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(54) **ELECTRICALLY POWERED BED**

ELEKTRISCH ANGETRIEBENES BETT

LIT À ALIMENTATION ÉLECTRIQUE

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Description

FIELD OF THE TECHNOLOGY

[0001] The present application relates to a bed, and in particular, to an electric bed.

BACKGROUND OF THE TECHNOLOGY

[0002] With the gradual improvement of people's living standards, people are paying more and more attention to sleep quality. Accordingly, beds for ensuring and improving sleep quality, especially adjustable beds, in particular electric beds driven by a drive device such as an electric motor, have been greatly developed in recent years.

[0003] Adjustable beds and electric beds derived from medical beds have not been used as sleeping beds for the general public over the years due to their defects such as complicated structure, expensive construction cost and appearance unsuitable for household use. With the development of technologies and optimization of design, electric beds having a relatively simple structure have been designed in the market. Such an electric bed has the following features, including:

a base bed frame, which is arranged horizontally;
at least one adjustable sub-frame, which is rotatably connected to the base bed frame and can rotate between a horizontal position and a lifting position;
a drive device, which is capable of driving the at least one adjustable sub-frame to rotate; and
a plurality of bed planks, which are independent of each other, wherein the plurality of bed planks include at least one fixed bed plank and at least one adjustable bed plank, and are connected with each other by hinges and then are fixed to the base bed frame and the adjustable sub-frame.

[0004] The electric bed has a relatively simple structure, and it can provide a basic function of lifting a bed plank. However, such an electric bed is generally assembled and packaged in whole in the factory in advance, and then is transported to a customer. During this process, packaging and transporting, in particular for multinational shipping, require that a package of the bed body be as small as possible, so that it is easy to load the bed into a container and that it is convenient to put the bed into an ordinary elevator for transportation when the bed is carried to the customer. However, the present electric bed assembled in whole in the factory in advance cannot well satisfy these requirements. Moreover, if the package of the bed assembled in whole is too large, some transportation companies, for example, the UPS, may refuse to transport the package, and extra labor and lifting machine are needed because the package cannot be moved to the customer through an ordinary elevator. These all lead to an increase of a final use cost for the customer, and reduce satisfaction of user experience as well.

[0005] US 2015/067965 A1 discloses an electric bed that includes: a base bed frame, which is horizontally disposed; a drive device, a plurality of bed planks, which are independent from each other and include at least one fixed bed plank and at least one adjustable bed plank.

SUMMARY

[0006] The present application aims to overcome one or more defects as described in the background technology.

[0007] For the above objective, the present application provides an electric bed, which is implemented through the following technical solutions, and that is designed as defined in claim 1. The dependent claims show some further embodiments of such an electric bed.

[0008] By such an arrangement, the bed planks and the bed frame can be packaged and transported separately. Moreover, the electric bed can be assembled in a simple manner, and there is no need to assemble the electric bed in whole in advance by using professional techniques in the factory. In this way, by packaging and transporting separately, transportation efficiency can be greatly improved, and the transportation cost can be greatly reduced so as to further reduce the use cost of a user. In addition, since a quick-assemble structure is provided, there is no need to assemble the bed planks and the bed frames by a professional worker in a professional factory. An ordinary user can perform the assembling conveniently by himself and experience the DIY fun, which can improve the user experience of the user.

[0009] In different embodiments of the electric bed according to the present application, we may depend on one and/or more of the following configurations.

[0010] According to the invention, the quick assembly devices are groove-shaped members having a groove shape complementary to a shape of an edge of the plurality of bed planks for fixing the plurality of bed planks in the groove-shaped members. For example, the groove has a cross-section in a C-shape which is complementary to a shape of an edge of the bed plank, so that the edge of the bed plank can be inserted into the groove for fixation. By such an arrangement, the bed planks can be quickly fitted into the quick assembly device, so to quickly connect to the base bed frame.

[0011] Further, the groove-shaped members are provided thereon with mounting holes so to facilitate passage of auxiliary mounting elements into the plurality of bed planks. By such an arrangement, it can be further ensured that the bed planks can be firmly fixed in the quick assembly devices. An example of the auxiliary mounting elements is bolts.

