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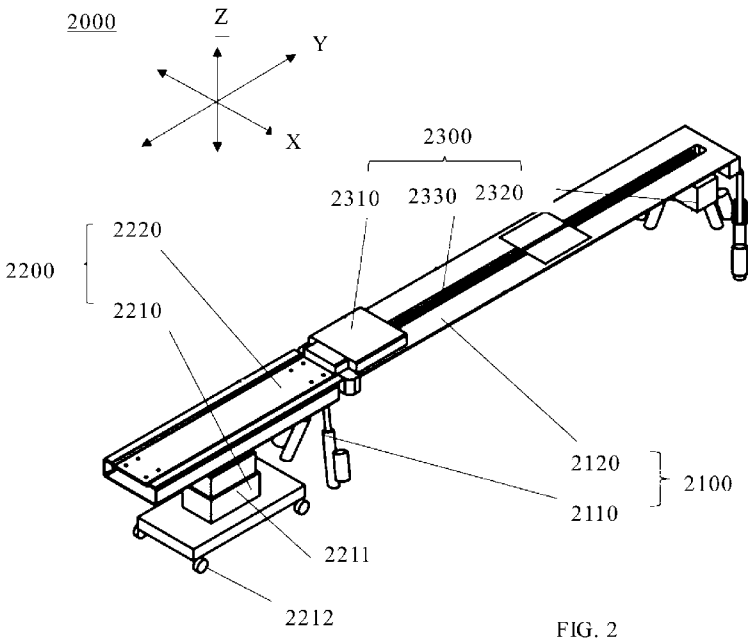

FIG. 2

(57) Abstract: Embodiment of the present disclosure provide a medical bed apparatus, a medical system, and a medical method using the medical system. The medical bed apparatus may include a medical bed, a transfer bed, and a conveying device. The medical bed may include a medical bed board and a support device. The support device may be configured to drive the medical bed board to move in multiple degrees of freedom. The conveying device may be detachably docked with at least a portion of the transfer bed, and the conveying device may be configured to transfer a subject between the transfer bed and the medical bed board.

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WO 2024/251288 A1

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MEDICAL BED APPARATUSES, MEDICAL SYSTEMS AND MEDICAL METHODS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to Chinese Application No. 202310686216.7 filed on June 9, 2023, Chinese Application No. 202321475921.4 filed on June 9, 2023, Chinese Application No. 202321472852.1 filed on June 9, 2023, and Chinese Application No. 202321475969.5 filed on June 9, 2023, the contents of each of which are hereby incorporated by reference.

TECHNICAL FIELD

[0002] The present disclosure relates to the field of medical devices, particularly to medical bed apparatuses, medical systems, and medical methods using the medical systems.

BACKGROUND

[0003] Radiation diagnosis and treatment devices often include a diagnostic and medical space for irradiating patients. A medical bed (also referred to as a medical table) may transport a patient into the diagnostic and medical space to enable diagnosis or treatment of an examination area of the patient. However, if an axial dimension of the diagnostic and medical space (e.g., a circular diagnostic and medical space surrounding the patient) is relatively long, it may result in an increased distance for transporting the patient on the medical bed, making it difficult to stably transport the patient using existing medical beds. Additionally, for patients with limited mobility, transporting them into the diagnostic and medical space may be highly inconvenient.

[0004] Therefore, efficiently and stably transporting patients into the diagnostic and medical space is a pressing technical issue in this field.

SUMMARY

[0005] One or more embodiments of the present disclosure provide a medical bed apparatus. The medical bed apparatus may include a medical bed, a transfer bed, and a conveying device. The medical bed may include a medical bed board and a support device. The support device may be configured to drive the medical bed board to move in multiple degrees of freedom. The conveying device may be detachably docked with at least a portion of the transfer bed, and the conveying device may be configured to transfer a subject between the transfer bed and the medical bed board.

[0006] In some embodiments, the support device may be capable of driving the medical bed board to move along three orthogonal directions.

[0007] In some embodiments, the support device may be capable of driving the medical bed board to move in six degrees of freedom.

[0008] In some embodiments, the support device may be connected to two ends of the medical bed.

[0009] In some embodiments, the support device may include a plurality of telescopic rods. One end of each of the plurality of telescopic rods may be connected to the medical bed board via a first hinge seat, and the other end of each of the plurality of telescopic rods may be connected to a second hinge seat. A portion of the plurality of telescopic rods may be connected to one end of the medical bed board, and another portion of the plurality of telescopic rods may be connected to the other end of the medical bed board.

[0010] In some embodiments, a plurality of first hinge seats may be spaced apart along a first circumference, and a plurality of second hinge seats may be spaced apart along a second circumference.

[0011] In some embodiments, the support device may include at least three telescopic rods. A portion of the at least three telescopic rods may be connected to one end of the medical bed board, and another portion of the at least three telescopic rods may be connected to the other end of the medical bed board.

[0012] In some embodiments, the support device may include six telescopic rods. Two of the six telescopic rods may be connected to one end of the medical bed board, and four of the six telescopic rods may be connected to the other end of the medical bed board.

[0013] In some embodiments, the support device may include six telescopic rods. Three of the six telescopic rods may be connected to one end of the medical bed board, and three of the six telescopic rods may be connected to the other end of the medical bed board.

[0014] In some embodiments, at least two of the plurality of telescopic rods may be distributed on two sides of a central axis of the medical bed board extending along a length direction of the medical bed board.

[0015] In some embodiments, each of the plurality of telescopic rods may be provided with a driving component for driving the telescopic rod to extend and/or retract.

[0016] In some embodiments, at least a portion of the medical bed may be located within a medical space of a medical device. The conveying device may be configured to transport the subject to a position on the medical bed board located within the medical space.

[0017] In some embodiments, the conveying device may be disposed on the medical bed. The conveying device may be detachably docked with the at least a portion of the transfer bed via a docking assembly.

[0018] In some embodiments, the transfer bed may include a movable bed body and a movable bed board detachably mounted on the movable bed body.

[0019] In some embodiments, the at least a portion of the transfer bed may include the movable bed board.

[0020] In some embodiments, the docking assembly may include a first docking member, a second docking member, and a locking mechanism. One of the first docking member and the second docking member may be disposed on the movable bed board. The other of the first docking member and the second docking member may be disposed on the conveying device. The first docking member may be configured to dock with the second docking member, and the locking mechanism is configured to connect and lock the docked first docking member and the second docking member.

[0021] In some embodiments, the docking assembly may include a receiving plate and a gap. The receiving plate may be disposed on the conveying device. The gap may be located between the movable bed body and the movable bed board. The receiving plate may be capable of being inserted into the gap to support the movable bed board.

[0022] In some embodiments, the first docking member may include a docking protrusion, and the second docking member includes a docking groove. One of an outer wall of the docking protrusion and an inner wall of the docking groove may be provided with a helical groove, and the other of the outer wall of the docking protrusion and the inner wall of the docking groove may be provided with a protrusion part capable of being inserted into the helical groove. The locking mechanism may include a first driving member, the first driving member being configured to drive the docking protrusion to rotate along an axis of the helical groove, so that the protrusion part moves along the helical groove.

[0023] In some embodiments, the first docking member includes a bolt, the second docking member may include a slot, and the locking mechanism may include a second driving member, the second driving member

being configured to drive the bolt to insert into the slot. The first docking member may include a hook, the second docking member may include a hook slot, and the locking mechanism may include a third driving member, the third driving member being configured to drive the hook to hook into the hook slot.

[0024] In some embodiments, the docking assembly may include a detection device, the detection device being configured to detect whether the first docking member and the second docking member are docked in place.

[0025] In some embodiments, the detection device may include a switch and/or a laser sensor.

[0026] In some embodiments, the conveying device may include a conveying member and a driving device. The driving device may be configured to drive the conveying member to move along a length direction of the medical bed board. The conveying member may be drivingly connected to the driving device.

[0027] In some embodiments, the transfer bed may include a lifting base, and/or the movable bed board may be detachably mounted on the lifting base.

[0028] In some embodiments, the lifting base may be provided with one or more universal wheels, and/or the movable bed body may include an automatic navigation device.

[0029] One or more embodiments of the present disclosure provide a medical system. The medical system may include a medical device and the medical bed apparatus described above, wherein: a medical bed board of a medical bed of the medical bed apparatus may be configured to pass through a medical space of the medical device along an axial direction of the medical space.

[0030] In some embodiments, the medical device may include a radiation therapy device, an imaging device, or a combination thereof, the imaging device may include any one of a magnetic resonance imaging (MRI) device, a positron emission tomography (PET) device, a positron emission computed tomography (PECT) device, a computed tomography (CT) device, an X-ray imaging device, a single-photon emission computed tomography (SPECT) device, or an ultrasound device, or a combination thereof.

[0031] One or more embodiments of the present disclosure provide a medical method using the medical system. The medical method may include: transporting a movable bed board through a conveying device of the medical bed apparatus, and placing the movable bed board onto a medical bed board of the medical bed of the medical bed apparatus at a position within the medical space of the medical device; adjusting a position of a subject by driving, using a support device of the medical bed, the medical bed board to move in multiple degrees of freedom; and performing a corresponding medical operation on the subject using the medical device.

[0032] In some embodiments, the medical method may further include: transferring the subject to a preset position using a transfer bed of the medical bed apparatus; and detaching the movable bed board from a movable bed body of the transfer bed.

[0033] In some embodiments, the medical method may further include: adjusting a relative position of the subject and one or more modalities of the medical system by adjusting a position of the movable bed board in the medical space through the conveying device.

[0034] One or more embodiments of the present disclosure provide a support device. The support device may include a plurality of telescopic rods coupled to a medical bed board of a medical bed, wherein the support device may be connected to two ends of the medical bed, and the support device may be capable of driving the medical bed board to move in six degrees of freedom.

[0035] In some embodiments, one end of each of the plurality of telescopic rods may be connected to the medical bed board via a first hinge seat, and the other end of each of the plurality of telescopic rods may be connected to a second hinge seat. A portion of the plurality of telescopic rods may be connected to one end of the medical bed board, and another portion of the plurality of telescopic rods may be connected to the other end of the medical bed board. A plurality of first hinge seats may be spaced apart along a first circumference, and a plurality of second hinge seats may be spaced apart along a second circumference.

[0036] In some embodiments, the support device may include at least three telescopic rods, wherein a portion of the at least three telescopic rods may be connected to one end of the medical bed board, and another portion of the at least three telescopic rods may be connected to the other end of the medical bed board.

BRIEF DESCRIPTION OF THE DRAWINGS

[0037] The present disclosure is further described in terms of exemplary embodiments. These exemplary embodiments are described in detail with reference to the drawings. The drawings are not to scale. These embodiments are non-limiting exemplary embodiments, in which like reference numerals represent similar structures throughout the several views of the drawings, and wherein:

[0038] FIG. 1 is a schematic diagram illustrating an exemplary structure of a medical system according to some embodiments of the present disclosure;

[0039] FIG. 2 is a schematic diagram illustrating an exemplary medical bed apparatus according to some embodiments of the present disclosure;

[0040] FIG. 3 is a schematic diagram illustrating a use of a medical bed apparatus according to some embodiments of the present disclosure;

[0041] FIG. 4 is a schematic diagram illustrating a use of a medical bed apparatus according to some embodiments of the present disclosure;

[0042] FIG. 5 is a schematic diagram illustrating an exemplary docking assembly according to some embodiments of the present disclosure;

[0043] FIG. 6 is an enlarged schematic diagram of portion M of FIG. 5;

[0044] FIG. 7 is a schematic diagram illustrating an exemplary docking protrusion and a first driving member of a docking assembly according to some embodiments of the present disclosure;

[0045] FIG. 8 is a schematic diagram illustrating an exemplary structure of a docking assembly according to some embodiments of the present disclosure;

[0046] FIG. 9 is a schematic diagram illustrating an exemplary structure of a docking assembly according to some other embodiments of the present disclosure;

[0047] FIG. 10 is a schematic diagram illustrating an exemplary structure of a docking assembly according to yet some other embodiments of the present disclosure;

[0048] FIG. 11 is a schematic diagram illustrating an exemplary structure of a conveying device in the embodiment of FIG. 10;

[0049] FIG. 12 is an enlarged schematic diagram of portion D of FIG. 10;

[0050] FIG. 13 is a schematic diagram illustrating an exemplary structure of a docking assembly according to some other embodiments of the present disclosure;

[0051] FIG. 14 is a schematic diagram illustrating an exemplary structure of a docking assembly according to yet some other embodiments of the present disclosure;

[0052] FIG. 15 is a schematic diagram illustrating an exemplary structure of a docking assembly according to yet some other embodiments of the present disclosure;

[0053] FIG. 16 is a schematic diagram illustrating an exemplary structure of a medical bed according to some embodiments of the present disclosure;

[0054] FIG. 17 is a schematic diagram illustrating an exemplary structure of a medical bed according to some embodiments of the present disclosure;

[0055] FIG. 18 is a schematic diagram illustrating an exemplary structure of a medical bed according to some embodiments of the present disclosure;

[0056] FIG. 19 is a schematic diagram illustrating a first circumference and a second circumference according to some embodiments of the present disclosure; and

[0057] FIG. 20 is a schematic diagram illustrating an exemplary structure of a conveying device according to some embodiments of the present disclosure.

DETAILED DESCRIPTION

[0058] In order to more clearly illustrate the technical solutions of the embodiments of the present disclosure, the accompanying drawings to be used in the description of the embodiments will be briefly described below. Obviously, the accompanying drawings in the following descriptions are only some examples or embodiments of the present disclosure, and that the present disclosure may be applied to other similar scenarios in accordance with these drawings without creative labor for those of ordinary skill in the art. Unless obviously acquired from the context or the context illustrates otherwise, the same numeral in the drawings refers to the same structure or operation.

[0059] As indicated in the present disclosure and in the claims, the singular forms "a," "an," and "the" may be intended to include the plural forms as well, unless the context clearly indicates otherwise. In general, the terms "comprise," "comprises," and/or "comprising," "include," "includes," and/or "including," when used in this disclosure, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0060] The present disclosure provides a medical bed apparatus, which may be used in various medical systems. In some embodiments, the medical bed apparatus may be used in scenarios with long boreholes and requiring multi-degree-of-freedom rotation. Exemplary application scenarios may include a radiotherapy system guided by a multimodal imaging device (e.g., a Positron Emission Tomography—Magnetic Resonance - Radiotherapy (PET-MR-RT) device). However, the medical bed apparatus is not limited to the exemplary application scenarios. In some embodiments, the medical bed apparatus may be used in multimodal imaging devices (e.g., a Positron Emission Tomography - Computed Tomography (PET-CT) device, a Positron Emission Tomography - Magnetic Resonance - Computed Tomography (PET-MR-CT) device, etc.), single-modality imaging-guided radiotherapy systems (e.g., a Magnetic Resonance - Radiotherapy (MR-RT) device, a Positron Emission Tomography - Radiotherapy (PET-RT) device, etc.), or the like. In some embodiments, the medical bed apparatus may be used independently as needed.

[0061] FIG. 1 is a schematic diagram illustrating an exemplary structure of a medical system. As shown in FIG. 1, the medical system may include a medical device 1100 and a medical table 1200. The medical device 1100 may include a medical space 1110 for radiographic diagnosis or treatment of a patient. The medical

space 1110 shown in FIG. 1 is a circular medical space 1110 surrounding the patient. The medical table 1200 may be used to transport the patient into the medical space 1110. For the circular medical space 1110, the space available for setting up the medical table 1200 may be relatively limited.

[0062] In some embodiments, as shown in FIG. 1, the medical table 1200 may be a cantilevered medical table 1210. The cantilevered medical table 1210 may include a cantilevered base 1211 and a cantilevered bed board 1212. The cantilevered base 1211 may be positioned at one end of an axial direction (e.g., a Y direction in FIG. 1) of the circular medical space 1110, and the cantilevered bed board 1212 may move relative to the cantilevered base 1211 along the axial direction of the circular medical space 1110 to transport the patient into the medical space 1110. Since the cantilevered base 1211 of the cantilevered medical table 1210 is positioned at one end of the axial direction (i.e., the Y direction in FIG. 1) of the medical space 1110, if an axial dimension of the medical space 1110 is relatively long, a transport distance of the cantilevered bed board 1212 also needs to be extended, leading to unstable transportation of the cantilevered medical table 1210. For example, due to the lack of support at the end of the cantilevered bed board 1212 away from the cantilevered base 1211, the cantilevered bed board 1212 may bend. Additionally, for some patients with limited mobility in the medical system, transferring the patients onto the medical table 1200 may be very inconvenient.

[0063] In view of this, one or more embodiments of the present disclosure provide a medical bed apparatus. The medical bed apparatus may include at least one of a medical bed, a transfer bed, or a conveying device. At least a portion of the medical bed may be located within a medical space of a medical device. The medical bed may be movable in multiple degrees of freedom (e.g., six degrees of freedom). A subject may be placed on the medical bed for imaging or radiation therapy. The transfer bed may be configured to transfer the subject to a position near the medical bed or the conveying device.

[0064] In some embodiments, the medical bed apparatus may include the medical bed and the conveying device. In some embodiments, the medical bed apparatus may include the medical bed, the transfer bed, and the conveying device.

[0065] By providing the support device to support two ends of a medical bed board, stability of the medical bed board is maintained even if an axial dimension of the medical space is relatively long. Additionally, the coordination between a medical bed, a transfer bed, and a conveying device facilitates the transfer of the movable bed board, allowing for convenient medical operations even in situations where the medical space is relatively narrow or has a long axial length.

[0066] FIG. 2 is a schematic diagram illustrating an exemplary medical bed apparatus according to some embodiments of the present disclosure. As shown in FIG. 2, the medical bed apparatus 2000 includes a medical bed 2100, a transfer bed 2200, and a conveying device 2300.

