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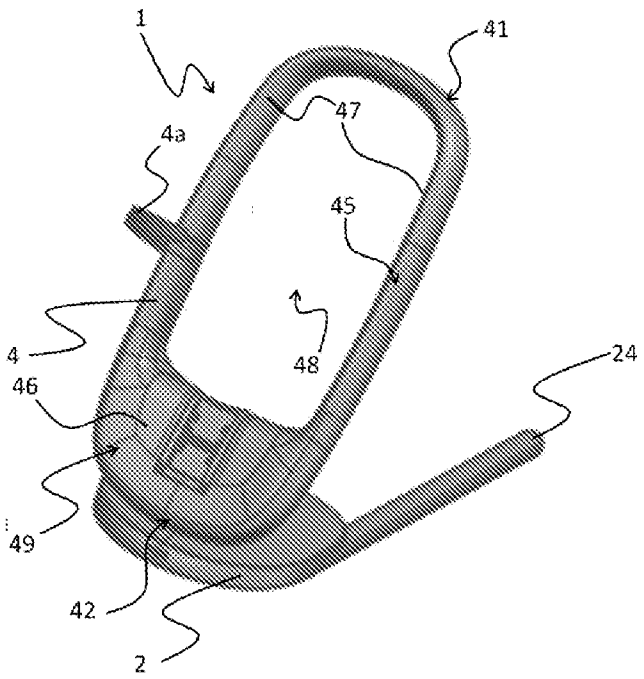
(54) Title: **A bouncer for a baby**

(57) Abstract

A bouncer (1) for a baby comprising: a base frame (2); a holding frame (3) arranged at an upper end (21) of said base frame (2); a seat frame (4), arranged at an inclined angle relative to said base frame (2), wherein the seat frame (4) is pivotally attached to the holding frame (3) around a horizontal axis at a first pivot point (X), and wherein said first pivot point (X) is located: along the length of the seat frame (4) such that first pivot point (X) and seat frame (4) form a lever; and at, or towards, a first end (31) of the holding frame (3), a biasing mechanism (5), wherein the biasing mechanism (5) is configured to provide a biasing force upon longitudinal displacement, and wherein the biasing mechanism (5) is: pivotally attached at a first end of (51) said biasing mechanism (5) to the seat frame (4) around a horizontal axis at a second pivot point (Y),pivotally attached at, or towards, a second end (52) of said biasing mechanism (5) to the holding frame (3) around a horizontal axis at a third pivot point (Z), wherein the third pivot point (Z) is located at, or towards, a second end (32) of the holding frame (3).



Technical Field

[001] The present invention relates to the field of baby bouncers.

Background

[002] Bouncers are used for babies and small children, allowing them sit in a semi upright position to have a better overview without loading the back excessively. In addition, bouncers may be used to let a baby move in an up-and-down or bouncing movement to keep the baby content and happy and to let the baby rock safely, as well as for calming the baby , depending on the degree, intensity and direction of the bouncing movement.

[003] The bouncing movement may be instigated by the baby itself shifting its weight within the bouncer, or by an adult gently rocking or pushing down on the bouncer.

[004] In the prior art, the bouncing motion is typically achieved either by providing a biasing member in the structure of the bouncer, or by gravitational swinging around a pivot point. However, the motion in current bouncers does not seem to keep all babies fond and calm. Furthermore, the structure of the present bouncing mechanisms typically limit the kinds of additional features that can included on the bouncer, such as; varying the degrees of tilt of the bouncer, varying the bouncing motion, and providing a swinging movement.

[005] WO2013139960A1 proposes a solution that combines a rotational movement and forward movement at different inclinations of the bouncer.

[006] It is an object of the present invention to improve upon, mitigate or significantly alleviate the shortcomings of the prior art.

Summary of the Invention

[007] According to a first aspect of the present invention, there is provided a bouncer for a baby comprising:

- a base frame;
- a holding frame arranged at an upper end of said base frame;
- a seat frame, arranged at an inclined angle relative to said base frame, wherein the seat frame is pivotally attached to the holding frame around a horizontal axis at a first pivot point, and wherein said first pivot point is located:
    - along the length of the seat frame such that first pivot point and seat frame form a lever; and
    - at or towards a first end of the holding frame,
- a biasing mechanism, wherein the biasing mechanism is configured to provide a biasing force upon longitudinal compression, and wherein the biasing mechanism is:
    - pivotally attached at a first end of said biasing mechanism, to the seat frame around a horizontal axis at a second pivot point,
    - pivotally attached at, or towards, a second end of said biasing mechanism to the holding frame around a horizontal axis at a third pivot point, wherein the third pivot point is located at or towards a second end of the holding frame.

[008] Thus, according to the first aspect of the invention, a bouncer with a structure and a biasing mechanism is provided that improves upon the prior art. In particular, the placement of the biasing mechanism, holding frame, seat frame and pivot points relative to each other form a triangular linkage bouncing mechanism with a smooth and long-lasting bouncing motion. Thereby, the present invention keeps a baby in the bouncer content for a longer period of time compared to the prior art.

[009] Furthermore, the arrangement of the aforementioned components of the bouncer are compact and facilitate the potential addition of functions such as varying angles of the seat frame, swinging of the seat frame and varying the bouncing motion.

[010] The base frame may be defined herein as a structure that is configured to be placed on a support structure, such as the ground. The base frame may preferably be configured to keep the bouncer stable as it is being set into motion. Typically, the base frame may comprise a flat structure with a longitudinal shape for taking up torque forces imparted from the motion of the seat frame through the holding frame. Thus, the base frame may preferably be arranged for mounting onto a horizontal support structure, such as a floor of a building.

[011] The holding frame may be configured to take up forces from the seat frame as the seat frame pivots in the first pivot point, and to take up forces from the biasing mechanism pivoting in the third pivot point. Preferably, the holding frame may comprise a longitudinal shape extending away from the base frame, thereby allowing the seat frame to pivot freely without coming into contact with the base frame or an underlying support structure. Thus, a first end and a second end of the holding frame may refer to the opposite ends of the holding frame in the longitudinal direction of the frame. It will therefore be understood that the holding frame may provide a rigid structure interconnecting the first pivot point and the third pivot point and the distance between these pivot points may be fixed.

[012] The seat frame may be configured to support the weight of a baby. The seat frame may comprise a longitudinal shape arranged in an inclined angle relative to said base frame. Thus, the seat frame may preferably be inclined relative to a horizontal plane. The shape of the seat frame may be longitudinally oval and configured to support the body of a baby, with a foot and leg rest at a lower end of the frame, a body supporting portion at a middle part of the frame and a head rest at an upper end of the frame. The seat frame may comprise a front side facing the body of the baby. The seat frame may be configured for being upholstered with a flexible material such as a textile over the front side. The back side of the seat frame may be arranged opposite to the front side in the lateral direction.

[013] The seat frame may comprise a protruding portion, extending from a lower end of the back side. The protruding portion may preferably be arranged along the length of the seat frame. The protruding portion may preferably extend along the seat frame for a distance longer than the biasing mechanism. Thus, the protruding portion may encompass the biasing mechanism. Advantageously, the protruding portion may extend from a foot and leg rest part of the seat frame, to a body supporting portion of the seat frame. The first pivot point may be arranged towards or at a distal end of the protruding portion, where the distal end may be defined as

distalmost to the back side of the seat frame. The second pivot point may be arranged at or towards the lowermost end of the seat frame, relative to the first pivot point, on the protruding portion. Thus, it will be understood that the seat frame may provide a rigid connection between the first pivot point and the second pivot point and the distance between these pivot points may be fixed. In certain other embodiments, the seat frame may provide a rigid connection between the second pivot point and the third pivot point, such that the distance between these points may be fixed.

[014] In certain embodiments of the invention, said first end of the holding frame may be at a lower end of the holding frame, said second pivot point may be at a lower end of the seat frame relative to the first pivot point, and said second end of the holding frame may be at an upper end of the holding frame. In these embodiments, the biasing mechanism may primarily be a compression mechanism, configured to provide a biasing force upon longitudinal compression as the seat frame is tilted backwards towards a more reclined position.

[015] In certain embodiments of the invention, said first end of the holding frame may be at an upper end of the holding frame, said second pivot point may be at a lower end of the seat frame relative to the first pivot point, and said second end of the holding frame may be at a lower end of the holding frame. In these embodiments, the biasing mechanism may primarily be an extension mechanism, configured to provide a biasing force upon longitudinal extension as the seat frame is tilted backwards.

[016] In embodiments of the invention, the biasing mechanism may comprise:

- a cam arranged at one end of said biasing mechanism, wherein the cam may be pivotally attached to one pivot point of the biasing mechanism around a horizontal axis; and,

- a follower arranged at the other end of said biasing mechanism, wherein the follower may be pivotally attached to the other pivot point, and wherein the follower comprises a face arranged to engage with a profile of the cam.

[017] Thus, it may be possible to rotate said cam and thereby adjust the distance between the second and third pivot points. This change in distance may cause the angles of the triangular linkage to adjust and thereby also the inclination of the seat

frame. With a change in the inclination of the seat frame, the distance from the first pivot point to the centre of gravitation of the seat frame may also change in both loaded and unloaded condition. Thus, the more upright the seat inclination is the smaller the distance may be between the centre of mass and the first pivot point. It therefore follows that the moment acting on the biasing mechanism may become lower the more upright the seat is inclined.

[018] Furthermore, the angle between the first and second pivot points at the third pivot point may be increased when the distance between the second and third pivot points is shortened. With the angle between the first and second pivot points at the third pivot point angle being wider, the angle of attack of the biasing mechanism may result in a larger angular displacement of the seat frame compared to a higher seat position. As a result of these changes in the triangular linkage by the adjustment of the cam, the bouncing motion may change as the inclination of the seat frame is adjusted.

