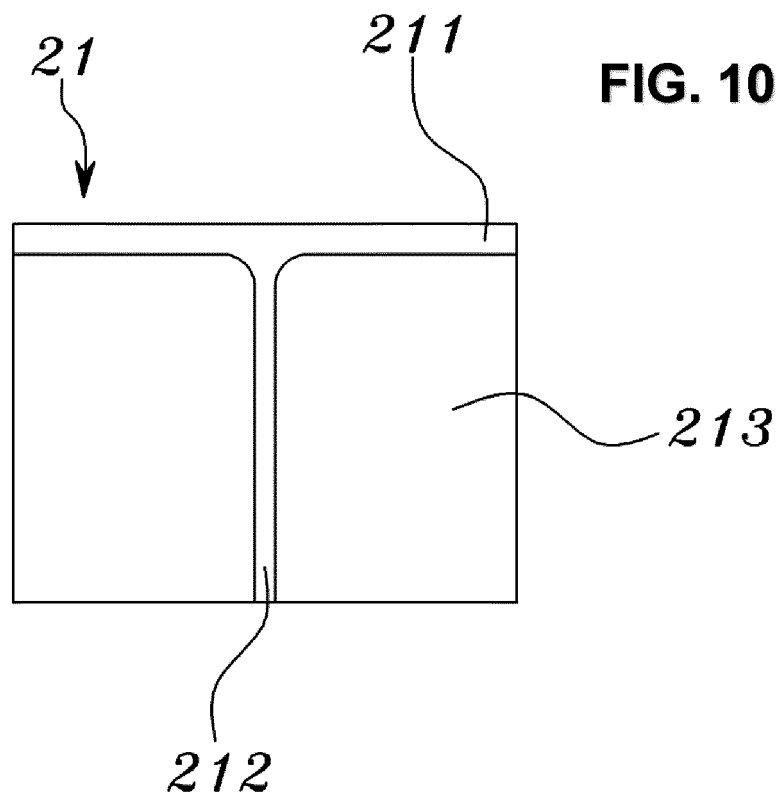


FIG. 7







