US 20250375042A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2025/0375042 A1**

Wang et al. (43) **Pub. Date: Dec. 11, 2025**

(54) **FOLDABLE BEDS**

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(21) Appl. No.: **19/227,596**

(22) Filed: **Jun. 4, 2025**

Related U.S. Application Data

(60) Provisional application No. 63/667,347, filed on Jul. 3, 2024.

(30) **Foreign Application Priority Data**

Jun. 7, 2024 (CN) 202421305378.8
Jun. 7, 2024 (CN) 202421310935.5

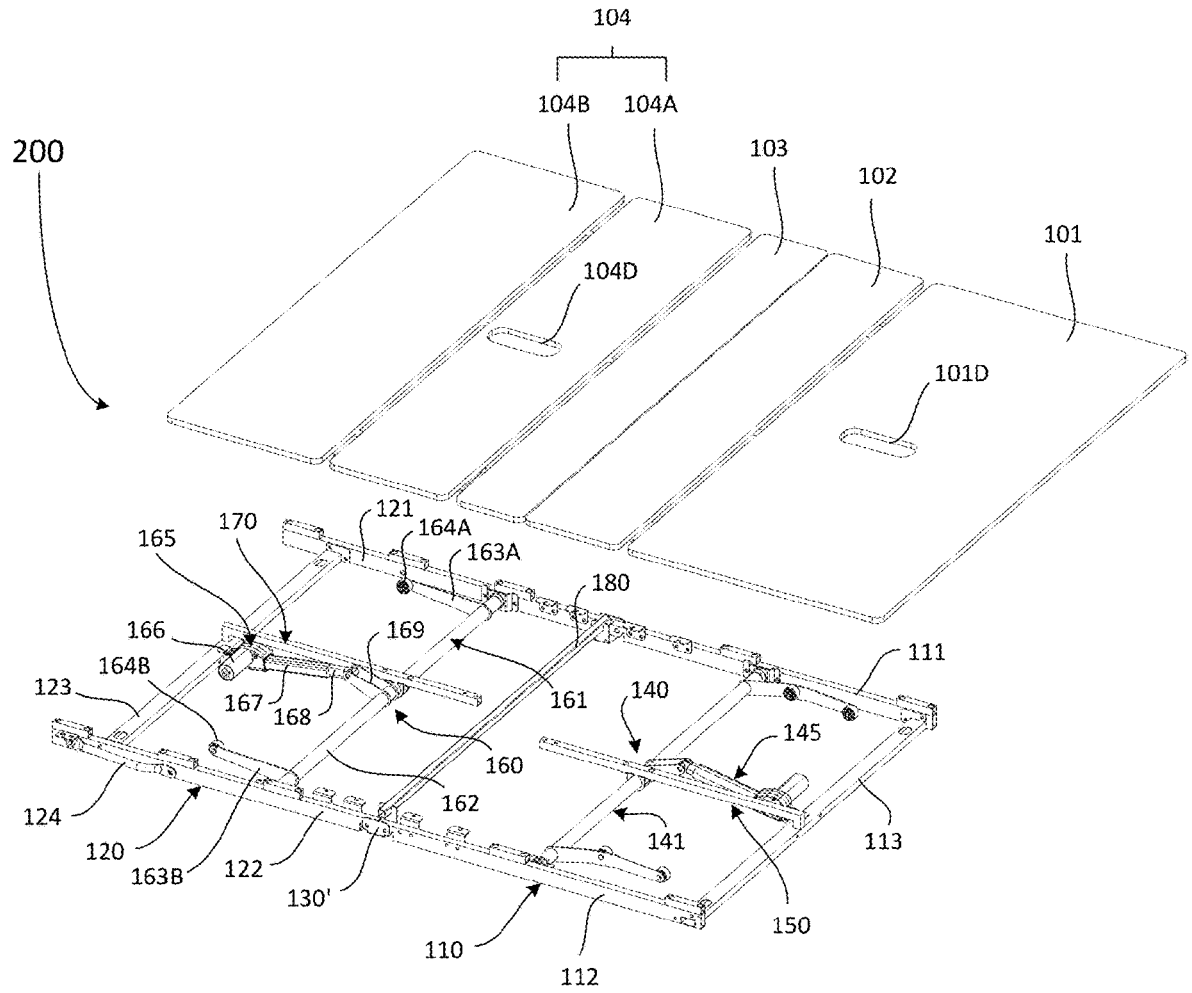
Publication Classification

(51) **Int. Cl.**
A47C 19/12 (2006.01)
A47C 20/04 (2006.01)

(52) **U.S. Cl.**
CPC ***A47C 19/122*** (2013.01); ***A47C 20/041*** (2013.01)

(57) **ABSTRACT**

A foldable bed including first and second support structures pivotally connected to each other; a plurality of bed boards comprising a back board and a first seat board hinged to the back board and fixed on the first support structure; a back lifting assembly comprising a back lifting bracket pivotally connected to the first support structure and abutting against the back board, and a back lifting actuator pivotally connected between the back lifting bracket and the first support structure to drive the back lifting bracket to pivotally move in an upward or downward rotating direction relative to the first support structure, which in turn drives the back board to rotate in a desired position. When the first and second support structures are folded, the plurality of bed boards are folded at the same time, thereby folding the foldable bed in a folded state.