[0067] In some embodiments, at least a portion of the medical bed 2100 may be located within the medical space 1110 (as shown in FIGs. 3-4, 13, 14, and 15) of a medical device (e.g., the medical device 1100 of the medical system). The medical bed 2100 may include a medical bed board 2120 and a support device 2110 supporting two ends of the medical bed board 2120 along a length direction of the medical bed board 2120, wherein the support device 2110 may be configured to drive the medical bed board 2120 to move in multiple degrees of freedom. In some embodiments, the support device 2110 may be configured to drive the medical bed board 2120 to move along at least three orthogonal directions.

[0068] The conveying device 2300 may be configured to transfer a subject (i.e., a patient) between the

transfer bed 2200 and the medical bed board 2120. In some embodiments, the conveying device 2300 may be configured to transfer the subject from the transfer bed 2200 to the medical bed 2100 and/or move the bed to different positions of the medical bed 2100. In some embodiments, the conveying device 2300 may be detachably docked with at least a portion of the transfer bed 2200, so as to move the at least a portion of the transfer bed 2200 while transferring the subject disposed therein.

[0069] In some embodiments, the transfer bed 2200 may be any feasible structure for placing the subject, such as a general hospital bed. The transfer bed in the broadest sense may not be a bed structure. For example, it may be a wheelchair structure, and for example, it may be a slab-like structural object. In some embodiments, the transfer bed 2200 may be considered part of the conveyor device 2300 or the medical bed board 2120. In other embodiments, the transfer bed 2200 may be non-required. when the patient has good mobility, the patient may move to the medical bed board 2120 on his or her own without the use of the transfer bed 2200.

[0070] The transfer bed 2200 may include a movable bed body 2210 and a movable bed board 2220 detachably mounted on the movable bed body 2210.

[0071] The conveying device 2300 may be configured to transfer the movable bed board 2220 between the movable bed body 2210 and the medical bed board 2120. The conveying device 2300 may be detachably docked with the movable bed board 2220, and may transport the movable bed board 2220 detached from the movable bed body 2210 to the medical bed board 2120. The conveying device 2300 may transport the movable bed board 2220 to a position on the medical bed board 2120 located within the medical space 1110 of the medical device. More descriptions of the conveying device 2300 may be found in FIGs. 3, 4, and 10 and the relevant descriptions thereof.

[0072] The medical bed 2100 refers to a bed for supporting a patient during a medical process. At least a portion of the medical bed 2100 may be located within the medical space 1110 of the medical system, enabling the patient on the medical bed 2100 to be diagnosed or treated within the medical space 1110.

[0073] The medical bed board 2120 refers to a platform used to support the patient, and the support device 2110 may be configured to stably support the medical bed board 2120. In some embodiments, the support device 2110 may be located at two ends of the medical bed board 2120.

[0074] The support device 2110 may be configured to drive the medical bed board 2120 to move, thereby adjusting a position of the patient for easier radiographic diagnosis and/or treatment operations. The support device 2110 may be configured to drive the medical bed board 2120 to move in multiple degrees of freedom.

[0075] In some embodiments, the support device 2110 may be configured to drive the medical bed board 2120 to move in six degrees of freedom.

[0076] The support device 2110 may be configured to drive the medical bed board 2120 to translate along one direction and/or rotate around the direction, or the support device 2110 may be configured to drive the medical bed board 2120 to translate along at least two different directions and/or rotate around the at least two different directions to achieve motion of the medical bed board 2120 in multiple degrees of freedom.

[0077] In some embodiments, the support device 2110 may be configured to drive the medical bed board 2120 to translate along three different directions and/or rotate around the three different directions.

[0078] In some embodiments, the support device 2110 may be configured to drive the medical bed board 2120 to move (e.g., translate, rotate) along three orthogonal directions. For example, the support device 2110

may drive the medical bed board 2120 to translate or rotate along an X-axis direction, a Y-axis direction, and a Z-axis direction shown in FIG. 2. As another example, the support device 2110 may drive the medical bed board 2120 to translate along one or more directions of the X-axis direction, Y-axis direction, and Z-axis direction and rotate around another one or more directions of the X-axis direction, Y-axis direction, and Z-axis direction. As yet another example, the support device 2110 may drive the medical bed board 2120 to translate along and rotate around the X-axis direction, Y-axis direction, and Z-axis direction shown in FIG. 2. More descriptions for the specific structure of the support device 2110 may be found in FIGs. 16, 17, and 18 and the corresponding descriptions thereof.

[0079] In some embodiments, the support device 2110 may drive the medical bed board 2120 to move in multiple degrees of freedom simultaneously (e.g., move simultaneously in six degrees of freedom). In some embodiments, the support device 2110 may drive the medical bed board 2120 to move in one or more degrees of freedom first, and then drive the medical bed board 2120 to move in another one or more degrees of freedom to adjust the position of the patient. In other words, the movement of the medical bed board 2120 in multiple degrees of freedom may occur simultaneously or independently in an order among different degrees of freedom.

[0080] The transfer bed 2200 may be used to transfer patients. For example, the transfer bed 2200 may transfer patients from a ward, an outpatient room, an operating room, etc., to the space where the medical system is located. The movable bed board 2220 being detachably mounted on the movable bed body 2210 may be understood as follows: the movable bed board 2220 may be placed on the movable bed body 2210, but it can be removed from the movable bed body 2210. For example, the movable bed board 2220 may be connected to the movable bed body 2210 in a detachable manner. As another example, the movable bed board 2220 may be directly placed on the movable bed body 2210 (the movable bed board 2220 and the movable bed body 2210 do not need to be connected). When the movable bed board 2220 is placed on the movable bed body 2210, the movable bed board 2220 may be removed from the movable bed body 2210 along one or more directions (for example, lifting the movable bed board 2220 upward may make it be removed from the movable bed body 2210).

[0081] The conveying device 2300 may be configured to transfer the movable bed board 2220. In some embodiments, the conveying device 2300 may be configured to transfer the movable bed board 2220 detached from the movable bed body 2210 to a position on the medical bed board 2120 within the medical space 1110 of the medical system, facilitating patient reception for diagnosis and/or treatment. The position of the movable bed board 2220 within the medical space 1110 may be adjusted by the conveying device 2300 based on a type of diagnostic and/or treatment operation required by the patient, a region on the body of the patient to be diagnosed and/or treated, a physique of the patient, etc.

[0082] In some embodiments, the medical bed apparatus 2000 may transport the patient as follows: the medical bed apparatus 2000 may transfer the patient (from a ward, an outpatient room, an operating room, etc.) to a position near the conveying device 2300 (e.g., a location where the conveying device 2300 may dock) via the transfer bed 2200. The conveying device 2300 may be docked with the movable bed board 2220 via a docking assembly 2400 (as shown in FIG. 6). The movable bed board 2220 may be detached from the movable bed body 2210, and subsequently the movable bed board 2220 may be transported to the medical bed 2100. In some embodiments, the conveying device 2300 may detach from the movable bed board 2220 first,

and after a diagnostic and treatment operation is completed, the conveying device 2300 may re-dock with the movable bed board 2220 and transport the movable bed board 2220 back to the movable bed body 2210. In some embodiments, the conveying device 2300 may remain docked with the movable bed board 2220 throughout the diagnostic and treatment operation and transport the movable bed board 2220 back to the movable bed body 2210 after the diagnostic and treatment operation is completed.

[0083] By setting the support device 2110 at two ends of the medical bed board 2120, even if the axial (along the Y-axis) dimension of the medical space 1110 is relatively long, the support device 2110 may stably support the medical bed board 2120. Meanwhile, the support device 2110 may also drive the medical bed board 2120 to move, changing the position of the patient for ease of diagnostic and treatment operations. The coordination among the medical bed 2100, the transfer bed 2200, and the conveying device 2300 may enable convenient transfer of the movable bed board 2220, thereby facilitating radiographic diagnosis and treatment of patients even in a narrow medical space 1110 or a medical space 1110 with a long axial length.

[0084] In some embodiments, the conveying device 2300 may be located adjacent to the medical bed 2100, for example, above the medical bed 2100. Merely by way of example, the conveying device 2300 may include a telescopic conveying rod (not shown in the drawings) that may be positioned above the medical bed 2100 and extend along a length direction of the medical bed 2100. The movable bed board 2220 may dock with one end of the telescopic conveying rod, and by adjusting the extension of the telescopic conveying rods, the movable bed board 2220 may be transported along the length direction of the medical bed 2100 from the movable bed body 2210 to the medical bed 2100.

[0085] In some embodiments, if the space around the medical bed 2100 is limited, for example, limited by the medical space 1110 of the medical device 1100, the conveying device 2300 may be positioned on the medical bed 2100.

[0086] FIGs. 3 and 4 are schematic diagrams illustrating a use of a medical bed apparatus according to some embodiments of the present disclosure. In some embodiments, as shown in FIGs. 3 and 4, the conveying device 2300 is disposed on the medical bed 2100. The conveying device 2300 may include a conveying member 2310 and a driving device 2320 configured to drive the conveying member 2310. FIGs. 3 and 4 illustrate the operation of the medical bed apparatus 2000 in a medical system. The driving device 2320 may be configured to drive the conveying member 2310 to move along a length direction of the medical bed 2100 on the medical bed board 2120. The docking assembly 2400 may be disposed on the conveying member 2310 and the movable bed board 2220. The movable bed body 2210 may drive the movable bed board 2220 to move to one end of the medical bed 2100, the conveying member 2310 may be connected to the movable bed board 2220 via the docking assembly 2400, and the driving device 2320 may drive the conveying member 2310 to drag the movable bed board 2220 along the length direction of the medical bed 2100, positioning the movable bed board 2220 to a location suitable for a diagnostic and treatment operation.

[0087] Referring further to FIG. 2, in some embodiments, a guide structure 2330 (e.g., a guide rail extending along the length direction of the medical bed 2100) may be provided on the medical bed 2100. The conveying member 2310 may move along the guide structure 2330 to ensure stable movement of the conveying member 2310 along the length direction of the medical bed 2100.

[0088] In some embodiments, the medical bed apparatus 2000 may further include a plurality of distributed gravity sensing devices and a speed control device. The plurality of distributed gravity sensing devices may

be configured to detect gravity distribution data or pressure distribution data of a plurality of preset points on the medical bed 2100. The plurality of distributed gravity sensing devices may be distributed at multiple preset points on the medical bed 2100. The plurality of distributed gravity sensing devices may be configured to obtain gravity distribution data. The speed control device may be located on the conveying device 2300 and may be configured to adjust a transmission speed of the conveying device 2300 based on the gravity distribution data.

[0089] In some embodiments, the plurality of distributed gravity sensing devices may include a plurality of pressure sensors distributed at different locations.

[0090] The preset points refer to preselected positions on the medical bed 2100, which may be set according to actual needs. In some embodiments, the preset points may be distributed at two ends and/or two sides of the medical bed 2100 along the length direction of the medical bed 2100. In some embodiments, the count of preset points set at the two ends of the medical bed 2100 may be greater than the count of preset points set at other positions of the medical bed 2100.

[0091] The gravity distribution data or pressure distribution data refers to data related to the gravity detected by the plurality of distributed gravity sensing devices. In some embodiments, the gravity distribution data may include at least one of a gravity magnitude, a gravity distribution position, etc., detected by the plurality of distributed gravity sensing devices.

[0092] In some embodiments, when the movable bed board 2220 moves on the medical bed 2100, it covers the plurality of distributed gravity sensing devices or a part thereof. The covered distributed gravity sensing devices bear a pressure of the movable bed board 2220, and the pressure borne at the preset points may be detected, which corresponds to the gravity magnitude of the corresponding part of the movable bed board 2220. The distribution positions of the plurality of distributed gravity sensing devices may represent the gravity distribution positions.

[0093] In some embodiments, the plurality of distributed gravity sensing devices may communicate with the speed control device.

[0094] The speed control device may analyze and process the gravity distribution data, and generate a corresponding control instruction, which may be sent to the conveying device 2300 to adjust the transmission speed of the conveying device 2300.

[0095] The transmission speed refers to the conveying speed of the conveying member 2310. The speed control device may adjust at least one of a speed, a power, etc. In some embodiments, the speed control device may include at least one of a variable speed motor, a transmission chain with an adjustable gear ratio, etc. The transmission chain may include at least one of a gear transmission chain, a belt transmission chain, a chain transmission chain, etc. In some embodiments, if a variable speed motor is used as the speed control device, it may replace the driving device 2320. In some embodiments, if a transmission chain with an adjustable gear ratio is used in the speed control device, it may be connected between the driving device 2320 and the conveying member 2310 in a transmission way.

[0096] By monitoring pressures at the plurality of preset points of the medical bed 2100 in real time through the plurality of distributed gravity sensing devices, it is possible to analyze whether the forces at the multiple preset points and the support forces are equal. When the support force is less than the force, the transmission speed may be reduced to prevent instability such as fluctuations during transmission.

[0097] In some embodiments, through the gravity distribution data, it is possible to determine whether the gravity at the multiple preset points of the medical bed 2100 is evenly distributed. For example, the gravity magnitude of each preset point in the gravity distribution data may be compared with a preset gravity threshold corresponding to the gravity magnitude. If the gravity magnitude is less than or equal to the preset gravity threshold, it may be determined that the gravity distribution is even. If the gravity magnitude is greater than the preset gravity threshold, it may be determined that the gravity distribution is uneven, and a current transmission speed may be reduced by a preset value. If the gravity distribution remains uneven after the transmission speed is reduced, the transmission speed may be further reduced, until the gravity distribution becomes even.

[0098] In some embodiments, by detecting the gravity distribution of the medical bed, it is possible to determine whether the medical bed or the patient is unstable. In the event of instability of the medical bed or the patient, the speed of the movable bed board is reduced, which prevents the patient from falling due to fluctuations.

[0099] In some embodiments, the medical bed apparatus 2000 may further include an auxiliary support device.

[0100] The auxiliary support device may be configured to provide auxiliary support to the movable bed board 2220 on the medical bed board 2120. In some embodiments, the auxiliary support device may be disposed on the medical bed board 2120. In some embodiments, the auxiliary support device may move along the length direction (e.g., the Y direction in FIG. 2) of the medical bed board 2120. In some embodiments, at least one side surface of the auxiliary support device may abut against a lower surface of the movable bed board 2220. In some embodiments, the auxiliary support device may move synchronously with the movable bed board 2220.

[0101] In some embodiments, the auxiliary support device may include various structures. For example, the auxiliary support device may include a groove provided along the length direction (e.g., the Y direction in FIG. 2) of the medical bed board 2120, and a slider slidably provided in the groove, wherein the slider may abut against the movable bed board 2220. As another example, the auxiliary support device may include a screw and a screw nut, wherein an axis of the screw may be parallel to the length direction (e.g., the Y direction in FIG. 2) of the medical bed board 2120, and the screw nut may be provided on the screw and may abut against the movable bed board 2220.

[0102] In some embodiments, the medical bed apparatus 2000 may, in response to determining that an instability is greater than a preset value, enable the auxiliary support device and move the auxiliary support device to a first auxiliary support position. In some embodiments, the first auxiliary support position may be determined based on the gravity distribution data. The instability may be determined based on the gravity distribution data and the transmission speed of the conveying device 2300.

[0103] The instability refers to relevant data reflecting a degree of instability of the movable bed board 2220. In some embodiments, the degree of instability may be related to a bending moment of the movable bed board 2220. For example, the greater the bending moment borne by the movable bed board 2220 is, the higher the instability of the movable bed board 2220 is.

[0104] In some embodiments, based on the gravity distribution data and the transmission speed, the instability may be determined through a preset table, which includes a preset correspondence relationship

between the gravity distribution data, the transmission speed, and the instability.

[0105] In some embodiments, the preset table may be constructed as follows: for the gravity distribution data and actual transmission speed during a patient bed transfer process, a count of instances of discomfort feedback from the patient, a count of medical personnel assisting in the transfer, a count of assisted transfers, a sliding frequency and/or a sliding magnitude of the patient relative to the bed board during the transfer process may be weighted and summed to obtain the instability.

[0106] The count of instances of discomfort feedback from the patient refers to the count of times during a transfer process of the movable bed board 2220 that the patient provides feedback of feeling uncomfortable, which may be obtained based on manual statistics.

[0107] The count of medical personnel assisting in the transfer refers to the total count of medical personnel assisting in the transfer of the movable bed board 2220 during a transfer process, which may be obtained based on manual statistics.

[0108] The count of assisted transfers refers to the count of times the medical personnel participate in assisting in the transfer of the movable bed board 2220 during a transfer process, which may be obtained based on manual statistics.

[0109] The sliding frequency of the patient relative to the bed board during the transfer process refers to the frequency at which the patient slides relative to the movable bed board 2220 during a transfer process. In some embodiments, the sliding frequency of the patient relative to the bed board during the transfer process may be determined based on the gravity distribution data. For example, if a similarity between the gravity distribution data collected at a time point or period (e.g., one minute) before a transfer process and the gravity distribution data collected at a time point or period (e.g., one minute) after the transfer process is less than a preset similarity threshold, it may be determined that the patient has slid. The sliding frequency refers to the count of occurrences of sliding per unit of time.

[0110] The sliding magnitude of the patient relative to the bed board during the transfer process refers to the distance the patient slides relative to the movable bed board 2220 during a transfer process. In some embodiments, the sliding magnitude of the patient relative to the bed board during the transfer process may be determined based on the gravity distribution data. For example, in a transfer process, a distance between a center of gravity corresponding to the gravity distribution data collected at a time point or period (e.g., one minute) before and a center of gravity corresponding to the gravity distribution data collected at a time point or period (e.g., one minute) later may be designated as the sliding magnitude. An average sliding magnitude may be obtained by taking an average of a plurality of sliding magnitudes.