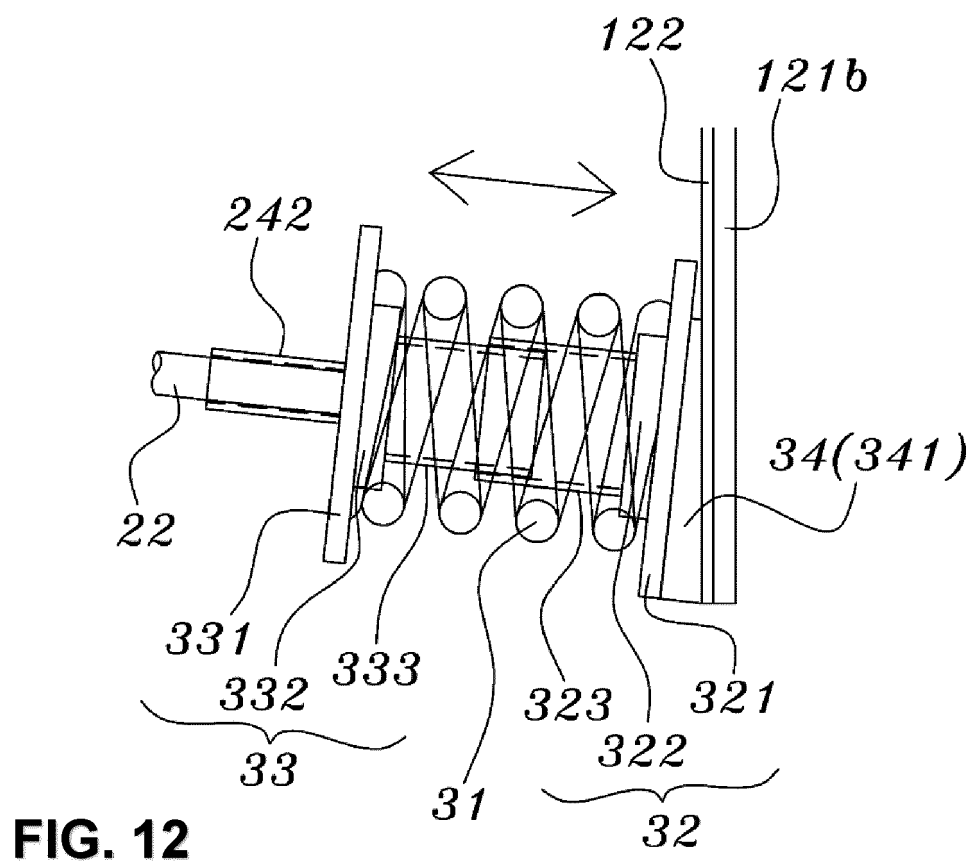
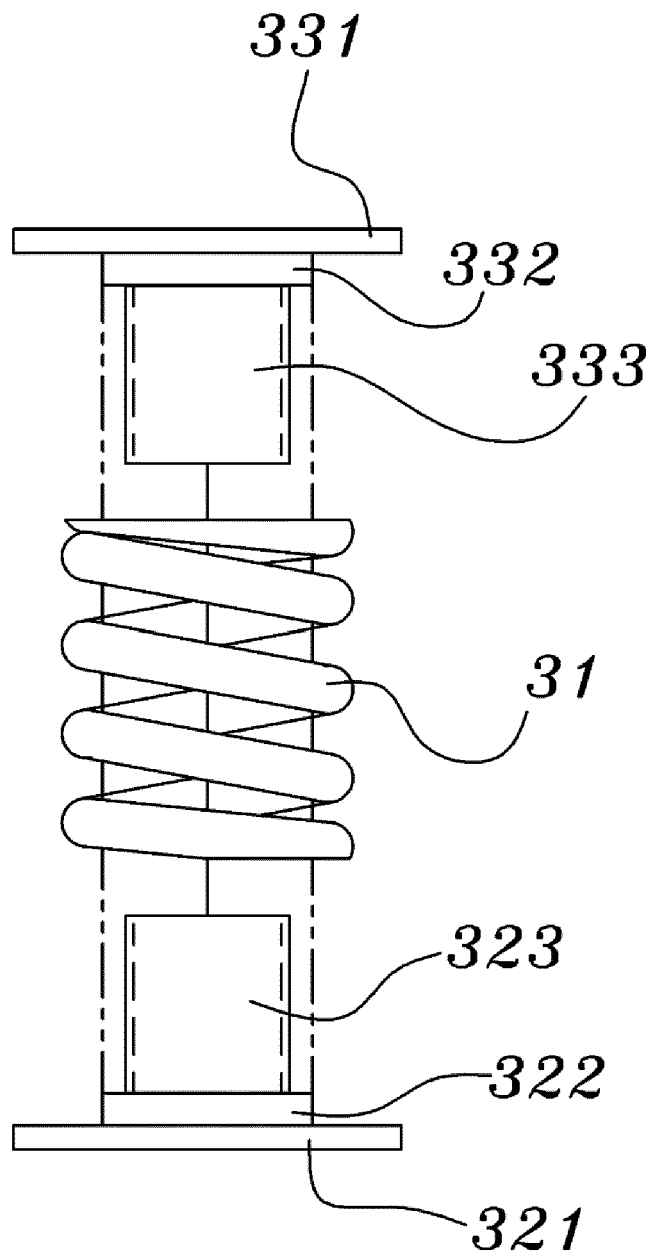