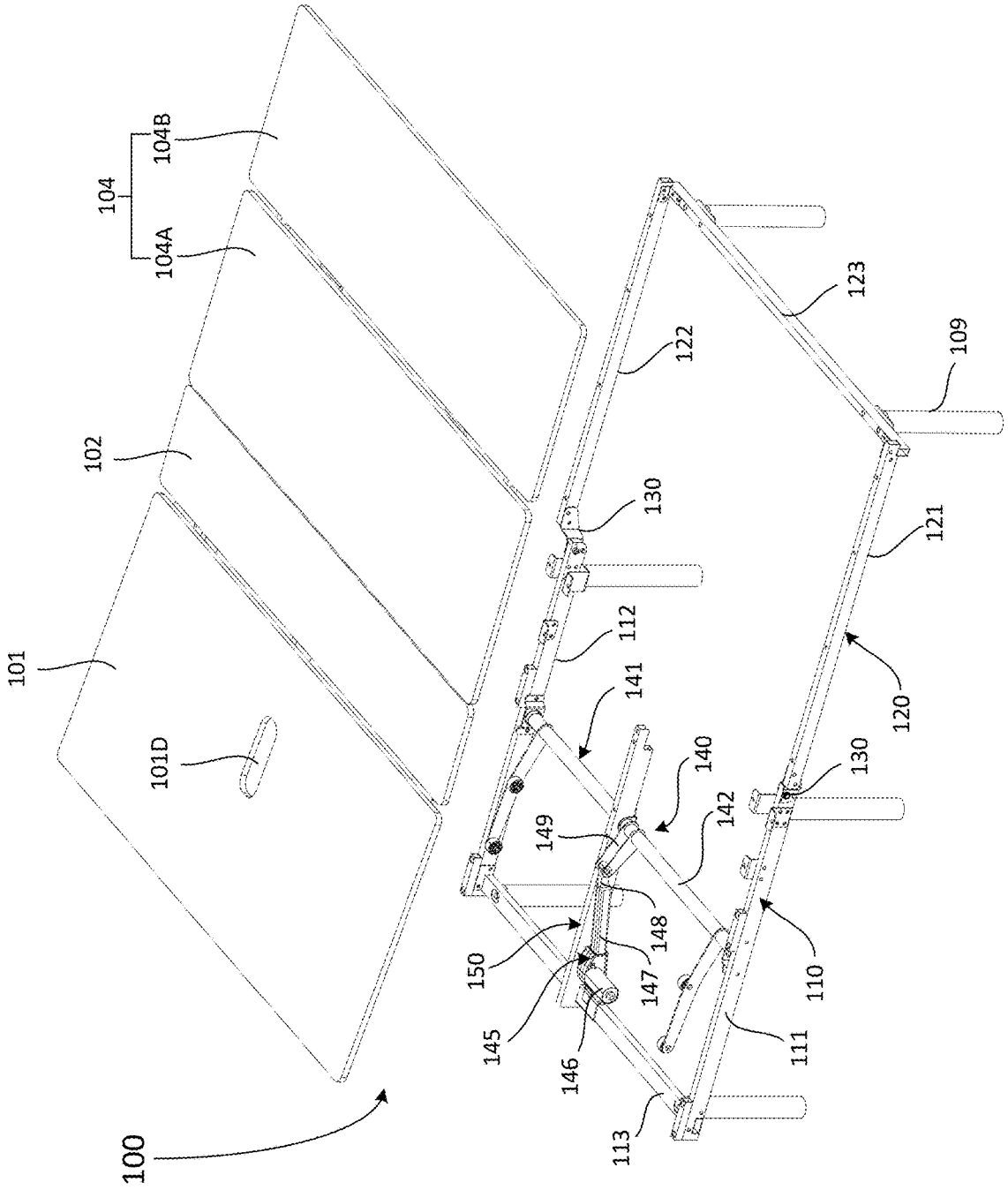

100
101
101D
102
104
104A
104B
109
110
111
112
113
120
121
122
123
130
140
141
142
145
146
147
148
149
150

FIG. 1

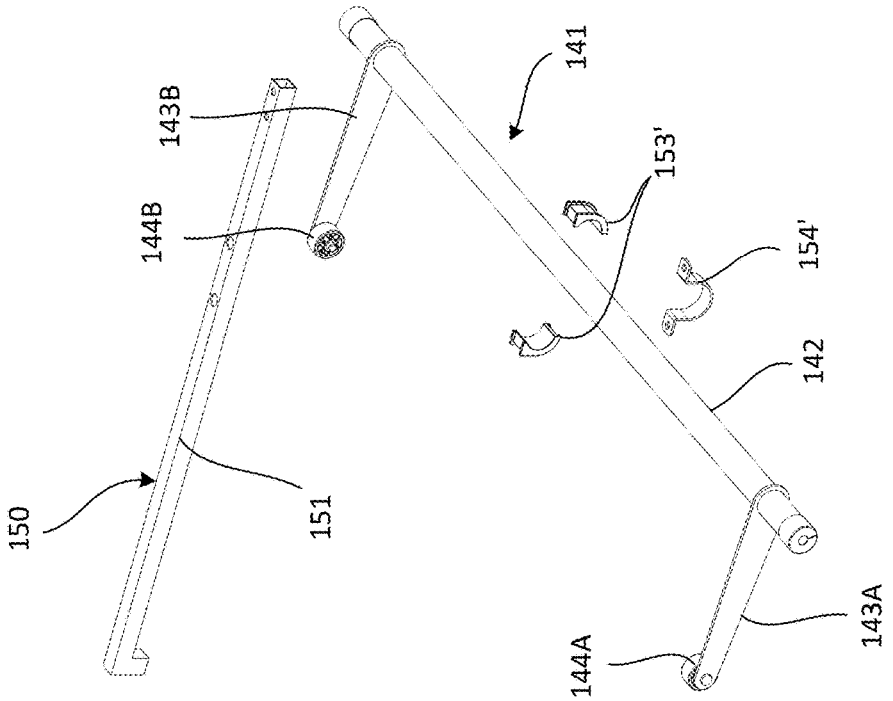

143B
144B
150
151
141
153'
154'
142
144A
143A

FIG. 2B

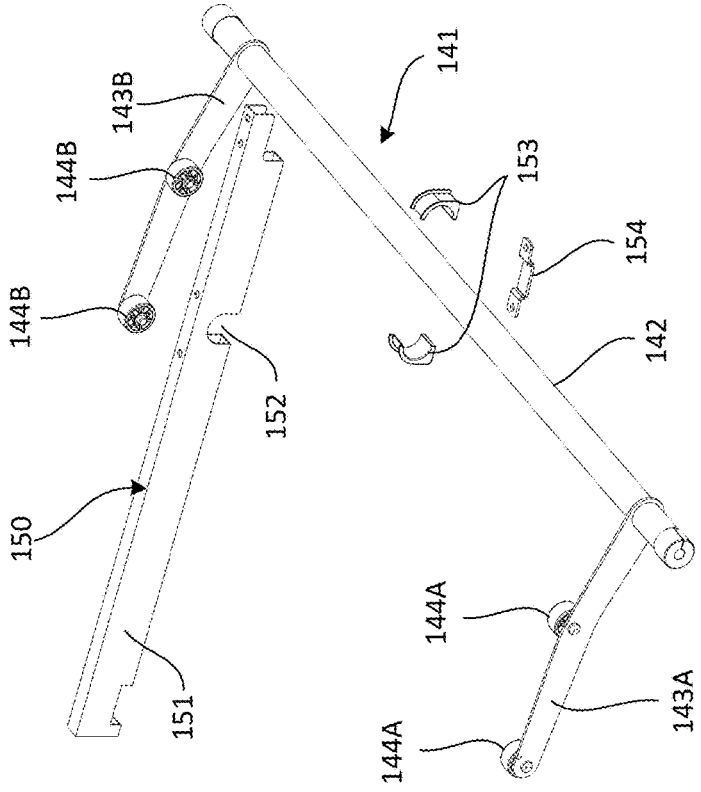