[0012] Optionally, the base bed frame and the at least one adjustable sub-frame each are provided thereon with a drive device fixation element for connecting the drive device.

[0013] Further, the drive device fixation element is a

lug piece which is provided thereon with fixation holes for fixing an end of the drive device by, for example, a pin or a spring clip.

[0014] Optionally, the electric bed includes two adjustable sub-frames, specifically a head frame and a leg frame. The head frame and the leg frame are separated by the at least one fixed bed plank disposed in a middle of the base bed frame and are capable of rotating and lifting in opposite directions. In this way, a lifting movement of the head bed plank and the leg bed plank can be provided, so that a corresponding bed plank movement mode can be provided to a customer.

[0015] Further, the electric bed further includes another fixed bed plank disposed at an end of the base bed frame away from the head frame and is configured to be fixed relative to the base bed frame or to flip with the leg frame by the quick assembly devices.

[0016] Optionally, the plurality of bed planks are wooden boards or composite boards on which grainy paper is attached.

[0017] Optionally, the drive device is a pushrod motor.

[0018] By means of the above arrangements, with same functions of a traditional electric bed, the electric bed of the present application has features of convenient transportation and simple assembling, which can reduce transportation cost, improve transportation efficiency and improve user experience.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] It shall be appreciated that in the present application, unless apparent contradictions or incompatibility exist, all the features, variations, and/or specific embodiments may be combined with one another in a number of ways.

[0020] Other features and advantages of the present application will become self-evident by reading the following specifically described nonrestrictive embodiments in conjunction with the accompanying drawings. In the drawings,

Fig. 1 shows a perspective view of a bed in whole after assembly according to an embodiment of the present application;

Fig. 2 shows an exploded view of components of the bed in whole according to an embodiment of the present application;

Fig. 3 shows an enlarged perspective view of a quick assembly device according to an embodiment of the present application; and

Fig. 4 shows an enlarged perspective view of a drive device fixation element according to an embodiment of the present application.

DETAILED DESCRIPTION

[0021] It shall be appreciated that the abovementioned drawings are not drawn to actual scale, and they are merely diagrams of various preferred features for illustrating principles of the present application. The design features, such as size, directions, orientations, and shapes disclosed in the present application depend on specific applications and using environments.

[0022] The present application will be illustrated in detail below in conjunction with the embodiments and the accompanying drawings. In these drawings, same reference numerals indicate the same or equivalent components of the present application.

[0023] Fig. 1 shows an embodiment of the present application. An electric bed shown in Fig. 1 includes: a base bed frame 2; adjustable sub-frames 31 and 32; a plurality of bed planks 11, 12, 13, and 14; and a drive device 6.

[0024] Specifically, the base bed frame 2 includes two longitudinally extending strip-shaped longitudinal members 22 and two transversely extending strip-shaped transverse members 21, which are bonded with each other, for example, through welding, riveting or other connecting techniques, so as to form a substantially rectangular frame having a plane P that may be horizontally positioned. Four corners of the rectangular frame are respectively provided with a bed foot 20 which is perpendicular to a plane where the rectangular frame is located or forms an angle of less than 90 degrees with the plane. Optionally, as shown in Fig. 2, the bed foot 20 can also be formed together with the transverse member 21 in one piece for the convenience of production.

[0025] Further, the base bed frame 2 further includes two intermediate transverse members 23 and 23', and two intermediate longitudinal members 24 and 24'. The intermediate transverse members 23 and 23' are arranged parallel to each other, and are perpendicularly connected to the longitudinal members 22 in the plane P of the frame, for example, through connecting techniques such as welding and riveting. The intermediate longitudinal members 24 and 24' are arranged parallel to each other, and are perpendicularly connected to the intermediate transverse members 23 and 23' in the plane P of the frame, for example, through connecting techniques such as welding and riveting. Further, the intermediate transverse members 23 and 23' and the intermediate longitudinal members 24 and 24' are substantially disposed in a middle position of the frame, and a function thereof will be described in the following text.

