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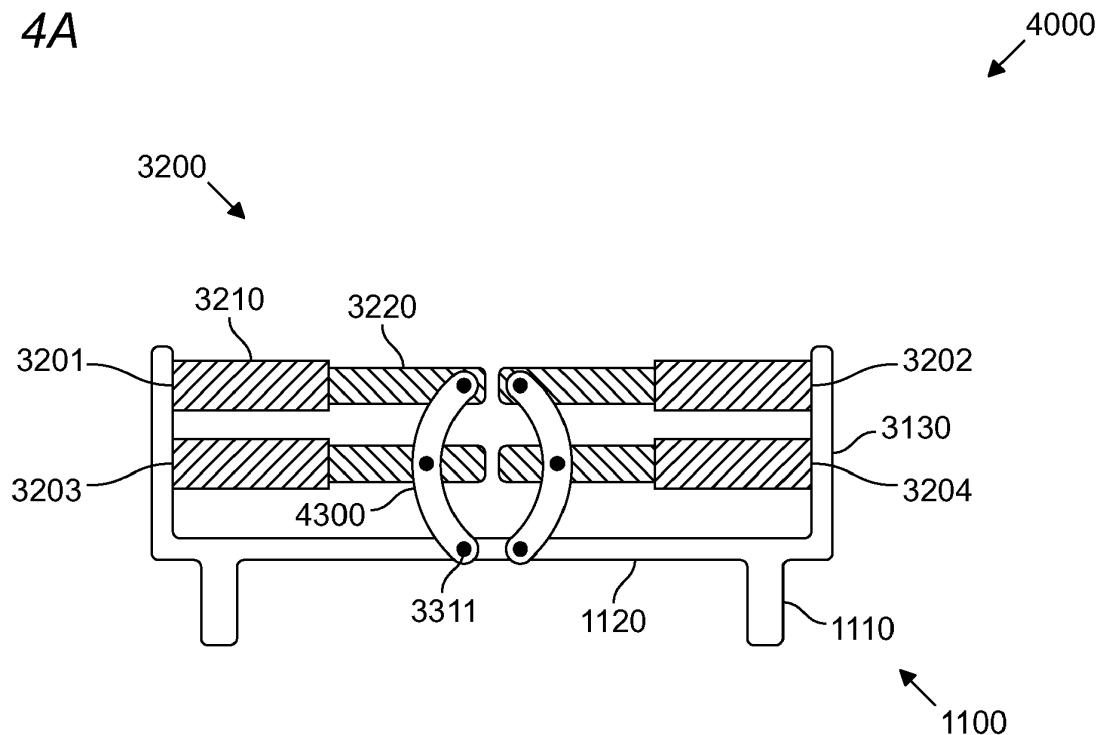
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(54) **BED RAIL SYSTEM**

(57) The invention generally relates to a bed rail system (4000), comprising: a frame (1100), a first telescopic bed rail (3201) comprising a first telescopic element (3210) and a second telescopic element (3220) which

can be at least partially inserted into each other, where the first telescopic element (3210) is connected to the frame (1100).

Fig. 4A



Description

Field of the invention

[0001] The present invention relates to a bed rail system.

Background art

[0002] Figures 1A and 1B schematically show a side view of a bed rail system 1000A according to the background art, in respectively closed and open position.

[0003] In particular, the bed rail system 1000A comprises a frame 1100. The frame 1100 allows the support of one or more bed rails 1200. In the embodiment shown, the two bed rails 1200 are movable in vertical direction, i.e. in direction Y in the drawings.

[0004] As shown by comparing Figures 1A and 1B, this allows positioning the bed rails 1200 in closed position, in Figure 1A, and in open position, in Figure 1B. In particular, by raising the bed rails, they are at a height which prevents a user of the bed from falling therefrom. Lowering them instead allows the user to get into or out of bed.

[0005] This solution has various disadvantages.

[0006] The bed rails 1200 must be able to be lowered to a sufficient level to avoid hindering the user during the step of getting into and out of the bed. This requires, in the position in Figure 1B, for the bed rails to be with the upper part therefore preferably below the level of the mattress. This requires the bed rails to be able to move decidedly downwards with respect to the frame, with an increase of the costs relative to the complexity of the frame which allows such a broad movement.

[0007] In addition, such downwards movement results in, in the position in Figure 1B, the bed rails 1200 being at the same level as the mattress (not shown). Returning the bed rails to the closed position in Figure 1A therefore requires the operator to raise the bed rails 1200, positioned beside the mattress. This requires sufficient space to remain between bed rails 1200 and mattress so as to be able to introduce hands to operate the bed rails 1200. This space results in an increase of the overall side dimensions of the bed rail system 1000A, as well as an increase of the materials and the costs.

[0008] Moreover, the bed rails 1200 are necessarily connected to two opposite sides of the bed - head and feet - so as to be kept in the closed position in Figure 1A. This requires the bed rails to have fixed length, between head and feet, which often limits the type of use of the bed. Indeed, it occurs often for the bed rail system 1000A to be applied to mattresses and/or beds having different lengths.

[0009] Figure 1C schematically shows a side view of a bed rail system 1000C according to the background art. This system differs from the bed rail system 1000A because the bed rail 1200C can be folded, it being hinged on hinges 1210.

[0010] This configuration introduces a further problem

because once folded, the height of the bed rail 1200C requires the hinges 1210 to be at a sufficient height off the floor to avoid the bed rail 1200C from touching the floor.

[0011] This solution therefore introduces a limitation to the minimum height of the bed.

[0012] In addition, in order to unfold the bed rail to open it, it is necessary for there to be a sufficient distance beside the bed to allow the rotation. This prevents positioning any element, for example even an only nightstand or a stool, beside the bed since this would interfere with the movement of the bed rail.

[0013] Moreover, this solution does not solve the problems relative to the need to adapt to beds with different lengths, the bed rail 1200C having a predetermined fixed length.

[0014] It is the aim of the invention to resolve one or more of the above disadvantages.

Summary of the invention

[0015] This aim is achieved by the invention, as defined by the independent claim. The dependent claims introduce further advantageous aspects of the invention.

[0016] The present invention is based on the generic concept that the bed rails may be implemented in a telescopic manner. Preferably, the telescopic direction of extension is such whereby the bed rails may extend telescopically in the longitudinal direction of extension of the bed, in at least one position. In certain embodiments, the telescopic direction of extension may rotate in space, hinged in a fixed rotation point with respect to the frame of the bed rail system and/or movable in linear manner with respect to the frame of the bed rail system. As is apparent from the following description, this advantageously allows the bed rail system to be adapted to beds having different lengths. Moreover, the telescopic configuration of the bed rails allows opening and closing the bed rails in particularly advantageous manners, as is apparent from the following description, which allow obtaining safety in closed position but also facilitating getting into and out of bed in open position.

[0017] An embodiment may refer to a bed rail system, comprising: a frame, a first telescopic bed rail comprising a first telescopic element and a second telescopic element, which can be at least partially inserted into each other, where the first telescopic element is connected to the frame.

[0018] In certain embodiments, the frame may comprise at least one vertical support bar, and the first telescopic element may be connected to the vertical support bar.

[0019] In certain embodiments, the bed rail system may further comprise: a second telescopic bed rail comprising a third telescopic element and a fourth telescopic element which can be at least partially inserted into each other, where the first telescopic bed rail and the second telescopic bed rail may have an opposite telescopic di-

rection of extension.

[0020] In certain embodiments, the bed rail system may further comprise: a guide element, where the guide element may be rotatably constrained to the frame and where the guide element may be rotatably constrained to the first telescopic bed rail.

[0021] In certain embodiments, the bed rail system may further comprise: a third telescopic bed rail comprising a fifth telescopic element and a sixth telescopic element which can be at least partially inserted into each other, where the guide element may be rotatably constrained to the third telescopic bed rail.

[0022] In certain embodiments, the first telescopic bed rail may be rotatably constrained to the frame and the third telescopic bed rail may be rotatably constrained to the frame.

[0023] In certain embodiments, the first telescopic bed rail may be movably constrained to the frame and the third telescopic bed rail may be movably constrained to the frame.

[0024] In certain embodiments, the guide element may be rotatably constrained to the frame by means of a first pin, the guide element may be rotatably constrained to the first telescopic bed rail by means of a second pin, the guide element may be rotatably constrained to the third telescopic bed rail by means of a third pin, and the third pin may be positioned between the first pin and the second pin in a direction of extension of the guide element.

[0025] In certain embodiments, a first line which defines, in order, the first pin, the third pin and the second pin, may define a concave surface, a second line, which joins the first pin and the second pin, may be entirely comprised in the concave surface.

[0026] In certain embodiments, the third pin may be lower than the first pin, in open position.

Brief list of drawings

[0027] Further features and advantages of the invention will be more apparent from the examination of the following detailed description of preferred, but not exclusive, embodiments, shown by way of non-limiting example, with the support of the accompanying drawings.

[0028] The same reference numerals identify the same components in the drawings.

[0029] In particular:

- Figures 1A and 1B schematically show a side view of a bed rail system 1000A according to the background art, in respectively closed and open position;
- Figure 1C schematically shows a side view of a bed rail system 1000C according to the background art;
- Figures 2A and 2B schematically show a side view of a bed rail system 2000 in respectively closed and open position;
- Figures 3A and 3B schematically show a side view of a bed rail system 3000 in respectively closed and open position;

- Figures 4A and 4B schematically show a side view of a bed rail system 4000 in respectively closed and open position;
- Figures 5A and 5C schematically show a side view of a bed rail system 5000 in respectively closed and open position;
- Figure 5B schematically shows a top view of the bed rail system 5000, in the position in Figure 5A;
- Figures 6A and 6C schematically show a side view of a bed rail system 6000 in respectively closed and open position;
- Figure 6B schematically shows a top view of the bed rail system 6000, in the position in Figure 6A;
- Figure 7A schematically shows a perspective view of a bed rail system 7000 with certain bed rails in closed position and certain bed rails in open position;
- Figure 7B schematically shows a top view of parts of the bed rail system 7000, in the position in Figure 7A;
- Figure 7C schematically shows a side view of the bed rail system 7000, in the position in Figure 7A.

Detailed description of embodiments

[0030] Figures 2A and 2B schematically show a side view of a bed rail system 2000 in respectively closed and open position.

[0031] The bed rail system 2000 may be applied to a bed or, more generally, to any support on which a person may be lying down, for example also to a stretcher.