FIG. 13



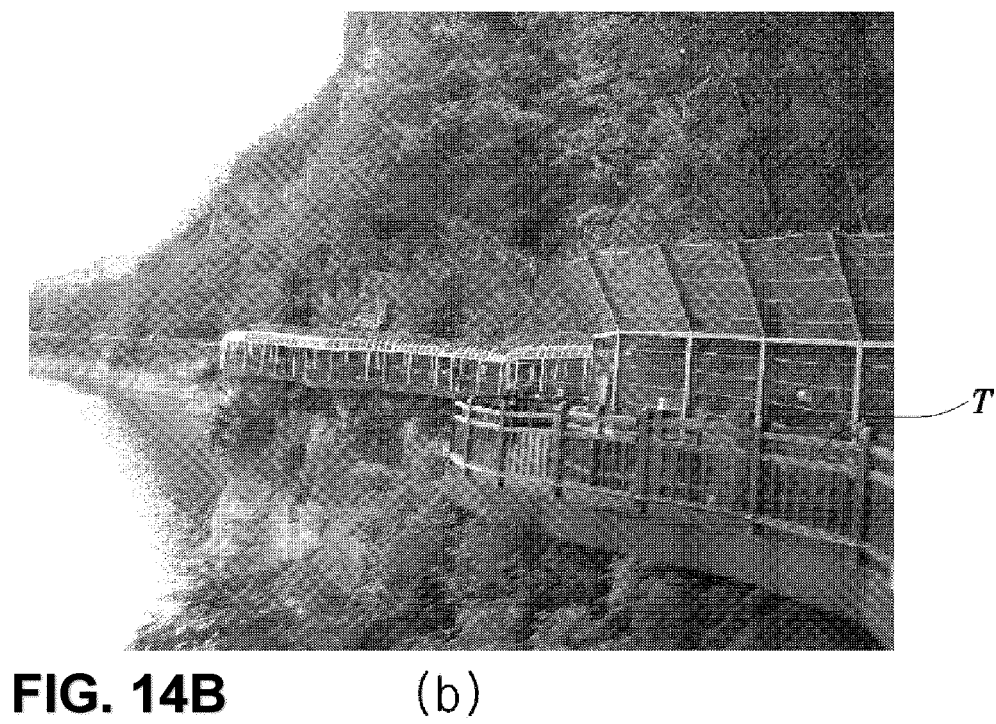
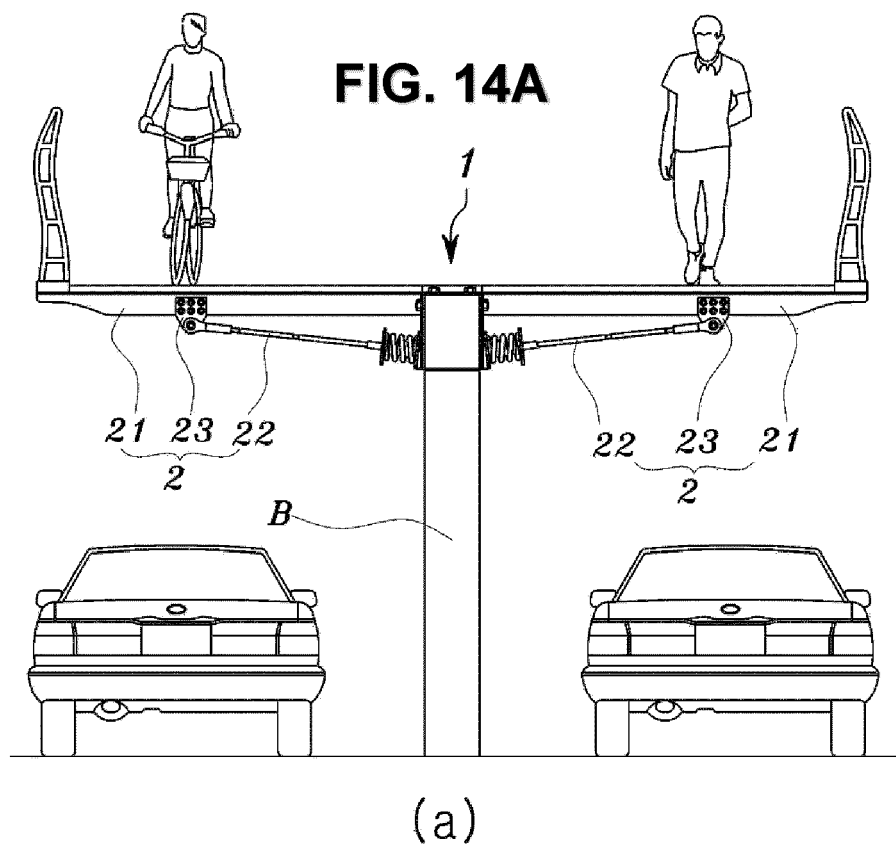