[0026] The adjustable sub-frame includes a head frame 31 and a leg frame 32 which are substantially in a shape of a rectangular frame. A side of the head frame 31 and a side of the leg frame 32 are rotatably connected to the base bed frame at joints respectively close to the intermediate transverse members 23 and 23'. The head frame 31 and the leg frame 32 can rotate between a horizontal position and a lifting position. In the horizontal position, the head frame 31 and the leg frame 32 are

substantially parallel to each other and are located in the plane P or each are deviated upwardly by a small amount. In the lifting position, a side of the head frame 31 and a side of leg frame 32 are lifted and each form a certain degree, for example, a degree in a range of 0-60 degrees, with the plane P.

[0027] The drive device, such as pushrod motors 61 and 62 as shown in Figs. 1 and 2 are respectively rotatably connected to the two intermediate longitudinal members 24 and 24' and the adjustable sub-frames 31 and 32 of the base bed frame 2 through drive device fixation elements, such as lug pieces 51, 52, 53 and 54, at two ends thereof. By means of such an arrangement, a telescopic action of a pushrod of the pushrod motor can drive the adjustable sub-frames 31 and 32 to rotate, so that the latter can rotate between the horizontal position and the lifting position.

[0028] Further, the drive device fixation element, for example, the lug pieces 51, 52, 53 and 54 as shown in Fig. 4, is a rigid fixation plate which is substantially in a triangular shape. A side of the drive device fixation element is fixed on the base bed frame or the adjustable sub-frame through a screw nut, welding, riveting or the like. A vertex opposite to the fixed side is provided with a fixation hole through which an end of the pushrod motor is rotatably connected, for example, in the form of a pin or a spring clip.

[0029] The electric bed further includes a plurality of quick assembly devices which are respectively disposed on the base bed frame 2 and the adjustable sub-frames. As shown in Figs. 1 and 2, a quick assembly device 40 is disposed on a rotation axis of the adjustable sub-frame 31, and a quick assembly device 43 is disposed on a rotation axis of the adjustable sub-frame 32. Quick assembly devices 41 and 42 are disposed on the transverse members 23 and 23' of the base bed frame 2.

[0030] As shown in Fig. 1, four independent bed planks, i.e., a head bed plank 11, a waist bed plank 12, a leg bed plank 13, and a foot bed plank 14, are provided. Optionally, these bed planks are wooden boards or composite boards on which grainy paper is attached. The head bed plank 11 is placed on the adjustable sub-frame 31, and is connected thereto by the quick assembly device 40, so that the head bed plank 11 may rotate with the adjustable sub-frame 31. Similarly, the leg bed plank 13 is placed on the adjustable sub-frame 32, and is connected thereto by the quick assembly device 40, so that the leg bed plank 13 may rotate with the adjustable sub-frame 32. The waist bed plank 12 is connected to the quick assembly devices 41 and 42, so that the waist bed plank 12 may be fixed on the transverse members 23 and 23' and thus are not movable relative to the base bed frame 2. The foot bed plank 14 may be disposed in two ways. A first disposition manner is shown in Figs. 1 and 2. An end of the foot bed plank 14 is rotatably connected to the leg bed plank 13 by additional quick assembly devices 44 and 45, while the other end of the foot bed plank 14 is connected to a rotation element 50 which is connected to the base bed frame. Under this disposition, rotation of the leg bed plank 13 can drive the foot bed plank 14 to flip. A second disposition manner is not shown in the drawings. In the second disposition, the foot bed plank 14 is fixed on the base bed frame 2 by additional quick assembly devices 44 and 45, for example, in the same fixation connection manner as that between the waist bed plank 12 and the base bed frame 2. Under this disposition, rotation of the leg bed plank 13 does not drive the foot bed plank 14 to flip.

[0031] It needs to be pointed out that these independent bed planks may be packaged and transported separately from the bed frames so that the electric bed can be delivered to a customer in smaller packages, and the customer can assemble the electric bed by himself. The quick assembly devices related in assembling the electric bed will be described in detail below.