[0032] The bed rail system 2000 comprises a frame 1100. The frame 1100 is generally an assembly of one or more elements adapted to support the bed rail system 2000. In certain cases, the frame 1100 of the bed rail system may also at least partially function as frame for the bed, for example support for the mattress and/or for a box spring of the mattress, etc.

[0033] In the solution shown in Figure 2A, the frame 1100 may comprise one or more legs 1110 to provide a support to the frame 1100 on the floor. In certain embodiments, the one or more legs 1110 may have a variable height.

[0034] The frame 1100 may further comprise a base 1120 connected to the one or more legs 1110. In certain embodiments, the base 1120 may be used to support elements of the bed rail system, as will be more apparent with reference to the embodiments of Figures 3 to 7, where the base is used for a connection to a guide element of the bed rails. In certain embodiments, the base may further at least partially provide a support for the mattress and/or a box spring for the mattress, which are not shown for clarity of illustration.

[0035] The frame 1100 may further comprise one or more support bars 1130 connected to the base 1120, and generally having a vertical extension, peripherally to the mattress. In the embodiments shown, there generally are four support bars, one for each corner of the bed, however it is obvious that this is not required and that it

is possible for example, to implement the invention only with two support bars 1130, for example on one side of the bed alone, or with two support bars at the headboard alone, or at the footboard, if it is not necessary to have bed rails extending for the whole length of the bed.

[0036] The bed rail system 2000 further comprises at least a first telescopic bed rail 2201. In the embodiment shown, there are a total of four telescopic bed rails 2201-2204 on each side of the bed. It is apparent that the number of telescopic bed rails 2201-2204 may however differ.

[0037] The description below of the first telescopic bed rail 2201 is provided with reference to one telescopic bed rail 2200. The telescopic bed rail 2200 may implement the first telescopic bed rail 2201, as well as the other telescopic bed rails 2202-2204.

[0038] The telescopic bed rail 2200 comprises a first telescopic element 2210 and a second telescopic element 2220, which can be at least partially inserted into each other.

[0039] In the embodiment shown, the first telescopic element 2210 has a larger cross section than the second telescopic element 2220, therefore allowing the insertion of the second telescopic element 2220 into the first telescopic element 2210. It is however apparent that an opposite configuration may be implemented. It is also apparent that in certain embodiments, there may be several telescopic elements. Here, it may be considered that the first and the second telescopic element are the two end elements of the sequence of telescopic elements.

[0040] In certain preferred embodiments, the first telescopic element 2210 has the followings sizes:

- length, in direction X, comprised between 30 cm and 100 cm,
- height, in direction Y, comprised between 6 cm and 15 cm,
- thickness, in direction Z, comprised between 3 cm and 6 cm.

[0041] In certain preferred embodiments, the second telescopic element 2220 has the followings sizes:

- length, in direction X, comprised between 50 cm and 120 cm,
- height, in direction Y, comprised between 4 cm and 14 cm,
- thickness, in direction Z, comprised between 2 cm and 5 cm.

[0042] It is apparent that the above-indicated sizes may be suitably inverted in the case the first telescopic element 2210 is inserted into the second telescopic element 2220.

[0043] The first telescopic element 2210 may be connected to the frame 1100. The connection is fixed, not necessarily permanent, in this embodiment. In other words, it is possible to assemble and/or disassemble the

first telescopic element 2210 to/from the frame 1100. In assembled position, the first telescopic element 2210 is however assembled in integral manner with respect to the frame 1100.

[0044] Thanks to this configuration, as shown by comparing Figures 2A and 2B, it is possible to telescopically open and close one or more telescopic bed rails 2200, thus obtaining the closed configuration, in Figure 2A, or the open one, in Figure 2B. Unlike the known bed rail systems, the opening and closing does not generate particular difficulties, avoiding problems due to the proximity of the mattress described above. This configuration also allows the bed rail system 2000 to be advantageously adapted to beds having different lengths thanks to the telescopic operation of the bed rails 2200.

[0045] In certain embodiments, such as for example the one shown in Figure 2A and 2B, the frame 1100 may comprise at least one vertical support bar 1130. There may be a single vertical support bar, preferably positioned close to a corner of the bed, as in the case of the vertical support bar 5130 in Figure 5B. Alternatively or in addition, there may be a dual vertical support bar, extending from a first corner of the bed to a second corner of the bed, as in the case of the vertical support bar 6130 in Figure 6B.

[0046] The first telescopic element 2210 may be connected to the vertical support bar 1130. In this manner, it is possible to position the telescopic bed rails 2201-2204 in fixed and safe manner by possibly connecting several vertical bars 1130 to one another, for example by means of the base 1120.

[0047] As described above, the bed rail system 2000 may comprise more than one first telescopic bed rail 2201. In particular, as shown, the bed rail system 2000 may further comprise a second telescopic bed rail 2202. As described for the generic telescopic bed rail 2200, this may comprise a telescopic element 2210 and a telescopic element 2220, which can be at least partially inserted into each other.

[0048] The first telescopic bed rail 2201 and the second telescopic bed rail 2202 may have an opposite telescopic direction of extension. Opposite direction means the two directions of telescopic extension are parallel, or substantially parallel, but in opposite direction. Substantially parallel, in particular in the closed position in Figure 2A, in certain embodiments may be considered two directions which, on the plane defined by the two directions, define two angles at the intersection thereof, with the smallest angle of these two having a maximum dimension of 30 degrees, preferably a maximum of 20 degrees.

[0049] Thanks to this configuration, it is possible to open the telescopic bed rails 2201 and 2202 in opposite directions, leaving the bed rails open close to the middle part of the bed. This is particularly advantageous since it is the middle part of the bed which is used to get into and out of bed. It is also on this part of the bed that possibly healthcare workers perform most of their operations. Therefore, the presence of the bed rails 2201,

2201, which are telescopically closed close to the headboard or the footboard of the bed, does not have particular disadvantages, in particular thanks to the reduced overall dimensions, allowed by the telescopic construction of the bed rails 2200.

[0050] The embodiment shown further comprises two further telescopic bed rails 2203, 2204 having a configuration and a function which is substantially similar to those of the telescopic bed rails 2201, 2202.

[0051] In certain embodiments, the distance Y in vertical direction, i.e. the empty space comprised between the telescopic bed rails 2201 and 2203 and/or between the telescopic bed rails 2202 and 2204, is preferably comprised between 2 cm and 15 cm. In particular, in embodiments providing also a vertical movement of the bed rails, the distance may be at least 2 cm in the closed position, for example the one in Figure 6C, and/or maximum 15 cm in the open position, for example the one in Figure 6A.

[0052] Figures 3A and 3B schematically show a side view of a bed rail system 3000 in respectively closed and open position.

[0053] The bed rail system 3000 differs from the bed rail system 2000 due to the presence of a guide element 3300 and due to the manner in which the telescopic bed rails 3201-3204 are connected to the frame 1100.

[0054] In particular, the guide element 3300 may be a rigid member connected to the frame 1100 and to one or more telescopic bed rails 3201-3204. Specifically, the guide element 3300 may be rotatably constrained to the frame 1100. This allows the guide element to rotate with respect to the constraining point, for example a pin 3311. In certain embodiments, the connection to the frame 1100 is possible in the form of a connection to the base 1120 of the frame 1100, for example as shown in Figure 3A. More generally, it is sufficient for the element of the frame 1100 to which the guide element is constrained to be in a relatively fixed position with respect to the element of the frame 1100 to which the telescopic bed rail connected to the guide element is constrained.

[0055] In certain embodiments, the connection of the guide element 3300 to the frame 1100 may occur in a middle, or substantially middle, area of the bed rail system 3000 and/or of the bed to which the bed rail system 3000 is applied. In certain embodiments, substantially middle may mean an area comprised between 35% and 65% of the length of the bed, between headboard and footboard.

[0056] The guide element 3300 may further be rotatably constrained to the first telescopic bed rail 3201, for example by means of a pin 3313. This connection allows a movement of the first telescopic bed rail 3201 which comprises a counter-clockwise rotation and simultaneously, a telescopic closing of the first telescopic bed rail 3201, as is apparent in Figure 3B. The two movements may advantageously be obtained simultaneously by activating the guide element 3300 alone.

[0057] In certain embodiments, the pin 3313 may be

positioned at an end of the second telescopic element 3220 opposite to the position of the first telescopic element 3210, as shown. It however is apparent in alternative embodiments that the pin 3313 may be positioned along the second telescopic element 3220, closer to the first telescopic element 3210 with respect to the end of the second telescopic element 3220 described above.

[0058] In certain embodiments, as for example shown in Figure 3, it is possible to provide a third telescopic bed rail 3203. The third telescopic bed rail 3203 may be positioned, in the closed position of the bed rail system 3000, in substantially parallel manner to the first telescopic bed rail 3201. Preferably, the first telescopic bed rail 3201 and the third telescopic bed rail 3203 are positioned along a single plane XY.

[0059] In the presence of the third telescopic bed rail 3203, the guide element 3300 may further be rotatably constrained to the third telescopic bed rail 3203, for example by means of a pin 3312. This results in a movement of the third telescopic bed rail 3203 which is substantially similar to what is described above for the first telescopic bed rail 3201. In a particularly advantageous manner, the action of the guide element 3300 may result in a movement of both the first and third telescopic bed rail 3201, 3203.

[0060] In certain embodiments, the pin 3312 may be positioned at an end of the second telescopic element 3220 opposite to the position of the first telescopic element 3210, as shown. It however is apparent in alternative embodiments that the pin 3312 may be positioned along the second telescopic element 3220, closer to the first telescopic element 3210 with respect to the end of the second telescopic element 3220 described above, such as for example shown in Figure 4A.

[0061] Moreover, the guide element 3300 may be rotatably constrained to the frame 1100 by means of a first pin 3311, as already described above. The guide element 3300 may also be rotatably constrained to the first telescopic bed rail 3201 by means of a second pin 3313 and to the third telescopic bed rail 3203 by means of a third pin 3312, as described above. In a direction of extension of the guide element, the third pin 3312 may be positioned between the first pin 3311 and the second pin 3313.

[0062] This configuration advantageously allows operating both telescopic bed rails 3201, 3203 with the activation of one guide element 3300 alone.

[0063] It is apparent that despite the guide element 3300 being shown as outer with respect to the positioning of the bed, with respect to the telescopic bed rails 3201, 3203, the invention is not limited to this embodiment and it is possible in addition or alternatively to position it in an inner manner, as for example shown in Figure 7. In addition or alternatively, the guide element 3300 may be positioned coaxially to the telescopic bed rails 3200, in particular allowing the passage of the guide element 3300 inside the telescopic bed rails 3200, by providing a specific hole in the telescopic bed rails 3200. In addition or alternatively, it is possible to provide a specific hole in

the guide element 3300 so as to allow the passage therein of the telescopic bed rails 3200.