[019] For inclinations of the seat frame that are more upright, the bouncing motion may be stiffer with a smaller angular displacement in comparison to more reclined positions. Babies may be prone to sit more upright as they increase in age and weight, and they may also be less desiring of large amplitudes in the bouncing motion as they sit more upright. Thus, the present invention may provide for a bouncing motion that may be adapted according to a baby's age and preference.

[020] In certain embodiments of the invention, the cam may be arranged at the second end of said biasing mechanism and may be pivotally attached to the third pivot point, and wherein the follower may be arranged at the first end of said biasing mechanism and may be pivotally attached to the second pivot point.

[021] In certain embodiments of the invention, the cam may be provided with a profile comprising at least two profile faces, each profile face being arranged at a different distance to the pivot point. Preferably, this pivot point may be the third or second pivot point. Thus, each profile face may be configured to engage with the follower face such that the cam is held in a non-rotating stable position and thus the seat frame is held in a certain inclination. Each of these inclinations may define a position, such as a lower and an upper position. In preferable embodiments, the cam profile faces may be flat.

[022] In certain embodiments of the invention, a biasing member may be provided between the follower face and the pivot point. Preferably, this pivot point may be the second or third pivot point. Since the adjustment of the length of the biasing mechanism may mainly be taken up by adjustment of the cam, the biasing member may therefore advantageously be minimally affected by the length adjustment. Thus, the biasing member may provide a substantially similar biasing force independent of the angular adjustment of the seat frame.

[023] In certain embodiments of the invention, the biasing member may be a coil spring. Alternatively, the biasing member may be any of magnetic, pneumatic, hydraulic, or elastomeric elements. A coil spring may advantageously provide a compact biasing member with desirable characteristics such as a linear force profile and high reliability. The biasing member may be provided with customisable stiffness and damping qualities.

[024] In certain embodiments of the invention, the cam may be provided with a profile comprising three profile faces each arranged at a different distance to the pivot point. Preferably, this pivot point may be the third pivot point or the second pivot point. Thus, the seat frame may in this preferable embodiment be adjustable in three different angles; an upper position, a middle position and a lower position. It will be understood that the upper position may be the most upright position, the middle position may be a more reclined position and the lower position may be the most reclined position. Thus, the angle between the seat frame and the base frame may be largest at the upper position, smaller at the middle position and smallest at the lower position.

[025] In certain embodiments of the invention, an axle of the cam may be provided with a lever configured to rotate the cam and thereby alternate engagement between the at least two profile faces. Thus, the cam may advantageously manipulated by the lever in order to adjust the inclination of the seat frame.

[026] In certain embodiments of the invention, the base frame may comprise a pedestal arranged at the upper end of said base frame. Thus, the holding frame may advantageously be arranged at an elevated distance above the base frame.

[027] In certain embodiments of the invention, the holding frame may be releasably attached to the pedestal. Preferably, a releasable attachment mechanism

may be arranged at the lower end of the holding frame, and be configured to engage with an engagement member of the pedestal. Thus, the holding frame and base frame may be releasable connected, facilitating transportation of the bouncer as it may take up less space when disassembled.

[028] In certain embodiments of the invention, the pedestal may be arranged to pivot around a vertical axis at a fourth pivot point, said fourth pivot point being arranged on the base frame. Thus, by providing for pivoting around the fourth pivot point, a swinging motion of the seat frame may be achieved. Since the seat frame may be inclined, the swinging motion of the seat frame may be experienced similar to a rocking motion. Furthermore, the combination of the swinging motion and the bouncing motion may allow for the seat frame to move in a figure-eight motion thereby providing additional soothing and calming of a baby.

[029] In certain embodiments of the invention, biasing means may be provided to bias the pedestal and thus the seat frame to a front facing position in relation to the base frame. By providing biasing means, a continuous swinging motion may be achieved by providing a push to the seat frame and it will swing back and forth over the front facing position, with minimal need for continued external force being applied.

[030] In certain embodiments of the invention, the pedestal may be provided with a crank arm extending radially outward from its rotational axis and where the biasing means may be provided at the distal end of the crank arm in relation to said axis. Thus, an additional moment may be provided to act on the rotation of the pedestal in order to achieve more leverage and thereby facilitating the use of biasing means with lower stiffness.

[031] In certain embodiments of the invention, the biasing means may comprise two swing biasing members each provided on either side of said distal end of the crank arm. Thus, an even distribution of force, increased force, increased redundancy and reduced stress on the crank arm may be achieved.

[032] In certain embodiments of the invention, a swing biasing member may comprise a coil spring. Alternatively, the biasing member may be any of magnetic, pneumatic, hydraulic, or elastomeric elements. A coil spring may advantageously provide a compact biasing member with desirable characteristics such as a linear

force profile and high reliability. The swing biasing member may be provided with customisable stiffness and damping qualities.

[033] In the following description, numerous specific details are introduced by way of example only to provide a thorough understanding of embodiments of the claimed device. One skilled in the relevant art, however, will recognize that these embodiments can be practiced without one or more of the specific details, or with other components, systems, etc. In other instances, well-known structures or operations are not shown, or are not described in detail, to avoid obscuring aspects of the disclosed embodiments.

Brief Description of the Figures

[034] The following drawings are appended to facilitate the understanding of the invention. The drawings show embodiments of the invention, which will now be described by way of example only, where:

[035] Fig. 1A and Fig. 1B are perspective views of the baby bouncer in assembled state, albeit without upholstering.

[036] Fig. 2A and Fig. 2B are perspective views illustrating components of the bouncing mechanism.

[037] Fig. 3A is a cross-section view illustrating mechanisms of the bouncer in an upper unloaded position.

[038] Fig. 3B is a cross-section view illustrating mechanisms of the bouncer in an upper loaded position.

[039] Fig. 4A and Fig. 4B are schematic illustrations of the working principle of the bouncing mechanism in an upper unloaded and upper loaded position.

[040] Fig. 5A and Fig. 5B are side perspective views illustrating the bouncer in an upper unloaded and an upper loaded position.

[041] Fig. 6A is a cross-section view illustrating mechanisms of the bouncer in a middle unloaded position.

[042] Fig. 6B is a cross-section view illustrating mechanisms of the bouncer in an middle loaded position

[043] Fig. 7A and Fig. 7B are schematic illustrations of the working principle of the bouncing mechanism in a middle unloaded and middle loaded position.

[044] Fig. 8A and Fig. 8B are side perspective views illustrating the bouncer in a middle unloaded and a middle loaded position.

[045] Fig. 9A is a cross-section view illustrating mechanisms of the bouncer in a lower unloaded position.

[046] Fig. 9B is a cross-section view illustrating mechanisms of the bouncer in a lower loaded position

[047] Fig. 10A and Fig. 10B are schematic illustrations of the working principle of the bouncing mechanism in a lower unloaded and lower loaded position.

[048] Fig. 11A and Fig. 11B are side perspective views illustrating the bouncer in a lower unloaded and a lower loaded position.

[049] Fig. 12A, Fig. 12B and Fig. 12C are cross-section views illustrating the different cam positions in unloaded upper, middle and lower positions.

[050] Fig. 13A and Fig. 13B are birds-eye views of the bouncer in a front-facing position and a swing position, respectively.

[051] Fig. 14A is an exploded view of the base frame and pedestal.

[052] Fig. 14B is an exploded up-close view of the pedestal and biasing means.

Detailed Description of the Figures

[053] In the following, one exemplary embodiment of the invention will be described. References will be made to the accompanying drawings. It shall be noted, however, that the drawings represent one exemplary embodiment only, and that other features and embodiments may well be within the scope of the invention

as claimed. Further, the mentioning of references such as "a" or "an" etc. should not be construed as excluding a plurality.

[054] Unless otherwise defined, all terms of art, notations and other scientific terms or terminology used herein are intended to have the meanings commonly understood by those of skill in the art to which this invention pertains. Certain terms of art, notations, and other scientific terms or terminology may, however, be defined specifically as indicated below.

[055] Fig. 1A and Fig. 1B illustrate an exemplary embodiment of the bouncer 1 in an assembled condition. The seat frame 4 is shown in an upper position, i.e. at its least reclined where the angle φ formed between the seat frame 4 and the base frame 2 is at its largest. However, the seat frame 4 is not shown with upholstery in Fig. 1A and Fig. 1B. Hence, the various portions of the seat frame 4 can be seen more clearly. The seat frame 4 is shown with an oval form defined along its periphery by a beam structure 47.

[056] As can be seen in Fig. 1B, which illustrates the front side 44 of the seat frame 4, towards a lower end 42 of the seat frame 4, the oval form is covered from beam-to-beam 47 by a seat frame plate cover 46. The plate cover 46 acts as a foot and leg rest of the seat frame 4, and protects the bouncing mechanism which is located under the plate 46. The plate cover 46 therefore forms a foot and leg rest portion 49 of the seat frame 4. The seat frame plate cover 46 is exemplified as extending about 1/3 of the longitudinal length of the seat frame 4 extending from the lower end 42 of the oval formed seat frame 4.

[057] In the portion of the seat frame 4 located adjacent to the seat frame plate cover 46 towards the upper end 41 of the seat frame, there is no structure between the beams 47 as they extend towards the upper end 41 of the seat frame 4. As the skilled person will understand in the context of the invention, the seat frame 4 is typically upholstered with a flexible fabric when the bouncer 1 is in use. This fabric is not illustrated in the Figures. The fabric is pulled over the seat frame 4 such that it extends between the beams 47 and thereby supports the body and main weight of a baby sitting in the bouncer 1. The portion of the seat frame 1 where the fabric extends between the beams 47 forms the body supporting portion 49.

[058] Fig. 1A illustrates two supporting feet 24 extending in parallel from the base frame 2 in a longitudinal direction parallel to that of the oval-formed seat

frame 4. When the bouncer 1 is bouncing and/or swinging, force is transferred from the seat frame 4 via the base frame 2 and to the supporting feet 24.