143B
144B
144B
150
151
152
141
153
154
142
144A
144A
143A

FIG. 2A

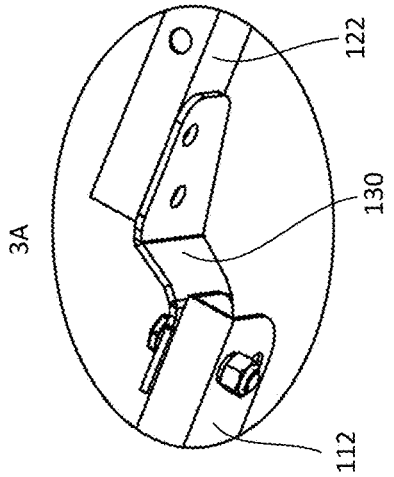

3A
122
130
112

FIG. 3A

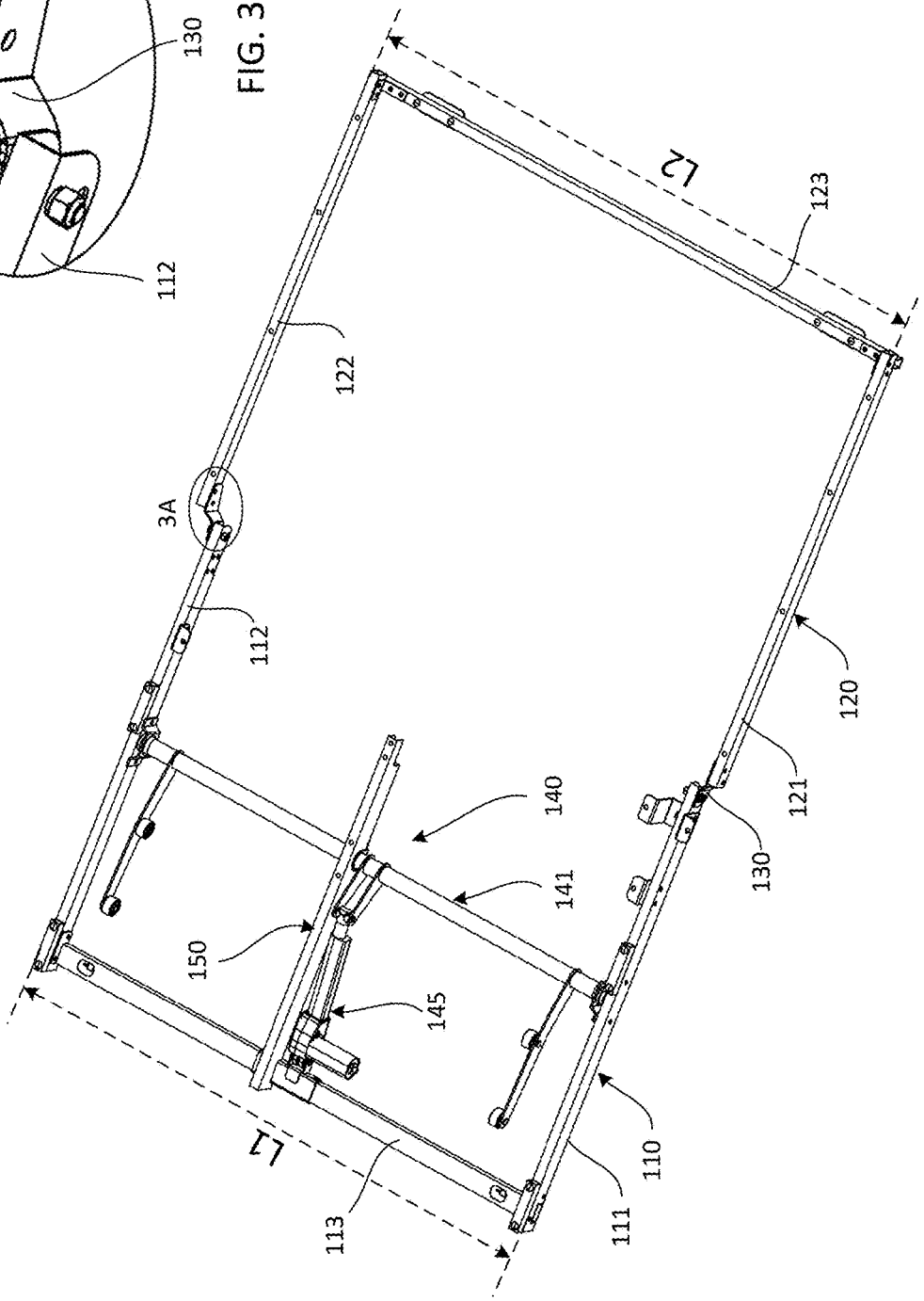

L2
123
122
3A
112
120
121
130
140
141
150
145
L1
110
111
113

FIG. 3

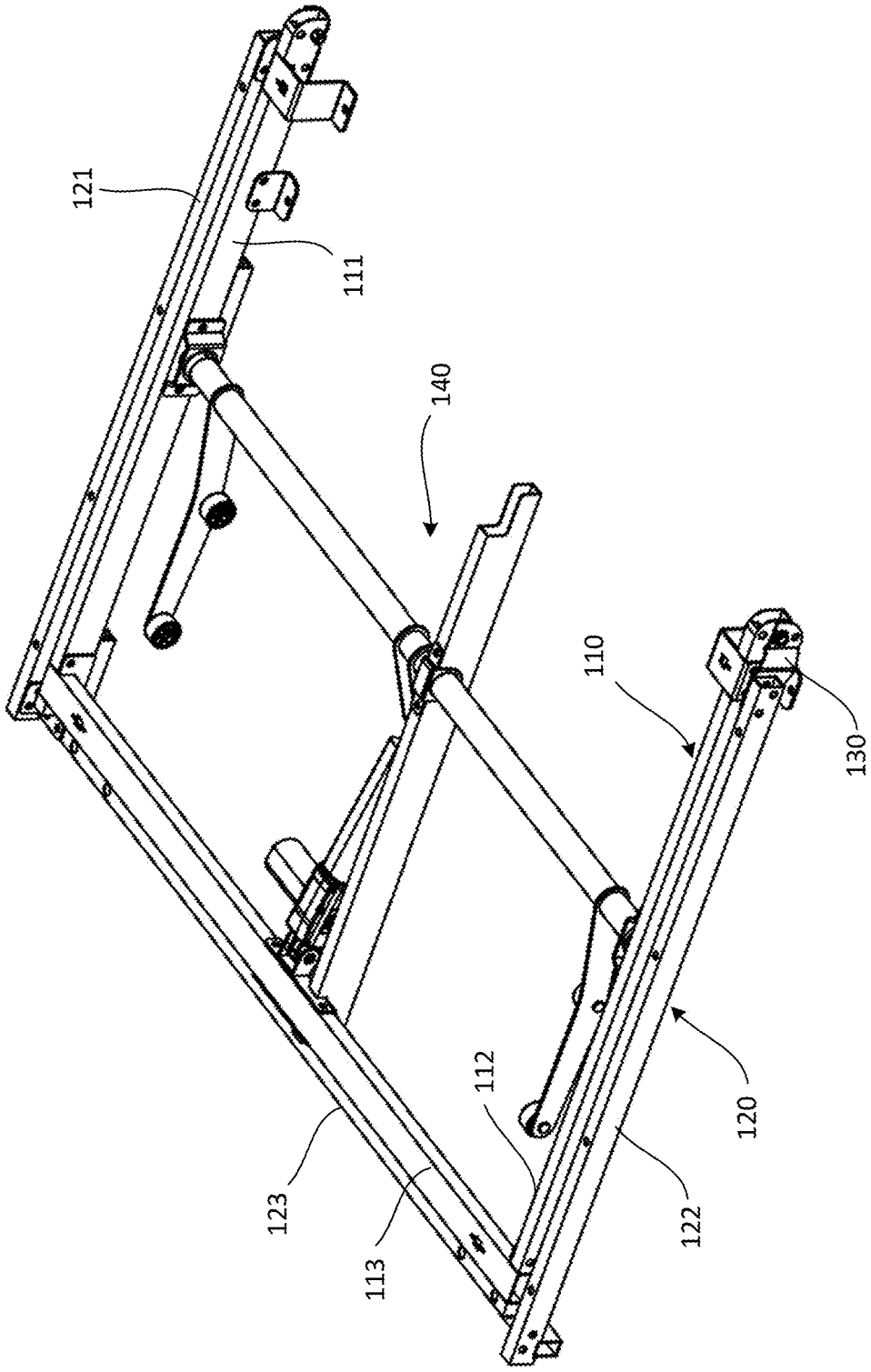


FIG. 4A