[0111] In some embodiments, based on the count of instances of discomfort feedback from the patient, the count of medical personnel assisting in the transfer, the count of assisted transfers, the sliding frequency of the patient relative to the bed board during the transfer process, and the average sliding magnitude, the instability may be determined using a preset algorithm (e.g., a weighted algorithm). For example, instability $N=W_1\times D+W_2\times M\times C+W_3\times P\times S$, wherein W_1, W_2, and W_3 denote preset values, N denotes instability, D denotes the count of instances of discomfort feedback from the patient, M denotes the count of medical personnel assisting in the transfer, C denotes the count of assisted transfers, P denotes the sliding frequency of the patient relative to the bed board during the transfer process, and S denotes the average sliding magnitude.

[0112] The first auxiliary support position refers to the position where the auxiliary support device needs to

support the movable bed board 2220. When the auxiliary support device moves to the first auxiliary support position and supports the movable bed board 2220, it may improve the stability of the movable bed board 2220.

[0113] In some embodiments, the first auxiliary support position may correspond to the location where the bending moment of the movable bed board 2220 is maximum. In some embodiments, based on the gravity distribution data, the gravity magnitude at various locations may be obtained, and by performing force analysis, a position corresponding to a maximum bending moment may be determined, and the position may be determined as the first auxiliary support position.

[0114] By way of example, the movable bed board 2220 may be supported from a bottom to a top at two ends of the movable bed board 2220 while the patient lies on the movable bed board 2220. The maximum bending moment is borne at a middle position of the movable bed board 2220, and the first auxiliary support position may be below the middle position of the movable bed board 2220. In other words, the auxiliary support device may support the movable bed board 2220 from below the middle position of the movable bed board 2220. In some embodiments, when the patient lies on the movable bed board 2220, the position on the movable bed board 2220 where the bending moment is maximum may be below the patient's center of gravity, and the position may be determined as the first auxiliary support position.

[0115] In some embodiments, by determining instability, it is possible to assess whether there is a risk of instability for the patient on the movable bed board and accordingly provide targeted auxiliary support to improve the stability of the movable bed board during transfer, thereby preventing the patient from falling off the movable bed board and ensuring the safety of the patient.

[0116] In some embodiments, the instability may be determined based on the gravity distribution data and the transmission speed of conveying device 2300 through an instability prediction model.

[0117] The instability prediction model refers to a model configured to determine the instability. In some embodiments, the instability prediction model may be a machine learning model, such as a convolutional neural network (CNN) model, etc.

[0118] In some embodiments, an input of the instability prediction model may include the gravity distribution data and the transmission speed of the conveying device 2300, and an output of the instability prediction model may include the instability. More descriptions of the gravity distribution data, the transmission speed of the conveying device, and the instability may be found in the relevant descriptions above.

[0119] In some embodiments, the instability prediction model may be obtained by training a plurality of first training samples with a first label. This training process may be executed on a remote server. The remote server may input the plurality of first training samples with the first label into an initial instability prediction model, construct a loss function based on the first label and a result of the initial instability prediction model, and iteratively update a parameter of the initial instability prediction model based on the loss function. When the loss function of the initial instability prediction model meets a preset condition, the model training is completed, and the trained instability prediction model is obtained. The preset condition may include the loss function converging or a count of iterations reaching a threshold.

[0120] In some embodiments, the first training sample may include the gravity distribution data and the transmission speed of the conveying device obtained from historical data. In some embodiments, in a

subsequent patient transfer process, the first label may be obtained by performing a weighted summation on the count of instances of discomfort feedback from the patient, the count of medical personnel assisting in the transfer, the count of assisted transfers, and the sliding frequency and sliding magnitude of the patient relative to the bed board during the transfer process in the historical data. More descriptions of the count of instances of discomfort feedback from the patient, the count of medical personnel assisting in the transfer, the count of assisted transfers, the sliding frequency and sliding magnitude of the patient relative to the bed board during the transfer process, and the weighted summation may be found in the relevant descriptions above.

[0121] In some embodiments, predicting the instability through the instability prediction model can improve the accuracy and efficiency of instability prediction.

[0122] In some embodiments, as shown in FIG. 2, the transfer bed 2200 may include a lifting base 2211. In some embodiments, the movable bed board 2220 may be detachably mounted on the lifting base 2211. By providing the lifting base 2211, the lifting base 2211 may drive the movable bed board 2220 to move up and down (along the Z-axis direction in FIG. 2) to adjust a height of the movable bed board 2220 from a ground, thereby facilitating the transfer of the patient. For example, by adjusting the lifting of the lifting base 2211 (e.g., lowering the height of the movable bed board 2220), the patient may be transferred to the movable bed board 2220 more easily, and then by adjusting the lifting of the lifting base 2211 (e.g., raising the height of the movable bed board 2220), the conveying device may dock with the movable bed board 2220 more easily. The lifting base 2211 may be raised and lowered via a driving device 2320. An exemplary driving device 2320 may include a motor (e.g., a linear motor), a hydraulic cylinder, an air cylinder, etc.

[0123] In some embodiments, the lifting base 2211 may be provided with one or more universal wheels 2212, which may facilitate the movement of the lifting base in multiple directions to facilitate the movement of the transfer bed 2200. In some embodiments, the movable bed body 2210 may include an automatic navigation device. The automatic navigation device may be configured to automatically plan a transfer route of the transfer bed 2200 based on a departure and a destination of the transfer bed 2200, and control the movable bed body 2210 to move along the planned transfer route. By providing the automatic navigation device, the process of transferring the patient with the transfer bed 2200 can be made more intelligent.

[0124] In some embodiments, the conveying device 2300 may be detachably docked with the movable bed board 2220 via the docking assembly 2400. The detachable docking between the conveying device 2300 and the movable bed board 2220 may be understood as follows: the conveying device 2300 may transport the movable bed board 2220, but the conveying device 2300 may detach from the movable bed board 2220 after the transmission process ends or after the patient's treatment is completed. For example, the movable bed board 2220 may be connected to the conveying device 2300 in a detachable manner, or the movable bed board 2220 may be directly placed on the conveying device 2300 (the movable bed board 2220 not connected with the conveying device 2300).

[0125] In some embodiments, the docking assembly 2400 may include a first docking member, a second docking member, and a locking mechanism. One of the first docking member and the second docking member may be disposed on the movable bed board 2220, and the other of the first docking member and the second docking member may be disposed on the conveying device 2300. The locking mechanism may be configured to connect and lock the docked first docking member and the second docking member to stably connect the movable bed board 2220 and the conveying device, thereby facilitating the transmission of the

movable bed board 2220 by the conveying device 2300.

[0126] In some embodiments, the docking assembly 2400 may further include a detection device 2470 configured to detect whether the first docking member and the second docking member are docked in place. When the first docking member and the second docking member are docked in place, the locking mechanism may be controlled to lock the conveying device 2300 to the movable bed board 2220, allowing the conveying device 2300 to transport the movable bed board 2220.

[0127] In some embodiments, the detection device 2470 may include a switch. In some embodiments, when the first docking member and the second docking member are docked in place, the switch is triggered and emit a trigger signal. The locking mechanism may begin the locking operation in response to the trigger signal.

[0128] In some embodiments, the detection device 2470 may include a laser sensor. The laser sensor may be configured to detect a relative position and/or a distance between the movable bed board 2220 and the conveying device 2300 (i.e., a relative position and/or a distance between the first docking member and the second docking member) to determine whether the first docking member and the second docking member are docked in place.

[0129] FIG. 5 is a schematic diagram illustrating an exemplary docking assembly according to some embodiments of the present disclosure. FIG. 6 is an enlarged schematic diagram of portion M of FIG. 5. FIG. 7 is a schematic diagram illustrating an exemplary docking protrusion and a first driving member of a docking assembly according to some embodiments of the present disclosure.

[0130] In some embodiments, the docking assembly may include a first docking member, a second docking member, and/or a locking mechanism. In some embodiments, as shown in FIGs. 5 and 6, the first docking member may include a docking protrusion 2410, and the second docking member may include a docking groove 2420. One of an outer wall of the docking protrusion 2410 and an inner wall of the docking groove 2420 may be provided with a helical groove (not shown in the drawings). It may be understood that the positions of the docking protrusion 2410 and the docking groove 2420 shown in FIGs. 5 and 6 may be interchanged. In other words, the first docking member may include the docking groove 2420, and the second docking member may include the docking protrusion 2410. A protrusion part 2411 capable of being inserted into the helical groove may be provided on one of the outer wall of the docking protrusion 2410 and the inner wall of the docking groove 2420. The docking protrusion 2410 may be rotatably arranged on the conveying device 2300 or the movable bed board 2220, and the docking protrusion 2410 may be configured to rotate along an axis of the helical groove. When the docking protrusion 2410 and the docking groove 2420 are docked in place, the protrusion part 2411 enters one end of the helical groove. During the rotation of the docking protrusion 2410, the protrusion part 2411 may move along the helical groove so that the docking protrusion 2410 enters the docking groove 2420.

[0131] FIG. 5 illustrates an example where the docking protrusion 2410 is rotatably arranged on the conveying device 2300 (the conveying member 2310), the protrusion part 2411 is disposed on the outer wall of the docking protrusion 2410, and the docking groove 2420 is disposed on the movable bed board 2220, with the helical groove disposed on the inner wall of the docking groove 2420. In some embodiments, a count of the protrusion part 2411 and a count of the helical groove may be more than one (e.g., two, three, etc.), and a plurality of protrusion parts 2411 and a plurality of helical grooves may be arranged in a one-to-one

correspondence.

[0132] The locking mechanism may include a first driving member 2450, which may be configured to drive the docking protrusion 2410 to rotate along the axis of the helical groove, causing the protrusion part 2411 to move along the helical groove. By coordinating the docking protrusion 2410 and the docking groove 2420, the docking between the conveying device 2300 and the movable bed board 2220 can be achieved, making the docking between the conveying device 2300 and the movable bed board 2220 stable and reliable.

[0133] In some embodiments, the first driving member 2450 may include a motor, a hydraulic cylinder, a gasoline engine, or other driving sources to achieve automatic driving of the docking protrusion 2410. In some embodiments, as shown in FIG. 7, the first driving member 2450 may be a manual driving component. For example, the first driving member 2450 may be a rod or a knob connected to the docking protrusion 2410 (shown as a rod in FIG. 7), and an operator (e.g., a doctor) may manually push the rod or rotate the knob to drive the docking protrusion 2410 to rotate.

[0134] FIG. 8 is a schematic diagram illustrating an exemplary structure of a docking assembly according to some embodiments of the present disclosure. FIG. 9 is a schematic diagram illustrating an exemplary structure of a docking assembly according to some other embodiments of the present disclosure.

[0135] In some embodiments, as shown in FIGs. 8 and 9, the first docking member includes a bolt 2430, the second docking member includes a slot 2440, and the locking mechanism includes a second driving member 2460, which may be configured to drive the bolt 2430 to insert into the slot 2440.

[0136] The second driving member 2460 may include a motor (e.g., a linear motor), a hydraulic cylinder, an air cylinder, etc. FIGs. 8 and 9 illustrate an example where the bolt 2430 is disposed on the movable bed board 2220 and the slot 2440 is disposed on the conveying device 2300. FIG. 8 illustrates a state before the bolt 2430 and the slot 2440 are docked, and FIG. 9 illustrates a state after the bolt 2430 and the slot 2440 are docked. It may be understood that the positions of the bolt 2430 and the slot 2440 may be interchanged, i.e., the bolt 2430 may be disposed on the conveying device 2300, and the slot 2440 may be disposed on the movable bed board 2220.

[0137] The movable bed board 2220 may be provided with a housing, and the bolt 2430 and the second driving member 2460 may be located inside the housing. The housing may protect the bolt 2430 and the second driving member 2460. An opening may be provided on the housing at a position where the bolt 2430 extends out. When the movable bed board 2220 and the conveying device 2300 move into position, the second driving member 2460 may drive the bolt 2430 to extend from the opening and then insert into the slot 2440, thereby locking the movable bed board 2220 and the conveying device 2300.

[0138] The docking between the conveying device 2300 and the movable bed board 2220 may be achieved by the cooperation of the bolt 2430 and the slot 2440, making the docking between the conveying device 2300 and the movable bed board 2220 stable and reliable.

[0139] FIG. 10 is a schematic diagram illustrating an exemplary structure of a docking assembly according to yet some other embodiments of the present disclosure. FIG. 11 is a schematic diagram illustrating an exemplary structure of a conveying device in the embodiments of FIG. 10. FIG. 12 is an enlarged schematic diagram of portion D of FIG. 10. In some embodiments, referring to FIGs. 10, 11, and 12, the first docking member of the docking assembly 2400 may include a hook 2491, and the second docking member may include a hook slot 2492. The locking mechanism includes a third driving member, which may be configured to

drive the hook 2491 to hook into or withdraw from the hook slot 2492. For example, the third driving member may be configured to drive the hook along a depth direction of the hook slot 2492, allowing the hook 2491 to hook into or withdraw from the hook slot 2492. As another example, the third driving member may drive the hook 2491 to rotate, allowing the hook 2491 to hook into or withdraw from the hook slot 2492. The third driving member may be a motor, a hydraulic cylinder, etc.

[0140] In some embodiments, a locking mechanism 2493 (e.g., a cam), a fourth driving member configured to drive the locking mechanism 2493 to move (e.g., driving the cam to rotate), and a triggering mechanism 2494 may be provided on the movable bed board 2220. The fourth driving member may be configured to drive the locking mechanism 2493 to move, allowing the movable bed board 2220 to move in a longitudinal direction of the movable bed board 2220. The triggering mechanism 2494 may be provided on the conveying device 2300, and when the movable bed board 2220 approaches the conveying device 2300, the triggering mechanism 2494 may be triggered. Then, the fourth driving member may drive the locking mechanism 2493 to move (e.g., driving the cam to rotate), causing the movable bed board 2220 to move a short distance in a direction away from the conveying device 2300, thereby ensuring that the hook 2491 is securely engaged in the hook slot 2492. In other words, when the hook 2491 is hooked into the hook slot 2492, a gap may exist between the hook 2491 and the hook slot 2492. By driving the movable bed board 2220 to move a short distance away from the conveying device 2300, the locking mechanism 2493 eliminates the gap between the hook 2491 and the hook slot 2492, ensuring that the hook 2491 is securely hooked into the hook slot 2492.

[0141] In some embodiments, the first docking member, second docking member, and locking mechanism may have different structures.

[0142] In some embodiments, the first docking member may further include a first actuating member, and the second docking member may further include a second actuating member. The first actuating member and the second actuating member may be configured to connect and disconnect the first docking member and the second docking member.

[0143] In some embodiments, the first actuating member and the second actuating member may be configured to generate an interacting force to connect or disconnect the first docking member and the second docking member. In some embodiments, the interacting force may be a magnetic force. At least one of the first actuating member and the second actuating member may generate the magnetic force and/or be magnetically attracted. For example, one of the first actuating member and the second actuating member may be a magnet, and the other of the first actuating member and the second actuating member may be a magnet or a metal that may be magnetically attracted, for example, iron, nickel, or the like. In some embodiments, the magnet may include a permanent magnet and/or an electromagnet.

[0144] Merely by way of example, the first docking member may include an electromagnet, the second docking member may be a magnetic component, and the locking mechanism may be an electrically connected switch associated with the electromagnet. When the movable bed board 2220 and the conveying device 2300 move into position, the electrically connected switch connected to the electromagnet may be turned on, causing the electromagnet to be energized and attract the magnetic component, thereby connecting and locking the movable bed board 2220 and the conveying device 2300. By changing a magnitude of a current, the magnetic force may be further adjusted to change the degree of connection.

[0145] In some embodiments, the docking assembly 2400 disposed on the medical bed 2100 may further

include an anti-skid device, which may be configured to prevent the docking assembly 2400 on the medical bed board 2120 from sliding.

[0146] In some embodiments, the anti-skid device may include one or more anti-skid strips or one or more anti-skid platforms disposed on at least one of the first docking member and the second docking member. In some embodiments, one of the first docking member and the second docking member may be slidably connected to the anti-skid platform disposed on the other one of the first docking member and the second docking member. By providing the one or more anti-skid strips or the one or more anti-skid platforms, the friction between the first docking member and the second docking member can be increased to prevent slippage.

[0147] In some embodiments, an anti-skid pattern may be set on the one or more anti-skid platforms. By providing the anti-skid pattern, the friction between the first docking member and the second docking member can be further increased.

[0148] By utilizing the advantages of a simple structure and convenient control provided by the interaction force to connect the first docking member and the second docking member, the connection structure can be simplified. By providing the anti-skid device, the friction between the first docking member and the second docking member can be increased, thereby improving the connection effectiveness and preventing slippage.

[0149] FIG. 13 is a schematic diagram illustrating an exemplary structure of a docking assembly according to some other embodiments of the present disclosure. FIG. 14 is a schematic diagram illustrating an exemplary structure of a docking assembly according to yet some other embodiments of the present disclosure. FIG. 15 is a schematic diagram illustrating an exemplary structure of a docking assembly according to yet some other embodiments of the present disclosure.

[0150] In some embodiments, referring to FIGs. 13, 14, and 15, the docking assembly 2400 may include a receiving plate 2480 disposed on the conveying device 2300 and a gap 2490 located between the movable bed body 2210 and the movable bed board 2220. The receiving plate 2480 may be configured to be inserted into the gap 2490 to support the movable bed board 2220.