[0064] It is also apparent that the guide element 3300 is shown as having a first end substantially at the pin 3311 and a second end substantially at the pin 3313. However, the invention is not limited to this configuration and it is possible for the guide element 3300 to extend beyond the pin 3311 and/or beyond the pin 3313. In particularly advantageous manner, an extension beyond the pin 3313 allows having a part of the guide element 3300 which lends itself to the manipulation thereof by a user and/or a healthcare worker. This possible extension may also be advantageously used to lock and/or release the guide element 3300 and/or to define range limits for the movement of the guide element 3300. An example of such implementation is discussed with reference to the release element 7500 of the embodiment in Figure 7.

[0065] As is apparent from Figures 3A and 3B, as well as the above description, the first telescopic bed rail 3201 in the bed rail system 3000 is rotatably constrained to the frame 1100. This allows the described rotation movement thereof. When present, the third telescopic bed rail 3203 is also rotatably constrained to the frame 1100. The vertical support bars 3130 therefore differ from the vertical support bars 1130 since they allow the rotatably constrained connection of the telescopic bed rails 3200.

[0066] In certain embodiments, the constraining points of the bed rails 3201, 3203 to the frame 1100 may be selected so that the bed rails 3201, 3203 have a substantially horizontal extension in the closed position shown in Figure 3A.

[0067] Despite two telescopic bed rails 3201, 3203 alone have been described, for example those on the side of the headboard of the bed, it is apparent that there may be other telescopic bed rails 3202, 3204. For example, in the embodiment shown in Figure 3, the telescopic bed rails 3202, 3204 operate in substantially mirror-like manner to the telescopic bed rails 3201, 3203.

[0068] The advantages already described for the bed rail system 2000 can therefore also be obtained for the bed rail system 3000, in particular concerning the adaptability of the system to beds having different length and the convenience of the opening in the middle area of the bed. In addition, the bed rail system 3000 allows applying a downward rotation movement to the individual bed rails which, in addition to the telescopic closing, improves the accessibility of the bed. Moreover, the bed rail system 3000 allows opening several bed rails simultaneously with a single action on the guide element 3300.

[0069] Figures 4A and 4B schematically show a side view of a bed rail system 4000 in respectively closed and open position. The bed rail system 4000 differs from the bed rail system 3000 due to the presence of a guide element 4300 that replaces the guide element 3300.

[0070] Generally, as shown in Figures 4A and 4B, the guide element 4300 has a curved shape; as is apparent from the drawings, this allows an improved accessibility to the bed in the open position of the bed rail system 4000.

[0071] As shown, the pin 3313 and/or the pin 3312 may be positioned at an end of the second telescopic element 3220, opposite to the position of the first telescopic element 3210. Alternatively or in addition, the pin 3313 and/or the pin 3312 may be positioned at a predetermined distance from the end of the second telescopic element 3220 described above, in direction of the first telescopic element 3210. In certain embodiments, the predetermined distance may be comprised between 5 cm and 35 cm from the end, preferably between 10 cm and 35 cm, even more preferably between 20 cm and 35 cm.

[0072] More specifically, a first line which joins, in order, the first pin 3311, the third pin 3312 and the second pin 3313, may be defined in the bed rail system 4000. This possibly curved line may define a concave surface in similar manner to the inside of a letter C. A second line may be defined that joins the first pin 3311 and the second pin 3313. The second line may be preferably completely comprised in the concave surface. In other words, the configuration of the pins 3311, 3312 and 3313 is such whereby the second line is only inside the concave surface defined by the first line. It is apparent that the second line may be intended as segment, limited at the ends thereof by the first pin 3311 and by the second pin 3313, and not as line having infinite length.

[0073] Alternatively, the positioning of the pin 3312 may be selected so as to not be along the second line that joins the pins 3311, 3313. The second pin may instead be positioned at a predetermined distance measured perpendicular to the second line that joins the pins 3311, 3313. The predetermined distance may be comprised between 2 cm and 20 cm.

[0074] The configuration of the guide element 4300 described above allows obtaining a broader opening area with respect to what can be obtained with the guide element 3300, as is apparent by comparing Figures 3B and 4B. The other advantages already described for the embodiment in Figure 3B remain unchanged.

[0075] Figures 5A and 5C schematically show a side view of a bed rail system 5000 in respectively closed and open position. Figure 5B schematically shows a top view of the bed rail system 5000, in the position in Figure 5A.

[0076] The dashed lines in Figure 5A and 5C schematically show the position of parts covered by the telescopic bed rails 5201-5204.

[0077] The bed rail system 5000 differs from the bed rail system 4000 for the type of constraint between the telescopic bed rails 5200 and the frame 1100.

[0078] In particular, the telescopic bed rails 5201-5204 are constrained to the frame 1100 movably instead of rotatably. In the embodiment shown, the constraint is implemented by a sliding seat 5131 made in the respective support bar 5130. It is apparent that various methods for movably constraining the telescopic bed rails 5201-5204 to the sliding seat 5131 are possible. It is apparent that the translation and rotational movements can be combined in certain embodiments. For simplicity of description, the following description is limited to a solely mov-

able constraint, therefore in the absence of a rotary movement. It is however apparent that the invention is not limited to this embodiment and that the connection mode of one or more telescopic bed rails to the respective vertical support bars may allow both types of movement.

[0079] The movable movement rather than the rotary type of movement described above advantageously allows moving the telescopic bed rails 5201-5204 downwards since the contact between the telescopic bed rails 5201-5204 that limits the downwards movement thereof in a translational manner occurs in a lower position than in rotation. This is more apparent from the embodiment shown in Figure 6.

[0080] In particular, Figures 6A and 6C schematically show a side view of a bed rail system 6000 in respectively closed and open position. Figure 6B schematically shows a top view of the bed rail system 6000, in the position in Figure 6A. The dashed lines in Figure 6A and 6C schematically show the position of parts covered by the telescopic bed rails 5201-5204 and/or of parts of the base 6120 of the frame 1110.

[0081] The bed rail system 6000 differs from the bed rail system 5000 due to the extension of the support bars 6130. In particular, the support bars 6130 may have a vertical extension up to a lower position, which is lower than the pin 3311. This results in the pin 3312 being lower than the pin 3311, in open position.

[0082] This configuration is particularly advantageous because it allows further improving the accessibility in the middle area of the bed. Moreover, with this configuration, it advantageously is possible to lower the bed rails 5200 to such height whereby they are level with, or possibly below, the mattress (not shown), thus allowing access to the bed from any point and not only from the middle area thereof.

[0083] Figure 7A schematically shows a perspective view of a bed rail system 7000 with certain bed rails in closed position and certain bed rails in open position. Figure 7B schematically shows a top view of parts of the bed rail system 7000, in the position in Figure 7A. Figure 7C schematically shows a side view of the bed rail system 7000, in the position in Figure 7A. Figure 7C also schematically shows vertical support bars 7130.

[0084] In particular, in all the Figures 7A to 7C, the bed rails 7201 and 7203 are shown in open position, while the bed rails 7202 and 7204 are shown in closed position.

[0085] The bed rail system 7000 differs from the bed rail system 6000 due to the presence of a sliding track 7400 and/or due to the presence of a handle 7320 and/or due to the presence of a lock/release element 7500 and/or due to the presence of a lock/release element 7600.

[0086] The sliding track 7400 is an element that joins at least two telescopic bed rails 7201, 7203 movably constrained to the same vertical support bar. In particular, the at least two telescopic bed rails 7201, 7203 may slide in known manner with respect to the sliding track 7400. The presence of the sliding track 7400 allows obtaining

advantages in terms of ease of sliding of the telescopic bed rails with respect to the vertical support bar and also in terms of range of translation movement also with vertical support bars having contained sizes. In particular, a possible outer travel of the sliding track 7400 with respect to the size of the vertical support bar allows increasing the range of the translation movement with vertical support bars having given size. This advantageously allows using a bed rail system 7000 with a frame 1100 having vertical support bars having reduced size, thus reducing the use of materials and the overall dimensions of the frame 1100.

[0087] The handle 7320 may be integrally connected to one or more telescopic bed rail 7200. The handle allows operating the telescopic bed rail on which the handle is positioned and, by means of the movement induced by the guide element 7300, also moving the other telescopic bed rails connected thereto. Due to this implementation, it is advantageously possible to avoid operating the telescopic bed rail by acting with one's hands directly on the telescopic elements, which could result in fingers being pinched, particularly in opening step.

[0088] In preferred embodiments, where there are at least two telescopic bed rails along the plane XY, one above the other, the handle 7320 may be preferably integrally connected to the upper telescopic bed rail, for example to the telescopic bed rails 7201, 7202, as shown. This allows advantageously using the handle as separation element between the two coplanar telescopic bed rails or in other terms, between the telescopic bed rail that is connected to the handle 7320 and the telescopic bed rail that may come into contact with the handle 7320. In this manner, it advantageously is avoided for the two coplanar bed rails to come into contact with each other in the opening step of the bed rail system 7000, making the successive closing complex.

[0089] The lock/release element 7500 may be implemented by means of any type of element assembled on the guide element 7300 and that may come into contact with the frame 1100 in one or more predetermined positions of the guide element 7300. In the embodiment shown, the lock/release element 7500 may come into contact, in interference, with the base 7120 of the frame 1100 on which the guide element 7300 is rotatably assembled. In preferred embodiments, to this end, the base 7120 may be provided with one or more seats, for example holes, for the insertion of the lock/release element 7500.

[0090] This configuration allows inserting/extracting the lock/release element, for example a screw, into/from the respective seats in the base 7120. By implementing the seats in predetermined positions of the base corresponding, for example to the closed and open positions of the bed rail system 7000, it is advantageously possible to fix the position of the lock/release element 7500, and therefore of the guide element 7300, and therefore of the telescopic bed rails connected thereto, in predetermined positions, for example in closed position and in open po-

sition.

[0091] The positioning of the lock/release element 7500 close to the base 7120 also advantageously allows an easy access by the personnel outside the bed and at the same time, limiting the access by the user of the bed, which could result in an accidental opening of the bed rails.

[0092] The lock/release element 7400 may be implemented by means of any type of element assembled on the support bar 7130 and that may cross the sliding area of one or more telescopic bed rails 7200. In the embodiment shown, the lock/release element 7600 may come into contact, in interference, with the telescopic bed rail 7202, thanks to the assembly on the support bar 7130 on which it slides. In preferred embodiments, to this end, the support bar 7130 may be provided with one or more holes, for example for the insertion of the lock/release element 7600.