[059] Fig. 1A illustrates the back side 45 of the seat frame 4. A protruding portion 43 is shown extending from the lower end 42 behind the foot and leg rest portion 49. The protruding portion 43 extends towards an upper end 21a of the base frame 2, where the seat frame 4 and the base frame 2 are releasably connected. As will be explained in more detail with reference to Fig. 3, Fig. 6 and Fig. 9, at least parts of the mechanisms related to bouncing, swinging, locking and detaching are located inside the protruding portion 43. Thus, during bouncing motion, the seat frame 4 forms a lever that pivots around a horizontal axis located at a first pivot point X on the protruding portion 43. Whilst during swinging motion, the seat frame 4 pivots around a vertical axis located at a fourth pivot point W extending through the upper end 21a of the base frame 2 and into the protruding portion 43 of the seat frame 4.

[060] A toy hanger 4a is shown extending from a beam 47 on the body supporting portion 48 of the seat frame 4. The toy hanger 4a may comprise an elastic material that jiggles a toy connected to the end of the hanger 4a during swinging and bouncing motion.

[061] Turning to Fig. 2A, the foot and leg rest portion 49 and seat frame plate cover 46 of the seat frame 4 is shown in more detail and with a middle part of the cover plate 46 removed. The seat frame 4 is shown in the upper position in an unloaded state. The middle part of the plate 46, which has been removed, covers the bouncing mechanism and facilitates inspection, assembly and maintenance of the bouncing mechanism. A cam 53 and a follower 54, that form part of the bouncing mechanism, can be seen in the uncovered section.

[062] In Fig. 2B, the seat frame 4 has been removed entirely from view, thereby exposing yet further parts of the bouncing mechanism. The functioning of the bouncing mechanism will be explained in further detail with reference to Figs. 3-12.

[063] The base frame 2 is shown extending towards its upper end 21a, where the base frame 2 connects to a first end 31 of a holding frame 3. The first end 31 of the holding frame 3 is exemplified as the lower end 31, in the vertical direction, in this particular embodiment. Thus, the second end 32 of the holding frame 3 coincides with the upper end 32, in the vertical direction. For the ease of understanding of

the particular embodiment illustrated in the figures, we will in the following refer to the upper/lower 31/32 ends of the holding frame 3 that correspond to the first/second 31/32 end of the holding frame 3. However, the skilled person will understand that the invention is not limited to this embodiment and that the invention can be realised in other embodiments where the different parts of the bouncing mechanism are arranged in different vertical or horizontal positions.

[064] The holding frame 3 is shown in Fig. 2B having a fork shape that is sandwiching the biasing mechanism 5 including the cam 53. Although it is not visible in the Figures, it will be understood that the protruding portion 43 of the seat frame 4 extends towards the lower end 32 of the holding frame 3 and therefore is also sandwiched by the holding frame 3. The protruding portion 43 extends past the first pivot point X, represented by a black circle X in Fig. 2B. The black circle X is shown to mark the axis X of an axle extending through the prongs of the holding frame 3. Thus, the protruding portion 43 of the seat frame 3 is hinged on the axle at the first pivot point X.

[065] A cam axle 531 extends from a cam lever 532 through the upper end 31 of the holding frame 3 and the second end of the biasing mechanism 5. For the ease of understanding of the particular embodiment illustrated in the figures, we will in the following refer to the lower/upper ends 51/52 of the biasing mechanism 5 that correspond to the first/second ends 51/52 of the biasing mechanism 5. However, the skilled person will understand that the invention is not limited to this embodiment and that the invention can be realised in other embodiments where the different parts of the bouncing mechanism are arranged in different vertical or horizontal positions.

[066] The cam lever 531 and cam axle 532 are fixedly attached to the cam 53. Thus, it will be understood that by rotating the cam lever 531, the cam 53 is rotated. In the illustrated embodiment of Fig. 2B, the centre axis of the cam axle 532 aligns with the third pivot point Z.

[067] A first/lower end 51 of the biasing mechanism 5 is exemplified as being located towards the lower end 42 of the seat frame 4. The biasing mechanism 5 is pivotally attached to the seat frame 4 at the lower end 51 of the biasing mechanism 5 by means of a shaft extending through said lower end 51. Thus, the axis of the shaft pivotally attaching the biasing mechanism 5 to the seat frame 4 is at the second pivot point Y. The seat frame 4 is not visible in Fig. 2B. However, the

connection of the lower end 51 of the biasing mechanism 5 to the seat frame 4 is partially visible in Fig. 2A.

[068] The upper end of the biasing mechanism 52 is illustrated in Fig. 2B as being located in a direction towards the upper end 41 of the seat frame 4 and forms a fork shape sandwiching the cam 53. This fork shape allows the cam 53 to slide in the prongs of the biasing mechanism 5 as the mechanism is longitudinally compressed. The cam 53 can be seen with a first cam face 53a pressing against a follower face 54a of the biasing mechanism 5. Though the biasing means 56 is not shown in Fig. 2B, it will be understood that the follower 54 presses up against a biasing means 56, such as a coiled spring which provides for longitudinal compression and a biasing force.

[069] Now turning to Fig. 3A and Fig. 3B, cross-sections of the mechanisms of the bouncer 1 are shown in an upper position in an unloaded and loaded state, respectively.

[070] Fig. 3A thus illustrates the seat frame 4 in a steep angle, extending from a lower end 42 and towards an upper end 41 which is not visible in the figure. The bouncer 1 will have this angle when it is in the upper position, and when there is no load in the bouncer or any load acting to push the upper end 41 of the seat frame 4 to a reclined loaded state.

[071] It can be seen in Fig. 3A that the protruding portion 43 of the seat frame 4 extends some distance along and out from the back side 45 of the seat frame 4, such that it encompasses various components of the bouncing mechanism. The first X, second Y and third Z pivot points are all located inside the periphery of the protruding portion 43 of the seat frame 4.

[072] The biasing mechanism 5 can be seen extending longitudinally from the second pivot point X, at the lower end 42 of the seat frame 4, and towards the third pivot point Z, towards the upper end 41 of the seat frame 4. The second pivot point X pivotally attaches the biasing mechanism 5 to the seat frame 4. The upper end 32 of the holding frame 3 is not visible in Fig. 3A, but it will be understood that the upper end 32 of the holding frame 3 located in the area around the third pivot point Z behind and in front of the illustrated seat frame 4.

[073] Extending from the second pivot point X the biasing mechanism 5 can be seen enveloping the follower 54 and the biasing means 56. The biasing means 56, exemplified as a coil spring, can be seen arranged inside the follower 54. Thus, the coil spring 56 will act to press the follower face 54a against the first cam face 53a. In the upper position, it will be the first cam face 53a that is engaging the follower face 54a. The second 53b and third 53c faces of the cam 53 can be seen disengaged, arranged clockwise respectively around the profile of the cam 53. It will be understood that by manipulating the cam lever 532, the cam 53 is rotated and thus the different cam faces 53a,53b,53c are brought into, or out of, contact with the follower face 54a.

[074] It can also be seen in Fig. 3A and Fig. 3B that each of the cam faces 53a,53b,53c are arranged at a different distance D to the third pivot point Z, with the first cam face 53a being at the longest distance, the second cam face 53b at a middle distance, and the third cam face 53c at the shortest distance. The skilled person will understand in the context of the invention that the number of, and distances of the cam faces can vary. These distances D will be explained in more detail with reference to Fig. 12.

[075] The prongs of the biasing mechanism 5 are not shown in Fig. 3A, but it will be understood that they sandwich the cam 53. Thus, the biasing mechanism 5 can both slide and pivot over the third pivot point Z via the follower 54 and the cam 53.

[076] As can be seen in Fig. 3A, the protruding portion 43 of the seat frame 4 has a concave shape towards the outermost end from the back side 45 of the seat frame 4. The concave shape of the protruding portion 43 fits within a concave shape of the holding frame 3. Furthermore, inside the middle part of the concave shape of the holding frame 3, a bulge can be seen. Thus, when the seat frame 3 pivots around the first pivot point X, it is guided by the concave shape of the holding frame 3. The bulge engages with each end of the concave part of the protruding portion 43 to limit rotation during bouncing motion.

[077] Extending vertically through the interior of base frame 2 from an upper end 21a to a lower end 21b, a pedestal 22 is arranged. The pedestal 22 also extends into the lower end 32 of the holding frame 3 where it is releasably connected to the holding frame 3. At the lower end 21a of the base frame 2, the pedestal 22 connects to a crank arm 221. The crank arm 221 extends horizontally along the base frame 2 from the pedestal 22. At the distal end of the crank arm 221, relative

to the pedestal 22, the crank arm 221 engages with biasing members 23 in the form of coil springs 23 arranged on either side of the crank arm 221. Thus, it will be understood that the pedestal 22 may rotate around its vertical axis, and that the biasing members 23 will act to bias the pedestal 22 towards a certain position. Since the pedestal 22 is releasably connected to the holding frame 3 at the upper end of the pedestal 22, the swinging rotation of the seat frame 4 will also act upon the biasing members 23 and thereby act to hold the seat frame 4 in a front-facing position.

[078] At the lower end 32 of the holding frame 3, Fig. 3A illustrates a releasable attachment mechanism 6. The releasable attachment mechanism 6 comprises a latch that engages with an engagement member 222 at the upper end of the pedestal 22 to the holding frame 3, thereby locking these components together. The releasable attachment mechanism 6 thereby allows for detaching the holding frame 3 and the seat frame 4 from the base frame 2. Thus when these parts are disassembled, the bouncer 1 can be transported in a more compact manner.

[079] At the upper end 21a of the base frame 2, just below the releasable attachment mechanism 6, a swing lock mechanism 7 can be seen in Fig. 3A. The swing lock mechanism 7 comprises a latch that can be manipulated to drive a locking pin from the upper end 21a of the base frame 2 into the holding frame 3. Thereby, by activating the swing lock mechanism 7, swinging rotation of the pedestal 22 and thus the seat frame 3 around the vertical axis may be prevented. This may be advantageous if only a bouncing motion is wanted.