[0032] Further, as shown in Fig. 3, the quick assembly device is a groove-shaped member having a groove shape complementary to a shape of an edge of the plurality of bed planks, so that the plurality of bed planks can be fixed in the groove-shaped member. In the illustrated example, the groove has a cross-section in a C-shape, which is configured to be complementary to a cross-sectional shape of the edge of the bed planks. The groove-shaped member has a bottom surface and two side surfaces which are substantially parallel to each other and perpendicular to the bottom surface, wherein free edges of the two side surfaces are configured to be close to each other, so that when a bed plank is inserted into this groove, i.e., when an edge of the bed plank contacts and rests against the bottom surface of the groove-shaped member, the two side surfaces of the groove have a securing force for clamping the bed plank so as to quickly fix the bed plank in the groove-shaped member.

[0033] Preferably, an entire length of the groove-shaped member is at least half of a length of a corresponding edge of a bed plank. Moreover, a width of the bottom surface of the groove-shaped member is slightly larger than a thickness of a corresponding bed plank. A width of the two side surfaces of the groove-shaped member is larger than the width of the bottom surface, preferably more than 1.5 times the width of the bottom surface so as to provide a better clamping effect.

[0034] Optionally, as shown in Fig. 3, the groove-shaped member is provided thereon with mounting holes 48, for example, two mounting holes 48 respectively located at ends of the groove-shaped member so to facilitate passage of auxiliary mounting elements into the plurality of bed planks. In the example illustrated in Fig. 3, the auxiliary mounting elements are bolts 49. When a bed plank is inserted into the groove, the bolts 49 are threaded into the mounting holes 48 and through a cross-section of the bed plank so as to achieve a better fixation effect.

[0035] Optionally, the quick assembly device can also be in other forms, as long as a structure thereof allows a user to easily and conveniently connect the bed planks

to the bed frames without the need of professional installation tools or techniques.

[0036] In addition, preferably, two adjacent quick assembly devices as shown in Figs. 1 and 2, for example, the quick assembly device of the head bed plank and the quick assembly device of the waist bed plank, and the quick assembly device of the leg bed plank and the quick assembly device of the foot bed plank, may be rotatably connected to each other. As shown in Fig. 3, the groove-shaped member may further include connection parts 46, for example, projecting connection plates, on which connection holes are provided, and, at the same time, an opposite groove-shaped member connected thereto is provided with corresponding connection parts as well, so that the two adjacent quick assembly devices can be rotatably connected to each other by the connection parts. Further, the connection parts may be directly connected to the base bed frame 2 to form a rotation axis of the adjustable sub-frame so as to reduce the number of components of the electric bed and reduce volume and weight of fittings.

[0037] The above embodiments serve only as examples and are not used to limit the scope of the present application. Those skilled persons in the art may expect other embodiments capable of achieving same functions based on the above embodiments and within the protection scope of the appended claims.

[0038] Those skilled in the art may master different embodiments, variations, and improvements. In particular, it shall be noted that unless apparent contradictions or incompatibility exist, the above features, variations, and/or specific embodiments of the present application may be combined with one another. All these embodiments, variations, and improvements shall fall within the scope of the appended claims.

Claims

1. An electric bed, comprising:

   a base bed frame (2), which is horizontally disposed; at least one adjustable sub-frame (31; 32), which is rotatably connected to the base bed frame (2) and is rotatable between a horizontal position and a lifting position; a drive device (6), which is capable of driving the at least one adjustable sub-frame (31; 32) to rotate; and a plurality of bed planks (11, 12, 13, 14), which are independent from each other and include at least one fixed bed plank (12) and at least one adjustable bed plank (11, 13, 14), **characterized in that** the electric bed further comprises a plurality of quick assembly devices (40, 41, 42, 43) disposed on the base bed frame (2) and the adjustable sub-frame (31; 32) for connecting the fixed bed plank (12) to the base bed frame (2) and fixing the adjustable bed plank (11, 13, 14) to the adjustable sub-frame (31; 32),
   wherein the quick assembly devices (40, 41, 42, 43) are groove-shaped members having a groove shape complementary to a shape of an edge of each of the plurality of bed planks (11, 12, 13, 14) for fixing the plurality of bed planks (11, 12, 13, 14) in the groove-shaped members.

2. The electric bed according to claim 1, wherein the groove-shaped members are provided thereon with mounting holes (48) for auxiliary mounting elements to thread therethrough and into the plurality of bed planks (11, 12, 13, 14).