[0093] This configuration allows inserting/extracting the lock/release element 7600, for example a screw, into/from the respective hole in the support bar 7130. By implementing the hole in a predetermined position of the support bar, corresponding for example to a position immediately below the position of the telescopic bed rail to be locked, for example 7202, in the closed position thereof, it advantageously is possible to fasten the telescopic bed rail in the closed position therefore, thus preventing the downward translation thereof.

[0094] The operation of opening and closing the systems of bed rails 3000-7000 was described as manual in the embodiments described above. However, thanks to the rotatable assembly of the guide element on the pin 3311, the configuration lends itself particularly well to the addition of an electric motor acting on the pin 3311, in direct manner or via one or more gears and/or other mechanical motion drive elements. The particular positioning of the pin 3311 in an area potentially below the mattress makes such embodiment even more advantageous.

[0095] In addition or alternatively, it is possible to provide one or more air springs (not shown) in combination with one or more telescopic bed rails. For example, at the level of a single telescopic bed rail, it is preferable to insert the air spring into the telescopic bed rail, thus avoiding undesired interactions with the air spring. It however is apparent that it, in addition or alternatively, is possible to connect the air spring also outside the telescopic bed rail. In certain embodiments, a first end of the air spring may be connected to the first telescopic element, while a second end may be connected to the second telescopic element.

[0096] In this manner, the extension action of the air spring may provide a force of extension to the telescopic bed rail. In certain embodiments, this force may be selected so as to be sufficient to bring the telescopic bed rail, and possibly one or more other telescopic bed rails due to the respective mechanical connections, into the closed position. This solution is particularly advanta-

geous because it prevents the bed rail system from accidentally opening. In alternative embodiments, the force applied by the spring may be less than the one required to bring the bed rail system to close. In this case, the action of the air spring is in any case sufficient to allow an accompaniment of the bed rail system in closing step and/or avoiding too quick an opening thereof.

[0097] It is apparent that the above considerations concerning the force applied by the single spring may be applied to the force applied by the sum of the springs in the case of several air springs.

[0098] In certain embodiments, one or more of the air springs may be replaced by one or more linear electric engines and/or one or more mechanical springs.

[0099] In addition, in certain embodiments, it is possible to provide one or more air and/or mechanical springs, and/or one or more linear motors, connected between the frame and one or more between the telescopic bed rails and/or one or more between the guide elements. The aim of these air and/or mechanical springs, and/or linear motors is substantially similar to that described above, generally the one of assisting the passage from the open position to the closed one of the bed rail system and/or to automate this passage in the absence of other forces acting on the bed rail system.

[0100] Moreover, in the embodiments described above, the two pins 3311 of the two guide elements possibly on the same side of the bed are advantageously positioned at a close distance. For example, in certain embodiments, the distance along the direction X between the two pins 3311 could be comprised between 4 cm and 20 cm. As described, the two guide elements connected to the two pins 3311 could be operated in independent manner.

[0101] Alternatively, or in addition, the relative closeness thereof allows connecting both pins 3311 to a single electric motor, in similar manner to what is described for the single pin 3311 above. Again alternatively, or in addition, the two pins may be mechanically connected to each other by means of gears and/or other mechanical motion drive elements so that the movement of one of the pins 3311 results in a movement induced on the other pin 3311. This would advantageously allow moving all the telescopic bed rails on one side of the bed with a single operation.

[0102] The invention was described with reference to various features, possibly disclosed as belonging to a single embodiment. However, it is apparent that to implement the invention, it is not necessary to implement all the features in a single embodiment described and any combination of features may form the basis of an embodiment according to the invention. It is also apparent that the features of various embodiments may be combined with one another, resulting in new embodiments of the invention. More generally, the invention is intended as defined by the following claims, with which one or more of the features described above can be combined independently from the other features described

in the same embodiment.

REFERENCE NUMERALS

[0103]

1000A, 1000C: bed rail system
 1100: frame
 1110: leg
 1120: base
 1130: support bar
 1200, 1200C: bed rail
 1210: hinge
 2000: bed rail system
 2200-2204: telescopic bed rail
 2210: first telescopic element
 2220: second telescopic element
 3000: bed rail system
 3130: support bar
 3200-3204: telescopic bed rail
 3210: first rotatable telescopic element
 3220: second hinged telescopic element
 3300: guide element
 3311-3313: pin
 4000: bed rail system
 4300: guide element
 5000: bed rail system
 5130: support bar
 5131: sliding seat
 5200-5204: telescopic bed rail
 5210: first movable telescopic element
 6000: bed rail system
 6120: base
 6130: support bar
 7000: bed rail system
 7120: base
 7130: support bar
 7200-7204: telescopic bed rail
 7210: first movable telescopic element
 7220: second hinged telescopic element
 7300: guide element
 7320: handle
 7400: sliding track
 7500: lock/release element
 7600: lock/release element

Claims

1. A bed rail system (2000, 3000, 4000, 5000, 6000, 7000) comprising:
 - a frame (1100),
 - a first telescopic bed rail (2201, 3201, 5201, 7201) comprising a first telescopic element (2210, 3210, 5210, 7210) and a second telescopic element (2220, 3220, 5220, 7220) which can be at least partially inserted into each other,

where the first telescopic element (2210, 3210, 5210, 7210) is connected to the frame (1100).

2. A bed rail system (2000, 3000, 4000, 5000, 6000, 7000) according to claim 1,
 - where the frame (1100) comprises at least one vertical support bar (1130, 3130, 5130, 6130, 7130), and
 - where the first telescopic element (2210, 3210, 5210, 7210) is connected to the vertical support bar (1130, 3130, 5130, 6130, 7130).
3. A bed rail system (2000, 3000, 4000, 5000, 6000, 7000) according to any one of the preceding claims, further comprising:
 - a second telescopic bed rail (2202, 3202, 5202, 7202) comprising a third telescopic element (2210, 3210, 5210, 7210) and a fourth telescopic element (2220, 3220, 5220, 7220) which can be at least partially inserted into each other,
 - where the first telescopic bed rail (2201, 3201, 5201, 7201) and the second telescopic bed rail (2202, 3202, 5202, 7202) have an opposite telescopic direction of extension.
4. A bed rail system (3000, 4000, 5000, 6000, 7000) according to any one of the preceding claims, further comprising:
 - a guide element (3300, 4300, 7300),
 - where the guide element (3300, 4300, 7300) is rotatably constrained to the frame (1100), and
 - where the guide element (3300, 4300, 7300) is rotatably constrained to the first telescopic bed rail (3201, 5201, 7201).
5. A bed rail system (3000, 4000, 5000, 6000, 7000) according to claim 4, further comprising:
 - a third telescopic bed rail (3203, 5203, 7203) comprising a fifth telescopic element (3210, 5210, 7210) and a sixth telescopic element (3220, 5220, 7220) which can be at least partially inserted into each other,
 - where the guide element (3300, 4300, 7300) is rotatably constrained to the third telescopic bed rail (3203, 5203, 7203).
6. A bed rail system (3000, 4000, 5000, 6000, 7000) according to claim 5,
 - where the first telescopic bed rail (3201, 5201, 7201) is rotatably constrained to the frame (1100), and
 - where the third telescopic bed rail (3203, 5203, 7203) is rotatably constrained to the frame (1100).
7. A bed rail system (5000, 6000, 7000) according to claim 5 or 6,
 - where the first telescopic bed rail (5201, 7201) is

movably constrained to the frame (1100), and
where the third telescopic bed rail (5203, 7203) is
movably constrained to the frame (1100).

8. A bed rail system (3000, 4000, 5000, 6000, 7000) 5
according to any one of claims from 5 to 7,
where the guide element (3300, 4300, 7300) is ro-
tatably constrained to the frame (1100) by means of
a first pin (3311),
where the guide element (3300, 4300, 7300) is ro- 10
tatably constrained to the first telescopic bed rail
(3201, 5201, 7201) by means of a second pin (3313),
where the guide element (3300, 4300, 7300) is ro-
tatably constrained to the third telescopic bed rail
(3203, 5203, 7203) by means of a third pin (3312), 15
and
where the third pin (3312) is positioned between the
first pin (3311) and the second pin (3313), in a direc-
tion of extension of the guide element (3300, 4300,
7300). 20
9. A bed rail system (4000, 5000, 6000, 7000) accord-
ing to claim 8,
where a first line, which joins, in order, the first pin
(3311), the third pin (3312) and the second pin 25
(3313), defines a concave surface,
where a second line, which joins the first pin (3311)
and the second pin (3313), is entirely comprised in
the concave surface. 30
10. A bed rail system (300, 4000, 5000, 6000, 7000) ac-
cording to claim 8 or 9,
where the third pin (3312) is lower than the first pin
(3311), in open position. 35