[080] Turning to Fig. 3B, it will be apparent that the same components are present as in Fig. 3A. However, in contrast, the seat frame 3 is in a loaded state. The angle φ, not shown in Fig. 3A, between the seat frame 3 and the base frame 2 is therefore somewhat smaller than in the unloaded state. Otherwise, it will be noted that the cam 53 is in the same position, with the first cam face 53a engaged with the follower face 54a.

[081] To contrast Fig. 3A and Fig. 3B, attention should be given to the position of the follower 54 and biasing member 56 that are visibly compressed in Fig. 3B in relation to Fig. 3A. Furthermore, the position of the second pivot point Y is displaced in Fig. 3B in relation to Fig. 3A. The second pivot point Y has been brought closer to the third pivot point Z. The second pivot point Y has also rotated clockwise in relation to the first pivot point X. This is due to the pivotal connection

of the seat frame 3 at the first pivot point X, the pivotal connection of the biasing mechanism 5 at the lower end 51 at the second pivot point Y, and the pivotal and slidable connection of the biasing mechanism 5 at the upper end 52 on the third pivot point Z.

[082] The position of the first X and third pivot point Z are not displaced in Fig. 3A and Fig. 3B, because they are fixedly arranged on the holding frame 3. Additionally, the distance from the first pivot point X to the second pivot point Y has not changed because they are both fixedly arranged on the protruding portion 43 of the seat frame 4.

[083] Additionally, it may be seen in Fig. 3B that the concave end of the protruding portion 43 of the seat frame 4 has rotated, such that no longer engages with the bulge on the concave part of the holding frame 3. Thus, it will be understood that in Fig. 3B the seat frame 4 can rotate yet more towards a smaller angle φ between the base frame 2 until it is stopped by engaging with the bulge. In contrast, Fig. 3A illustrates that the seat frame 4 cannot rotate further towards a larger angle φ in relation to the base frame 2 as the bulge is preventing further rotation in the anti-clockwise direction.

[084] Turning to Fig. 4A and Fig. 4B, the principle of the bouncing mechanism will be explained. These figures illustrate the holding frame 3 schematically, extending from a lower end 31 to an upper end 32, with a shape roughly corresponding to that of Fig. 3A and Fig. 3B. Here it can be more clearly seen how the first pivot point X and the third pivot point Z are fixed in position and distance B relative to each other on the holding frame 3.

[085] Fig. 4A and Fig. 4B do not illustrate the seat frame 4 or the biasing mechanism 5, but it will be understood from the description of Fig. 3A and 3B that the seat frame 4 fixes the first X and second Y pivot points at a set distance C in relation to each other. The biasing mechanism 5 is compressible, and therefore allows for the distance A between the second Y and third Z pivot points to vary.

[086] Fig. 4A corresponds to the unloaded state of the seat frame 4 in the upper position, as in Fig. 3A. Fig. 4B corresponds to the loaded state of the seat frame 4 in the upper position, as in Fig. 3B. Thus, it will be seen that the angle αU between first X and third Z pivots points at the second pivot point Y in the upper position decreases as the seat frame 4 is loaded: αU1> αU2. Simultaneously, the length AU

between the second Y and third Z pivot points decreases as the biasing mechanism 5 is compressed: AU1 > AU2. Additionally, the angle βU between the second Y and first pivot points X at the third pivot point Z increases: βU1< βU2. The bounce angle λ, representing the radial displacement of the second pivot point Y around the first pivot point X is also illustrated.

[087] Turning to Fig. 5A and Fig. 5B, the seat frame 4 is again shown in the upper position in an unloaded and loaded state respectively. In contrast to Figs. 3 and 4, Figs. 5 illustrates the bouncer 1 in a sideview without going into details of the components.

[088] The cam lever 532 can be seen in the upper position in Fig. 5A and Fig 5B. It will be understood, with reference to Figs. 8 and 11, that the cam lever 432 is rotated counterclockwise in order to rotate the cam 53 and thereby engage a different cam face 53a-c with the follower face 54a.

[089] The angle between the seat frame 4 and the base frame 2, φU1 in the unloaded state and φU1 in the loaded state are shown respectively in Fig. 5A and Fig. 5B.

[090] Furthermore, Fig. 5A illustrates the distance δU1 from the first pivot point X to the centre of mass of the seat frame 4 in an unloaded state. In the unloaded state, the distance is relatively small δU1. With a small distance, the moment acting on the biasing member 56 is relatively small and the damping will be stiff with the bounce having a small pendulous motion.

[091] Fig. 5B illustrates the distance δU2 from the first pivot point X to the centre of mass of the seat frame 4 and a baby 10 in a loaded state. In this state, the distance δU is larger than for the unloaded state. With a larger distance, δU1<δU2, the moment acting on the biasing member 56 is larger than for an unloaded state. Additionally, the weight of the baby 10 will provide more force and therefore a higher moment. Therefore, the damping will be less stiff than for the unloaded state, providing a more bounce having a larger pendulous motion.

[092] Turning now to Fig. 6A and Fig. 6B, similar cross sections to those of Fig. 3A and Fig. 3B are illustrated. The same components are all present and visible, however the seat frame 4 is shown in the middle position. In this middle position, the seat frame 4 has a smaller angle φM relative to the base frame 2 than for the

upper position. Thus, it will be seen that the triangular linkage formed by the pivot points X,Y,Z and the biasing mechanism has shifted.

[093] In order to shift the geometry of the triangular linkage, the cam 53 has been rotated such that the first cam face 53a is no longer in engagement with the follower face 54. Instead, the second cam face 53b is now in engagement with the follower face 54a. As has been explained, and will be explained in more detail with reference to Fig. 12, the distance Db from the second cam face 53b to the third pivot point Z is shorter in comparison to the distance Da from the first cam face 53a. The compression of the biasing mechanism 5 can occur due to the fork form of the biasing mechanism 5, providing a sliding engagement with the third pivot point Z. Thus, the rotation of the cam 53 forces the triangular linkage to change geometry. The shortened distance Da>Db causes the angles α,β,γ between the pivot points X,Y,Z to change – αU1>αM1, βU1<βM1, γU1>γM1 – and thereby forces the seat frame 4 to the more reclined middle position.

[094] Comparing Fig. 7A and Fig. 7B with Fig. 4A and Fig. 4B, the shift in geometry of the triangular linkage will be understood. As has been explained, the distance B and position between the first X and third pivot points Y are fixed. The distance C between the first X and second Y pivot point is fixed, but the second pivot point Y rotates around the first pivot point X. Thus, when the distance A between the second Y and third pivot point Z is changed by rotation of the cam 53, there must be a change of angles α,β,γ. There is a decrease in the angle α between the first X and third Z pivots points at the second pivot point Y, and a decrease in the angle γ between the second Y and third Z pivot points at the first pivot point X. The angle β between the second Y and the first X pivot points at the third pivot point Z increases.

[095] Since the seat frame 4 is pivotally connected to both the second Y and third Z pivot points, it is moved from the upper to the middle position. Notably, when the seat frame 4 is reclined, the change in the geometry of the triangular linkage ensures that smaller compressions of distance A, between the second Y and third Z pivot points result in larger pendulous motions of the seat frame 4. Thus, the change in position towards more reclined, also provides for a motion that will have larger amplitudes during bouncing which may be advantageous for calming of smaller babies.

[096] The working principle of the bouncing mechanism in Fig. 7A and Fig. 7B is similar to that of Fig. 4A and Fig. 4B. The skilled person will understand that the principle applies similarly when the bouncer is loaded in the middle position and reference is therefore made to the aforementioned description of Fig. 4.

[097] Fig. 8A and Fig. 8B also illustrate a similar view of the bouncer 1 as Fig. 5A and Fig. 5B, albeit with the seat frame 4 in a middle position. Thus, the cam lever 532can be seen in the middle position in Fig. 8A and Fig 8B, clockwise rotated in comparison to the upper position.

[098] The distance δM from the first pivot point X to the centre of mass is larger in the middle position, than the upper position. This is particularly notable for Fig. 8B, where a baby 10 is sitting in the bouncer. This larger distance $\delta M2 > \delta U2$ provides more momentum, thereby ensuring a larger and softer pendulous motion during bounce.

[099] Figs. 9-11 present similar illustrations of the bouncer 1, seat frame 4 and bouncing mechanism as the aforementioned Figures 3-8, albeit in a lower position. Most significantly for these figures, the cam 53 is shown rotated such that the third cam face 53c is engaging the follower face 54a – thereby causing a similar change of geometry in the triangular linkage as described with reference to the earlier figures. The skilled person will therefore understand how that the components are similar, and how they interact with reference to the description of the earlier figures.

[100] Fig. 12A, Fig. 12B and Fig. 12C provides comparative views of the unloaded bouncing mechanism in the upper, middle and lower positions respectively. These Figures illustrate zoomed in details of the cross-sections in Fig. 3A, Fig. 9A and Fig. 6A respectively, with particular focus on the distance Da,Db,Dc between the follower face/cam face 54a/53a,53b,53c and the third pivot point Z. It can be seen how this distance is shortened for each of the seat frame 4 positions moving from upper to lower. This is due to the rotation of the cam 53, thereby changing the particular cam face 53a,53b,53c engaging with the follower face 54a.

[101] Notably, the distance between the second pivot Y and the follower face 54a does not substantially change during change of position of the seat frame 4. Thus, the biasing force provided by the biasing member 56 does not substantially change as the seat frame 4 is moved between the three positions. This is advantageous, as

the biasing member 56 would otherwise become compressed and the pendulous motion would become stiffer as the seat frame 4 became more reclined. The combination of the change in angle β, the distance δ from the first pivot point X to the centre of mass and the constant length of the biasing member 56 ensures that a softer bounce with a larger pendulous motion is provided as the seat frame 4 moves to from upper to lower position.

[102] Turning now to Fig. 13A and Fig. 13B the assembled bouncer 1 is illustrated in an upper position, unloaded state, in a birds-eye view. Both figures illustrate various main components of the bouncer 1, that have already been presented in relation to the aforementioned figures. However, a black circle can be seen representing the vertical axis forming the fourth pivot point W of the pedestal 22. This axis is where the seat frame 4 will rotate around during swinging motion.