FIG. 15

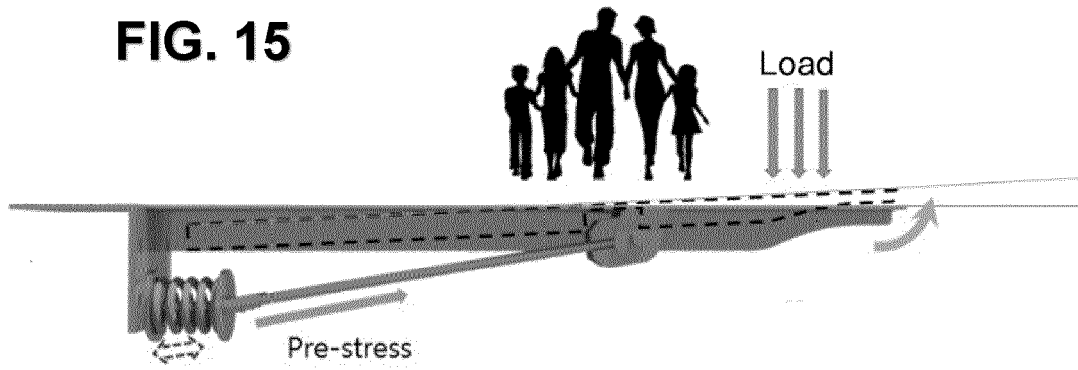


FIG. 16

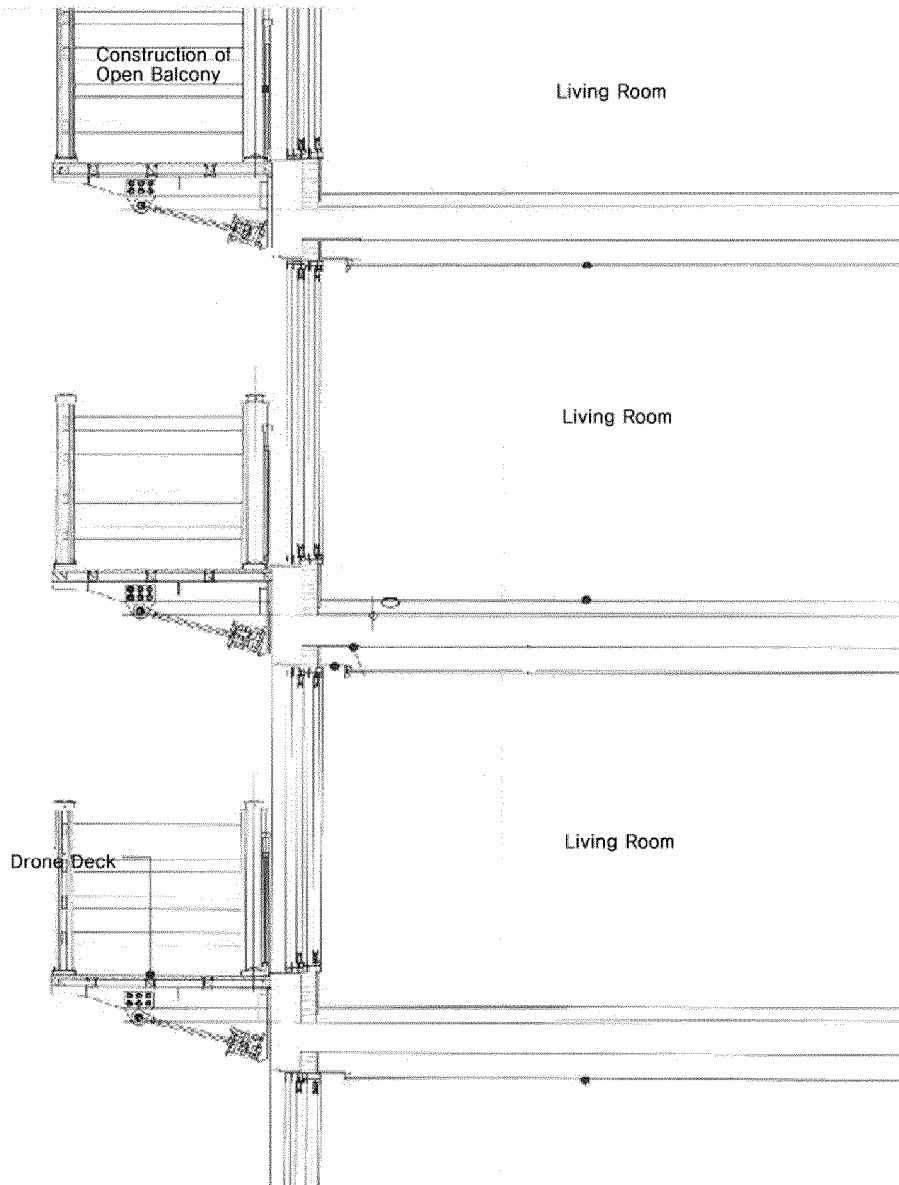
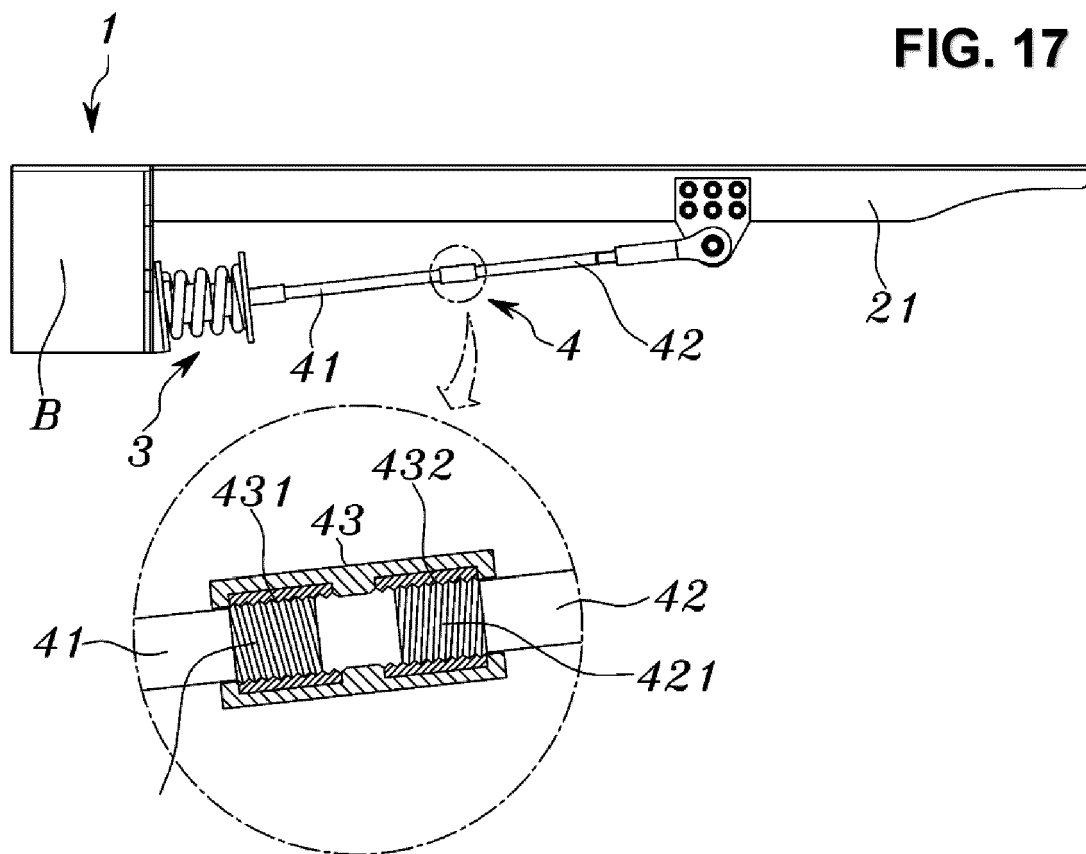


FIG. 17





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			E01D E01C E04B E04G
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 13 April 2021	Examiner Saretta, Guido
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