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Fig. 1A

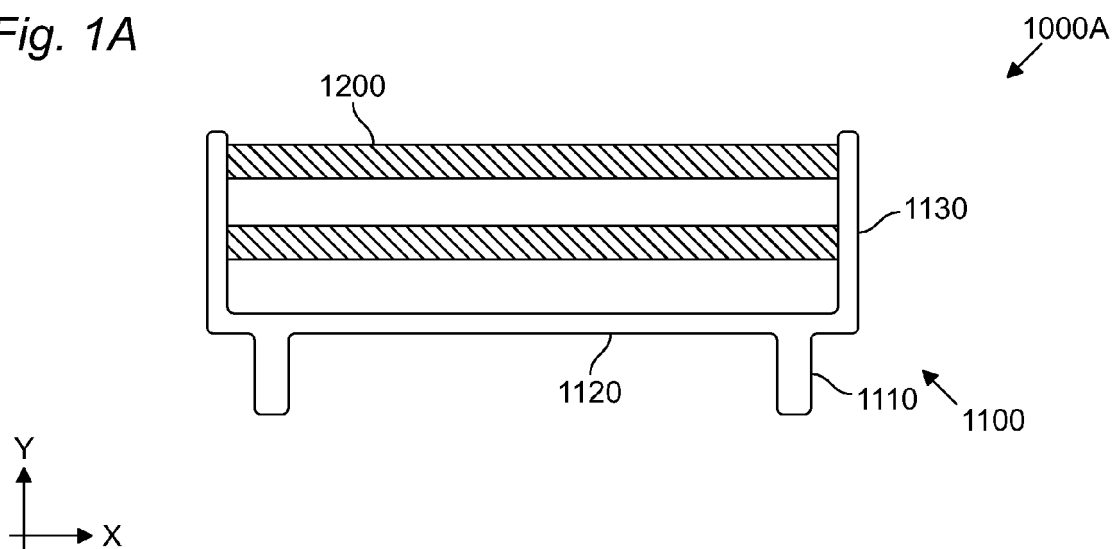


Fig. 1B

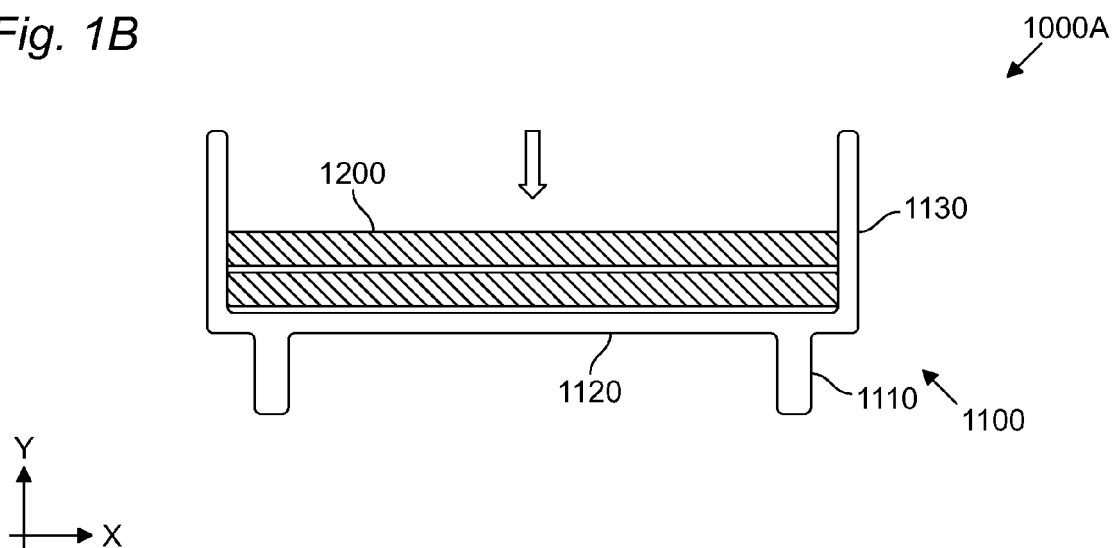


Fig. 1C

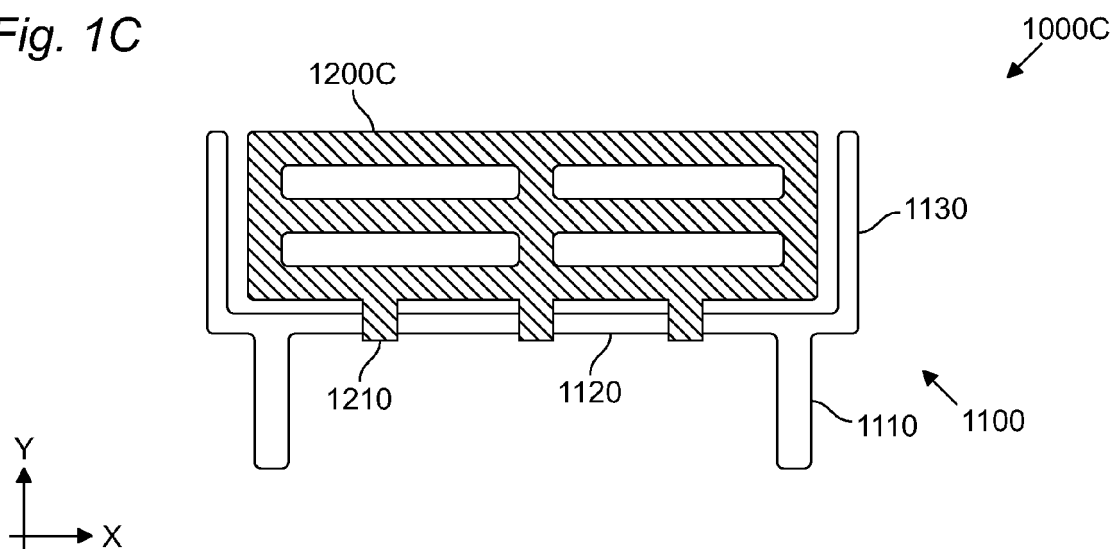


Fig. 2A

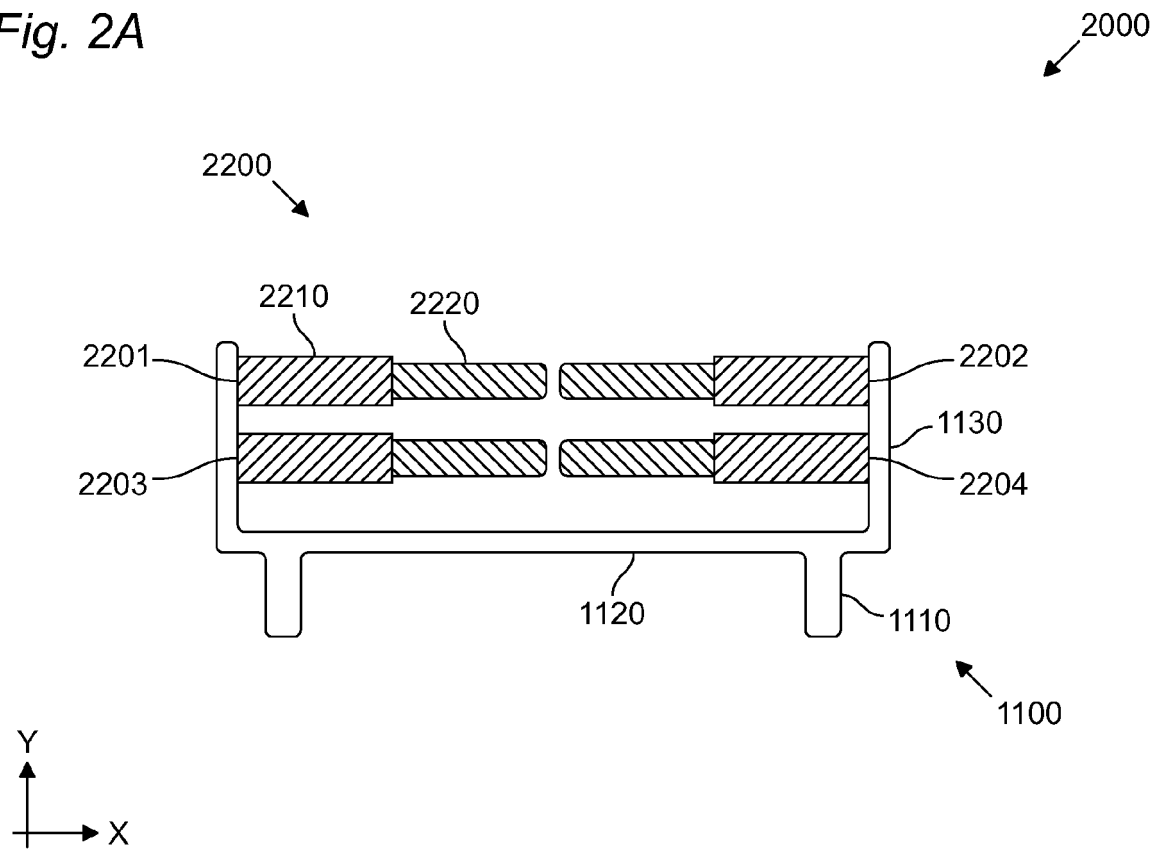


Fig. 2B

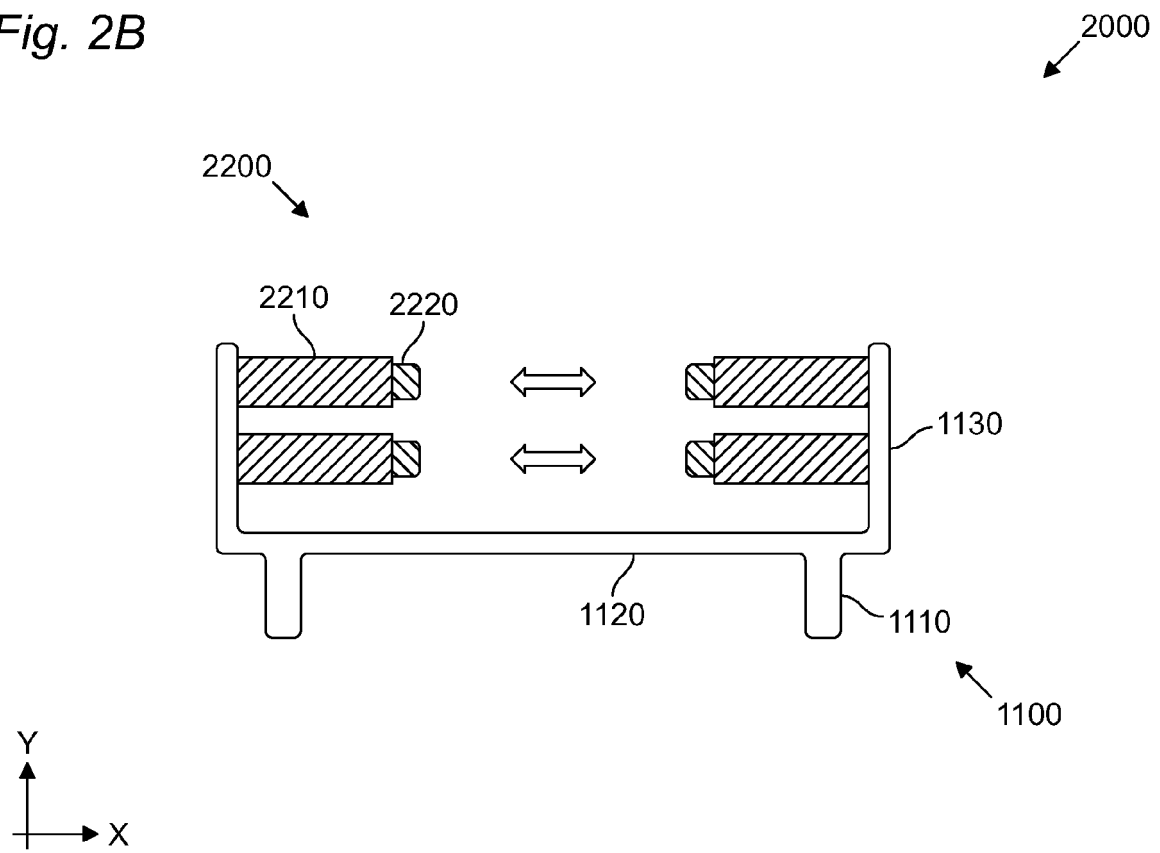