[0151] FIGs. 13, 14, and 15 illustrate an example where the medical bed apparatus 2000 is applied in a radiotherapy system. FIG. 13 illustrates a state when the receiving plate 2480 is not inserted into the gap 2490 (the movable bed board 2220 is not docked with the conveying device 2300). FIG. 14 illustrates a state after the receiving plate 2480 is inserted into the gap 2490 (the movable bed board 2220 is docked with the conveying device 2300). FIG. 15 illustrates a state after the receiving plate 2480 moves the movable bed board 2220 onto the medical bed 2100.

[0152] In some embodiments, after the receiving plate 2480 is inserted into the movable bed board 2220, the receiving plate 2480 may lift the movable bed board 2220 upward to detach the movable bed board 2220 from the movable bed body 2210. In some embodiments, when the movable bed body 2210 includes a lifting base 2211, after the receiving plate 2480 is inserted into the movable bed board 2220, the lifting base 2211 may descend to detach the movable bed board 2220 from the movable bed body 2210, and the movable bed board 2220 may be supported by the receiving plate 2480.

[0153] In some embodiments, a plurality of support rods may be provided between a bottom of the movable bed board 2220 and the movable bed body 2210, creating a gap 2490 between the movable bed board 2220 and the movable bed body 2210.

[0154] In some embodiments, if the conveying device 2300 includes a conveyor member 2310, the receiving plate 2480 may be positioned on one side of the conveyor member 2310 close to the movable bed board 2220. By coordinating the receiving plate 2480 with the gap 2490, the docking between the conveying device 2300 and the movable bed board 2220 is achieved, simplifying the structure of the docking assembly 2400 and making it easier to operate.

[0155] In some embodiments, the support device 2110 may include at least two mechanical arms (not shown in the drawings), which may be connected to two ends of the medical bed board 2120 of the medical bed 2100, respectively. The at least two mechanical arms may include multiple joints articulated in sequence, providing the medical bed 2100 with multiple degrees of freedom, such as six degrees of freedom.

[0156] FIG. 16 is a schematic diagram illustrating an exemplary structure of a medical bed according to some embodiments of the present disclosure. FIG. 17 is a schematic diagram illustrating an exemplary structure of a medical bed according to some embodiments of the present disclosure. FIG. 18 is a schematic diagram illustrating an exemplary structure of a medical bed according to some embodiments of the present disclosure.

[0157] In some embodiments, referring to FIGs. 16, 17, and 18, the support device 2110 may include a plurality of telescopic rods 2111. One end of each of the plurality of telescopic rods 2111 may be connected to the medical bed board 2120 via a first hinge seat 2112. The other end of each of the plurality of telescopic rods 2111 may be connected to a static/fixed platform (e.g., the ground) via a second hinge seat 2113. In some embodiments, a portion of the plurality of telescopic rods 2111 may be connected to one end of the medical bed board 2120, and another portion of the plurality of telescopic rods 2111 may be connected to the other end of the medical bed board 2120. A plurality of first hinge seats 2112 may be spaced apart along a first circumference, and a plurality of second hinge seats 2113 may be spaced apart along a second circumference.

[0158] In some embodiments, the support device 2110 may include at least two telescopic rods 2111. For example, two telescopic rods 2111 may be connected to the two ends of the medical bed board 2120 along the length direction of the medical bed board 2120, which solves the problem of sagging or bending of the cantilever bed board 1212 in the cantilevered medical table 1210 due to the lack of support at one end, thus improving the safety during a medical process (e.g., radiographic imaging).

[0159] By hinging the plurality of telescopic rods 2111 to the medical bed board 2120 through the plurality of first hinge seats 2112 and to the static platform through the plurality of second hinge seats 2113, and by setting the count of the plurality of telescopic rods 2111 and the type and layout of the plurality of first hinge seats 2112 and the plurality of second hinge seats 2113, the medical bed 2100 can achieve multiple degrees of freedom in rotation and/or movement, meeting positioning requirements for patients during medical operations.

[0160] In some embodiments, the support device 2110 may include at least three telescopic rods 2111. A portion of the at least three telescopic rods 2111 may be connected to one end of the medical bed 2120, and another portion of the at least three telescopic rods 2111 may be connected to the other end of the medical bed 2120.

[0161] In some embodiments of the present disclosure, the support device 2110 is provided with a plurality of telescopic rods 2111, each of which independently supports the medical bed board 2120, thereby preventing

the accumulation of motion errors. In some embodiments of the present disclosure, the support device 2110 with the plurality of telescopic rods 2111 can also improve the stiffness of the medical bed 2100 and the precision of motion control.

[0162] In some embodiments, a count of the plurality of telescopic rods 2111 may be three, with one telescopic rod 2111 located at one end of the medical bed board 2120 and two telescopic rods 2111 located at the other end of the medical bed board 2120. Referring to FIG. 16, the at least three telescopic rods 2111 may include a first telescopic rod 2111-1, a second telescopic rod 2111-2, and a third telescopic rod 2111-3. A first end (an end near the medical bed board 2120) of each of the first telescopic rod 2111-1, the second telescopic rod 2111-2, and the third telescopic rod 2111-3 may be hinged to the medical bed board 2120 via a first hinge seat 2112. A second end (an end away from the medical bed board 2120) of each of the first telescopic rod 2111-1, the second telescopic rod 2111-2, and the third telescopic rod 2111-3 may be connected to a second hinge seat 2113. In some embodiments, the plurality of telescopic rods 2111 may be hinged to the static platform through a plurality of second hinge seats 2113. For example, the first telescopic rod 2111-1 and the second telescopic rod 2111-2 may be connected to one end of the medical bed board 2120 along a length direction of the medical bed board 2120 (i.e., a length direction of the medical bed 2100), and the third telescopic rod 2111-3 may be connected to the other end of the medical bed board 2120 along the length direction of the medical bed board 2120. FIG. 16 illustrates three orthogonal directions, wherein an X direction represents a width direction of the medical bed board 2120 (medical bed 2100), a Y direction represents a length direction of the medical bed board 2120 (medical bed 2100), and a Z direction represents a height direction of the medical bed board 2120.

[0163] By providing three telescopic rods 2111 on the medical bed 2100, with each telescopic rod 2111 hinged to the medical bed board 2120 through a first hinge seat 2112 and hinged to the static platform through a second hinge seat 2113, the medical bed 2100 may have six degrees of freedom. Through the telescopic motion of the three telescopic rods 2111, the medical bed board 2120 may translate along the X, Y, and Z directions, and/or rotate around the X, Y, and Z axes. It should be noted that the movements of the medical bed board 2120 in different degrees of freedom are achieved through the telescopic motion of the plurality of telescopic rods and the coordination between the plurality of first hinge seats 2112 and the plurality of second hinge seats 2113.

[0164] In some embodiments, the count of the plurality of telescopic rods 2111 may be six, and the medical bed 2100 may form a six-axis parallel platform. For example, as shown in FIG. 17, the support device 2110 may include six telescopic rods 2111: a first telescopic rod 2111-1, a second telescopic rod 2111-2, a third telescopic rod 2111-3, a fourth telescopic rod 2111-4, a fifth telescopic rod 2111-5, and a sixth telescopic rod 2111-6.

[0165] In some embodiments, referring to FIG. 17, two of the six telescopic rods 2111 (for example, the third telescopic rod 2111-3 and the sixth telescopic rod 2111-6) may be connected to one end of the medical bed board 2120 along the length direction of the medical bed board 2120, and the other four telescopic rods 2111 (for example, the first telescopic rod 2111-1, the second telescopic rod 2111-2, the fourth telescopic rod 2111-4, and the fifth telescopic rod 2111-5) may be connected to the other end of the medical bed board 2120 along the length direction of the medical bed board 2120. This arrangement provides more stable support for the medical bed board 2120 by the six telescopic rods 2111, enhancing the stability of the medical bed 2100.

Additionally, the end of the medical bed 2100 with only two telescopic rods 2111 has more space due to the relatively fewer count of telescopic rods 2111, facilitating the positioning of the transfer bed 2200 (a bed used for transferring a patient) near the end with two telescopic rods 2111, thus facilitating the transfer of the patient between the transfer bed 2200 and the medical bed 2100.

[0166] In some embodiments, referring to FIG. 18, three of the six telescopic rods 2111 (for example, the first telescopic rod 2111-1, the second telescopic rod 2111-2, and the fourth telescopic rod 2111-4) may be connected to one end of the medical bed board 2120 along the length direction of the medical bed board 2120, and the other three telescopic rods 2111 (for example, the third telescopic rod 2111-3, the fifth telescopic rod 2111-5, and the sixth telescopic rod 2111-6) may be connected to the other end of the medical bed board 2120 along the length direction of the medical bed board 2120. This arrangement also enhances the stability of the medical bed 2100. It may be understood that when the support device 2110 includes six telescopic rods, the count of the plurality of first hinge seats 2112 and the count of the plurality of second hinge seats 2113 are also six, with the first end of each telescopic rod 2111 connected to a corresponding first hinge seat 2112 at the second end of each telescopic rod 2111 connected to a corresponding second hinge seat 2113.

[0167] By setting up six telescopic rods 2111 on the medical bed 2100, the medical bed 2100 may achieve six degrees of freedom. Through the telescopic motion of the three telescopic rods 2111, the medical bed board 2120 may translate along the X, Y, and Z directions, and rotate around the X, Y, and Z axes.

[0168] In some embodiments, the count of telescopic rods 2111 may be four, with one of the four telescopic rod 2111 connected to one end of the medical bed board 2120 along the length direction of the medical bed board 2120, and the other three of the four telescopic rods 2111 connected to the other end of the medical bed board 2120 along the length direction of the medical bed board 2120. Similar to the previous description, this configuration allows the medical bed 2100 to have six degrees of freedom. In some embodiments, the count of telescopic rods 2111 may be seven, with three of the seven telescopic rods 2111 connected to one end of the medical bed board 2120 along the length direction of the medical bed board 2120, and the other four of the seven telescopic rods 2111 connected to the other end of the medical bed board 2120 along the length direction of the medical bed board 2120. Similar to the previous description, this configuration allows the medical bed board 2100 to have six degrees of freedom. In some embodiments, the count of telescopic rods 2111 may be eight, with four of the eight telescopic rods 2111 connected to one end of the medical bed board 2120 along the length direction of the medical bed board 2120, and the other four of the eight telescopic rods 2111 connected to the other end of the medical bed board 2120 along the length direction of the medical bed board 2120. Similar to the previous description, this configuration allows the medical bed board 2100 to have six degrees of freedom.

[0169] In some embodiments, referring to FIGs. 16, 17, and 18, at least two of the plurality of telescopic rods 2111 may be distributed on two sides of a central axis extending along the length direction of the medical bed board 2120. For example, as shown in FIG. 16, a first telescopic rod 2111-1 and a second telescopic rod 2111-2 may be distributed on the two sides of the central axis P1 extending along the length direction of the medical bed board 2120. A third telescopic rod 2111-3 may be precisely disposed on the central axis P1 or on either side of the central axis P1. As another example, as shown in FIG. 17, a third telescopic rod 2111-3 and a sixth telescopic rod 2111-6 may be distributed on the two sides of the central axis P2 extending along the length direction of the medical bed board 2120; a first telescopic rod 2111-1 and a second telescopic rod 2111-

2 may be distributed on the sides of the central axis P2 extending along the length direction of the medical bed board 2120; a fourth telescopic rod 2111-4 and a fifth telescopic rod 2111-5 may be distributed on the two sides of the central axis P2 extending along the length direction of the medical bed board 2120. As yet another example, as shown in FIG. 18, a first telescopic rod 2111-1 and a second telescopic rod 2111-2 may be distributed on the two sides of the central axis P3 extending along the length direction of the medical bed board 2120; a fifth telescopic rod 2111-5 and a sixth telescopic rod 2111-6 may be distributed on the two sides of the central axis P3 extending along the length direction of the medical bed board 2120. A third telescopic rod 2111-3 and a fourth telescopic rod 2111-4 may be precisely distributed on the central axis P3 or on either side of the central axis P3. In some embodiments, the two telescopic rods 2111 distributed on the two sides of the central axis extending along the length direction of the medical bed board 2120 may be symmetrically or asymmetrically distributed with respect to the central axis.

[0170] By arranging at least two telescopic rods on the two sides of the central axis extending along the length direction of the medical bed board 2120, the stability of the telescopic rods in supporting the medical bed board 2120 can be enhanced. In addition, the coordination between different telescopic rods enables the medical bed 2100 to move in multiple degrees of freedom, thus facilitating adjustment of a spatial position of the medical bed board 2120 and a position of the patient.

[0171] In some embodiments, each of the plurality of telescopic rods 2111 may be extended or retracted to adjust an overall length of the telescopic rod, and under the cooperation of the plurality of first hinge seats 2112 and the plurality of second hinge seats 2113, the medical bed 2100 may have multiple degrees of freedom (e.g., three degrees of freedom or six degrees of freedom), thereby facilitating the adjustment of the spatial position of the medical bed board 2120 and the position of the patient. Taking the third telescopic rod 2111-3 in FIG. 16 as an illustrative example, the third telescopic rod 2111-3 may include an inner rod and an outer sleeve, with the outer sleeve fitting over an outer side of the inner rod. One end of the inner rod may be hinged to the medical bed board 2120 through the first hinge seat 2112, and the other end of the inner rod may extend into the outer sleeve, with the outer sleeve connected to the second hinge seat 2113 away from the medical bed board 2120. The outer sleeve may be hinged to the static platform through the second hinge seat 2113. In some embodiments, the inner rod may be extended or retracted relative to the outer sleeve, and by controlling a length (also referred to as an extension length) of extension or retraction of the inner rod relative to the outer sleeve, the overall length of the third telescopic rod 2111-3 may be adjusted. In some embodiments, by adjusting the extension length of each of the plurality of telescopic rods separately to adjust the overall length of the telescopic rod and coordinating with the corresponding first hinge seat 2112 and the corresponding second hinge seat 2113, the medical bed 2100 may have different degrees of freedom, thus enabling the adjustment of the spatial position of the medical bed board 2120 and the position of the patient, thereby facilitating scanning and detection of the patient.

[0172] In some embodiments, each of the plurality of telescopic rods 2111 may be provided with a driving component (see FIG. 17) for driving the telescopic rod 2111 to extend and/or retract. In some embodiments, a count of the driving component 2114 may be one, and one driving component 2114 may be used for driving the telescopic rod 2111 to extend and retract. In some embodiments, the count of the driving component 2114 may be two, with one driving component 2114 used for driving the telescopic rod 2111 to extend and the other driving component 2114 used for driving the telescopic rod 2111 to retract.

[0173] In some embodiments, the driving component 2114 may drive the inner rod of the corresponding telescopic rod 2111 to extend relative to the outer sleeve to increase the overall length of the telescopic rod 2111. As another example, the driving component 2114 may drive the inner rod of the corresponding telescopic rod 2111 to retract relative to the outer sleeve to decrease the overall length of the telescopic rod 2111. In some embodiments, the extension length of the inner rod relative to the outer sleeve of different telescopic rods 2111 may be reasonably set according to actual needs (e.g., a spatial position, a posture, etc., of the patient), and the extension or retraction of the plurality of telescopic rods 2111 driven by the corresponding driving component 2114 can be coordinated. In some embodiments, the driving component 2114 may include an electric cylinder, a pneumatic cylinder, a hydraulic cylinder, or the like. By providing the driving components 2114 to drive the plurality of telescopic rods 2111 to extend or retract respectively, an operation difficulty can be reduced for an operator, and the convenience and accuracy of operation can be improved.

[0174] FIG. 19 is a schematic diagram illustrating a first circumference and a second circumference according to some embodiments of the present disclosure. In some embodiments, referring to FIGs. 16, 17, 18, and 19, at least three first hinge seats 2112 may be spaced apart along a first circumference A, and at least three second hinge seats 2113 may be spaced apart along a second circumference B. In some embodiments, each hinge seat may include a hinge point. For example, referring to FIGs. 16 and 19, when the count of the plurality of telescopic rods is three, the three first hinge points at which the three first hinge seats 2112 are respectively located may form the first circumference A, and the three second hinge points at which the three second hinge seats 2113 are respectively located may form the second circumference B. In other words, the three first hinge seats 2112 are spaced apart along the first circumference A, and the three second hinge seats 2113 are spaced apart along the second circumference B. As another example, referring to FIG. 17 (or FIG. 18) and FIG. 19, if the count of the plurality of telescopic rods is six, six first hinge seats 2112 are spaced apart along the first circumference A, and six second hinge seats 2113 are spaced apart along the second circumference B.

[0175] In some embodiments, the first end of each of the plurality of telescopic rods 2111 may be hinged to the medical bed board 2120 through the first hinge seat 2112 corresponding to the telescopic rod. When the telescopic rod extends or retracts under an action of a third driving member, the first hinge seat 2112 corresponding to the telescopic rod may move with the inner rod of the telescopic rod, causing a change in the position of the first hinge seat 2112, and thus a change in the hinge point corresponding to the first hinge seat 2112. Therefore, the first circumference A may also be referred to as a dynamic circumference. The second end of each of the plurality of telescopic rods may be hinged to the static platform through the corresponding second hinge seat 2113, and a position of the second hinge seat 2113 is fixed. Therefore, the second circumference B may also be referred to as a static circumference.

[0176] By arranging a positional distribution of the plurality of first hinge seats 2112 on the first circumference A and a positional distribution of the plurality of second hinge seats 2113 on the second circumference B, a movement of the medical bed board 2120 of the medical bed 2100 in multiple degrees of freedom within an aperture 105 of a scanning device (e.g., a movement along the length direction of the medical bed board 2120 or in a direction perpendicular to the length direction of the medical bed board 2120) can be controlled.

[0177] It should be noted that the illustration in FIG. 19, where a diameter of the first circumference A is

smaller than a diameter of the second circumference B, is merely exemplary. In actual situations, the diameter of the first circumference A may also be equal to or greater than the diameter of the second circumference B. The present disclosure does not specifically limit a size relationship between the diameter of the first circumference A and the diameter of the second circumference B.