[103] The distance φU1 from the fourth pivot point W, to the upper unloaded centre of mass of the seat frame is shown in Fig. 13A. As will be understood, the distance φ from the centre of mass to the fourth pivot point W will vary depending on the position of the seat frame 4 and whether the bouncer is loaded or unloaded. The more reclined the seat frame 4, the larger the distance φ. The swinging motion will therefore be determined by the distance φ, and the distance from the fourth pivot point W to the biasing means 23 acting on the crank arm 22. Larger distances φ therefore result in a higher force acting on the biasing members 23. Therefore, when the seat frame 4 is more reclined, the swinging motion is more pendulous and softer, which may be advantageous.

[104] In Fig. 13A, the seat frame 4 is shown in a front-facing position. The biasing means 23 acting on the crank arm 221 will ensure that the seat frame 4 is biased towards the front-facing position once a sideways force has been provided to the seat frame 4. The swing lock mechanism 7 can be actuated when the seat frame 4 is in the front-facing position, thereby preventing swinging motion.

[105] Fig. 13B illustrates the seat frame 4 rotated at an angle θ relative to the front-facing position. It will be understood that the seat frame 4 can be rotated radially in the opposite direction over the front-facing position to that of example in Fig. 13B. The biasing means 23 is configured to ensure that the seat frame 4 swings to a certain angle θ before swinging back, and stopping means are typically arranged in the base frame 2 to ensure that the crank arm 221 is prevented from rotating past a certain angle θ relative to the front facing position.

[106] Turning now to Fig. 14A and Fig. 14B, exploded views of the swinging mechanism are illustrated.

[107] Fig. 14A illustrates the base plate 2 separated into a cover plate 25 and an underlying plate 26, with the pedestal 22, crank arm 221 and biasing means 23 shown floating between the plates 25,26. Thus, it will be seen how the upper part 21a of the base plate 2 encircles the middle portion of the pedestal 22 once assembled. At the lower portion of the pedestal 22, the crank arm 221 can be seen attached. At the upper portion of the pedestal 22 an engaging member can be seen. This engaging member will project from above the upper end 21a of the base frame 2 and into the holding frame 3.

[108] Fig. 14B illustrates the pedestal 22, crank arm 221 and biasing means 23 from Fig. 14A in closer detail. The crank arm 221 extends from the pedestal 22 at its lower end. The biasing means 23 can be seen arranged at the distal end of the crank arm 221 relative to the pedestal 22, and are exemplified by two coil springs 23a,23b on either side of the crank arm. Though not shown in the Figures, it will be understood that the coil springs 23a,23b will be fixed to the base plate 2 at the end of each coil spring 23a,23b distal to the crank arm 221. Thereby, during rotation of the pedestal 22, the coil springs 23a,23b will act in unison with one compressing and the other elongating, as the seat frame 4 and thus the crank arm 221, is moved from side to side over the front-facing position. Preferably, the coil springs 23a,23b are always providing a compressing biasing force, both during compression and elongation from a front-facing state.

[109] At the upper end of the pedestal 22, the engaging member is shown in the form of a plate configured for engaging with the releasable attachment mechanism 6 on the holding frame 3. When the seat frame 4 swings, the rotation will be imparted from the holding frame 3 onto the engagement member 222 and thereby the pedestal 22, which in turn acts on the crank arm 221 and the biasing members 23a,23b.

[110] In the preceding description, various aspects of the device according to the invention have been described with reference to the illustrative embodiments. For purposes of explanation, specific numbers, systems and configurations were set forth in order to provide a thorough understanding of the device and its workings. However, this description is not intended to be construed in a limiting sense. Various modifications and variations of the illustrative embodiment, as well as other

embodiments of the device, which are apparent to persons skilled in the art to which the disclosed subject matter pertains, are deemed to lie within the scope of the present invention.

List of Reference Numbers

1	Bouncer
10	Baby
2	Base frame
21a	Upper end of base frame
21b	Lower end of base frame
22	Pedestal
221	Crank arm
222	Engagement member
23	Biasing means
23a	First biasing member
23b	Second biasing member
24	Supporting feet
25	Cover base plate
26	Underlying base plate
3	Holding frame
31	First/upper end of holding frame
32	Second/lower end of holding frame
4	Seat frame
4a	Toy hanger
41	Upper end of seat frame
42	Lower end of seat frame
43	Protruding portion
44	Front side of seat frame
45	Back side of seat frame
46	Seat frame plate cover
47	Seat frame beams
48	Body supporting portion of seat frame
49	Foot and leg rest portion of seat frame
5	Biasing mechanism
51	First/lower end of biasing mechanism
52	Second/upper end of biasing mechanism
53	Cam
531	Cam axle
532	Cam lever
53a	First profile face
53b	Second profile face
53c	Third profile face
54	Follower
54a	Follower face
56	Biasing member
6	Releasable attachment mechanism
7	Swing lock mechanism
A	Length between second and third pivot points
B	Length between first and third pivot points
C	Length between first and second pivot points
α	Angle between first and third pivots points at second pivot point
β	Angle between second and first pivot points at third pivot point
γ	Angle between second and third pivot points at first pivot point
δ	Distance from first pivot point to centre of mass
φ	Distance from fourth pivot point to centre of mass
θ	Swing angle
λ	Bounce angle

φ	Angle between seat frame and base frame
D	Distance from profile face to third pivot point
W	Fourth pivot point
X	First pivot point
Y	Second pivot point
Z	Third pivot point

Claims

1. A bouncer (1) for a baby comprising:
    - a base frame (2);
    - a holding frame (3) arranged at an upper end (21) of said base frame (2);
    - a seat frame (4), arranged at an inclined angle relative to said base frame (2), wherein the seat frame (4) is pivotally attached to the holding frame (3) around a horizontal axis at a first pivot point (X), and wherein said first pivot point (X) is located:
        - along the length of the seat frame (4) such that first pivot point (X) and seat frame (4) form a lever; and
        - at, or towards, a first end (31) of the holding frame (3),
    - a biasing mechanism (5), wherein the biasing mechanism (5) is configured to provide a biasing force upon longitudinal displacement, and wherein the biasing mechanism (5) is:
        - pivotally attached at a first end of (51) said biasing mechanism (5) to the seat frame (4) around a horizontal axis at a second pivot point (Y),
        - pivotally attached at, or towards, a second end (52) of said biasing mechanism (5) to the holding frame (3) around a horizontal axis at a third pivot point (Z), wherein the third pivot point (Z) is located at, or towards, a second end (32) of the holding frame (3).

2. The bouncer (1) according to claim 1, wherein said first end (31) of the holding frame (3) is at, or towards, a lower end of the holding frame (3), said second pivot point (Y) is located at, or towards, a lower end of the seat frame (4) relative to the first pivot point (X), and said second end (32) of the holding frame (3) is located at, or towards, an upper end of the holding frame (3).

3. The bouncer (1) according to any of the preceding claims, wherein the biasing mechanism (5) comprises:
    - a cam (53) arranged at one end (51,52) of said biasing mechanism (5), wherein the cam (53) is pivotally attached to one pivot point (Y,Z) of the biasing mechanism (5) around a horizontal axis; and,

- a follower (54) arranged at the other end (51,52) of said biasing mechanism (5), wherein the follower (54) is pivotally attached to the other pivot point (Y,Z), and wherein the follower (54) comprises a face (54a) arranged to engage with a profile of the cam (53).

4. The bouncer (1) according to claim 3, wherein the cam (53) is arranged at the second end (52) of said biasing mechanism (53) and is pivotally attached to the third pivot point (Z), and wherein the follower (54) is arranged at the first end (51) of said biasing mechanism (53) and is pivotally attached to the second pivot point (Y).

5. The bouncer (1) according to claim 3 or 4, wherein the cam (53) is provided with a profile comprising at least two profile faces (53a,53b), each profile face (53a,53b) being arranged at a different distance (Da,Db) to the pivot point (Y,Z).

6. The bouncer (1) according to any of claims 3-5, wherein a biasing member (56) is provided between the follower face (54) and the pivot point (Y,Z).

7. The bouncer (1) according to claim 6, wherein the biasing member (56) is a coil spring.

8. The bouncer (1) according to any of claims 3-7, wherein the cam (53) is provided with a profile comprising three profile faces (53a,53b,53c) each arranged at a different distance (Da,Db,Dc) to the pivot point (Y,Z).

9. The bouncer (1) according to any of claims 3-8, wherein an axle (531) of the cam (53) is provided with a lever (532) configured to rotate the cam (53).

10. The bouncer (1) according to any of the preceding claims, wherein the base frame (2) comprises a pedestal (22) arranged at the upper end (21) of said base frame (2).

11. The bouncer (1) according to claim 10, wherein the holding frame (3) is releasably attached to the pedestal (22).

12. The bouncer (1) according to claim 11, wherein the pedestal (22) is arranged to pivot around a vertical axis at a fourth pivot point (W), said fourth pivot point (W) being arranged on the base frame (2).

13. The bouncer (1) according to claim 12, wherein biasing means (23) are provided to bias the pedestal (22) and thus the seat frame (4) to a front facing position (F) in relation to the base frame (2).

14. The bouncer (1) according to claim 13, wherein the pedestal (22) is provided with a crank arm (221) extending radially outward from its rotational axis and where the biasing means (23) are provided at the distal end of the crank arm (221) in relation to said axis.

15. The bouncer (1) according to claim 14, wherein the biasing means comprises two biasing members (23a,23b) each provided on either side of said distal end of the crank arm (221).