Fig. 3A

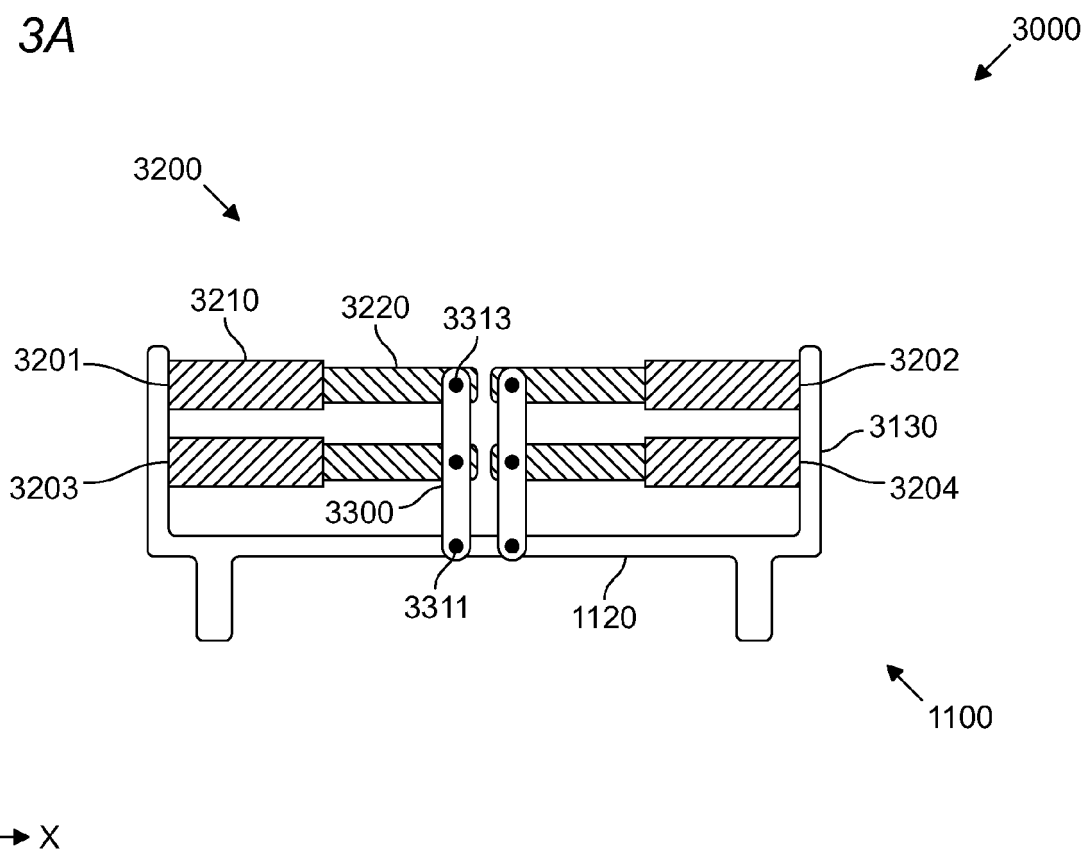


Fig. 3B

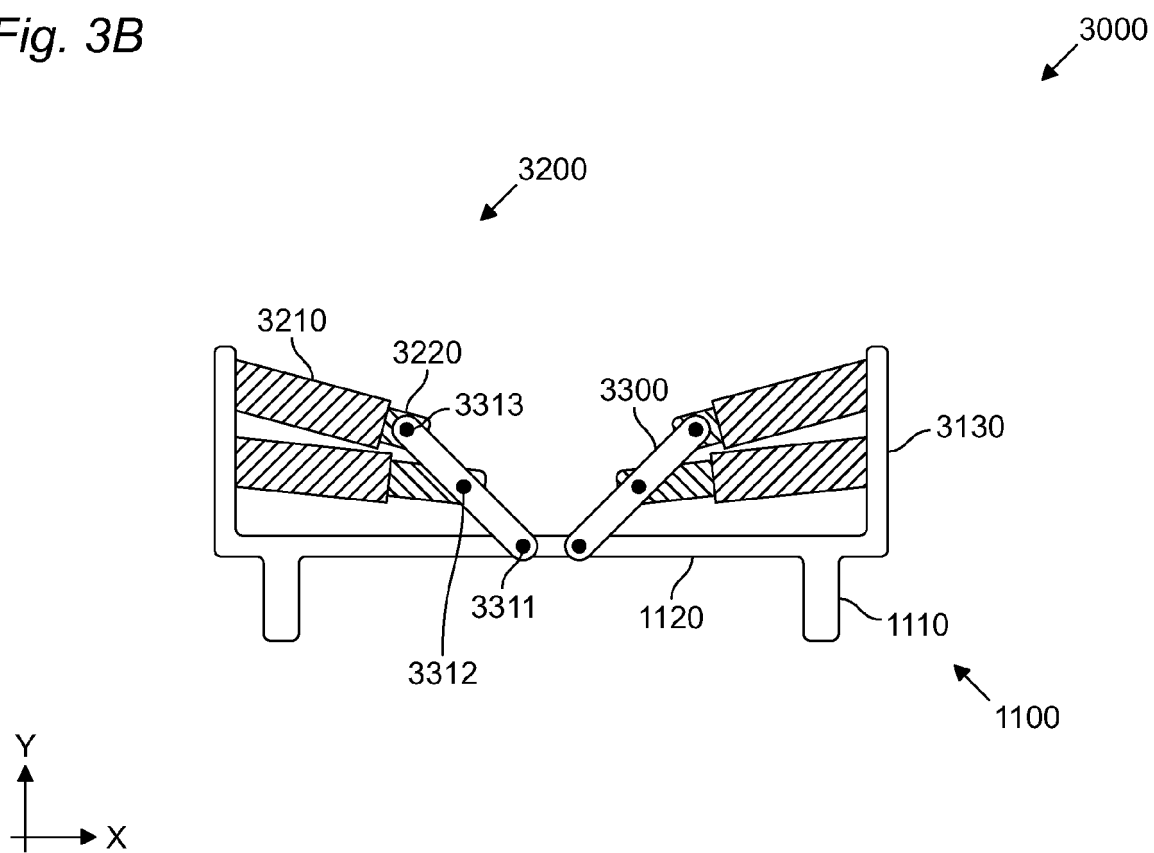


Fig. 4A

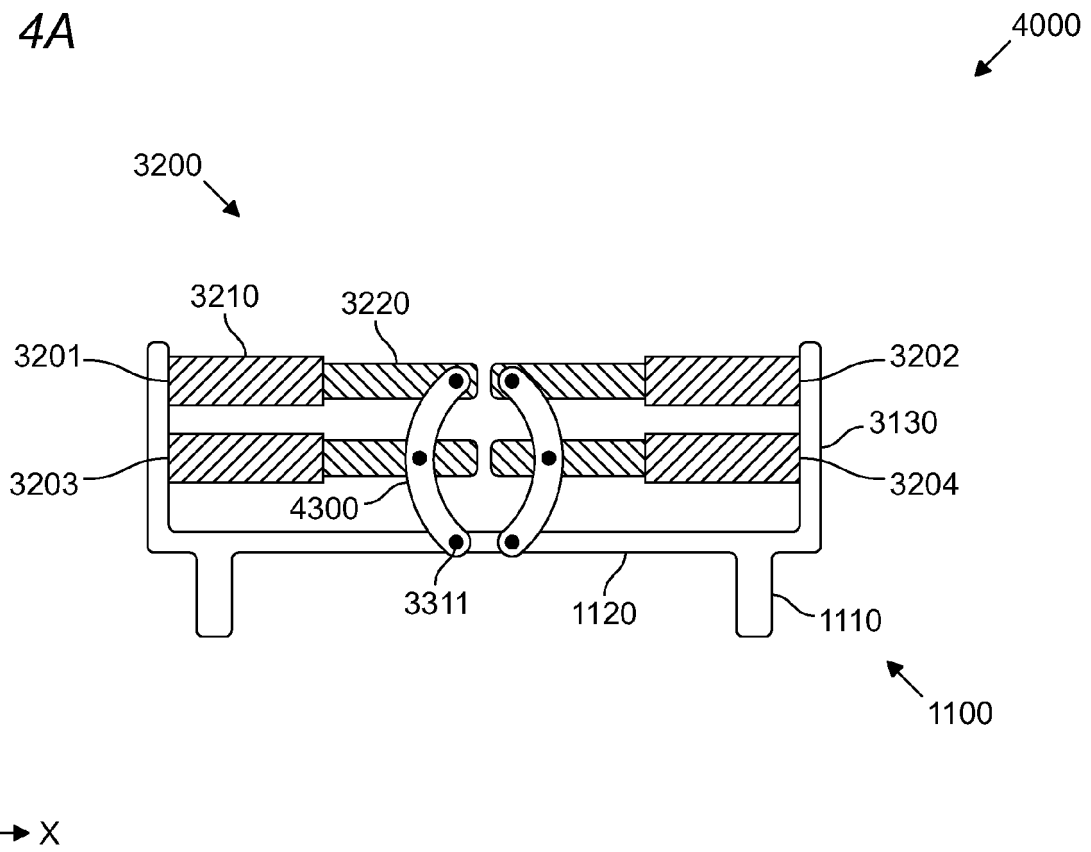


Fig. 4B

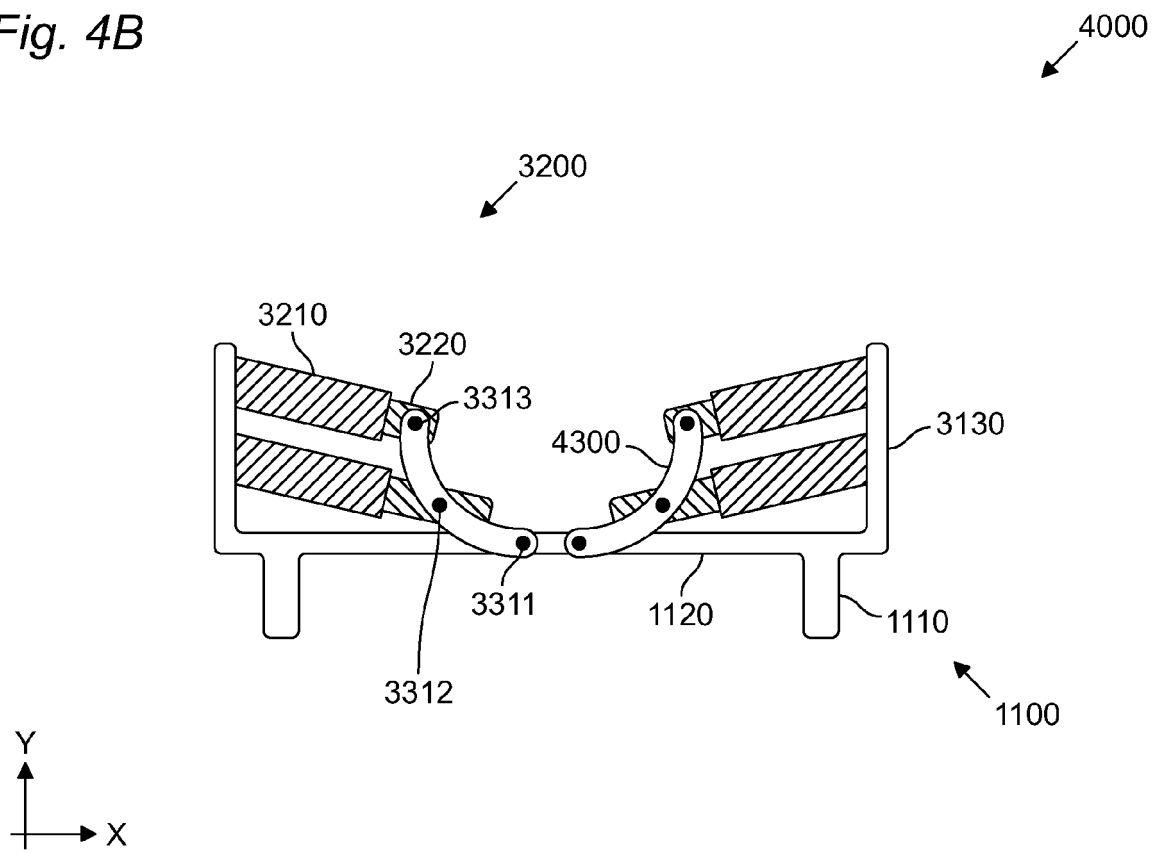


Fig. 5A

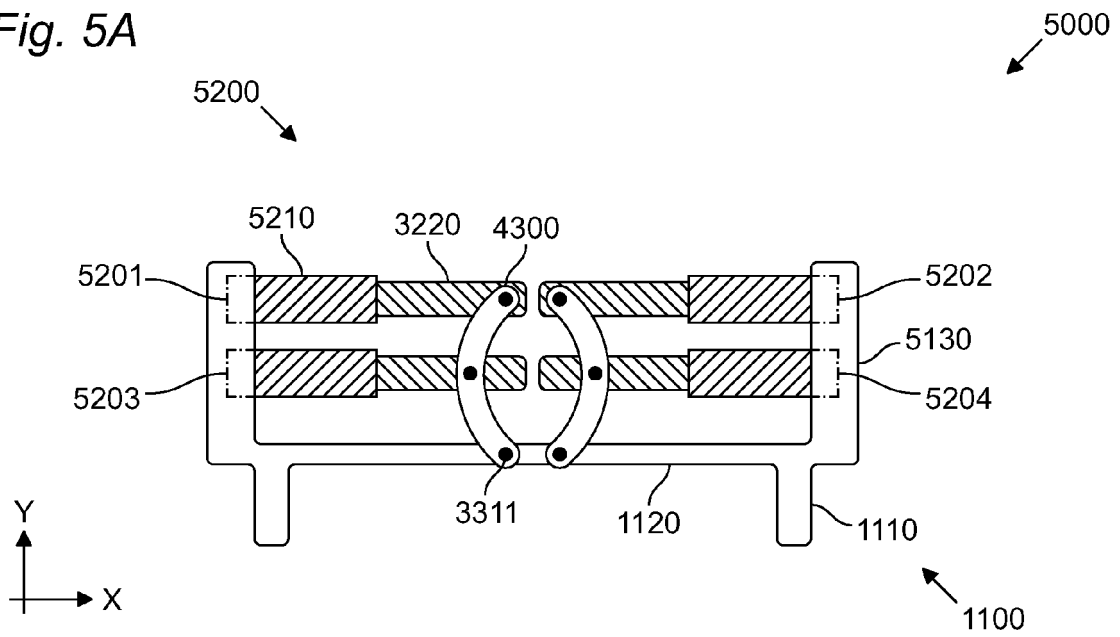


Fig. 5B