[0178] In some embodiments, the first hinge seat 2112 may include a Hooke joint or a ball joint, and the second hinge seat 2113 may include a Hooke joint. In some embodiments, a type of the first hinge seat 2112 and a type of the second hinge seat 2113 may be the same. For example, both the first hinge seat 2112 and the second hinge seat 2113 may be Hooke joints. In some embodiments, the type of the first hinge seat 2112 and the second hinge seat 2113 may be different. For example, the first hinge seat 2112 may be a ball joint, and the second hinge seat 2113 may be a Hooke joint. By setting the first hinge seat 2112 as a Hooke joint or a ball joint and the second hinge seat 2113 as a Hooke joint, the medical bed board 2120 can move in multiple degrees of freedom, and the stability of the medical bed 2100 can be maintained even after the medical bed board 2120 moves in different degrees of freedom (i.e., a stable state of the medical bed 2100 remains unchanged after movement of the medical bed board 2120).

[0179] In some embodiments, one end of each of the plurality of telescopic rods 2111 may be hinged to the medical bed board 2120 through a Hooke joint or a ball joint, and the other end of each of the plurality of telescopic rods 2111 may be hinged to the static platform through a Hooke joint. By adjusting the count of the plurality of telescopic rods, the medical bed 2100 may have different degrees of freedom. For example, if the count of the plurality of telescopic rods is six, the medical bed 2100 may have six degrees of freedom. As another example, if the count of the plurality of telescopic rods is three, the medical bed 2100 may have three degrees of freedom. Furthermore, compared to a serial structure multi-degree-of-freedom platform, the parallel structure multi-degree-of-freedom medical bed 2100 provided in the embodiments of the present disclosure has greater stiffness, load-bearing capacity, and higher motion control accuracy by adjusting the count of the plurality of telescopic rods, the types of the plurality of first hinge seat 2112 and the plurality of second hinge seat 2113, and the positional distributions of the plurality of first hinge seats 2112 and the plurality of second hinge seats 2113 . Additionally, if the serial structure multi-degree-of-freedom platform has more degrees of freedom, a weight of the serial structure is increased, resulting in greater inertia of the platform. In contrast, the parallel structure multi-degree-of-freedom medical bed 2100 has the advantage of achieving smaller inertia.

[0180] In some embodiments, the medical bed 2100 may further include a plurality of telescopic guardrails, which may be located around a perimeter of the medical bed board 2120.

[0181] Telescopic guardrails refer to guardrails with telescopic functionality. In some embodiments, the plurality of telescopic guardrails may extend along a direction perpendicular to an upper surface of the medical bed board 2120 (e.g., the Z-direction in FIG. 2). In some embodiments, when the movable bed board 2220 moves onto the medical bed board 2120, the plurality of telescopic guardrails may extend upward along a direction perpendicular to the upper surface of the medical bed board 2120 (e.g., the Z-direction in FIG. 2) until they surpass the upper surface of the movable bed board 2220. By providing the plurality of telescopic guardrails, they may be extended when needed to protect a patient on the movable bed board 2220, preventing the patient from falling off.

[0182] In some embodiments, a flexible component may be provided on a side of the plurality of telescopic

guardrails close to the patient.

[0183] The flexible component refers to a structure made of a flexible material, for example, rubber, cotton, sponge, air cushions, etc. By providing the flexible component on the side of the plurality of telescopic guardrails close to the patient, the flexible component may act as a buffer when the patient collides with the plurality of telescopic guardrails, thereby improving patient comfort.

[0184] In some embodiments, the plurality of telescopic guardrails may be configured to: in response to receiving a guardrail activation instruction, activate the corresponding telescopic guardrail. In some embodiments, the plurality of telescopic guardrails may be connected to a control device of the medical bed apparatus 2000 via a signal. The control device of the medical bed apparatus 2000 may generate the guardrail activation instruction and send the guardrail activation instruction to the plurality of telescopic guardrails, causing at least one of the plurality of telescopic guardrails to execute at least one action of extending upward, retracting downward, etc.

[0185] In some embodiments, the guardrail activation instruction may be determined based on patient characteristics, an enabled degree of freedom, and the medical space 1110.

[0186] The patient characteristics refer to characteristics related to the patient. In some embodiments, the patient characteristics may include at least one of a height, a weight, an age, etc. of the patient. The patient characteristics may be manually obtained and input into the control device of the medical bed apparatus 2000.

[0187] The enabled degree of freedom refers to a direction in which the medical bed board 2120 needs to move and/or rotate. For example, the medical bed board 2120 may move along a length direction (e.g., the Y-direction in FIG. 2). As another example, the medical bed board 2120 may rotate around a vertical axis (e.g., the Z-direction in FIG. 2). The control device of the medical bed apparatus 2000 may determine the enabled degree of freedom by monitor the movement of the medical bed board 2120 through a displacement sensor, etc.

[0188] The medical space refers to the aperture of the medical space 1110. In some embodiments, the control device of the medical bed apparatus 2000 may obtain the medical space in various ways. For example, the control device may obtain the medical space based on at least one of a manufacturer, historical data, manual input, etc.

[0189] The guardrail activation instruction may include the telescopic guardrail(s) to be activated, a height of extension or retraction, and a speed of extension or retraction. In some embodiments, the control device of the medical bed apparatus 2000 may determine the telescopic guardrail(s) to be activated based on the enabled degree of freedom and determine the height of extension or retraction of the telescopic guardrail(s) based on the patient characteristic, and the speed of extension or retraction may be preset.

[0190] For example, if the enabled degree of freedom is rotating to one side around the Y-axis (as flipping outwards in FIG. 16), then the telescopic guardrail to be activated may be the telescopic guardrail on a side of a rotation direction (e.g., closer to the outer side of the paper in FIG. 16).

[0191] In some embodiments, a correspondence table between the patient characteristics and the height of extension or retraction may be constructed. For example, by statistically analyzing average dimensional information of patients in patient characteristics (e.g., an average body dimension of 12-year-olds weighing 30kg and 140cm tall), the required height of extension or retraction may be manually determined and recorded in a table to form the correspondence table. It may be understandable that since the aperture of the medical

space 1110 is fixed, the height of extension or retraction may be limited by the aperture of the medical space 1110, i.e., the height of extension or retraction of the telescopic guardrails may not exceed a set height threshold. If the height of extension or retraction is less than the aperture of the medical space 1110, then the height of extension or retraction may be determined as valid. If the height of extension or retraction exceeds the aperture of the medical space 1110, then the height of extension or retraction may be determined as invalid, and in this case, the actual the height of extension or retraction of the telescopic guardrails may be the height threshold.

[0192] In some embodiments, by providing the plurality of telescopic guardrails, automated control of the plurality of telescopic guardrails can be achieved when the medical bed board moves and/or rotates, thus protecting the patient and preventing the patient from falling off the movable bed board.

[0193] FIG. 20 is a schematic diagram illustrating an exemplary structure of a conveying device according to some embodiments of the present disclosure. In some embodiments, as shown in FIG. 20, the conveying device 2300 includes a conveying member 2310 and a driving device 2320. The driving device 2320 may be configured to drive the conveying member 2310 to move along a length direction of the medical bed board 2120. The conveying member 2310 may be configured to drag the movable bed board 2220, directly pulling the movable bed board 2220 and a patient on the movable bed board 2220 onto the medical bed board 2120. For example, the conveying member 2310 may be a trailer. In some embodiments, the movable bed board 2220 may be part of a transfer bed (e.g., the transfer bed 2200), and the movable bed board 2220 may be detachably provided on a movable bed body (e.g., the movable bed body 2210). The movable bed body may drive the movable bed board 2220 and the patient on the movable bed board 2220 to a position around the medical bed 2100 (e.g., to an end of two telescopic rods of a transfer bed with six telescopic rods). Then the movable bed body may dock with the conveying member 2310 and detach from the movable bed body under the drag of the conveying member 2310 (e.g., the trailer). The conveying member 2310 may drive the movable bed board 2220 to move onto the medical bed board 2120. In some embodiments, the movable bed board 2220 may be carried by medical staff to a position around the medical bed 2100 and docked with the conveying member 2310 (e.g., the trailer). The arrangement of the conveying member 2310 and the driving device 2320 can transport the patient over a longer distance.

[0194] In some embodiments, the conveying member 2310 and the driving device 2320 may be connected in a transmission way through a transmission assembly. In some embodiments, the transmission assembly may include a belt transmission assembly or a chain transmission assembly. In some embodiments, the transmission assembly may include a gear rack transmission assembly or a worm gear transmission assembly.

[0195] Referring to FIGs. 3, 4, 13, 14, and 15, in some embodiments, the medical system may include a medical device 1100 and a medical bed apparatus 2000, wherein the medical device 1100 may include a medical space 1110. The medical space 1110 may be a circular space around the patient. An axial direction of the medical space 1110 is the Y direction in the drawings. At least a portion of the medical bed 2100 of the medical bed apparatus 2000 may be located within the medical space 1110. In some embodiments, the medical bed 2100 of the medical bed apparatus 2000 passes through the medical space 1110 along the axial direction of the medical space 1110. By using the above medical bed apparatus 2000, the medical system can not only transport a patient requiring radiological diagnosis and treatment more conveniently and safely but also stably perform radiological diagnosis and treatment when the axial length of the medical space is

relatively long.

[0196] In some embodiments, the medical system may include an imaging device and the medical device 1100, and an isocenter of the imaging device may coincide with an isocenter of the medical device 1100. The medical device 1100 may cooperate with the imaging device, allowing the medical system to have both radiographic imaging and radiation therapy functions, with radiation therapy being conducted under the guidance of radiographic imaging. The isocenters of the imaging device and the medical device 1100 refer to points around which an accelerator rotates during radiographic imaging and treatment processes. By configuring the isocenter of the imaging device to coincide with the isocenter of the medical device 1100, the accuracy of image guidance during radiation therapy can be ensured.

[0197] In some embodiments, the medical system may include a magnetic resonance imaging (MRI) device, a positron emission tomography (PET) device, a positron emission computed tomography (PECT) device, a computed tomography (CT) device, an X-ray imaging device, a single-photon emission computed tomography (SPET) device, an ultrasound device, or the like. The medical system may include a radiation therapy (RT) device. The medical system may include one of the above imaging device and treatment device or a combination thereof. For example, when multiple devices of the medical system need to scan and detect a patient, the axial length of the medical space 1110 may be relatively long (which may be considered as the accumulation of the axial length of the medical space 1110 corresponding to each medical device 1100). By supporting two ends of the medical bed board 2120 with the supporting device 2110, the patient can be more stably supported. Additionally, if the medical bed 2100 described in FIGs. 16, 17, and 18 is used, the patient can be more stably supported and safely translated and rotated during movements, especially when the axial length of the medical space 2100 is relatively long.

[0198] In some embodiments, the conveying device 2300 may transport the movable bed board 2220 into at least a portion of the medical space 1110 in which the medical bed 2100 is located. In some embodiments, the medical space 1110 may be a circular space around the patient.

[0199] In some embodiments, a portion of the support device 2110 of the medical bed apparatus 2000 may be located at one end of an axial direction of the medical space 1110, and another portion of the support device 2110 may be located at the other end along the axial direction of the medical space 1110. For example, a portion of the at least three telescopic rods of the support device 2110 may be located at one end of the axial direction of the circular medical space, and another portion of the at least three telescopic rods may be located at the other end of the axial direction of the medical space 1110. With this configuration, at least a portion of the medical bed board 2120 of the medical bed 2100 is located within the medical space 1110, and the length direction of the medical bed board 2120 is parallel to the axial direction of the medical space 1110. In some embodiments, the medical bed 2100 may transport the patient into the circular medical space, and when the medical device 1100 performs scanning diagnosis on the patient, the plurality of telescopic rods of the medical bed 2100 may be controlled to extend or retract according to diagnostic and treatment requirements so as to adjust a position of the medical bed board 2120 in the medical space 1110 and a posture of the patient, thereby facilitating scanning diagnosis of the patient. In some embodiments, if the axial length of the medical space 1110 of the medical device 1100 is relatively long, a conveying distance along the length direction of the medical bed board 2120 is relatively long accordingly. By applying the medical bed 2100 to the medical system, with at least three telescopic rods supporting the medical bed board at two ends of the medical bed

board along its length direction, problems such as sagging or bending of a cantilever bed board in a cantilever-type medical bed due to lack of support at one end can be avoided, thus improving safety during a scanning detection process. Additionally, leveraging the advantages of the medical bed 2100, which has multiple degrees of freedom, higher motion control precision, and lower inertia, can meet requirements on the spatial position and posture of the patient during the scanning detection process.

[0200] Some embodiments of the present disclosure further provide a medical method, which uses the medical system described in any of the above embodiments for medical operations. The medical method may include one or more of the following operations:

[0201] The movable bed board 2220 may be transported, using the conveying device 2300 of the medical bed apparatus 2000, to a position on the medical bed board 2120 of the medical bed apparatus 2000's medical bed 2100 located within the medical space 1110 of the medical device 1100.

[0202] The medical bed board 2120 of the medical bed 2100 may be driven by the support device 2110 of the medical bed 2100 to move in multiple degrees of freedom to adjust a position of a subject (i.e., a patient).

[0203] A corresponding medical operation may be performed on the subject using the medical device 1100.

[0204] In some embodiments, before the conveying device 2300 transports the movable bed board 2220, the subject may be transferred to a predetermined position using the transfer bed 2200 of the medical bed apparatus 2000 and the movable bed board 2220 may be detached from the movable bed body 2210 of the transfer bed 2200.

[0205] In some embodiments, the subject may be transported to the predetermined position through other manners, for example, via a wheelchair or a regular hospital bed.

[0206] In some embodiments, after the movable bed board 2220 is transferred into the medical space 1110, the position of the movable bed board 2220 within the medical space 1110 may be further adjusted by the conveying device 2300 to modify a relative position between the subject and one or more modalities of the medical system. For example, the conveying device 2300 may adjust the subject to correspond to an imaging modality by adjusting the movable bed board 2220 in order to image the subject. As another example, the conveying device 2300 may adjust the subject to correspond to a radiation therapy modality by adjusting the movable bed board 2220 in order to administer radiation therapy to the subject.

[0207] In the above operations, the predetermined position may be understood as the position where a conveying mechanism (e.g., the conveying device 2300) transports the movable bed board 2220 detached from the movable bed body 2210. For example, the predetermined position may be a position where the conveying device 2300 docks with the movable bed board 2220 through the docking assembly 2400.

[0208] In some embodiments, the operation of detaching the movable bed body 2210 from the movable bed board 2220 may be performed after the transfer bed 2200 has moved to the predetermined position, thereby ensuring stable connection between the movable bed body 2210 and the movable bed board 2220 during the transfer process. In some embodiments, the operation of detaching the movable bed body 2210 from the movable bed board 2220 may be performed before the transfer bed 2200 moves to the predetermined position.

[0209] In some embodiments, during the process of adjusting the position of the patient through the support device 2110, an isocenter of the medical device 1100 may be positioned within a region of interest (e.g., a lesion site, a suspected lesion site, etc.) on the patient. More descriptions of other relevant aspects of the method described above may be found in the relevant descriptions of the medical bed apparatus 2000 and the

medical system above, which will not be repeated here.

[0210] Having thus described the basic concepts, it may be rather apparent to those skilled in the art after reading this detailed disclosure that the foregoing detailed disclosure is intended to be presented by way of example only and is not limiting. Various alterations, improvements, and modifications may occur and are intended to those skilled in the art, though not expressly stated herein. These alterations, improvements, and modifications are intended to be suggested by this disclosure, and are within the spirit and scope of the exemplary embodiments of this disclosure.

WHAT IS CLAIMED IS:

1. A medical bed apparatus (2000), comprising a medical bed (2100), a transfer bed (2200), and a conveying device (2300), wherein:

the medical bed (2100) includes a medical bed board (2120) and a support device (2110);

the support device (2110) is configured to drive the medical bed board (2120) to move in multiple degrees of freedom;

the conveying device (2300) is detachably docked with at least a portion of the transfer bed (2200), the conveying device (2300) being configured to transfer a subject between the transfer bed (2200) and the medical bed board (2120).

2. The medical bed apparatus (2000) of any one of claims 1, wherein the support device (2110) is capable of driving the medical bed board (2120) to move along three orthogonal directions.

3. The medical bed apparatus (2000) of any one of claims 1or 2, wherein the support device (2110) is capable of driving the medical bed board (2120) to move in six degrees of freedom.

4. The medical bed apparatus (2000) of any one of claims 1-3, wherein the support device (2110) is connected to two ends of the medical bed (2100).

5. The medical bed apparatus (2000) of claim 4, wherein the support device (2110) includes a plurality of telescopic rods (2111), wherein one end of each of the plurality of telescopic rods (2111) is connected to the medical bed board (2120) via a first hinge seat (2112), and the other end of each of the plurality of telescopic rods (2111) is connected to a second hinge seat (2113); a portion of the plurality of telescopic rods (2111) is connected to one end of the medical bed board (2120), and another portion of the plurality of telescopic rods (2111) is connected to the other end of the medical bed board (2120).

6. The medical bed apparatus (2000) of claim 5, wherein a plurality of first hinge seats (2112) are spaced apart along a first circumference, and a plurality of second hinge seats (2113) are spaced apart along a second circumference.

7. The medical bed apparatus (2000) of claim 5 or 6, wherein the support device (2110) includes at least three telescopic rods (2111), wherein a portion of the at least three telescopic rods (2111) are connected to one end of the medical bed board (2120), and another portion of the at least three telescopic rods (2111) are connected to the other end of the medical bed board (2120).