16. The bouncer (1) according to any of claims 12-15, wherein the biasing means comprise coiled springs.

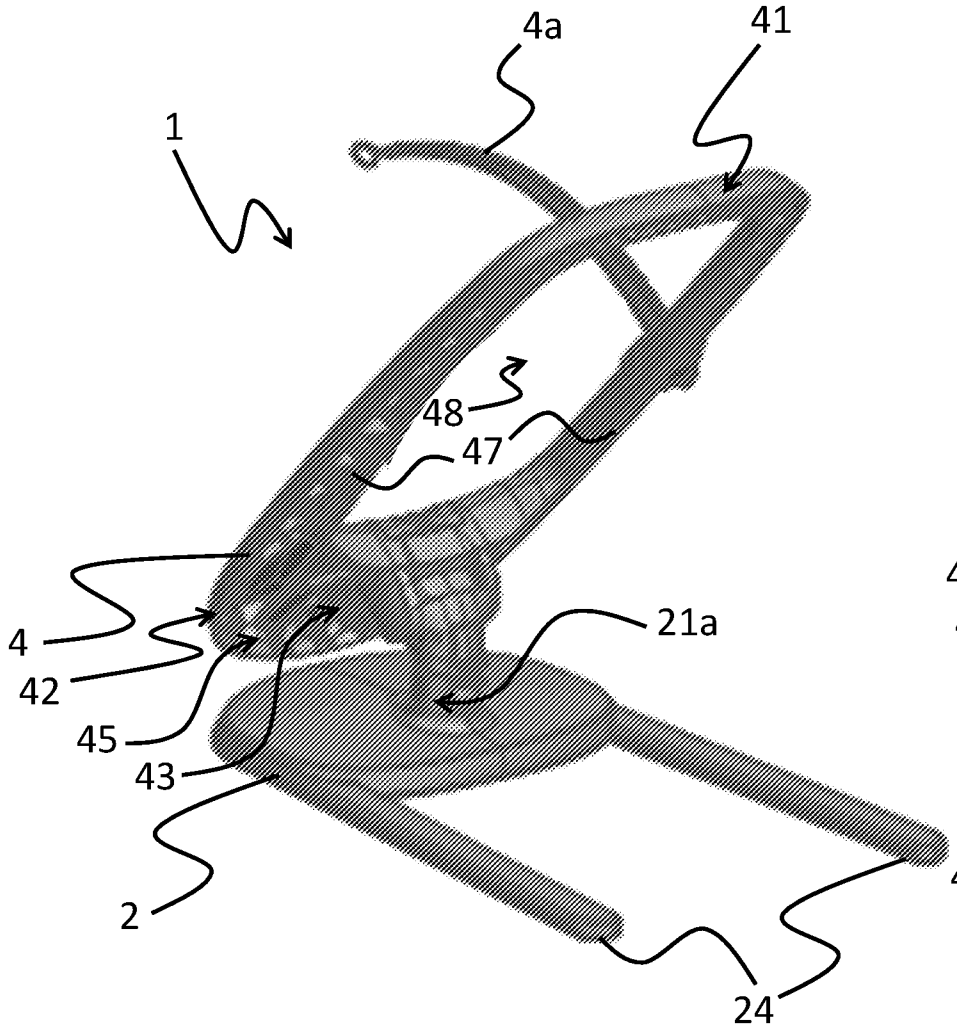


Fig. 1A

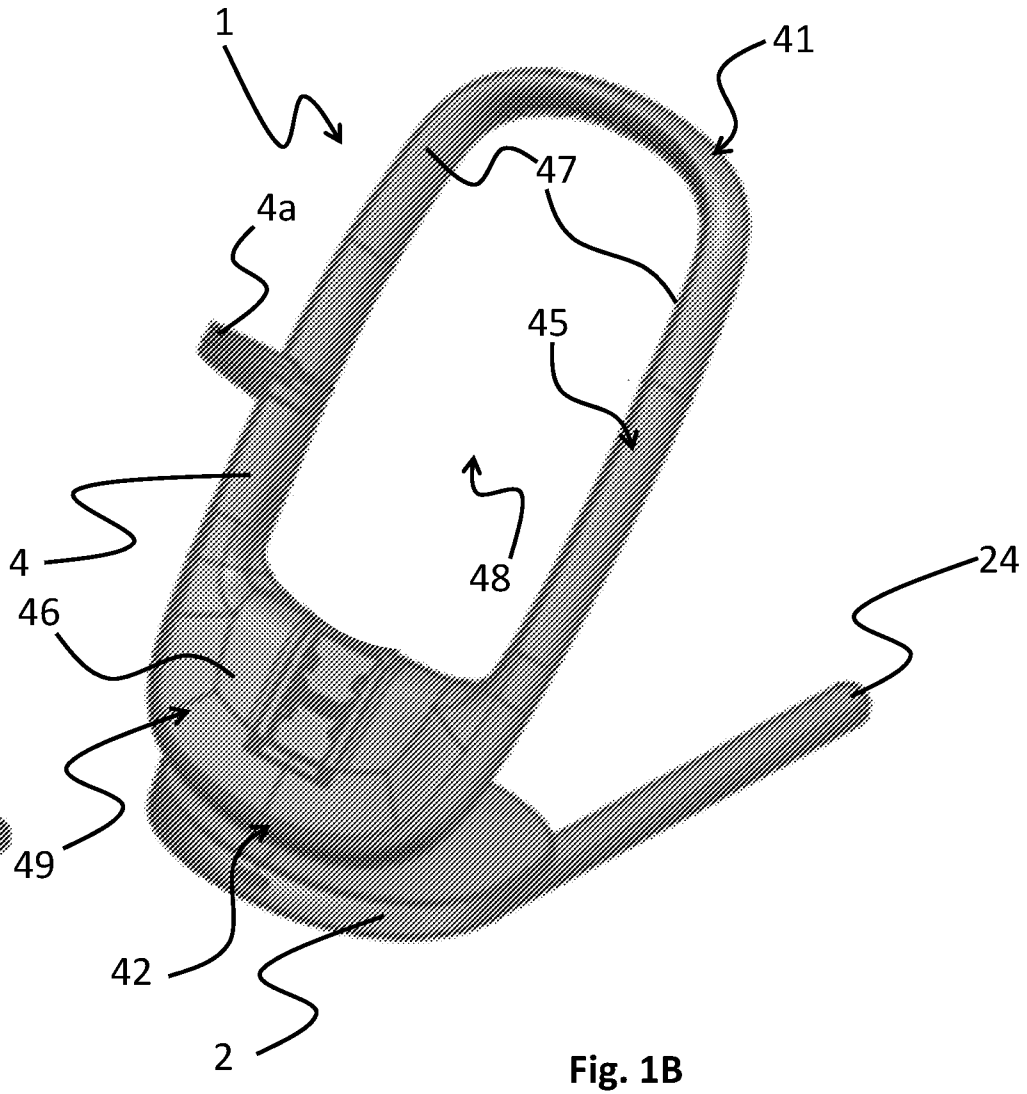


Fig. 1B

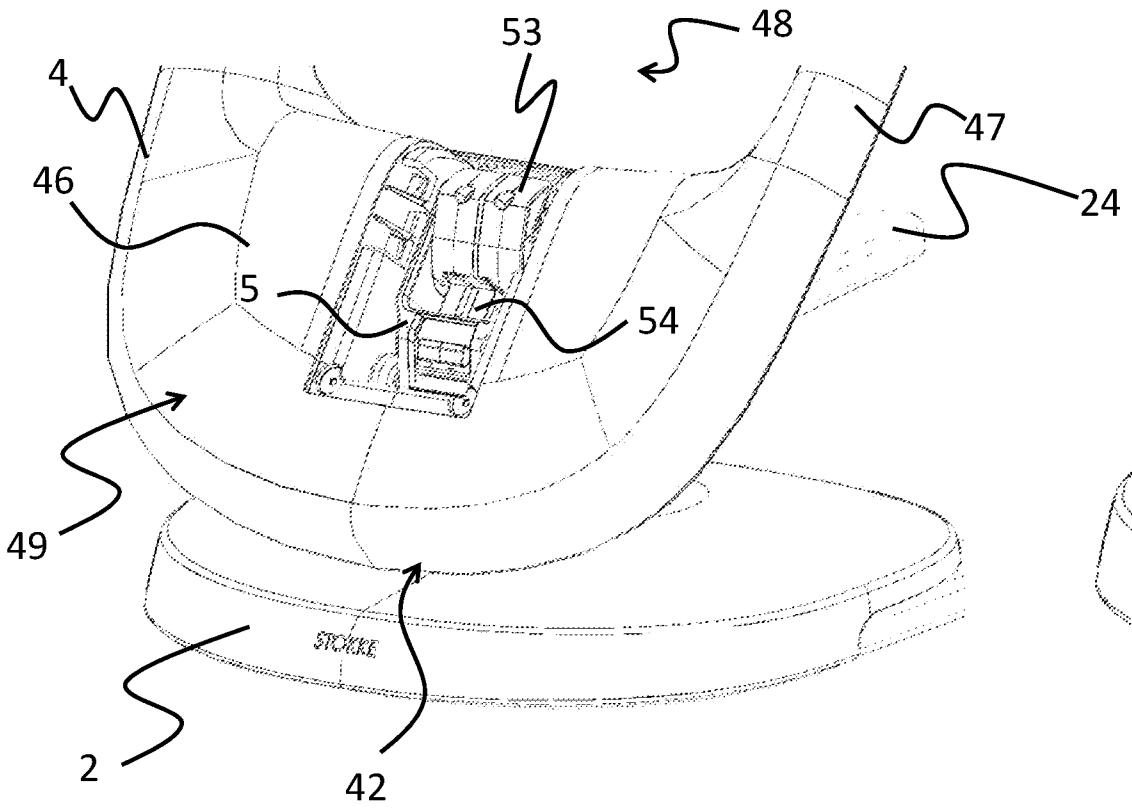

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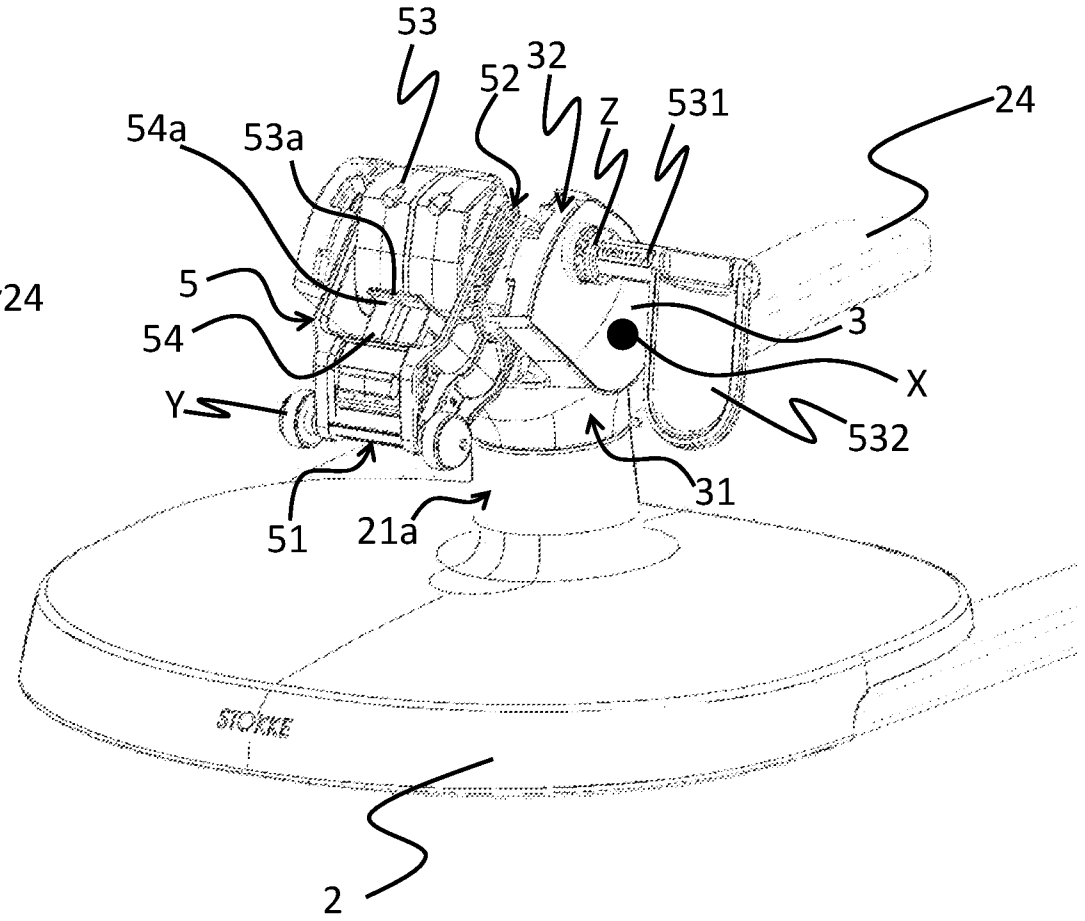