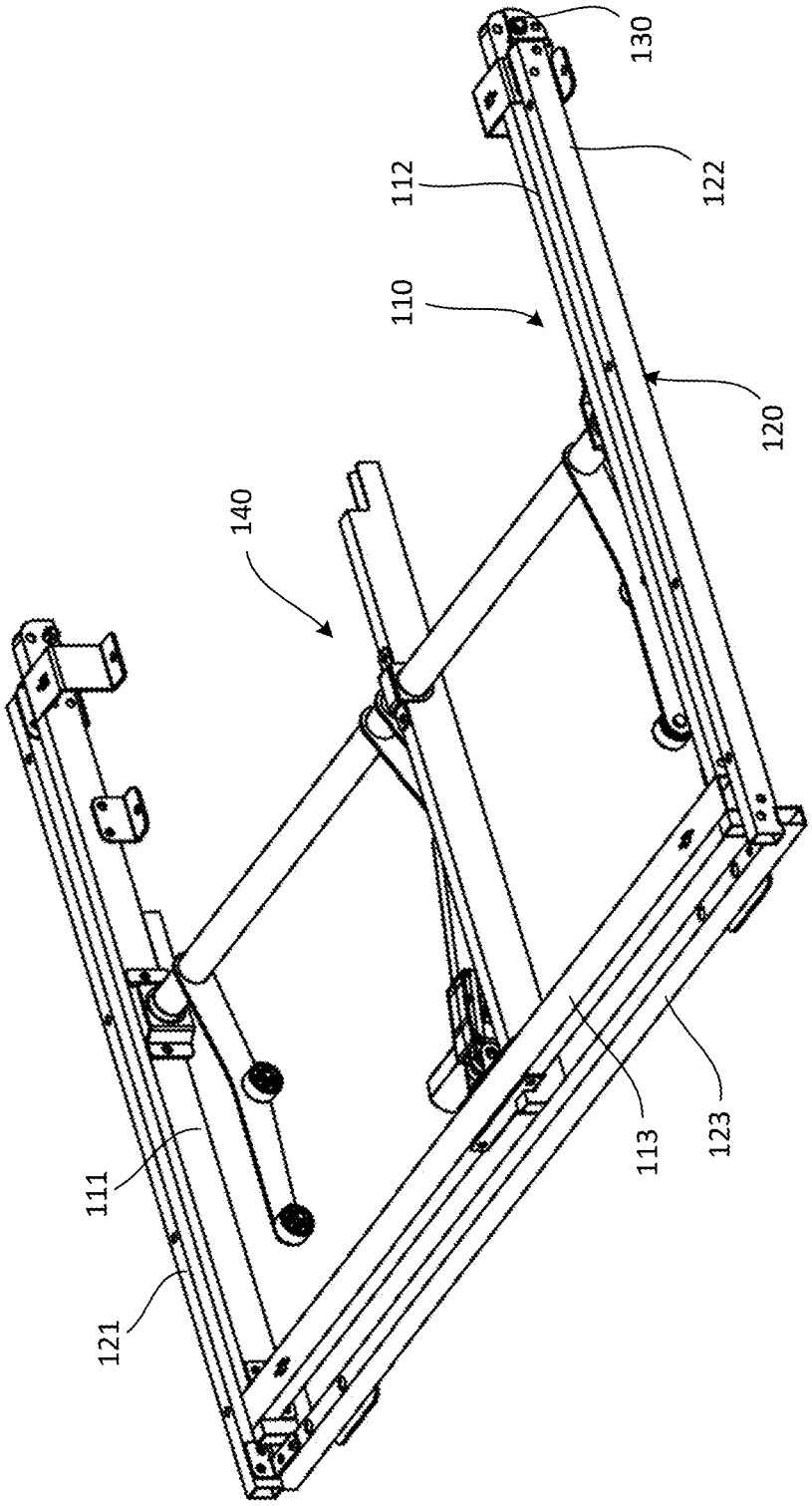


FIG. 4B

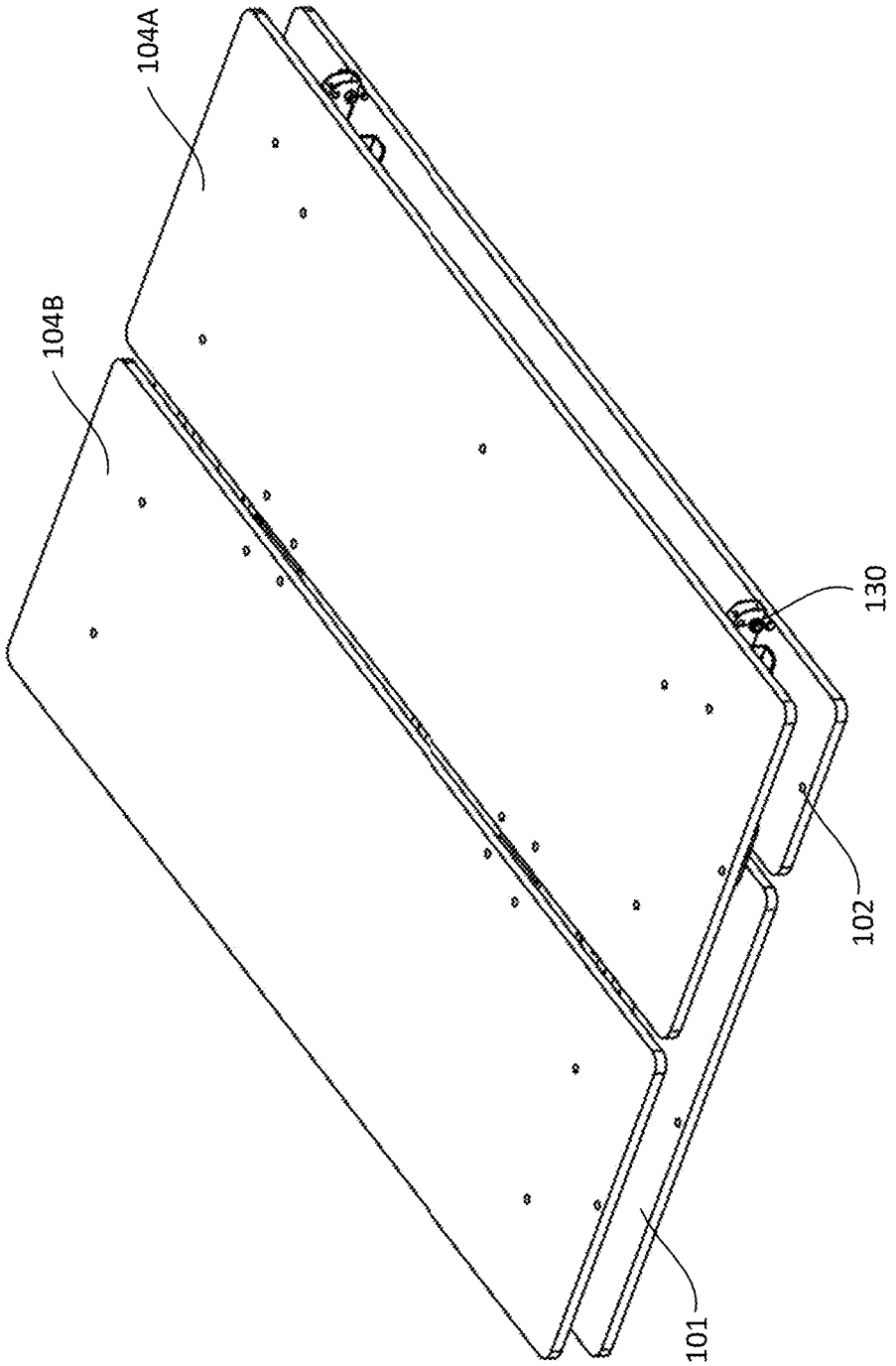


FIG. 5

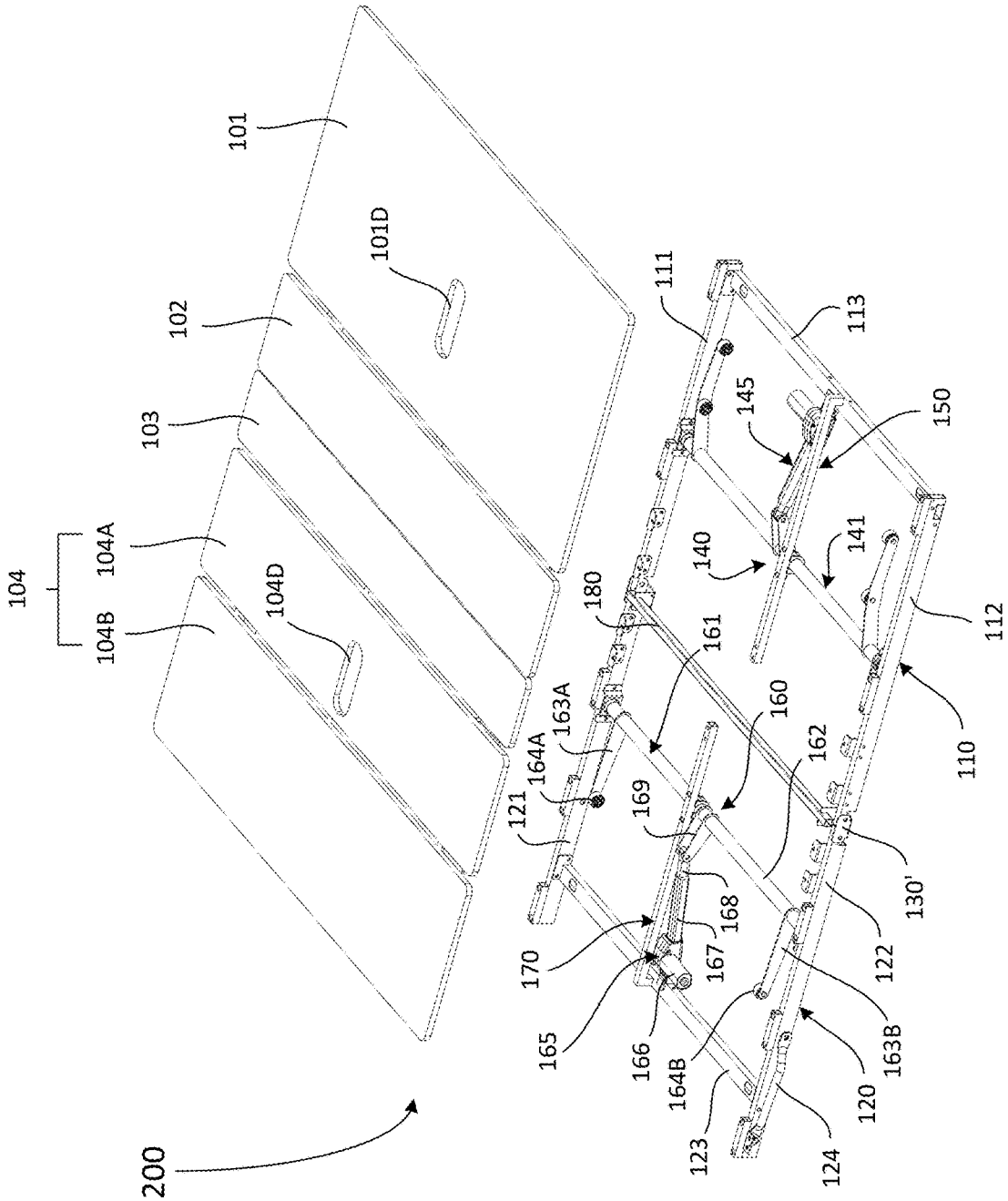

200
101
101D
102
103
104
104A
104B
104D
111
113
145
150
140
141
180
161
112
110
160
162
163A
164A
121
169
130'
168
167
170
165
166
164B
122
163B
120
123
124