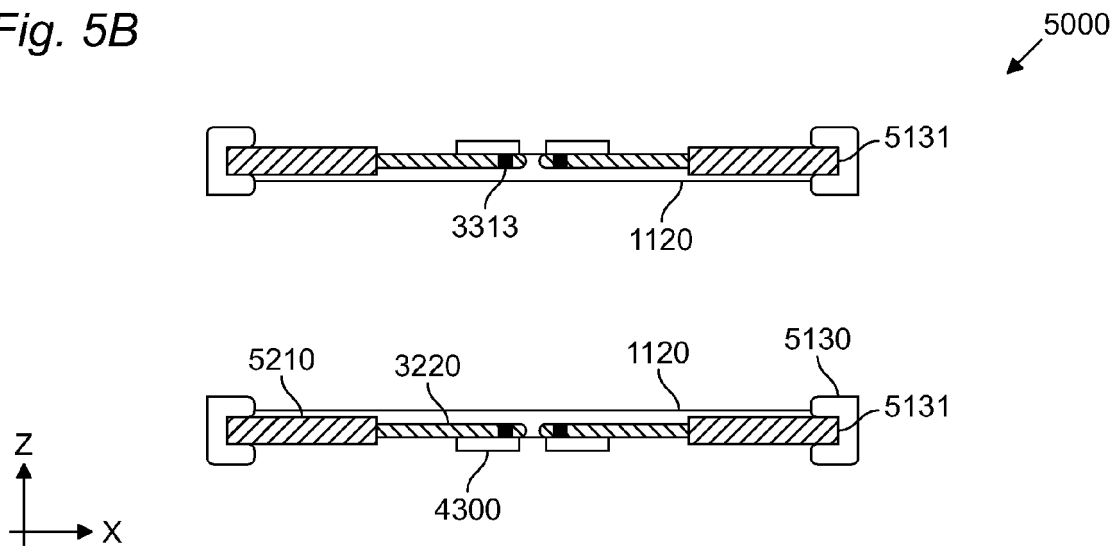


Fig. 5C

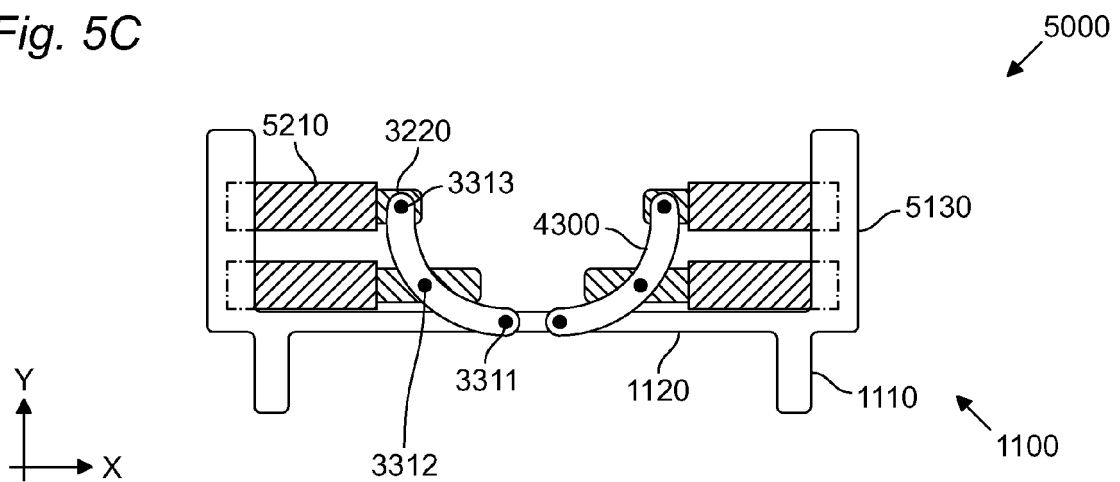


Fig. 6A

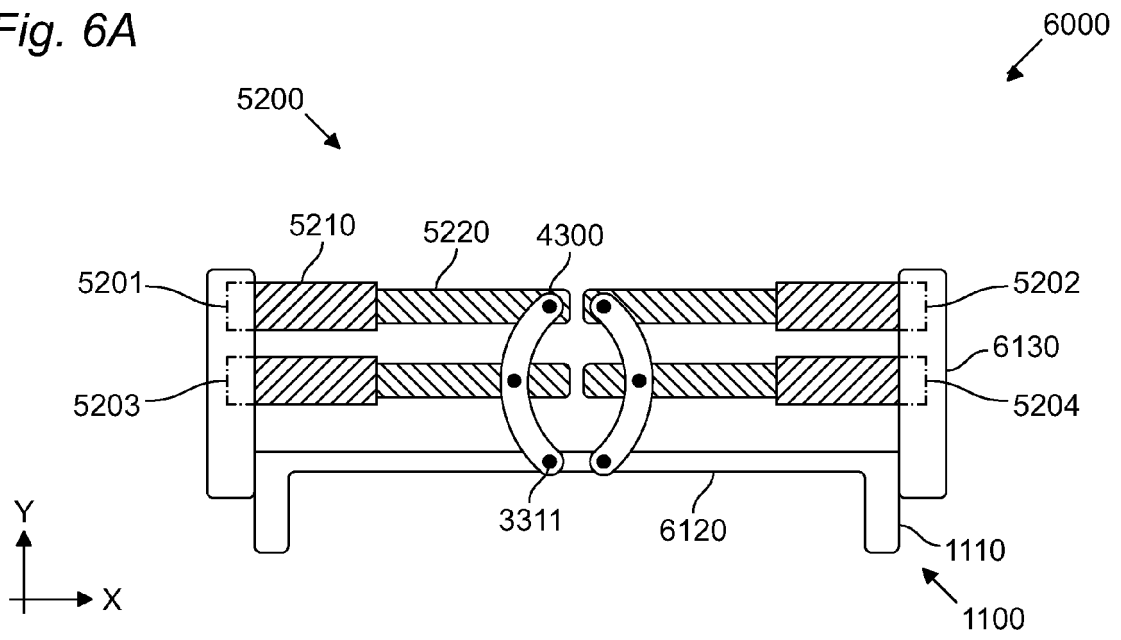


Fig. 6B

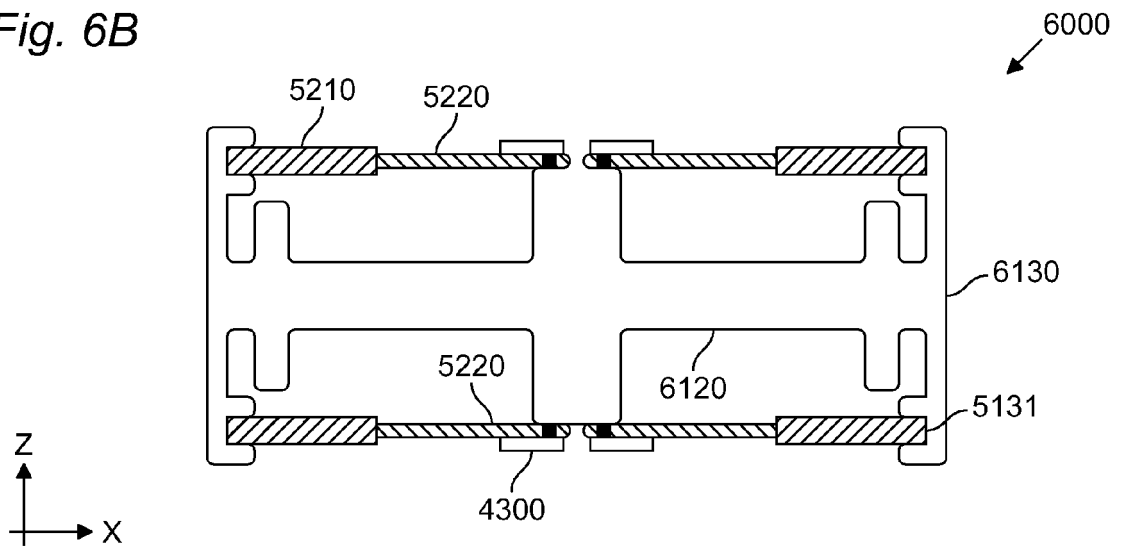


Fig. 6C

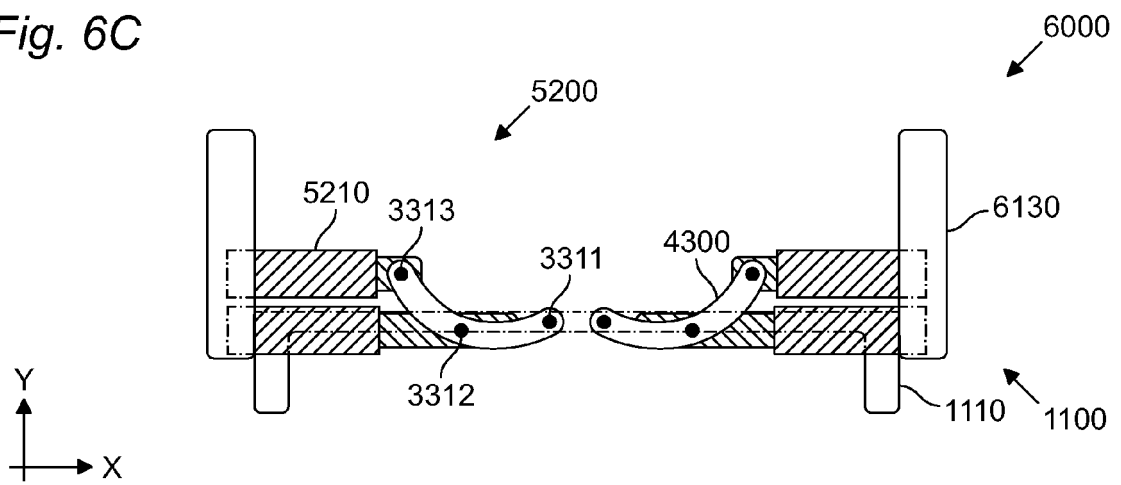


Fig. 7A

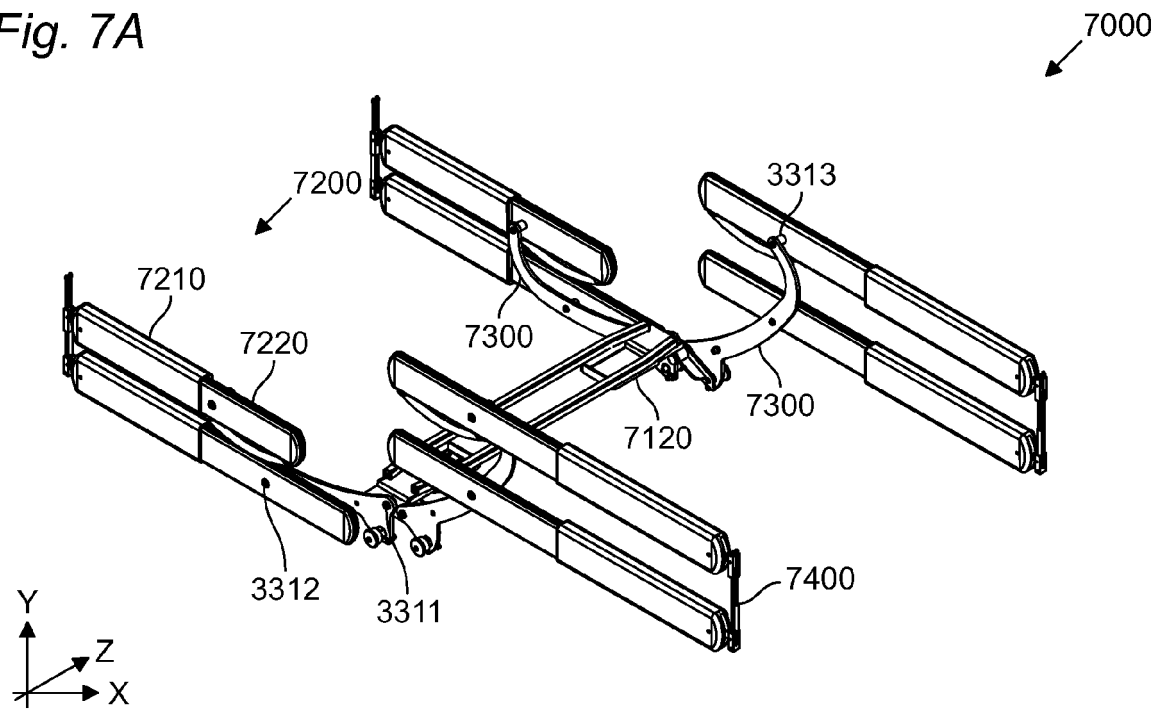


Fig. 7B