Fig. 2A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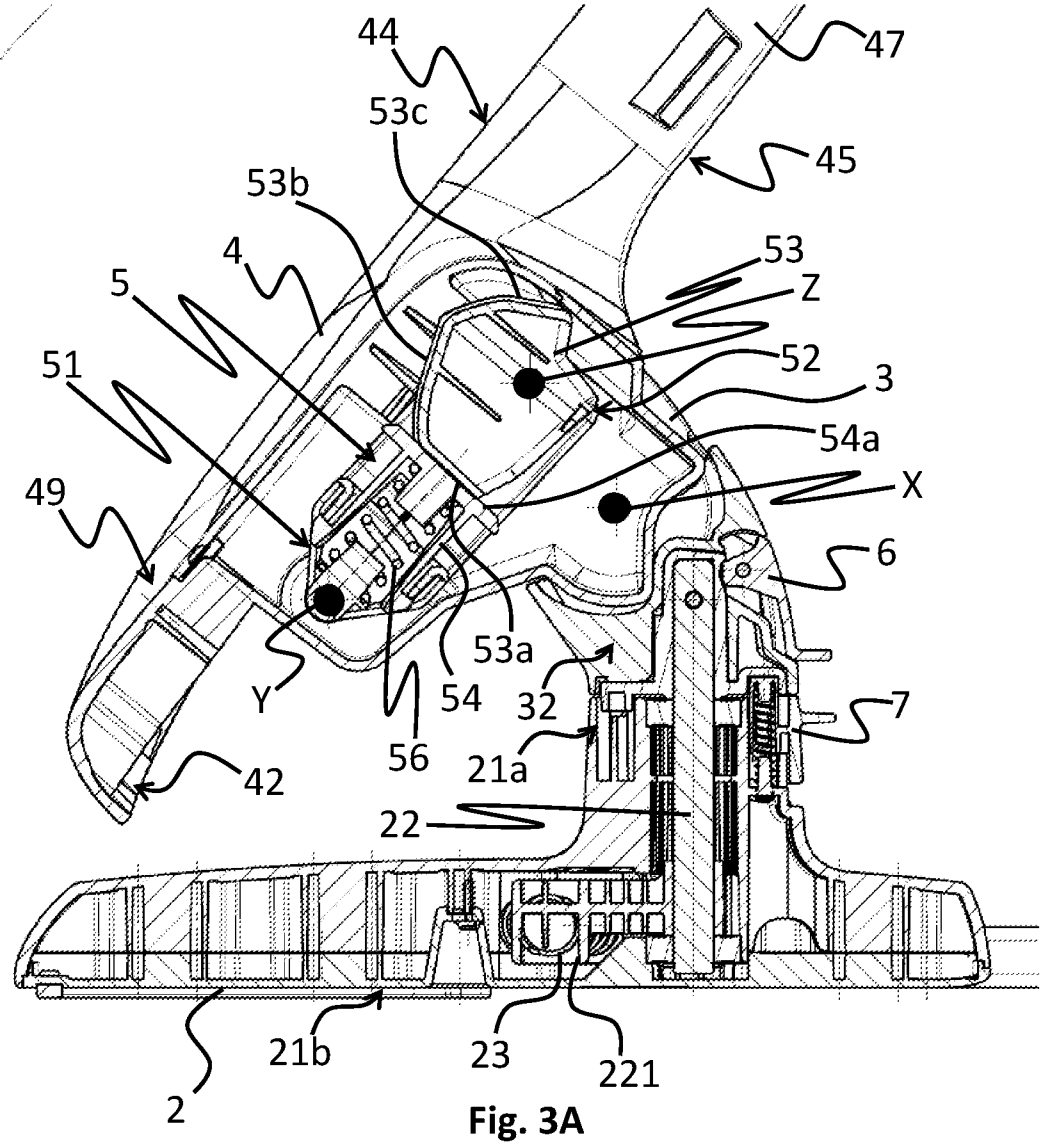
STOKKE

Fig. 2B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22
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21b
23
221

Fig. 3A

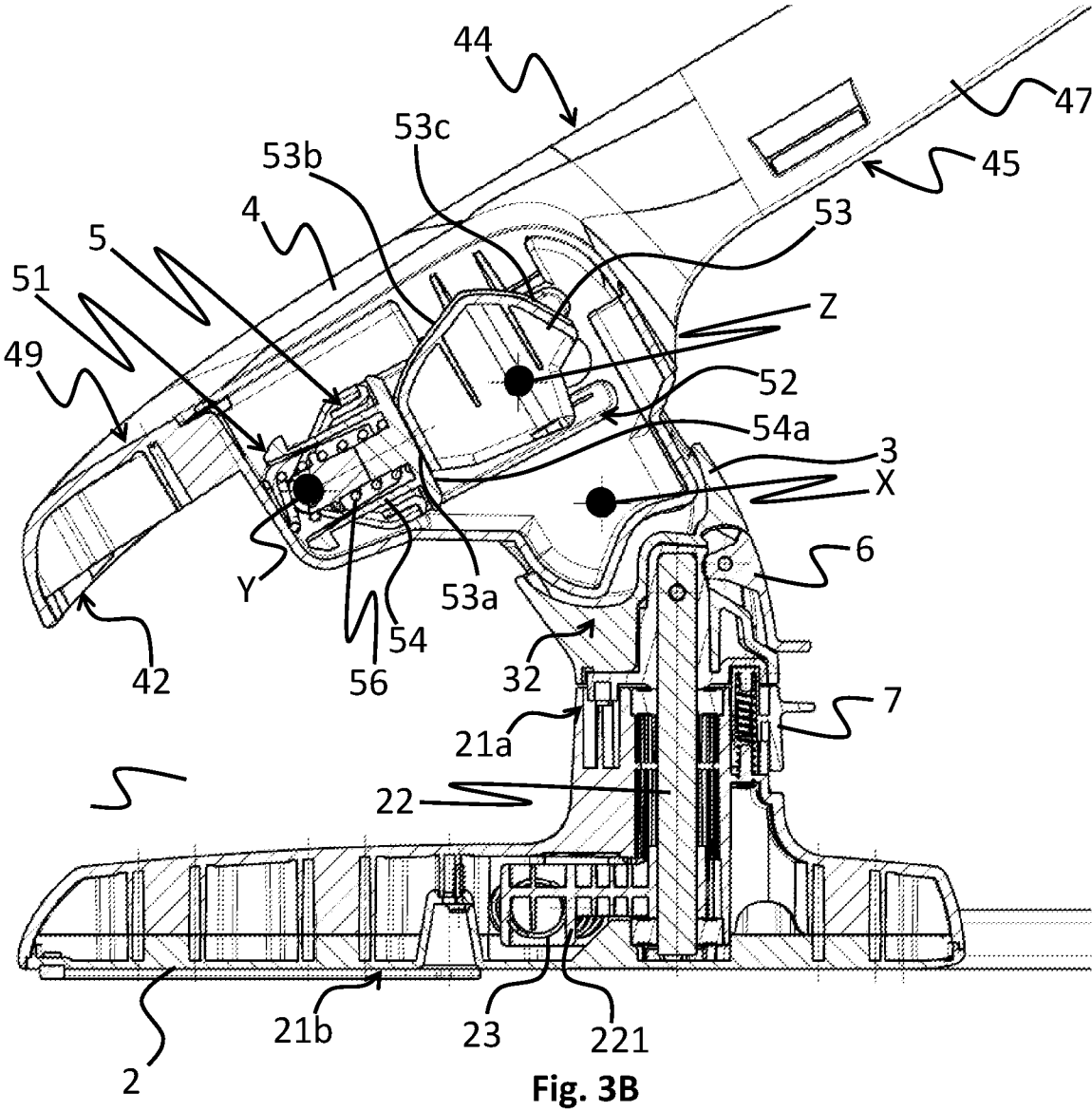
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Fig. 3B