FIG. 6

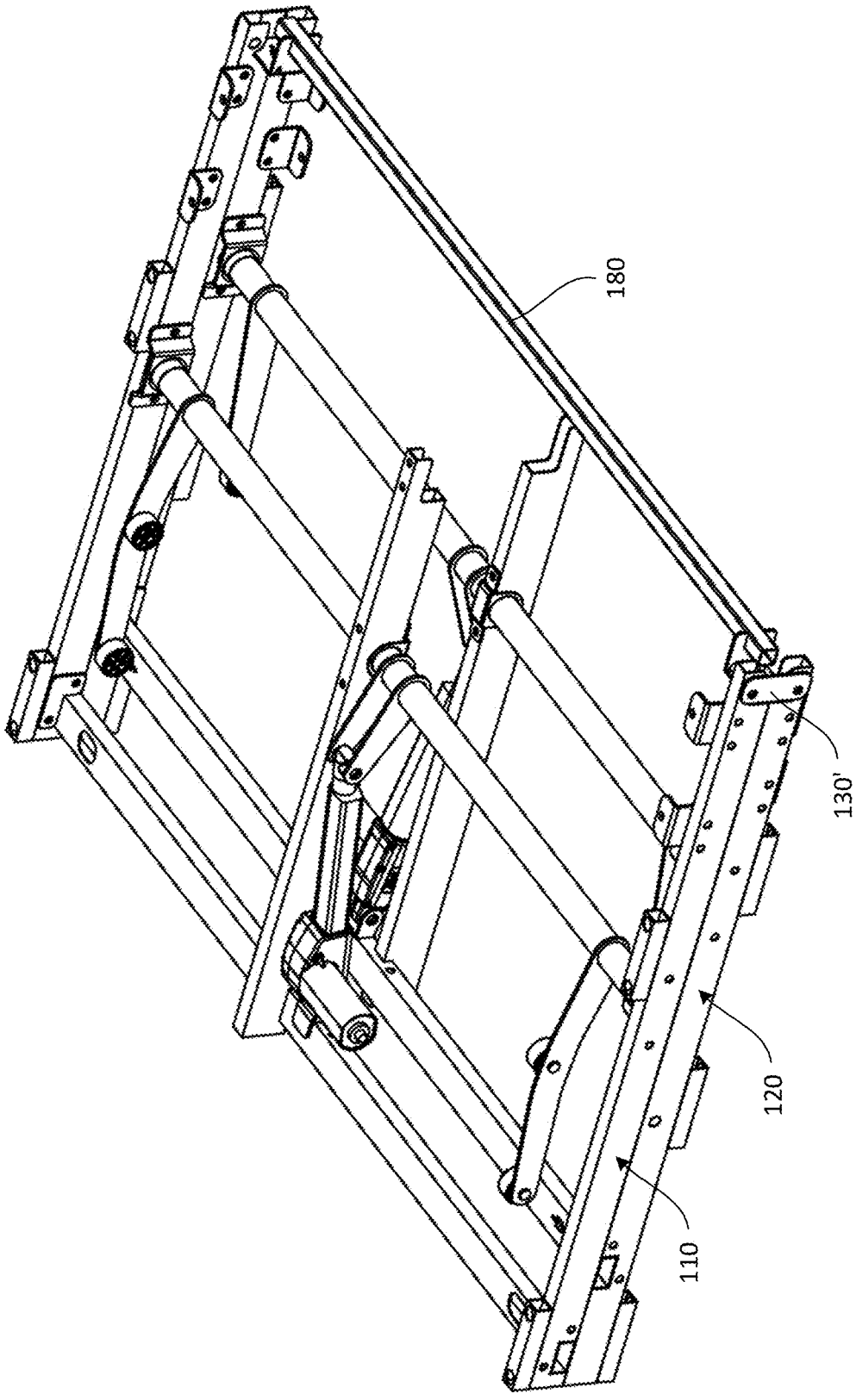


FIG. 7

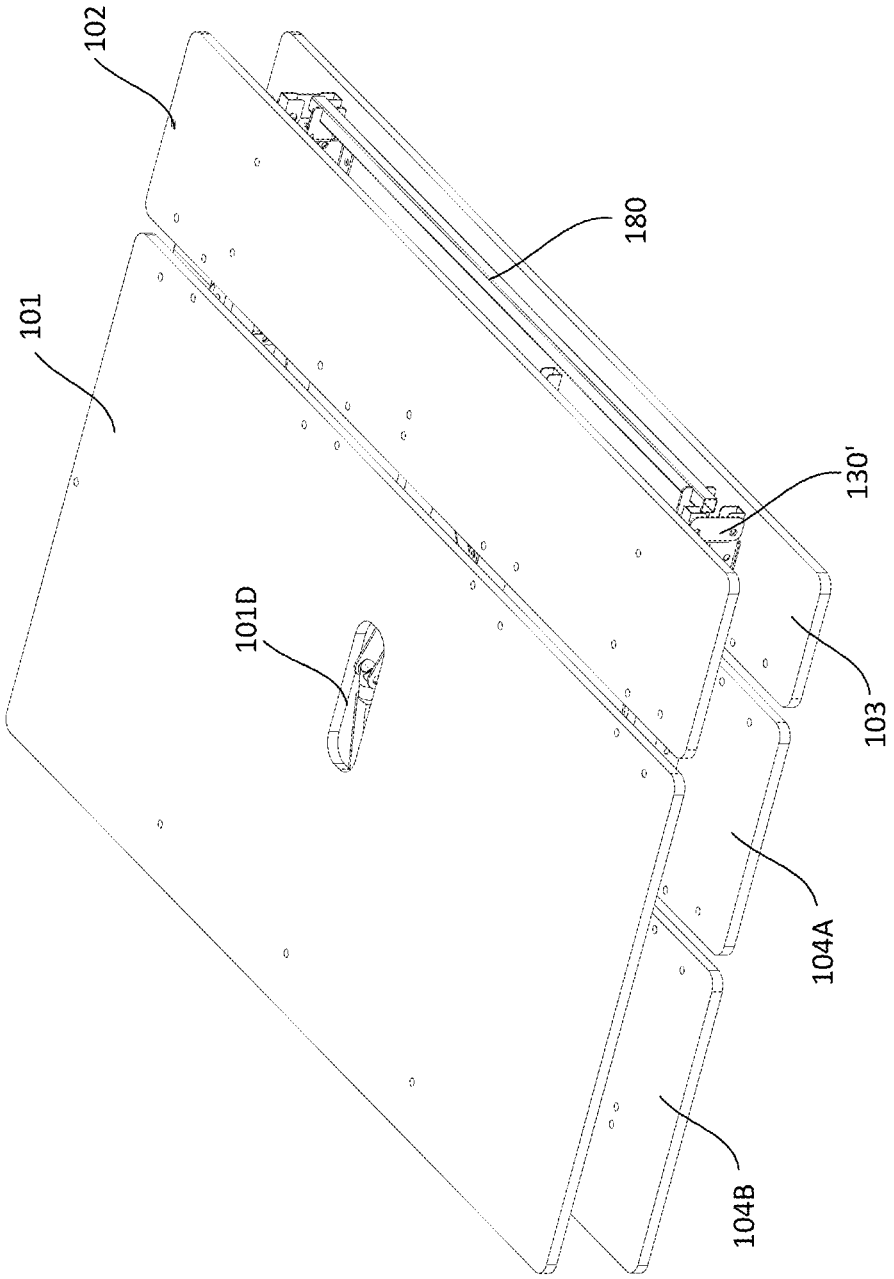


FIG. 8

FOLDABLE BEDS

CROSS-REFERENCE TO RELATED PATENT APPLICATIONS

[0001] This application claims priority to and the benefit of U.S. Provisional Patent Application Ser. Nos. 63/667,347 filed Jul. 3, 2024, which is incorporated herein in its entirety by reference.

[0002] This application claims priority to and benefit of Chinese Patent Application Serial Nos. 202421305378.8 and 202421310935.5, both filed Jun. 7, 2024, which are incorporated herein in their entireties by reference.

FIELD OF THE INVENTION

[0003] The invention generally relates to a bed, and more particular to foldable beds.

BACKGROUND OF THE INVENTION

[0004] Sleep is critical for people in every aspect of their lives. Beds are necessary furniture for people to sleep on. A conventional bed usually occupies a relatively large area of the living space for people and is not convenient to carry. Thus, it is beneficial and desirable for people to have a bed system that is foldable to reduce the space for storage and transportation. In addition, it is also beneficial and desirable that the bed system can adjust body positions based on user's sleep preference so that the user achieves maximum comfort during sleep.

SUMMARY OF THE INVENTION

[0005] In one aspect, this invention relates to a foldable bed comprising a support assembly comprising a first support structure and a second support structure pivotally connected to each other; a plurality of bed boards disposed on the support assembly, comprising a back board and a first seat board hinged at one end to each other, the first seat board being fixed on the first support structure; a back lifting assembly comprising a back lifting bracket pivotally connected to the first support structure and abutting against the back board, and a back lifting actuator pivotally connected between the back lifting bracket and the first support structure. In operation, the back lifting actuator drives the back lifting bracket to pivotally move in an upward rotating direction or a downward rotating direction relative to the first support structure, which in turn drives the back board to flip along the hinged end with the first seat board so as to adjust the back board in desired positions. When the first support structure and the second support structure are folded, the plurality of bed boards are folded at the same time, thereby folding the foldable bed in a folded state.

[0006] In one embodiment, the back board has an opening defined to avoid interference when the back lifting assembly drives the back board to flip.

[0007] In one embodiment, the first support structure comprises a pair of first side rails transversely spaced and longitudinally aligned, an upper rail fixedly connected to the pair of first side rails at their upper ends, and a connecting mechanism comprising a connecting rod having a first end fixed to the upper rail and an opposite, second end fixed to the first seat board, and a connecting structure pivotally connecting the back lifting bracket to the connecting rod.

[0008] In one embodiment, the back lifting bracket comprises a middle bar pivotally mounted to the connecting rod and the pair of first side rails of the first support structure, and a pair of swing arms transversely spaced and longitudinally aligned, and rigidly connected to the middle bar.

[0009] In one embodiment, each of the pair of swing arms is equipped with at least one wheel.

[0010] In one embodiment, the swing arms are in an arc-shaped design.

[0011] In one embodiment, the back lifting actuator comprises a motor member, an outer tube extending from the motor member, and an activation rod having a first end portion received in the outer tube and an opposite, second end portion, wherein the activation rod is engaged with the motor member and configured to be telescopically movable relative to the outer tube according to a direction of motor rotation, wherein the motor member is pivotally connected to the upper rail of the first support structure and the second end portion of the activation rod pivotally connected to the middle bar of the back lifting bracket via a mounting bracket, or wherein the motor member is pivotally connected to the middle bar of the back lifting bracket via the mounting bracket and the second end portion of the activation rod pivotally connected to the upper rail of the first support structure, such that when the activation rod telescopically moves, it drives the middle bar, thereby the pair of swing arms, of the back lifting bracket to rotate accordingly.

[0012] In one embodiment, the connecting structure comprises a clamping member sleeved on the middle bar of the back lifting bracket, and a fixing bracket fixing the clamping member to the connecting rod.

[0013] In one embodiment, the connecting rod has a notch formed between the first and second ends for accommodating the clamping member therein.

[0014] In one embodiment, the second support structure comprises a lower rail and a pair of second side rails transversely spaced and longitudinally aligned, wherein the pair of second side rails has lower ends fixedly connected to two ends of the lower rail and upper ends respectively hinged to lower ends of the pair of first side rails of the first support structure by a pair of hingers.

[0015] In one embodiment, a length of the lower rail of the second support structure is longer than that of the upper rail of the first support structure, wherein each first sider rail is hinged to the inner side of a corresponding second side rail such that when the first support structure and the second support structure are folded, the first support structure is stored inside the second support structure.

[0016] In one embodiment, the plurality of bed boards further comprises a second seat board fixed on the second support structure, and a leg board hinged to the second seat board.

[0017] In one embodiment, the foldable bed further comprises a leg lifting assembly comprising a leg lifting bracket pivotally connected to the second support structure and abutting against the leg board, and a leg lifting actuator pivotally connected between the leg lifting bracket and the second support structure. In operation, the leg lifting actuator drives the leg lifting bracket to pivotally move in an upward rotating direction or a downward rotating direction relative to the second support structure, which in turn drives the leg board to flip along the hinged end with the second seat board so as to adjust the leg board in desired positions.

[0018] In one embodiment, the leg lifting bracket comprises a middle bar pivotally mounted to the pair of second

side rails of the second support structure, and a pair of swing arms transversely spaced and longitudinally aligned, and rigidly connected to the middle bar.