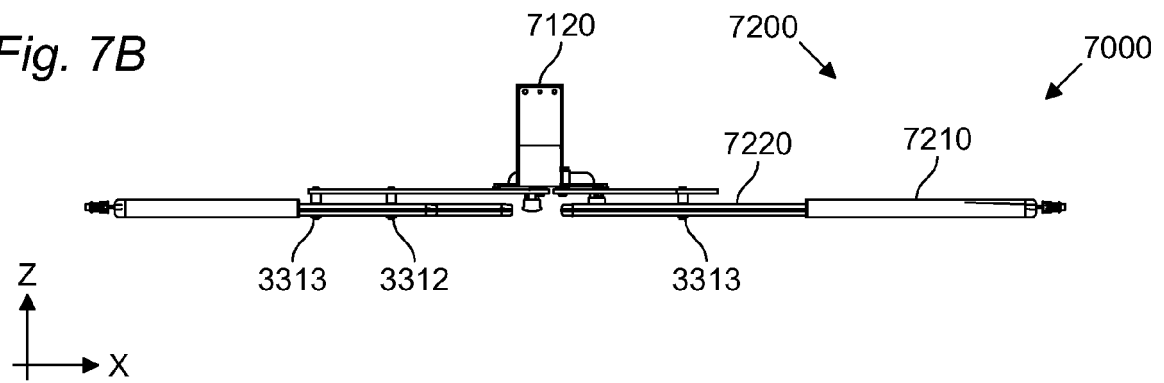
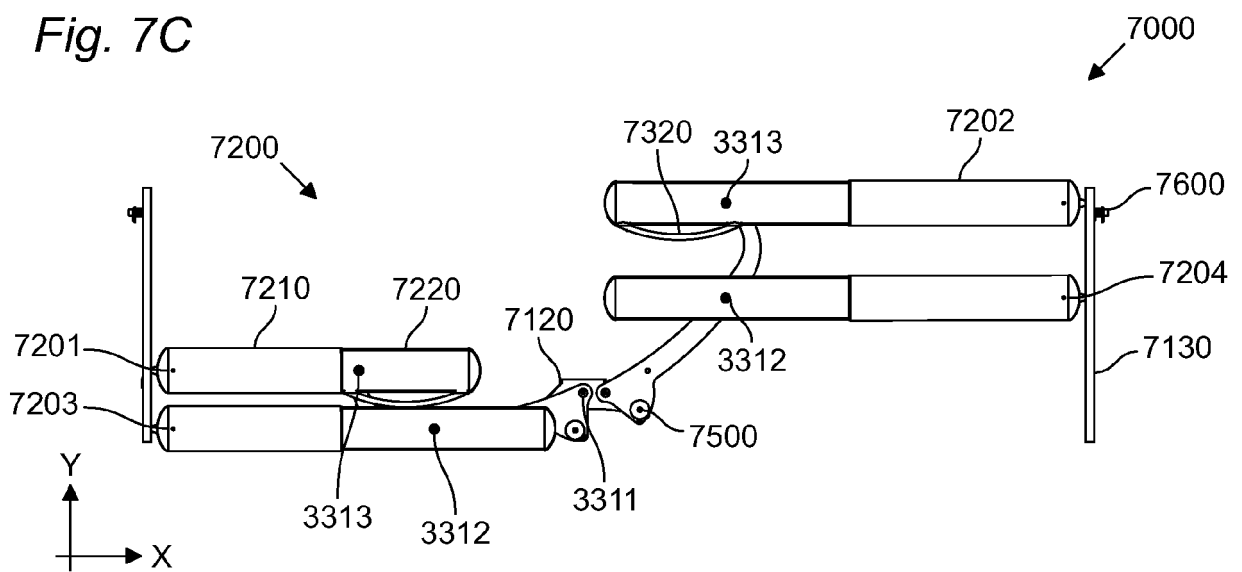


Fig. 7C





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Place of search The Hague		Date of completion of the search 30 March 2021	Examiner Petzold, Jan
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