3. The electric bed according to claim 2, wherein the auxiliary mounting elements are bolts (49).

4. The electric bed according to claim 1, wherein the base bed frame (2) and the at least one adjustable sub-frame (31; 32) each are provided thereon with a drive device fixation element for connecting the drive device (6).

5. The electric bed according to claim 4, wherein the drive device fixation element is a lug piece (51, 52, 53 54) that is provided thereon with a fixation hole for fixing an end of the drive device (6).

6. The electric bed according to claim 1, comprising two adjustable sub-frames (31; 32) including a head frame and a leg frame, the head frame and the leg frame being separated by the at least one fixed bed plank (12) disposed in a middle of the base bed frame (2) and being capable of rotating and lifting in opposite directions.

7. The electric bed according to claim 6, further comprising a foot bed plank (14) disposed at an end of the base bed frame (2), the foot bed plank (14) being away from the head frame and being configured to be fixed relative to the base bed frame (2) or to flip with the leg frame by the quick assembly devices (40, 41, 42, 43).

8. The electric bed according to claim 1-7, wherein the plurality of bed planks (11, 12, 13, 14) are wooden boards or composite boards on which grainy paper is attached.

9. The electric bed according to claim 1-7, wherein the drive device (6) is a pushrod motor (61; 62).

Patentansprüche

1. Elektrisches Bett, aufweisend:

   einen Basis-Bettrahmen (2), welcher horizontal

angeordnet ist, mindestens einen verstellbaren Sub-Rahmen (31, 32), welcher mit dem Basis-Bettrahmen (2) drehbar verbunden ist und zwischen einer Horizontal-Position und einer Anheb-Position drehbar ist, eine Antriebsvorrichtung (6), welche in der Lage ist, den mindestens einen verstellbaren Sub-Rahmen (31, 32) anzutreiben, sich zu drehen, und mehrere Bettplanken (11, 12, 13, 14), welche voneinander unabhängig sind und mindestens eine fixierte Bettplanke (12) und mindestens eine verstellbare Bettplanke (11, 13, 14) aufweisen,
dadurch gekennzeichnet, dass
das elektrische Bett ferner mehrere Schnellmontagevorrichtungen (40, 41, 42, 43) aufweist, welche an dem Basis-Bettrahmen (2) und an dem verstellbaren Sub-Rahmen (31, 32) angeordnet sind zum Verbinden der fixierten Bettplanke (12) mit dem Basis-Bettrahmen (2) und zum Befestigen der verstellbaren Bettplanke (11, 13, 14) an dem verstellbaren Sub-Rahmen (31, 32),
wobei die Schnellmontagevorrichtungen (40, 41, 42, 43) nutförmige Elemente sind, welche eine Nut-Form aufweisen, welche komplementär zu einer Form eines Randes von jeder der mehreren verstellbaren Bettplanken (11, 12, 13, 14) ist zum Fixieren der mehreren verstellbaren Bettplanken (11, 12, 13, 14) in den nutförmigen Elementen.

2. Elektrisches Bett gemäß Anspruch 1, wobei die nutförmigen Elemente mit Montier-Löchern (48) daran versehen sind, damit sich Hilfsmotageelemente dort hindurch und in die mehreren Bettplanken (11, 12, 13, 14) ziehen.

3. Elektrisches Bett gemäß Anspruch 2, wobei die Hilfsmontageelemente Bolzen (49) sind.

4. Elektrisches Bett gemäß Anspruch 1, wobei der Basis-Bettrahmen (2) und der mindestens eine verstellbare Sub-Rahmen (31, 32) jeweils mit einem Antriebsvorrichtung-Befestigungselement daran versehen sind zum Anschließen der Antriebsvorrichtung (6).

5. Elektrisches Bett gemäß Anspruch 4, wobei das Antriebsvorrichtung-Befestigungselement ein Ansatzteil (51, 52, 53, 54) ist, welches daran bereitgestellt ist mit einem Befestigungsloch zum Befestigen eines Endes der Antriebsvorrichtung (6).