8. The medical bed apparatus (2000) of claim 7, wherein the support device (2110) includes six telescopic rods (2111), and wherein:

two of the six telescopic rods (2111) are connected to one end of the medical bed board (2120), and four of the six telescopic rods (2111) are connected to the other end of the medical bed board (2120).

9. The medical bed apparatus (2000) of claim 7, wherein the support device (2110) includes six telescopic rods (2111), and wherein:

three of the six telescopic rods (2111) are connected to one end of the medical bed board (2120), and three of the six telescopic rods (2111) are connected to the other end of the medical bed board (2120).

10. The medical bed apparatus (2000) of claim 7, wherein at least two of the plurality of telescopic rods (2111) are distributed on two sides of a central axis of the medical bed board (2120) extending along a length direction of the medical bed board (2120).

11. The medical bed apparatus (2000) of claim 7, wherein each of the plurality of telescopic rods (2111) is provided with a driving component (2114) for driving the telescopic rod (2111) to extend and/or retract.

12. The medical bed apparatus (2000) of claim 1, wherein:

at least a portion of the medical bed (2100) is located within a medical space (1110) of a medical device; and

the conveying device (2300) is configured to transport the subject to a position on the medical bed board (2120) located within the medical space (1110).

13. The medical bed apparatus (2000) of claim 1, wherein:

the conveying device (2300) is disposed on the medical bed (2100); and

the conveying device (2300) is detachably docked with the at least a portion of the transfer bed (2200) via a docking assembly (2400).

14. The medical bed apparatus (2000) of any one of claims 1-13, wherein the transfer bed (2200) includes a movable bed body (2210) and a movable bed board (2220) detachably mounted on the movable bed body (2210).

15. The medical bed apparatus (2000) of claim 14, wherein the at least a portion of the transfer bed (2200) includes the movable bed board (2220).

16. The medical bed apparatus (2000) of any one of claims 14 or 15, wherein:

the docking assembly (2400) includes a first docking member, a second docking member, and a locking mechanism;

one of the first docking member and the second docking member is disposed on the movable bed board (2220);

the other of the first docking member and the second docking member is disposed on the conveying device (2300); and

the first docking member is configured to dock with the second docking member, and the locking mechanism is configured to connect and lock the docked first docking member and the second docking

member.

17. The medical bed apparatus (2000) of any one of claims 14 or 15, wherein:

the docking assembly (2400) includes a receiving plate (2480) and a gap (2490),

the receiving plate (2480) is disposed on the conveying device (2300),

the gap (2490) is located between the movable bed body (2210) and the movable bed board (2220), and

the receiving plate (2480) is capable of being inserted into the gap (2490) to support the movable bed board (2220).

18. The medical bed apparatus (2000) of claim 16, wherein:

the first docking member includes a docking protrusion (2410), and the second docking member includes a docking groove (2420);

one of an outer wall of the docking protrusion (2410) and an inner wall of the docking groove (2420) is provided with a helical groove, and the other of the outer wall of the docking protrusion (2410) and the inner wall of the docking groove (2420) is provided with a protrusion part (2411) capable of being inserted into the helical groove; and

the locking mechanism includes a first driving member (2450), the first driving member (2450) being configured to drive the docking protrusion (2410) to rotate along an axis of the helical groove, so that the protrusion part (2411) moves along the helical groove.

19. The medical bed apparatus (2000) of claim 16, wherein:

the first docking member includes a bolt (2430), the second docking member includes a slot (2440), and the locking mechanism includes a second driving member (2460), the second driving member (2460) being configured to drive the bolt (2430) to insert into the slot (2440); or

the first docking member includes a hook (2491), the second docking member includes a hook slot (2492), and the locking mechanism includes a third driving member, the third driving member being configured to drive the hook (2491) to hook into the hook slot (2492).

20. The medical bed apparatus (2000) of any one of claims 16-19, wherein the docking assembly (2400) includes a detection device (2470), the detection device (2470) being configured to detect whether the first docking member and the second docking member are docked in place.

21. The medical bed apparatus (2000) of claim 20, wherein the detection device (2470) includes a switch and/or a laser sensor.

22. The medical bed apparatus (2000) of any one of claims 1-21, wherein:

the conveying device (2300) includes a conveying member (2310) and a driving device (2320),

the driving device (2320) is configured to drive the conveying member (2310) to move along a length direction of the medical bed board (2120); and

the conveying member (2310) is drivingly connected to the driving device (2320).

23. The medical bed apparatus (2000) of any one of claims 1-22, wherein:

the transfer bed (2200) includes a lifting base (2211), and/or the movable bed board (2220) is detachably mounted on the lifting base (2211); and/or

the lifting base (2211) is provided with one or more universal wheels (2212), and/or the movable bed body (2210) includes an automatic navigation device.

24. A medical system, comprising a medical device (1100) and the medical bed apparatus (2000) of any one of claims 1-23, wherein:

a medical bed board (2120) of a medical bed (2100) of the medical bed apparatus (2000) is configured to pass through a medical space (1110) of the medical device (1100) along an axial direction of the medical space (1110).

25. The medical system of claim 21, wherein the medical device (1110) includes a radiation therapy device, an imaging device, or a combination thereof, the imaging device comprising any one of a magnetic resonance imaging (MRI) device, a positron emission tomography (PET) device, a positron emission computed tomography (PECT) device, a computed tomography (CT) device, an X-ray imaging device, a single-photon emission computed tomography (SPECT) device, or an ultrasound device, or a combination thereof.

26. A medical method using the medical system of any one of claims 21-25 for medical therapy, the method comprising:

transporting a movable bed board (2220) through a conveying device (2300) of the medical bed apparatus (2000), and placing the movable bed board (2220) onto a medical bed board (2120) of the medical bed (2100) of the medical bed apparatus (2000) at a position within the medical space (1110) of the medical device (1100);

adjusting a position of a subject by driving, using a support device (2110) of the medical bed (2100), the medical bed board (2120) to move in multiple degrees of freedom; and

performing a corresponding medical operation on the subject using the medical device (1100).

27. The medical method of claim 25, further comprising:

transferring the subject to a preset position using a transfer bed (2200) of the medical bed apparatus (2000); and

detaching the movable bed board (2220) from a movable bed body (2210) of the transfer bed (2200).

28. The medical method of claim 25, further comprising:

adjusting a relative position of the subject and one or more modalities of the medical system by adjusting a position of the movable bed board (2220) in the medical space (1110) through the conveying device (2300).

29. A support device (2110) comprising a plurality of telescopic rods (2111) coupled to a medical bed

board (2120) of a medical bed (2100), wherein the support device (2110) is connected to two ends of the medical bed (2100), and the support device (2110) is capable of driving the medical bed board (2120) to move in six degrees of freedom.

30. The support device (2110) of claim 29, wherein one end of each of the plurality of telescopic rods (2111) is connected to the medical bed board (2120) via a first hinge seat (2112), and the other end of each of the plurality of telescopic rods (2111) is connected to a second hinge seat (2113); a portion of the plurality of telescopic rods (2111) is connected to one end of the medical bed board (2120), and another portion of the plurality of telescopic rods (2111) is connected to the other end of the medical bed board (2120); a plurality of first hinge seats (2112) are spaced apart along a first circumference, and a plurality of second hinge seats (2113) are spaced apart along a second circumference.

31. The support device (2110) of claim 29, wherein the support device (2110) includes at least three telescopic rods (2111), wherein a portion of the at least three telescopic rods (2111) are connected to one end of the medical bed board (2120), and another portion of the at least three telescopic rods (2111) are connected to the other end of the medical bed board (2120).