[0019] In one embodiment, each of the pair of swing arms is equipped with at least one wheel.

[0020] In one embodiment, the leg lifting actuator comprises a motor member, an outer tube extending from the motor member, and an activation rod having a first end portion received in the outer tube and an opposite, second end portion, wherein the activation rod is engaged with the motor member and configured to be telescopically movable relative to the outer tube according to a direction of motor rotation, wherein the motor member is pivotally connected to the lower rail of the second support structure and the second end portion of the activation rod pivotally connected to the middle bar of the leg lifting bracket via a mounting bracket, or wherein the motor member is pivotally connected to the middle bar of the leg lifting bracket via the mounting bracket and the second end portion of the activation rod pivotally connected to the lower rail of the second support structure, such that when the activation rod telescopically moves, it drives the middle bar, thereby the pair of swing arms, of the leg lifting bracket to rotate accordingly.

[0021] In one embodiment, the leg board comprises a thigh board and a lower leg board, wherein one end of the thigh board is hinged to the second seat board and the other end of the thigh board is hinged to one end of the lower leg board, and wherein the leg lifting bracket abuts against the thigh board such that the movement of the leg lifting bracket in the upward rotating direction or the downward rotating direction results in the position of the thigh board to be adjusted.

[0022] In one embodiment, the second support structure further comprises at least one support bar having a first end hinged to the pair of the second side rails of the second support structure, and a second end hinged to the lower leg board, such that when the position of the thigh board is adjusted, the position of the lower leg board is adjusted accordingly.

[0023] In one embodiment, the second support structure further comprises a connecting mechanism comprising a connecting rod having a first end fixed to the lower rail and an opposite, second end fixed to the second seat board, and a connecting structure pivotally connecting the leg lifting bracket to the connecting rod.

[0024] These and other aspects of the invention will become apparent from the following description of the preferred embodiment taken in conjunction with the following drawings, although variations and modifications therein may be affected without departing from the spirit and scope of the novel concepts of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] The accompanying drawings illustrate one or more embodiments of the invention and, together with the written description, serve to explain the principles of the invention. Wherever possible, the same reference numbers are used throughout the drawings to refer to the same or like elements of an embodiment.

[0026] FIG. **1** shows an exploded view of a foldable bed in a flat state according to one embodiment of the invention.

[0027] FIG. **2**A shows an exploded view of a back lifting bracket of the foldable bed according to one embodiment of the invention.

[0028] FIG. **2**B shows an exploded view of a back lifting bracket of the foldable bed according to another embodiment of the invention.

[0029] FIG. **3** shows a support assembly and a back lifting assembly of the foldable bed according to one embodiment of the invention.

[0030] FIG. **3**A shows an enlarged view of section **3**A of the foldable bed shown in FIG. **3**.

[0031] FIG. **4**A shows a perspective view of the support assembly and the back lifting assembly of the foldable bed in a folded state according to one embodiment of the invention.

[0032] FIG. **4**B shows another perspective view of the support assembly and the back lifting assembly of the foldable bed in the folded state according to one embodiment of the invention.

[0033] FIG. **5** shows a perspective view of the foldable bed in the folded state according to one embodiment of the invention.

[0034] FIG. **6** shows an exploded view of a foldable bed with bed platforms/boards in a flat state according to another embodiment of the invention.

[0035] FIG. **7** shows a perspective view of a support assembly and a back lifting assembly of the foldable bed in the folded state according to one embodiment of the invention.

[0036] FIG. **8** shows a perspective view of the foldable bed in the folded state according to one embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0037] The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which exemplary embodiments of the present invention are shown. The present invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this invention will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like reference numerals refer to like elements throughout.

[0038] The terms used in this specification generally have their ordinary meanings in the art, within the context of the invention, and in the specific context where each term is used. Certain terms that are used to describe the invention are discussed below, or elsewhere in the specification, to provide additional guidance to the practitioner regarding the description of the invention. For convenience, certain terms may be highlighted, for example using italics and/or quotation marks. The use of highlighting and/or capital letters has no influence on the scope and meaning of a term; the scope and meaning of a term are the same, in the same context, whether or not it is highlighted and/or in capital letters. It will be appreciated that the same thing can be said in more than one way. Consequently, alternative language and synonyms may be used for any one or more of the terms discussed herein, nor is any special significance to be placed upon whether or not a term is elaborated or discussed herein. Synonyms for certain terms are provided. A recital of one or more synonyms does not exclude the use of other synonyms.

The use of examples anywhere in this specification, including examples of any terms discussed herein, is illustrative only and in no way limits the scope and meaning of the invention or of any exemplified term. Likewise, the invention is not limited to various embodiments given in this specification.

[0039] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used herein, the singular forms "a," "an," and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise.

[0040] It will be understood that when an element is referred to as being "on," "attached" to, "connected" to, "coupled" with, "contacting," etc., another element, it can be directly on, attached to, connected to, coupled with or contacting the other element or intervening elements may also be present. In contrast, when an element is referred to as being, for example, "directly on," "directly attached" to, "directly connected" to, "directly coupled" with or "directly contacting" another element, there are no intervening elements present. It will also be appreciated by those of skill in the art that references to a structure or feature that is disposed "adjacent" to another feature may have portions that overlap or underlie the adjacent feature.

[0041] It will be understood that, although the terms first, second, third, etc. may be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers and/or sections should not be limited by these terms. These terms are only used to distinguish one element, component, region, layer or section from another element, component, region, layer or section. Thus, a first element, component, region, layer or section discussed below can be termed a second element, component, region, layer or section without departing from the teachings of the present invention.

[0042] Furthermore, relative terms, such as "lower" or "bottom" and "upper" or "top," may be used herein to describe one element's relationship to another element as illustrated in the figures. It will be understood that relative terms are intended to encompass different orientations of the device in addition to the orientation shown in the figures. For example, if the device in one of the figures is turned over, elements described as being on the "lower" side of other elements would then be oriented on the "upper" sides of the other elements. The exemplary term "lower" can, therefore, encompass both an orientation of lower and upper, depending on the particular orientation of the figure. Similarly, if the device in one of the figures is turned over, elements described as "below" or "beneath" other elements would then be oriented "above" the other elements. The exemplary terms "below" or "beneath" can, therefore, encompass both an orientation of above and below.

[0043] It will be further understood that the terms "comprise(s)" and/or "comprising," or "include(s)" and/or "including" or "has (have)" and/or "having" or "contain(s)" and/or "containing" when used in this specification specify the presence of stated features, regions, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, regions, integers, steps, operations, elements, components, and/or groups thereof.

[0044] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which the present invention belongs. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and the present invention, and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

[0045] As used herein, "around," "about," "substantially" or "approximately" shall generally mean within 20 percent, preferably within 10 percent, and more preferably within 5 percent of a given value or range. Numerical quantities given herein are approximate, meaning that the terms "around," "about," "substantially" or "approximately" can be inferred if not expressly stated.

[0046] As used in this specification, the term "board" or "platform" refers to a bed board or a bed panel.

[0047] As used in this specification, the phrase "at least one of A, B, and C" should be construed to mean a logical (A or B or C), using a non-exclusive logical OR. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.

[0048] The description below is merely illustrative in nature and is in no way intended to limit the invention, its application, or uses. The broad teachings of the invention can be implemented in a variety of forms. Therefore, while this invention includes particular examples, the true scope of the invention should not be so limited since other modifications will become apparent upon a study of the drawings, the specification, and the following claims. For purposes of clarity, the same reference numbers will be used in the drawings to identify similar elements. It should be understood that one or more steps within a method may be executed in different order (or concurrently) without altering the principles of the invention.

[0049] The description will be made as to the embodiments of the invention in conjunction with the accompanying drawings in FIGS. **1**-**8**. In accordance with the purposes of this invention, as embodied and broadly described herein, this invention, in one aspect, relates to a foldable beds.

[0050] Referring to FIGS. **1**-**5**, the foldable bed **100** is also adjustable and includes a support assembly having a first support structure **110** and a second support structure **120** pivotally connected to each other via a pair of hingers **130**, a plurality of bed boards (platforms) disposed on the support assembly, and a driving assembly disposed between the support assembly and the plurality of bed boards for operably adjusting positions/postures of at least one of the plurality of bed boards. As such, when the first support structure **110** and the second support structure **120** are folded, the plurality of bed boards are folded at the same time, thereby folding the foldable bed in a folded state, as shown in FIGS. **4**A-**4**B and **5**.

[0051] In one embodiment, the plurality of bed boards includes a back board **101**, a first seat board **102** hinged at one end to the back board **101** and fixed on the first support structure **110**, and a leg board **104** arranged on the second support structure **120**, as shown in FIG. **1**. In one embodiment, the back board **101** has an opening **101**D defined therein to avoid interference when the back lifting assembly **140** drives the back board **101** to flip.

[0052] In one embodiment, as shown in FIGS. **1**, **3** and **4**A-**4**B, the first support structure **110** comprises a pair of first side rails **111** and **112** transversely spaced and longitudinally aligned, an upper rail **113** fixedly connected to the

pair of first side rails **111** and **112** at their upper ends, and a connecting mechanism **150** comprising a connecting rod **151** having a first end fixed to the upper rail **113** and an opposite, second end fixed to the first seat board **102**, and a connecting structure pivotally connecting the back lifting bracket **141** to the connecting rod **151**. The fixed connections between the first side rails **111** and **112** and the upper rail **113** can be achieved by any fixed connection means such as welding means, molding means, screwing means, mating connections, or the likes.