6. Elektrisches Bett gemäß Anspruch 1, aufweisend: zwei verstellbare Sub-Rahmen (31, 32), welche einen Kopfteil-Rahmen und einen Fußteil-Rahmen aufweisen, wobei der Kopfteil-Rahmen und der Fußteil-Rahmen mittels mindestens einer fixierten Bettplanke (12) separiert sind, welche in einer Mitte des Basis-Bettrahmens (2) angeordnet ist und in der Lage ist, sich in entgegengesetzte Richtungen zu drehen und anzuheben.

7. Elektrisches Bett gemäß Anspruch 6, ferner aufweisend:
eine Fußteil-Bettplanke (14), welche an einem Ende des Basis-Bettrahmens (2) angeordnet ist, wobei die Fußteil-Bettplanke (14) von dem Kopfteil-Rahmen entfernt ist und konfiguriert ist, um relativ zu dem Basis-Bettrahmen (2) fixiert zu sein oder um mit dem Fußteil-Rahmen zu kippen mittels der Schnellmontagevorrichtungen (40, 41, 42, 43).

8. Elektrisches Bett gemäß einem der Ansprüche 1 bis 7, wobei die mehreren Bettplanken (11, 12, 13, 14) hölzerne Bretter oder Verbundplatten sind, auf welchen körniges Papier angebracht ist.

9. Elektrisches Bett gemäß einem der Ansprüche 1 bis 7, wobei die Antriebsvorrichtung (6) ein Schubstangenmotor (61, 62) ist.

Revendications

1. Lit électrique, comprenant :

un cadre de lit de base (2), qui est disposé horizontalement ; au moins un sous-cadre réglable (31 ; 32), qui est raccordé en rotation au cadre de lit de base (2) et est rotatif entre une position horizontale et une position relevée ; un dispositif d'entraînement (6), qui est capable d'entraîner l'au moins un sous-cadre réglable (31 ; 32) en rotation ; et une pluralité de panneaux de lit (11, 12, 13, 14), qui sont indépendants les uns des autres et incluent au moins un panneau de lit fixe (12) et au moins un panneau de lit réglable (11, 13, 14), **caractérisé en ce que** le lit électrique comprend en outre une pluralité de dispositifs à assemblage rapide (40, 41, 42, 43) disposés sur le cadre de lit de base (2) et le sous-cadre réglable (31 ; 32) pour raccorder le panneau de lit fixe (12) au cadre de lit de base (2) et fixer le panneau de lit réglable (11, 13, 14) au sous-cadre réglable (31 ; 32),
dans lequel les dispositifs à assemblage rapide (40, 41, 42, 43) sont des éléments en forme de rainure présentant une forme de rainure complémentaire à une forme d'un bord de chacun de la pluralité de panneaux de lit (11, 12, 13, 14) permettant de fixer la pluralité de panneaux de lit (11, 12, 13, 14) dans les éléments en forme de rainure.

2. Lit électrique selon la revendication 1, dans lequel

les éléments en forme de rainure sont équipés de trous de montage (48) pour un filetage à travers ceux-ci et sur la pluralité de panneaux de lit (11, 12, 13, 14) par des éléments de montage auxiliaires.

3. Lit électrique selon la revendication 2, dans lequel les éléments de montage auxiliaires sont des boulons (49) .

4. Lit électrique selon la revendication 1, dans lequel le cadre de lit de base (2) et l'au moins un sous-cadre réglable (31 ; 32) sont chacun équipés d'un élément de fixation de dispositif d'entraînement destiné à raccorder le dispositif d'entraînement (6).

5. Lit électrique selon la revendication 4, dans lequel l'élément de fixation de dispositif d'entraînement est une pièce de tenon (51, 52, 53, 54) qui est équipée d'un trou de fixation destiné à fixer une extrémité du dispositif d'entraînement (6).

6. Lit électrique selon la revendication 1, comprenant deux sous-cadres réglables (31 ; 32) incluant un cadre de tête et un cadre de jambe, le cadre de tête et le cadre de jambe étant séparés par l'au moins un panneau de lit fixe (12) disposé dans un milieu du cadre de lit de base (2) et capable de tourner et de se relever dans des directions opposées.