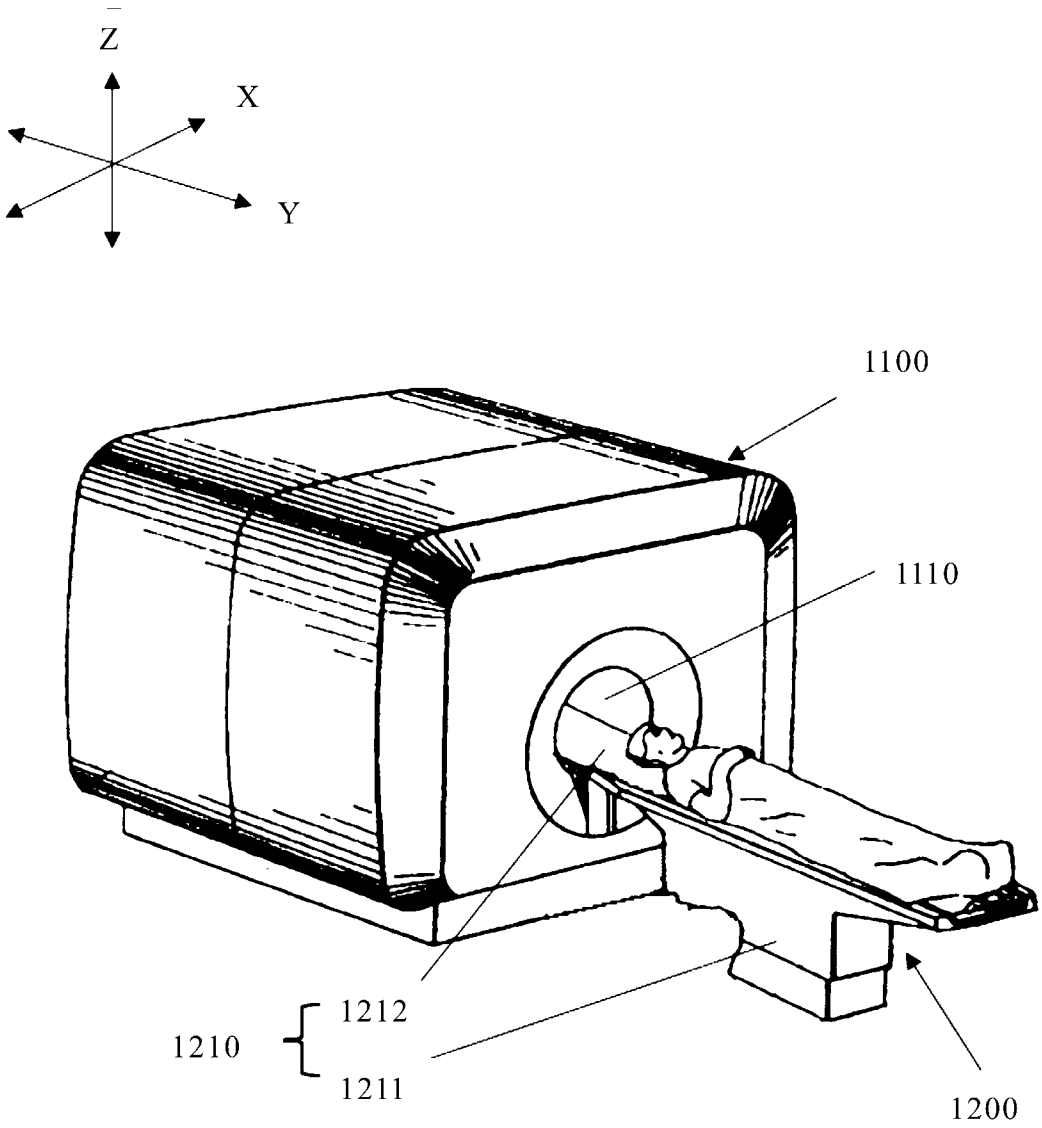


FIG. 1

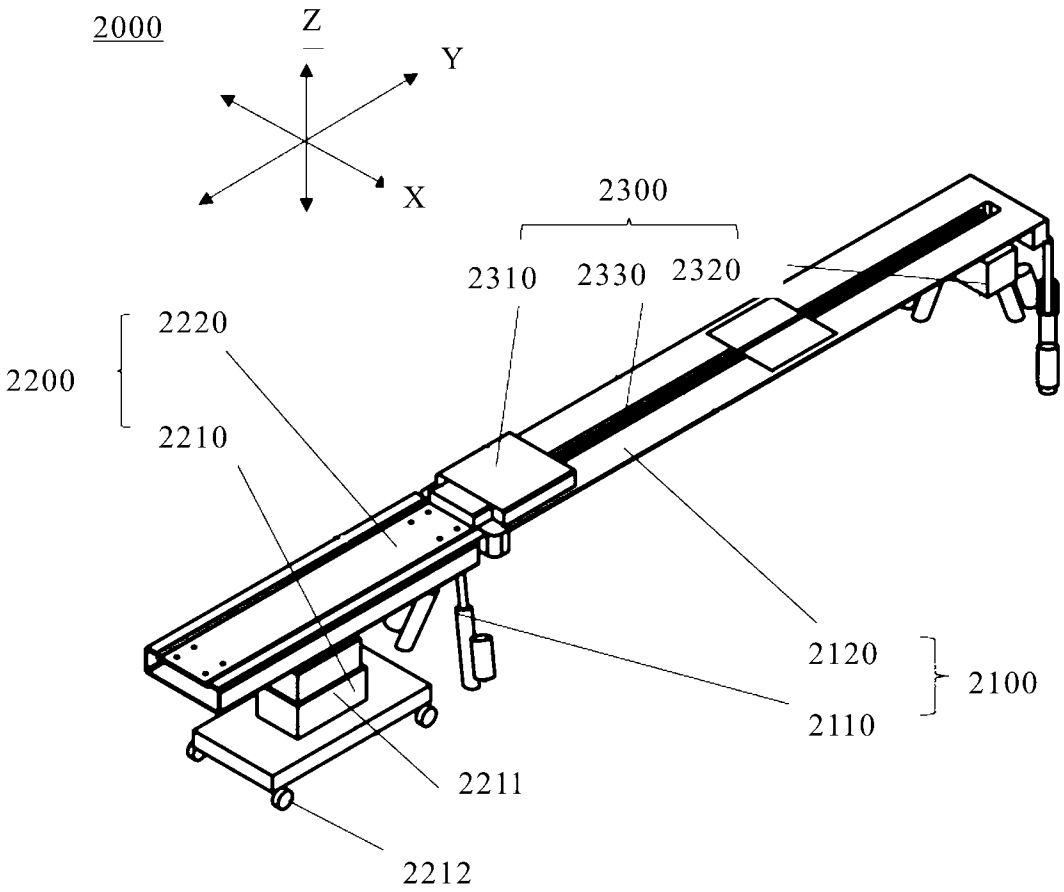

2000
Z
Y
X
2300
2310
2330
2320
2220
2200
2210
2120
2100
2110
2211
2212

FIG. 2

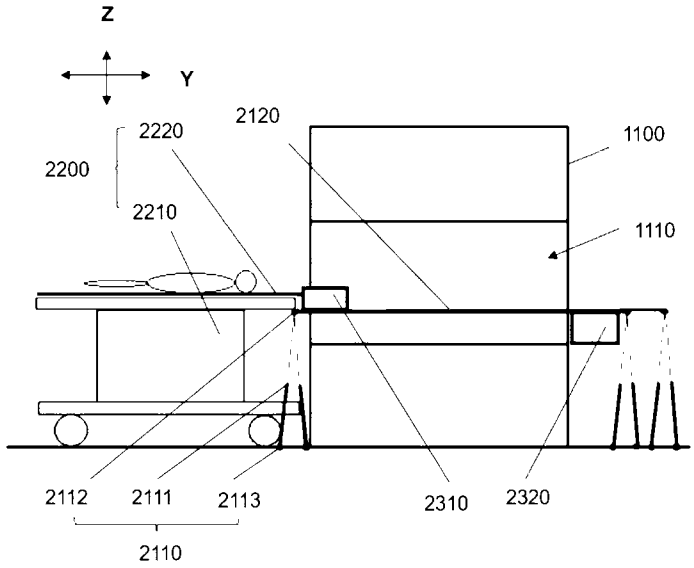


FIG. 3

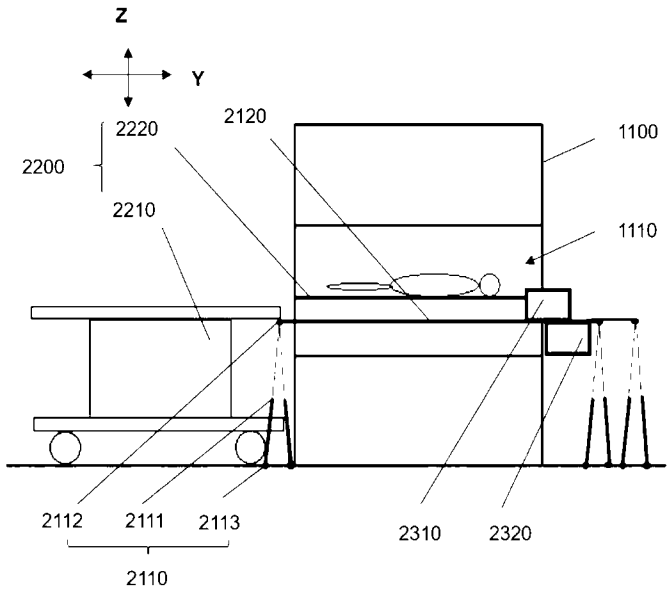


FIG. 4

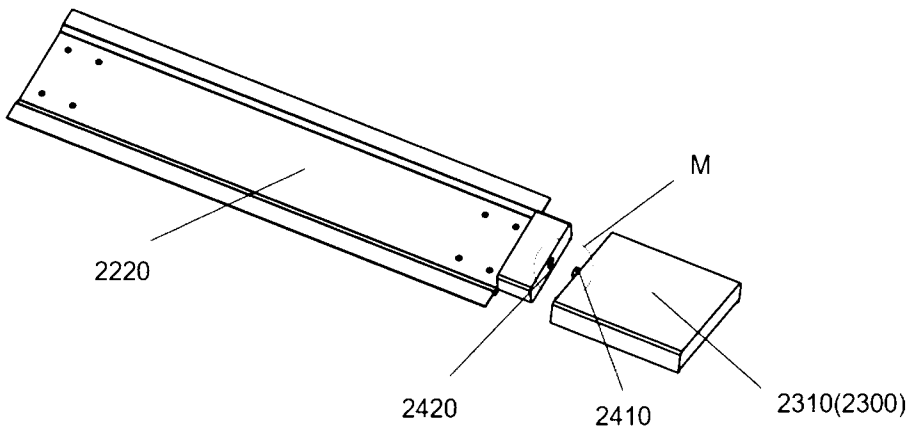


FIG. 5

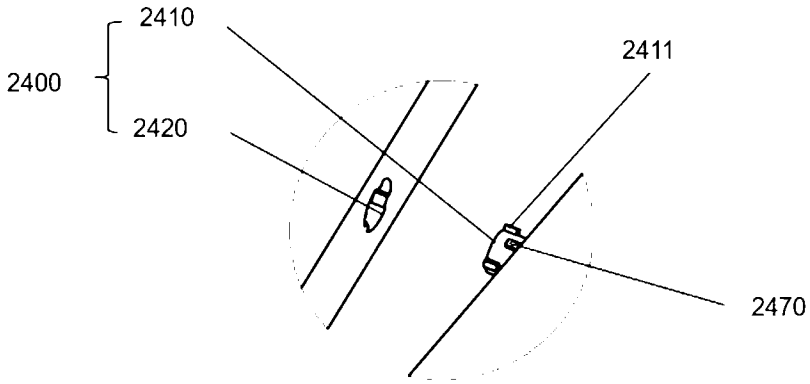


FIG. 6

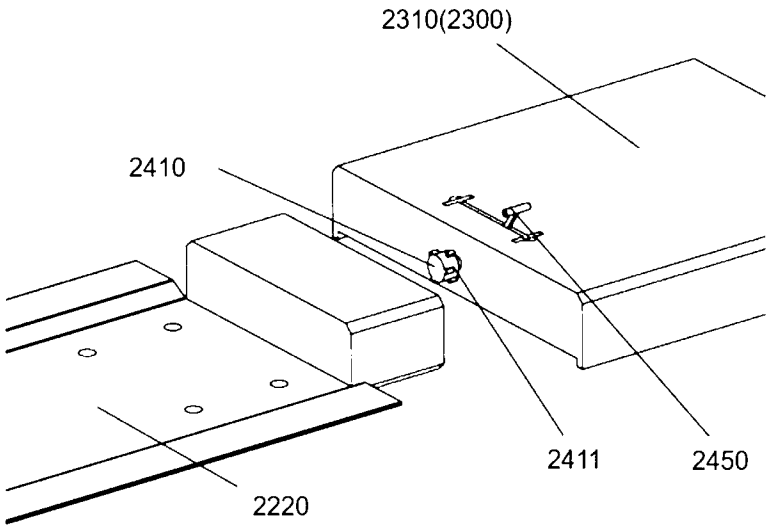


FIG. 7

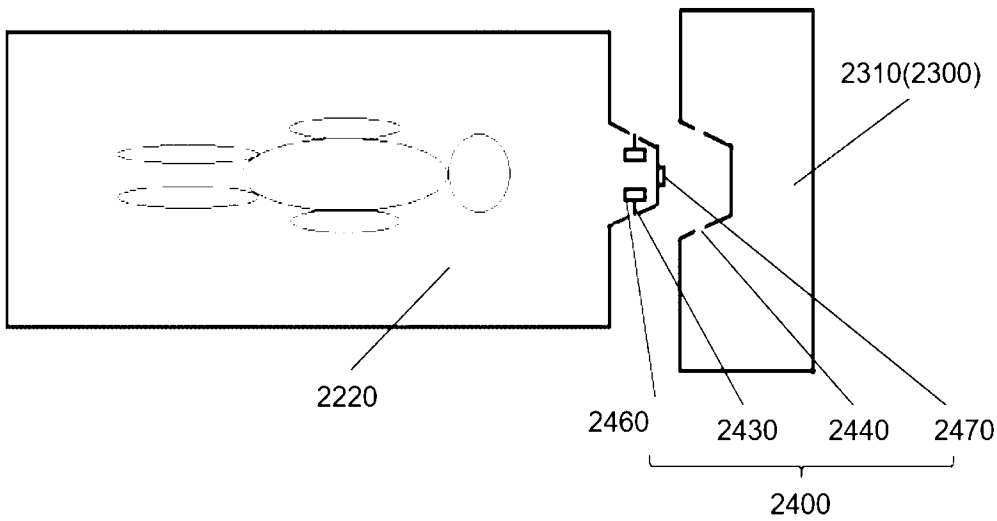


FIG.8

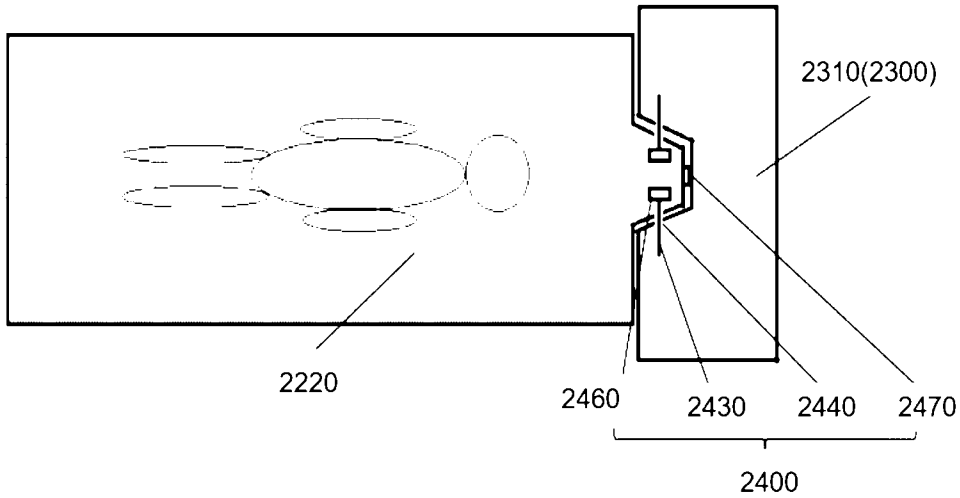


FIG. 9

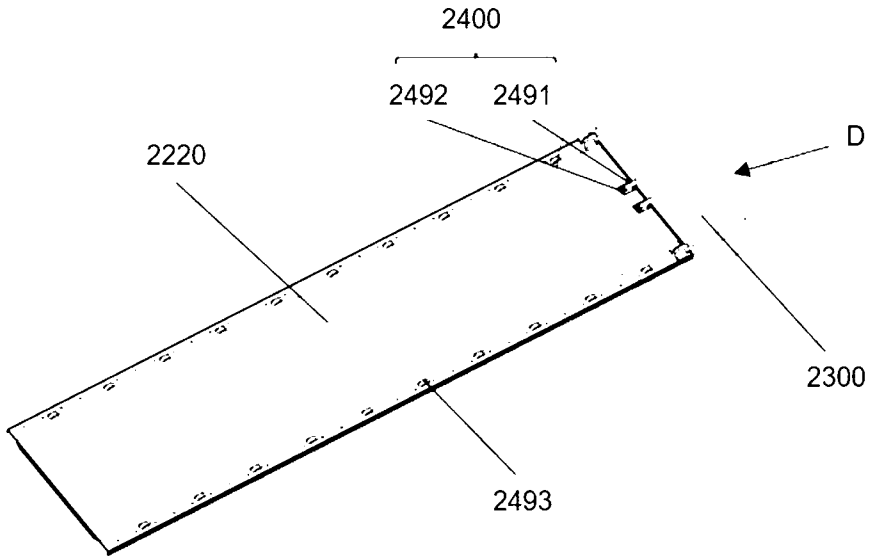


FIG. 10

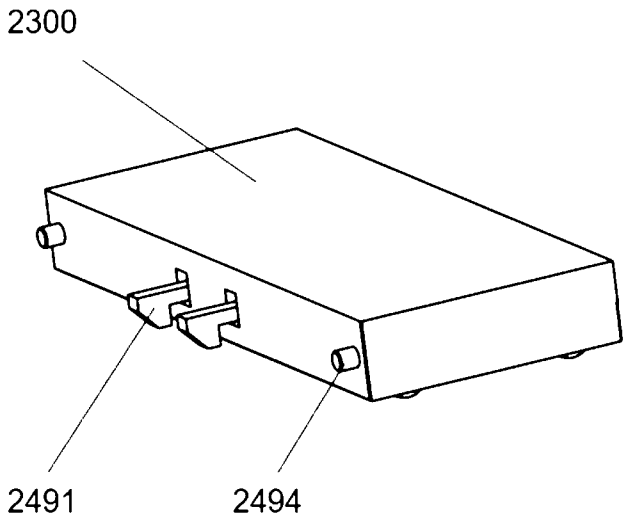


FIG. 11

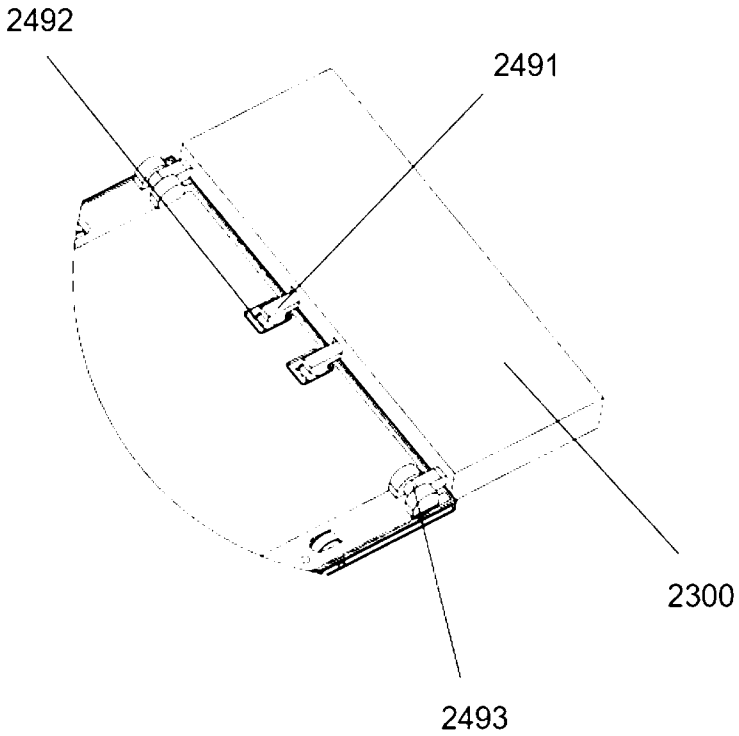

2492
2491
2300
2493

FIG. 12

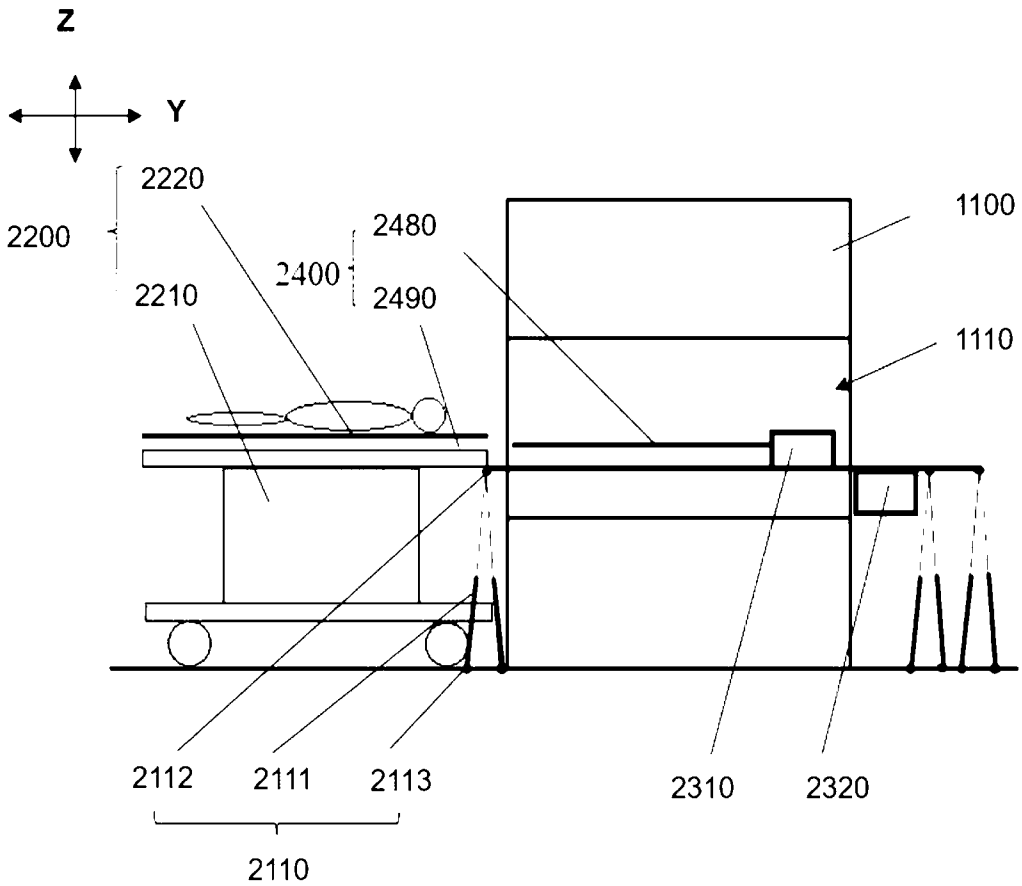
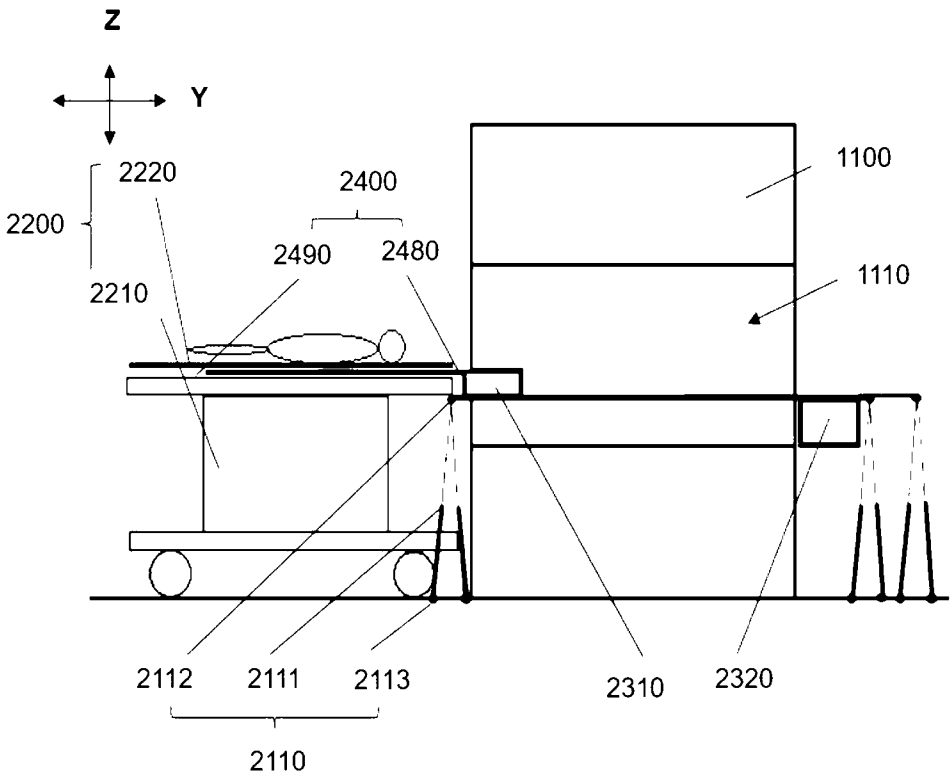

Z
Y
2220
2200
2480
2400
2490
2210
1100
1110
2112
2111
2113
2310
2320
2110

FIG. 13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2220
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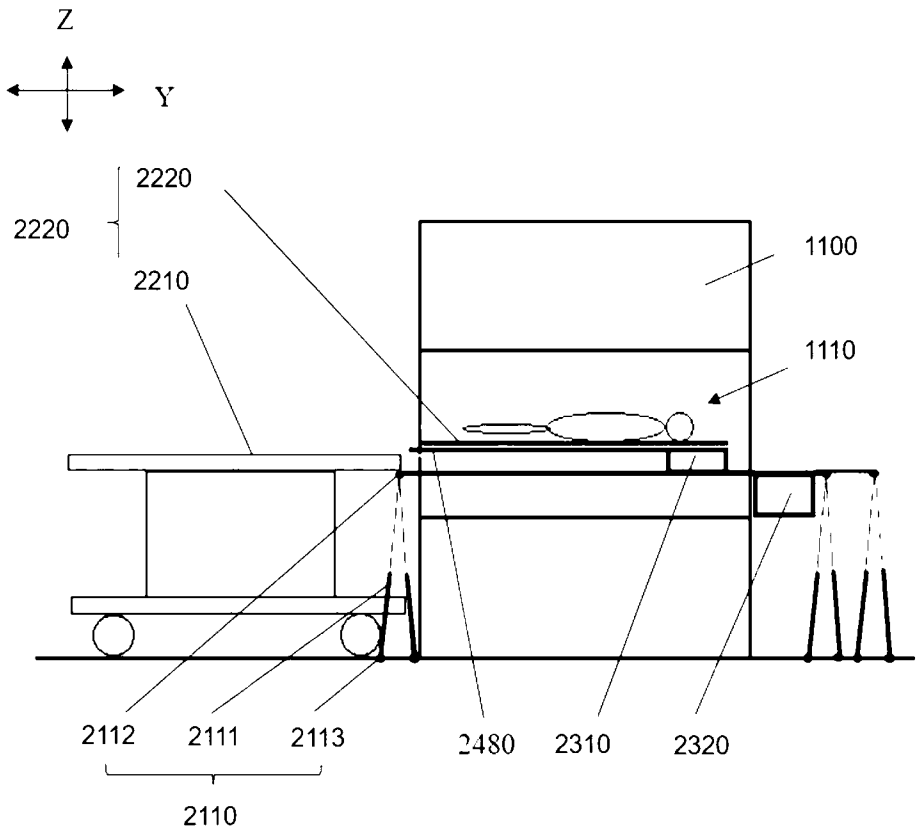
2320
2110