[0053] As shown in FIGS. **2**A and **2**B, the connecting structure comprises a clamping member **153**/**153'** sleeved on the middle bar **142** of the back lifting bracket **141**, and a fixing bracket **154**/**154'** fixing the clamping member **153** to the connecting rod **151**, by, for example, screwing the fixing bracket **154**/**154'** to the connecting rod **151**. In one embodiment, the connecting rod **151** has a notch **152** formed between the first and second ends for accommodating the clamping member **153** therein, as shown in FIG. **2**A. It should be noted that the clamping member **153**/**153'** can be any types of clamps as long as it can hold the middle bar **142** and the middle bar **142** is rotatable therein, and the fixing bracket **154**/**154'** can be any types of fixing brackets to fix the clamping member **153** to the connecting rod **151**.

[0054] Accordingly, the use of the connecting mechanism **150** to connect the first support structure **110**, the first seat board **102** and the back lifting assembly **140** together makes the structural connection of the foldable bed **100** tighter, and the back lifting actuator **145** drive the back lifting bracket **141** to rotate more smoothly.

[0055] In one embodiment, as shown in FIGS. **1**, **3** and **4**A-**4**B, the second support structure **120** comprises a lower rail **123** and a pair of second side rails **121** and **122** transversely spaced and longitudinally aligned. The pair of second side rails **121** and **122** has lower ends fixedly connected to two ends of the lower rail **123** and upper ends respectively hinged to lower ends of the pair of first side rails **111** and **112** of the first support structure **110** by the hingers **130**. Similarly, the fixed connections between the second side rails **121** and **122** and the lower rail **123** can be achieved by any fixed connection means such as welding means, molding means, screwing means, mating connections, or the likes.

[0056] In one embodiment, as shown in FIG. **3**, a length, L**2**, of the lower rail **123** of the second support structure **120** is longer than the length, L**1**, of the upper rail **113** of the first support structure **110**. Each first sider rail **111**/**112** is hinged to the inner side of a corresponding second side rail **121**/**122**, as shown in FIGS. **3** and **3**A, such that when the first support structure **110** and the second support structure **120** are folded, the first support structure **11** is stored inside the second support structure **120**, as shown in FIGS. **4**A-**4**B, thereby reducing the size (e.g., thickness) of the foldable bed in a folded state.

[0057] In addition, the foldable bed may include a plurality of support legs **109** removably mounted under the support assembly.

[0058] In the exemplary embodiment shown in FIGS. **1**, **3** and **4**A-**4**B, the driving assembly includes a back lifting assembly **140** comprising a back lifting bracket **141** pivotally connected to the first support structure **110** and abutting against the back board **101**, and a back lifting actuator **145** pivotally connected between the back lifting bracket **141** and the first support structure **110**. As such, in operation, the back lifting actuator **145** drives the back lifting bracket **141** to pivotally move in an upward rotating direction or a downward rotating direction relative to the first support structure **110**, which in turn drives the back board **101** to flip along the hinged end with the first seat board **102** so as to adjust the back board **101** in desired positions.

[0059] In one embodiment, as shown in FIGS. **1** and **2**A-**2**B, the back lifting bracket **141** comprises a middle bar **142** pivotally mounted to the connecting rod **151** and the pair of first side rails **111** and **112** of the first support structure **110**, and a pair of swing arms **143**A and **143**B transversely spaced and longitudinally aligned, and rigidly connected to the middle bar **142**. In one embodiment, the swing arms **143**A and **143**B are in an arc-shaped design. In one embodiment, each of the pair of swing arms **143**A and **143**B is equipped with one wheel **144**A/**144**B, as shown in FIG. **2**B, or two wheels **144**A/**144**B, as shown in FIG. **2**A, to ensure the back board **101** to flip more smoothly, thereby reducing friction and wearing thereof.

[0060] In one embodiment, as shown in FIG. **1**, the back lifting actuator **145** comprises a motor member **146**, an outer tube **147** extending from the motor member **146**, and an activation rod **148** having a first end portion received in the outer tube **147** and an opposite, second end portion, wherein the activation rod **148** is engaged with the motor member **146** and configured to be telescopically movable relative to the outer tube **147** according to a direction of motor rotation. In one embodiment, the motor member **146** is pivotally connected to the upper rail **113** of the first support structure **110** and the second end portion of the activation rod **148** pivotally connected to the middle bar **142** of the back lifting bracket **141** via a mounting bracket **149**, as shown in FIG. **1**. In the exemplary embodiment, the mounting bracket **149** is fixed to the middle bar **142**, and the second end portion of the activation rod **148** is pivotally connected to the mounting bracket **149**. Alternatively, the motor member **146** is pivotally connected to the middle bar **142** of the back lifting bracket **141** via the mounting bracket **149** and the second end portion of the activation rod **148** pivotally connected to the upper rail **113** of the first support structure **110** (not shown). In the exemplary embodiment, the mounting bracket **149** is fixed to the middle bar **142**, and the motor member **146** is pivotally connected to the mounting bracket **149**.

[0061] As such, when the activation rod **148** telescopically moves (i.e., extended/expended or collapsed/contracted), it drives the middle bar **142**, thereby the pair of swing arms **143**A and **143**B, of the back lifting bracket **141** to rotate accordingly. The rotation of the pair of swing arms **143**A and **143**B results in the back board **101** to rotate along the hinged end with the first seat board **102**, thereby adjusting the position/posture (i.e., angle) of the back board **101** at user's preference, so as to achieve maximum comfort for users during sleep. For example, when the back board **101** is adjusted in a horizontal posture, it is more suitable for users to lie down and sleep, and when in a tilted posture at a certain angle, it is more suitable for users to lie down and read.

[0062] Further, the use of the connecting mechanism **150** to connect the support structure **110**, the seat board **102** and the lifting assembly **140** together makes the structural connection of the foldable bed tighter, and the lifting actuator

145 drive the lifting bracket 141 to rotate more smoothly, thereby improving the overall stability and durability of the foldable bed.

[0063] Moreover, when the first support structure 110 and the second support structure 120 are folded, the plurality of bed boards are folded at the same time, thereby folding the foldable bed in a folded state, as shown in FIGS. 4A-4B and 5, which reduces the space for storage and transportation. In addition, when folded, the first support structure 11 is stored inside the second support structure 120, as shown in FIGS. 4A-4B, thereby further reducing the space (thickness) of the foldable bed in the folded state.

[0064] Referring to FIGS. 6-8, the foldable bed 200 is shown according to another embodiment of the invention. Similar to the foldable bed 100 disclosed above, the foldable bed 200 is also adjustable and includes the support assembly having the first support structure 110 and the second support structure 120 pivotally connected to each other via a pair of hingers 130', the back board 101 and the first seat board 102 hinged to the back board 101 and fixed on the first support structure 110, and the back lifting assembly 140 disposed between the first support structure 110 and the back board 101 for operably adjusting the position/posture of the back board 101 at the preference of the user. As such, when the first support structure 110 and the second support structure 120 are folded, the plurality of bed boards are folded at the same time, thereby folding the foldable bed in the folded state, as shown in FIGS. 7 and 8.

[0065] In addition, the foldable bed 200 further comprises a leg lifting assembly 160 comprising a leg lifting bracket 161 pivotally connected to the second support structure 120 and abutting against the leg board 104, and a leg lifting actuator 165 pivotally connected between the leg lifting bracket 161 and the second support structure 120. In operation, the leg lifting actuator 165 drives the leg lifting bracket 161 to pivotally move in an upward rotating direction or a downward rotating direction relative to the second support structure 120, which in turn drives the leg board 104 to flip along the hinged end with the second seat board 103 so as to adjust the leg board 104 in desired positions.

[0066] The plurality of bed boards further comprises a second seat board 103 fixed on the second support structure 120, and a leg board 104 hinged to the second seat board 103. The leg board 104 includes a thigh board 104A and a lower leg board 104B, wherein one end of the thigh board 104A is hinged to the second seat board 103 and the other end of the thigh board 104A is hinged to one end of the lower leg board 104B. The leg lifting bracket 161 abuts against the thigh board 104A such that the movement of the leg lifting bracket 161 in the upward rotating direction or the downward rotating direction results in the position/posture of the thigh board 104A to be adjusted. In one embodiment, the thigh board 104A has an opening 104D defined therein to avoid interference when the leg lifting assembly 160 drives the thigh board 104A to flip.

[0067] In one embodiment, the leg lifting bracket 161 comprises a middle bar 162 pivotally mounted to the pair of second side rails 121 and 122 of the second support structure 120, and a pair of swing arms 163A and 163B transversely spaced and longitudinally aligned, and rigidly connected to the middle bar 162. In one embodiment, each of the pair of swing arms 163A and 163B is equipped with at least one wheel 164A/164B.