7. Lit électrique selon la revendication 6, comprenant en outre un panneau de lit de pied (14) disposé au niveau d'une extrémité du cadre de lit de base (2), le panneau de lit de pied (14) étant éloigné du cadre de tête et étant configuré pour être fixe par rapport au cadre de lit de base (2) ou pour être basculé avec le cadre de jambe par les dispositifs à assemblage rapide (40, 41, 42, 43).

8. Lit électrique selon la revendication 1-7, dans lequel la pluralité de panneaux de lit (11, 12, 13, 14) sont des panneaux en bois ou des panneaux composites sur lesquels un papier granuleux est fixé.

9. Lit électrique selon la revendication 1-7, dans lequel le dispositif d'entraînement (6) est un moteur à tige-poussoir (61 ; 62).

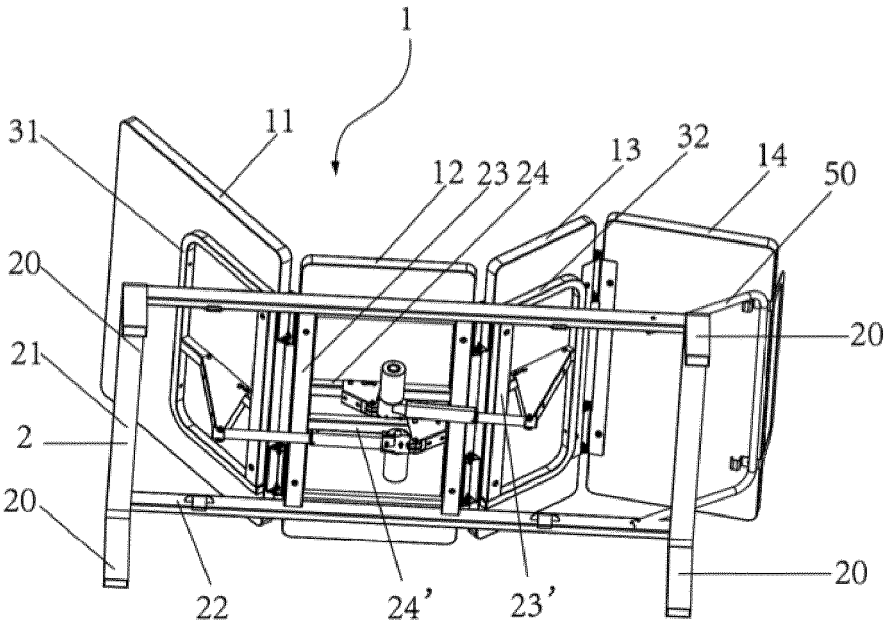

Figure 1

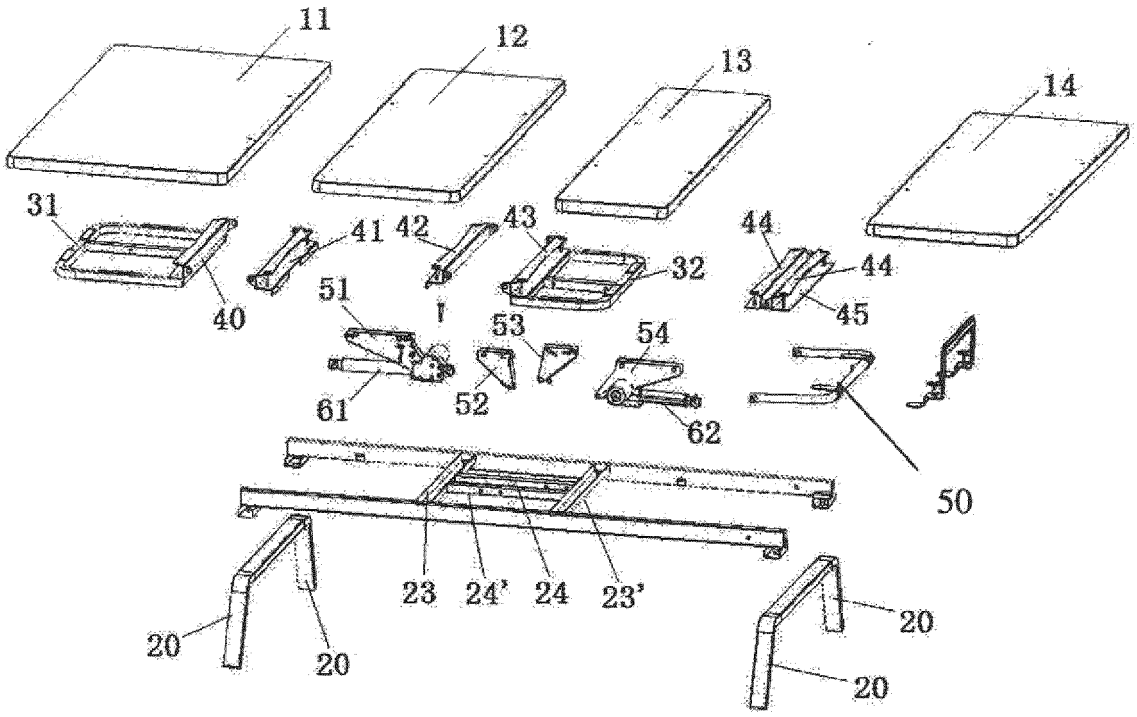
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Figure 2