FIG. 14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2210
1100
1110
2112
2111
2113
2480
2310
2320
2110

FIG. 15

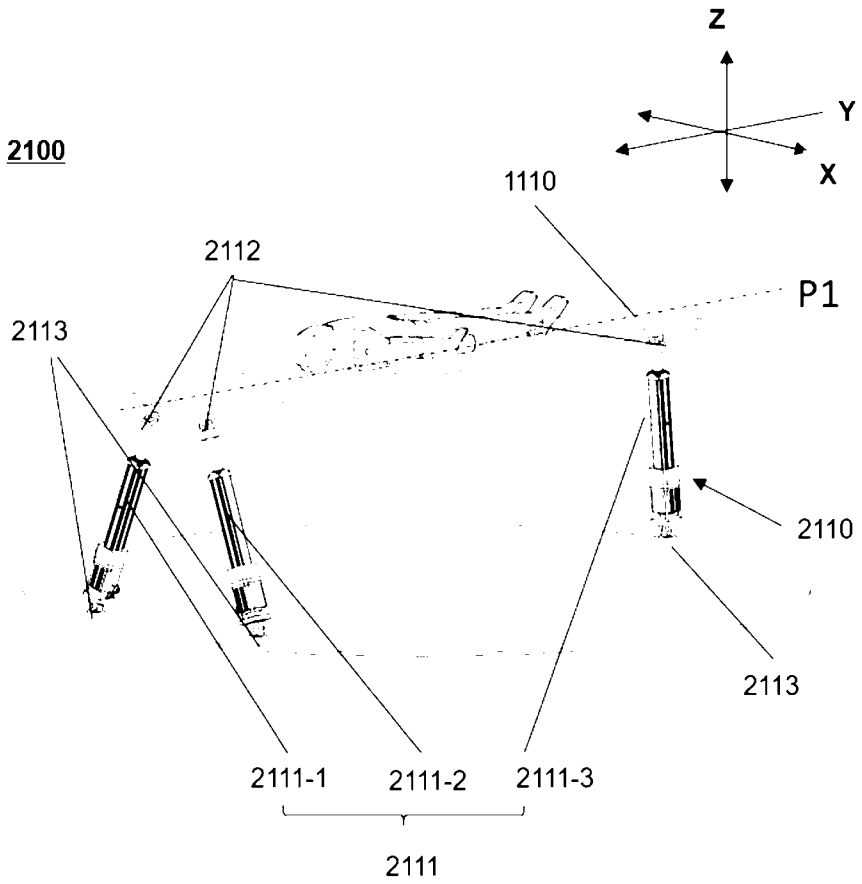
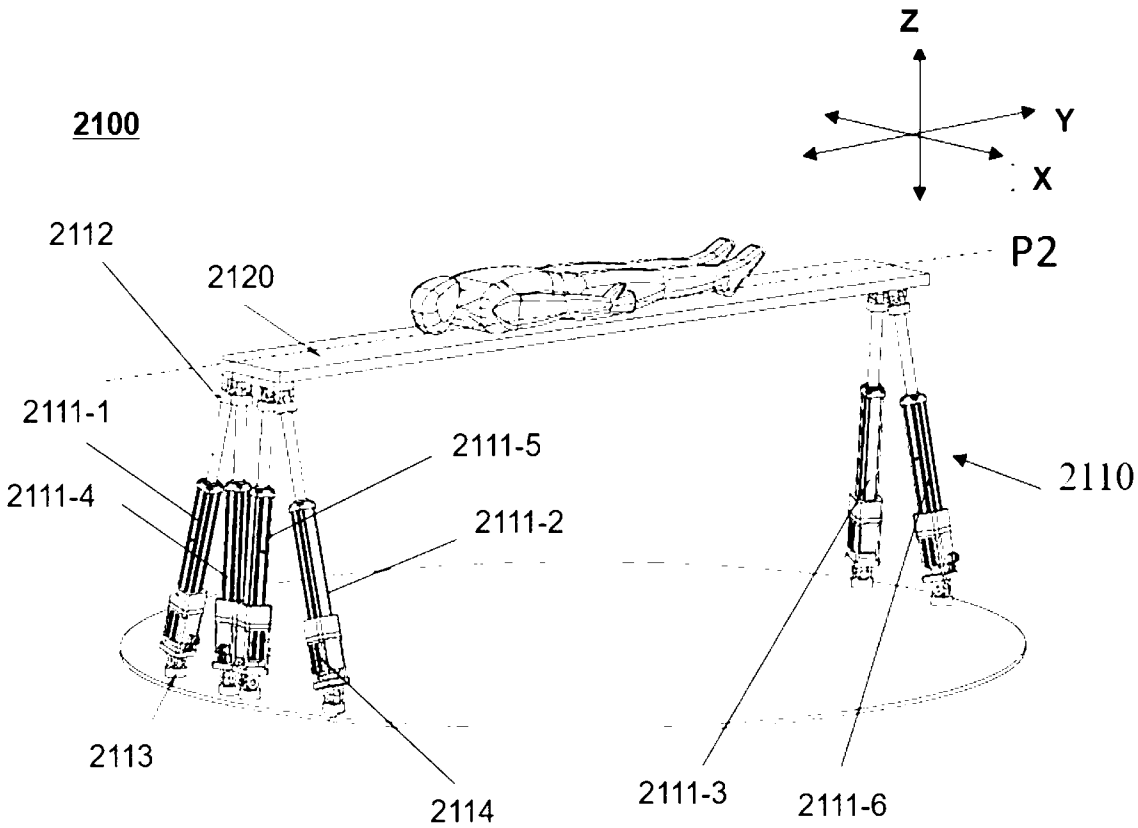

Z
Y
X
2100
1110
2112
P1
2113
2110
2113
2111-1
2111-2
2111-3
2111

FIG. 16


Z
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X
2100
2112
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P2
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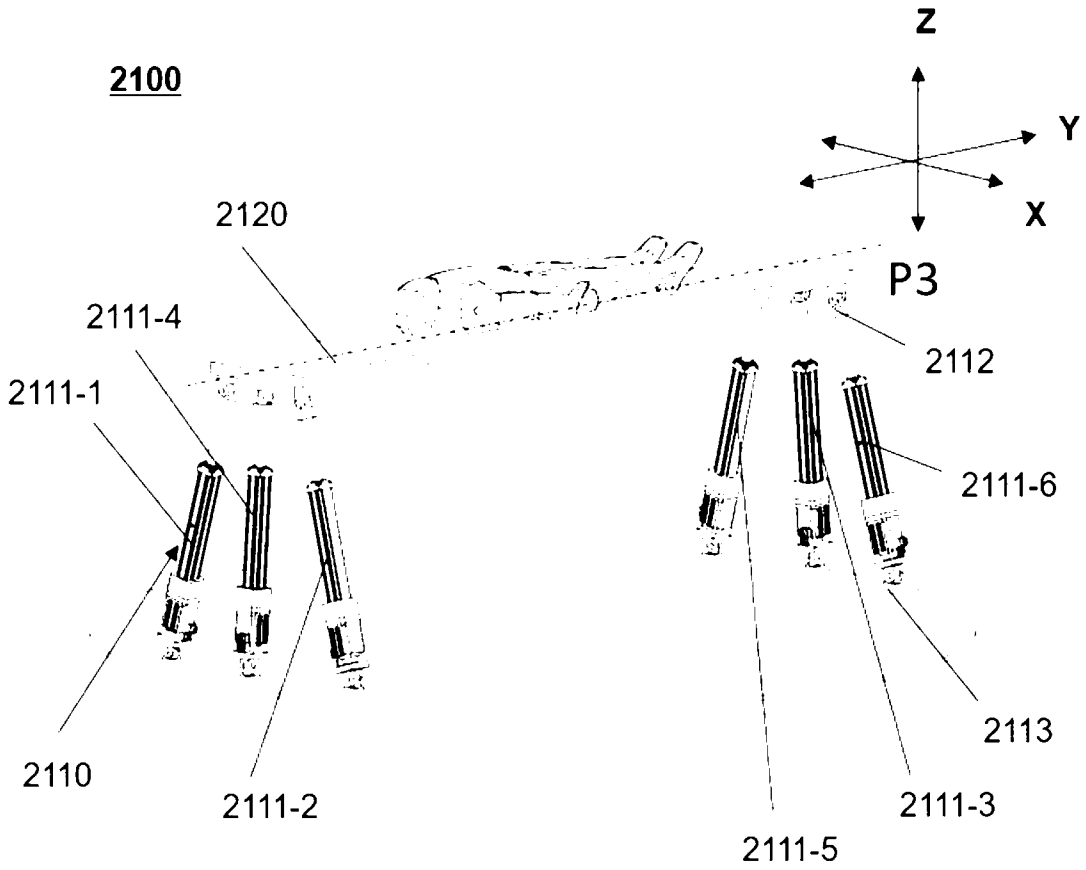
2113
2114
2111-3
2111-6

FIG. 17


2100
Z
Y
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2120
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2111-5

FIG. 18

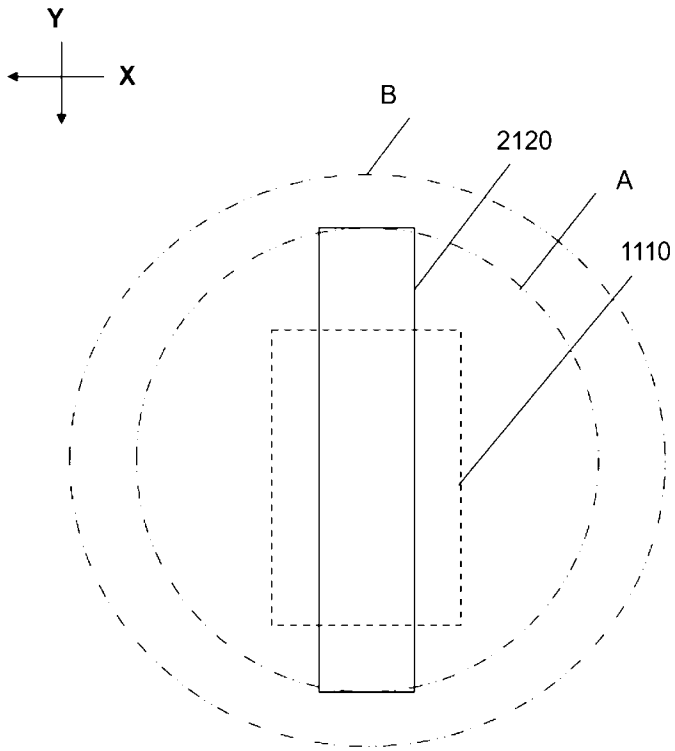

FIG. 19

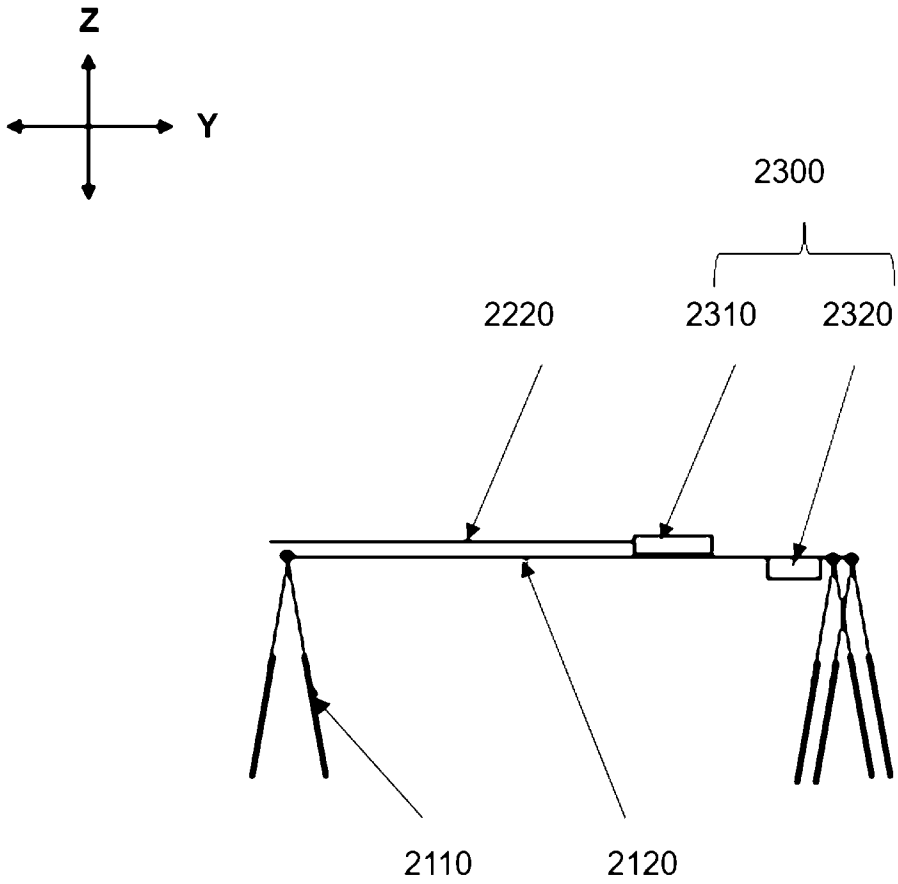

FIG. 20

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2024/098288

A. CLASSIFICATION OF SUBJECT MATTER

A61B 5/16(2006.01)i; A61B 5/055(2006.01)i; A61B 8/00(2006.01)i; A61B 6/04(2006.01)i; A61N 5/10(2006.01)i; A61G 1/02(2006.01)i; A61G 1/04(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: A61B, A61N, A61G

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

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

CNPAT, CNKI, EPODOC, WPI: medical, transfer+, bed?, convey+, driv+, board?, detach+, dock+, support +, telescop+, rod?, degree?, freedom?, hinge?, pivot+, seat?

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 220512858 U (SHANGHAI UNITED IMAGING HEALTHCARE CO., LTD.) 23 February 2024 (2024-02-23) claims 1-10,description, paragraphs [0003]-[0048], figures 1-5	1-31
PX	CN 220512857 U (SHANGHAI UNITED IMAGING HEALTHCARE CO., LTD.) 23 February 2024 (2024-02-23) claims 1-10,description, paragraphs [0004]-[0061], figures 1-8C	1-31
PX	CN 220546282 U (SHANGHAI UNITED IMAGING HEALTHCARE CO., LTD.) 01 March 2024 (2024-03-01) claims 1-12,description, paragraphs [0004]-[0080], figures 1-9	1-31
Y	CN 115998532 A (SHANGHAI UNITED IMAGING HEALTHCARE CO., LTD.) 25 April 2023 (2023-04-25) claims 1-10, description, paragraphs [0005]-[0109] and figures 1-4	1-28
Y	CN 208990083 U (GUANGZHOU KLARITY MEDICAL EQUIPMENT CO., LTD.) 18 June 2019 (2019-06-18) claims 1-7, description, paragraphs [0004]-[0031] and figures 1-2	1-28

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

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

Date of the actual completion of the international search	Date of mailing of the international search report
04 September 2024	**11 September 2024**

Name and mailing address of the ISA/CN	Authorized officer
CHINA NATIONAL INTELLECTUAL PROPERTY ADMINISTRATION **6, Xitucheng Rd., Jimen Bridge, Haidian District, Beijing 100088, China**	**MA,Xin** Telephone No. **(+86) 010-53962597**

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 208990083 U (GUANGZHOU KLARITY MEDICAL EQUIPMENT CO., LTD.) 18 June 2019 (2019-06-18) claims 1-7, description, paragraphs [0004]-[0031] and figures 1-2	29-31
X	WO 2017092105 A1 (SHENZHEN INSTITUTES OF ADVANCED TECHNOLOGY CHINESE ACADEMY OF SCIENCES) 08 June 2017 (2017-06-08) claims 1-10,description, line 15 page 2 to line 17 page 5,figures 1-10	29-31
A	CN 110559145 A (BEIJING ARRAYS MEDICAL IMAGING CORP.) 13 December 2019 (2019-12-13) the whole document	1-31
A	CN 112618175 A (MINFOUND MEDICAL SYSTEMS CO., LTD.) 09 April 2021 (2021-04-09) the whole document	1-31
A	CN 114767437 A (JIANGSU PANASIA MEDICAL TECHNOLOGY GROUP CO., LTD.) 22 July 2022 (2022-07-22) the whole document	1-31
A	CN 108618926 A (ZENG, Fanyu) 09 October 2018 (2018-10-09) the whole document	1-31
A	JP 2011160833 A (TOSHIBA K.K. et al.) 25 August 2011 (2011-08-25) the whole document	1-31

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2024/098288

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	220512858	U	23 February 2024	None			
CN	220512857	U	23 February 2024	None			
CN	220546282	U	01 March 2024	None			
CN	115998532	A	25 April 2023	CN	216091096	U	22 March 2022
				WO	2023020292	A1	23 February 2023
				CN	115886778	A	04 April 2023
CN	208990083	U	18 June 2019	None			
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CN	112618175	A	09 April 2021	CN	112618175	B	27 June 2023
CN	114767437	A	22 July 2022	CN	114767437	B	14 March 2023
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