[0068] In one embodiment, the leg lifting actuator 165 comprises a motor member 166, an outer tube 167 extending from the motor member 166, and an activation rod 168 having a first end portion received in the outer tube 167 and an opposite, second end portion, wherein the activation rod 168 is engaged with the motor member 166 and configured to be telescopically movable relative to the outer tube 167 according to a direction of motor rotation, wherein the motor member 166 is pivotally connected to the lower rail 123 of the second support structure 120 and the second end portion of the activation rod 168 pivotally connected to the middle bar 162 of the leg lifting bracket 161 via a mounting bracket 169, as shown in FIG. 6. In the exemplary embodiment, the mounting bracket 169 is fixed to the middle bar 162, and the second end portion of the activation rod 168 is pivotally connected to the mounting bracket 169. Alternatively, the motor member 166 is pivotally connected to the middle bar 162 of the leg lifting bracket 161 via the mounting bracket 169 and the second end portion of the activation rod 168 pivotally connected to the lower rail 123 of the second support structure 120 (not shown). In the exemplary embodiment, the mounting bracket 169 is fixed to the middle bar 162, and the motor member 166 is pivotally connected to the mounting bracket 169.

[0069] As such, when the activation rod 168 telescopically moves (i.e., extended/expended or collapsed/contracted), it drives the middle bar 162, thereby the pair of swing arms 163A and 163B, of the leg lifting bracket 161 to rotate accordingly. The rotation of the pair of swing arms 163A and 163B results in the thigh board 104A to rotate along the hinged end with the second seat board 103, thereby adjusting the position/posture (i.e., angle) of the thigh board 104A at user's preference, so as to achieve maximum comfort for users.

[0070] In one embodiment, the second support structure 120 further comprises at least one support bar 124 having a first end hinged to the pair of the second side rails 121 and 122 of the second support structure 120, and a second end hinged to the lower leg board 104B, such that when the position of the thigh board 104A is adjusted, the position of the lower leg board 104B is adjusted accordingly.

[0071] In one embodiment, the second support structure 120 also comprises a connecting mechanism 170 comprising a connecting rod 171 having a first end fixed to the lower rail 123 and an opposite, second end fixed to the second seat board 103, and a connecting structure pivotally connecting the leg lifting bracket 161 to the connecting rod 171. Similar to the connecting mechanism 150 disclosed above, the connecting mechanism 170 is adapted to connect the second support structure 120, the second seat board 103 and the leg lifting bracket 161 together so as to make the structural connection of the foldable bed tighter, and the leg lifting actuator 165 drive the leg lifting bracket 161 to rotate more smoothly, thereby improving the overall stability and durability of the foldable bed.

[0072] In sum, the invention provides a bed system that is capable of adjusting body positions based on user's sleep preference so that the user achieves maximum comfort, and also is foldable so as to reduce the space for storage and transportation.

[0073] The foregoing description of the exemplary embodiments of the invention has been presented only for the purposes of illustration and description and is not intended to be exhaustive or to limit the invention to the

precise forms disclosed. Many modifications and variations are possible in light of the above teaching.

[0074] The embodiments were chosen and described in order to explain the principles of the invention and their practical application so as to enable others skilled in the art to utilize the invention and various embodiments and with various modifications as are suited to the particular use contemplated. Alternative embodiments will become apparent to those skilled in the art to which the invention pertains without departing from its spirit and scope. Accordingly, the scope of the invention is defined by the appended claims rather than the foregoing description and the **10** exemplary embodiments described therein.

What is claimed is:

1. A foldable bed, comprising:

a support assembly comprising a first support structure and a second support structure pivotally connected to each other;

a plurality of bed boards disposed on the support assembly, comprising a back board and a first seat board hinged to the back board and fixed on the first support structure;

a back lifting assembly comprising a back lifting bracket pivotally connected to the first support structure and abutting against the back board, and a back lifting actuator pivotally connected between the back lifting bracket and the first support structure,

wherein in operation, the back lifting actuator drives the back lifting bracket to pivotally move in an upward rotating direction or a downward rotating direction relative to the first support structure, which in turn drives the back board to flip along the hinged end with the first seat board so as to adjust the back board in desired positions; and

wherein when the first support structure and the second support structure are folded, the plurality of bed boards are folded at the same time, thereby folding the foldable bed in a folded state.

2. The foldable bed of claim **1**, wherein the first support structure comprises a pair of first side rails transversely spaced and longitudinally aligned, an upper rail fixedly connected to the pair of first side rails at their upper ends, and a connecting mechanism comprising a connecting rod having a first end fixed to the upper rail and an opposite, second end fixed to the first seat board, and a connecting structure pivotally connecting the back lifting bracket to the connecting rod.

3. The foldable bed of claim **2**, wherein the back lifting bracket comprises a middle bar pivotally mounted to the connecting rod and the pair of first side rails of the first support structure, and a pair of swing arms transversely spaced and longitudinally aligned, and rigidly connected to the middle bar.

4. The foldable bed of claim **3**, wherein each of the pair of swing arms is equipped with at least one wheel.

5. The foldable bed of claim **3**, wherein the swing arms are in an arc-shaped design.

6. The foldable bed of claim **3**, wherein the back lifting actuator comprises a motor member, an outer tube extending from the motor member, and an activation rod having a first end portion received in the outer tube and an opposite, second end portion, wherein the activation rod is engaged with the motor member and configured to be telescopically movable relative to the outer tube according to a direction of motor rotation, wherein the motor member is pivotally connected to the upper rail of the first support structure and the second end portion of the activation rod pivotally connected to the middle bar of the back lifting bracket via a mounting bracket, or wherein the motor member is pivotally connected to the middle bar of the back lifting bracket via the mounting bracket and the second end portion of the activation rod pivotally connected to the upper rail of the first support structure, such that when the activation rod telescopically moves, it drives the middle bar, thereby the pair of swing arms, of the back lifting bracket to rotate accordingly.

7. The foldable bed of claim **3**, wherein the connecting structure comprises a clamping member sleeved on the middle bar of the back lifting bracket, and a fixing bracket fixing the clamping member to the connecting rod.

8. The foldable bed of claim **7**, wherein the connecting rod has a notch formed between the first and second ends for accommodating the clamping member therein.

9. The foldable bed of claim **2**, wherein the second support structure comprises a lower rail and a pair of second side rails transversely spaced and longitudinally aligned, wherein the pair of second side rails has lower ends fixedly connected to two ends of the lower rail and upper ends respectively hinged to lower ends of the pair of first side rails of the first support structure by a pair of hingers.

10. The foldable bed of claim **10**, wherein a length of the lower rail of the second support structure is longer than that of the upper rail of the first support structure, wherein each first sider rail is hinged to the inner side of a corresponding second side rail such that when the first support structure and the second support structure are folded, the first support structure is stored inside the second support structure.

11. The foldable bed of claim **9**, wherein the plurality of bed boards further comprises a second seat board fixed on the second support structure, and a leg board hinged to the second seat board.

12. The foldable bed of claim **11**, further comprising:

a leg lifting assembly comprising a leg lifting bracket pivotally connected to the second support structure and abutting against the leg board, and a leg lifting actuator pivotally connected between the leg lifting bracket and the second support structure,

wherein in operation, the leg lifting actuator drives the leg lifting bracket to pivotally move in an upward rotating direction or a downward rotating direction relative to the second support structure, which in turn drives the leg board to flip along the hinged end with the second seat board so as to adjust the leg board in desired positions.

13. The foldable bed of claim **12**, wherein the leg lifting bracket comprises a middle bar pivotally mounted to the pair of second side rails of the second support structure, and a pair of swing arms transversely spaced and longitudinally aligned, and rigidly connected to the middle bar.

14. The foldable bed of claim **13**, wherein each of the pair of swing arms is equipped with at least one wheel.

15. The foldable bed of claim **13**, wherein the leg lifting actuator comprises a motor member, an outer tube extending from the motor member, and an activation rod having a first end portion received in the outer tube and an opposite, second end portion, wherein the activation rod is engaged with the motor member and configured to be telescopically movable relative to the outer tube according to a direction of

motor rotation, wherein the motor member is pivotally connected to the lower rail of the second support structure and the second end portion of the activation rod pivotally connected to the middle bar of the leg lifting bracket via a mounting bracket, or wherein the motor member is pivotally connected to the middle bar of the leg lifting bracket via the mounting bracket and the second end portion of the activation rod pivotally connected to the lower rail of the second support structure, such that when the activation rod telescopically moves, it drives the middle bar, thereby the pair of swing arms, of the leg lifting bracket to rotate accordingly.

16. The foldable bed of claim **15**, wherein the leg board comprises a thigh board and a lower leg board, wherein one end of the thigh board is hinged to the second seat board and the other end of the thigh board is hinged to one end of the lower leg board, and wherein the leg lifting bracket abuts against the thigh board such that the movement of the leg lifting bracket in the upward rotating direction or the downward rotating direction results in the position of the thigh board to be adjusted.

17. The foldable bed of claim **16**, wherein the second support structure further comprises at least one support bar having a first end hinged to the pair of the second side rails of the second support structure, and a second end hinged to the lower leg board, such that when the position of the thigh board is adjusted, the position of the lower leg board is adjusted accordingly.

18. The foldable bed of claim **9**, wherein the second support structure further comprises a connecting mechanism comprising a connecting rod having a first end fixed to the lower rail and an opposite, second end fixed to the second seat board, and a connecting structure pivotally connecting the leg lifting bracket to the connecting rod.

19. The foldable bed of claim **1**, wherein the back board has an opening defined to avoid interference when the back lifting assembly drives the back board to flip.

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