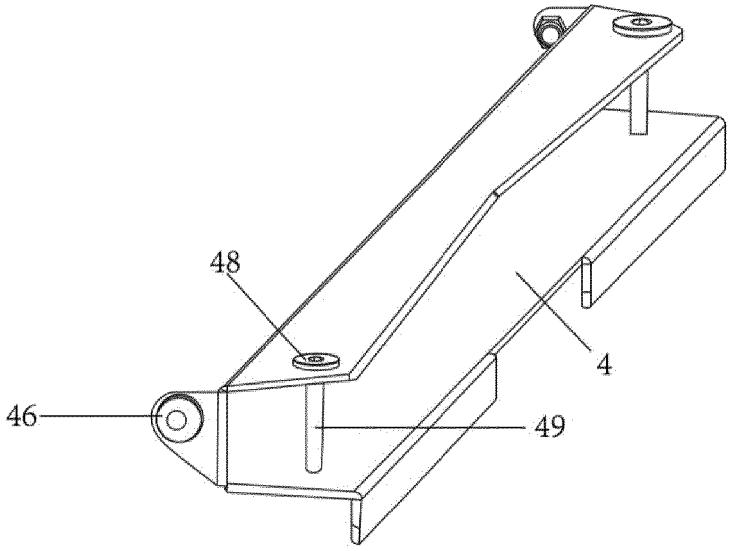

Figure 3

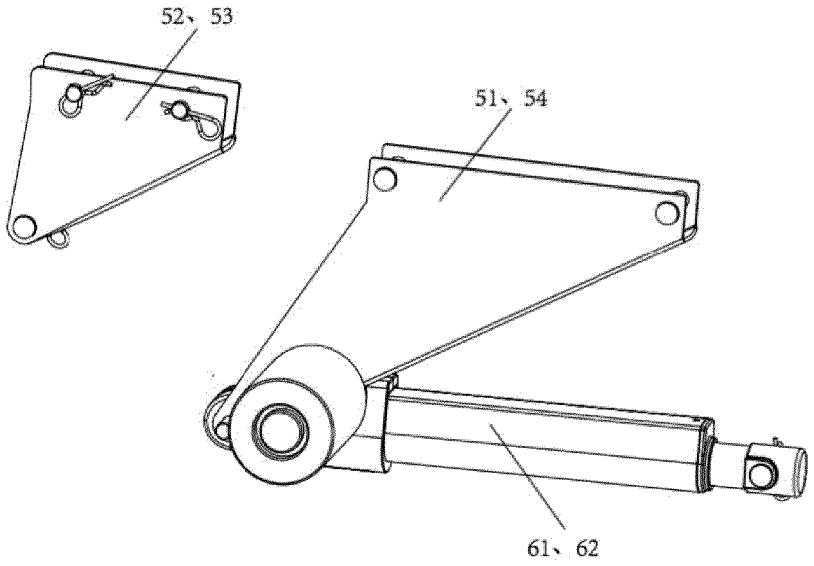

Figure 4

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 2015067965 A1 **[0005]**