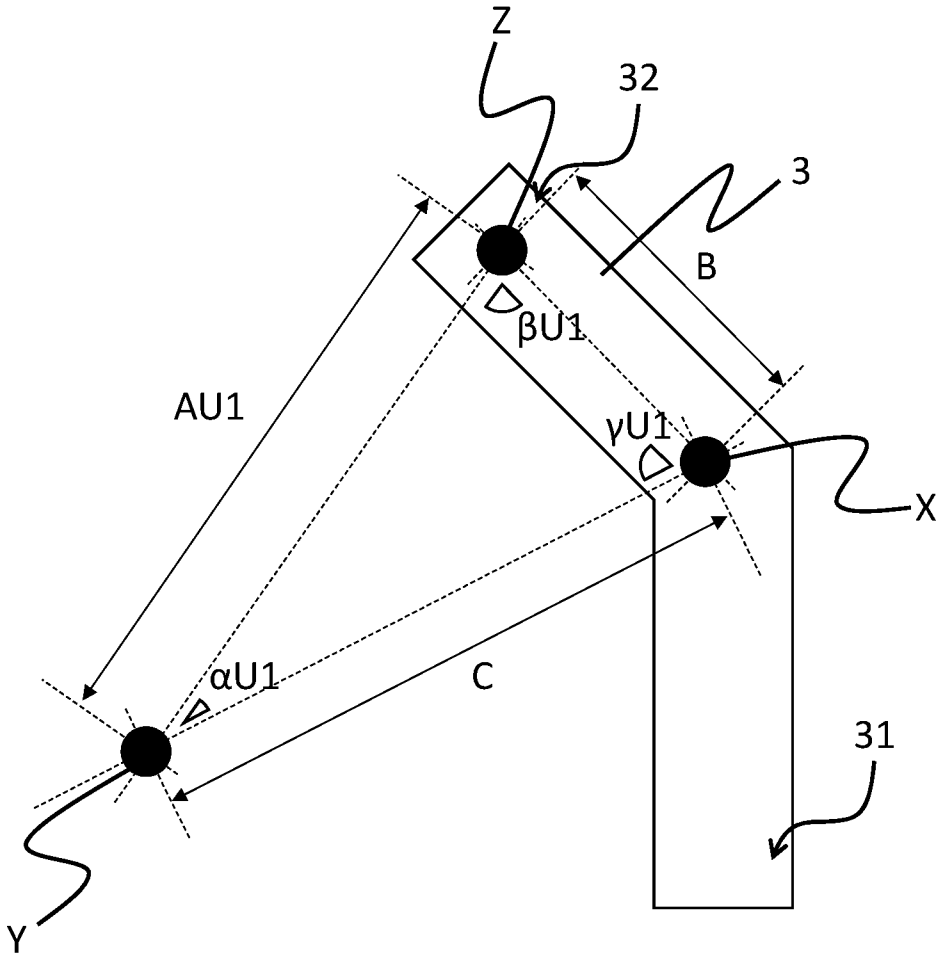

Fig. 4A

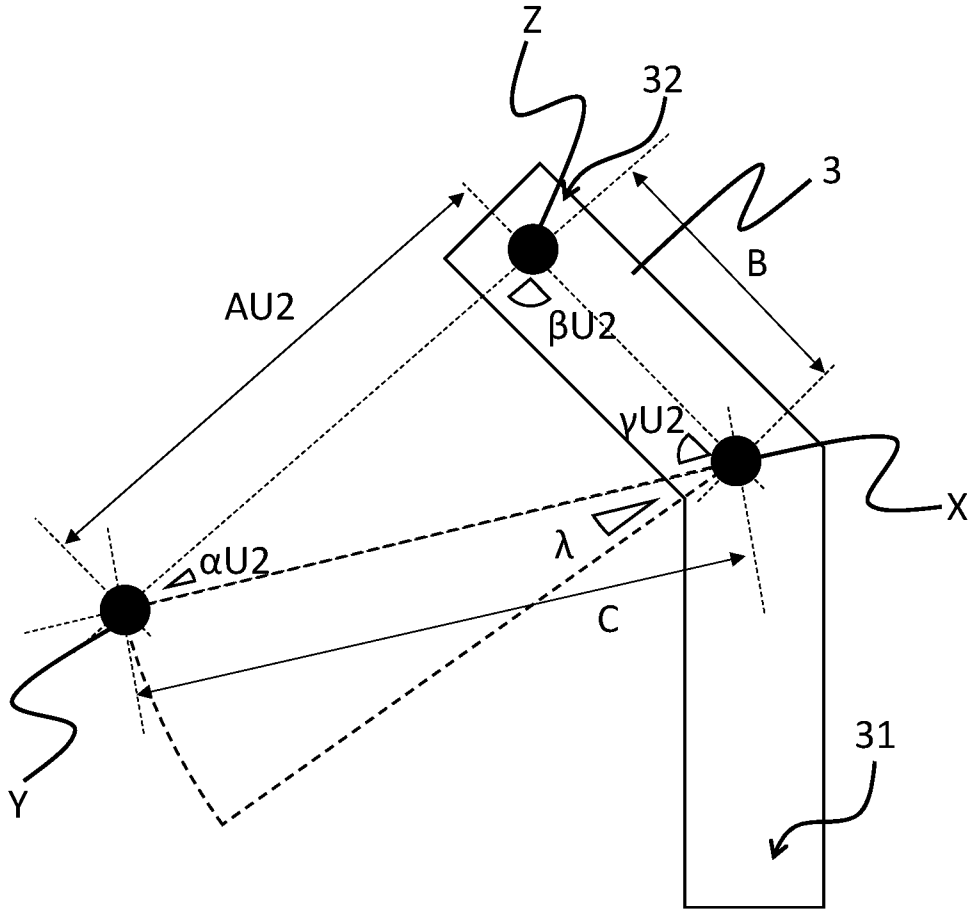

Fig. 4B

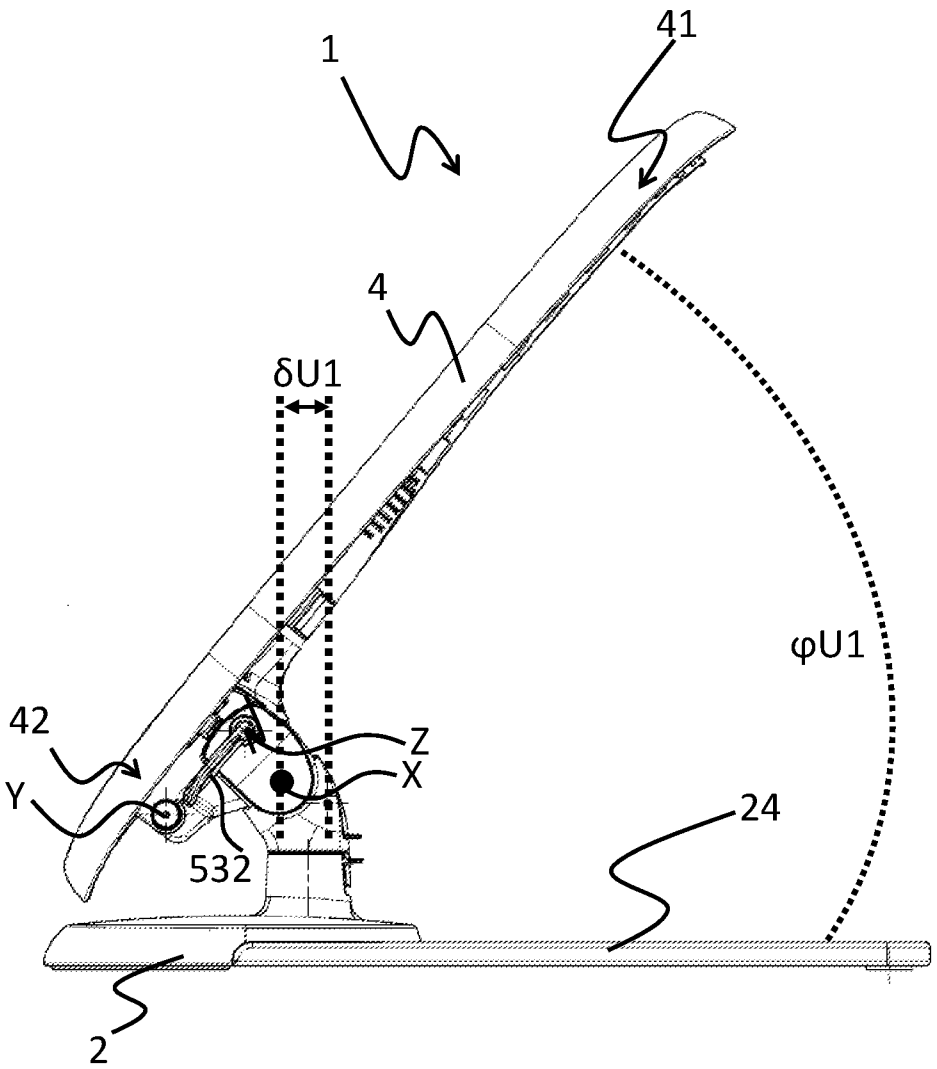

Fig. 5A

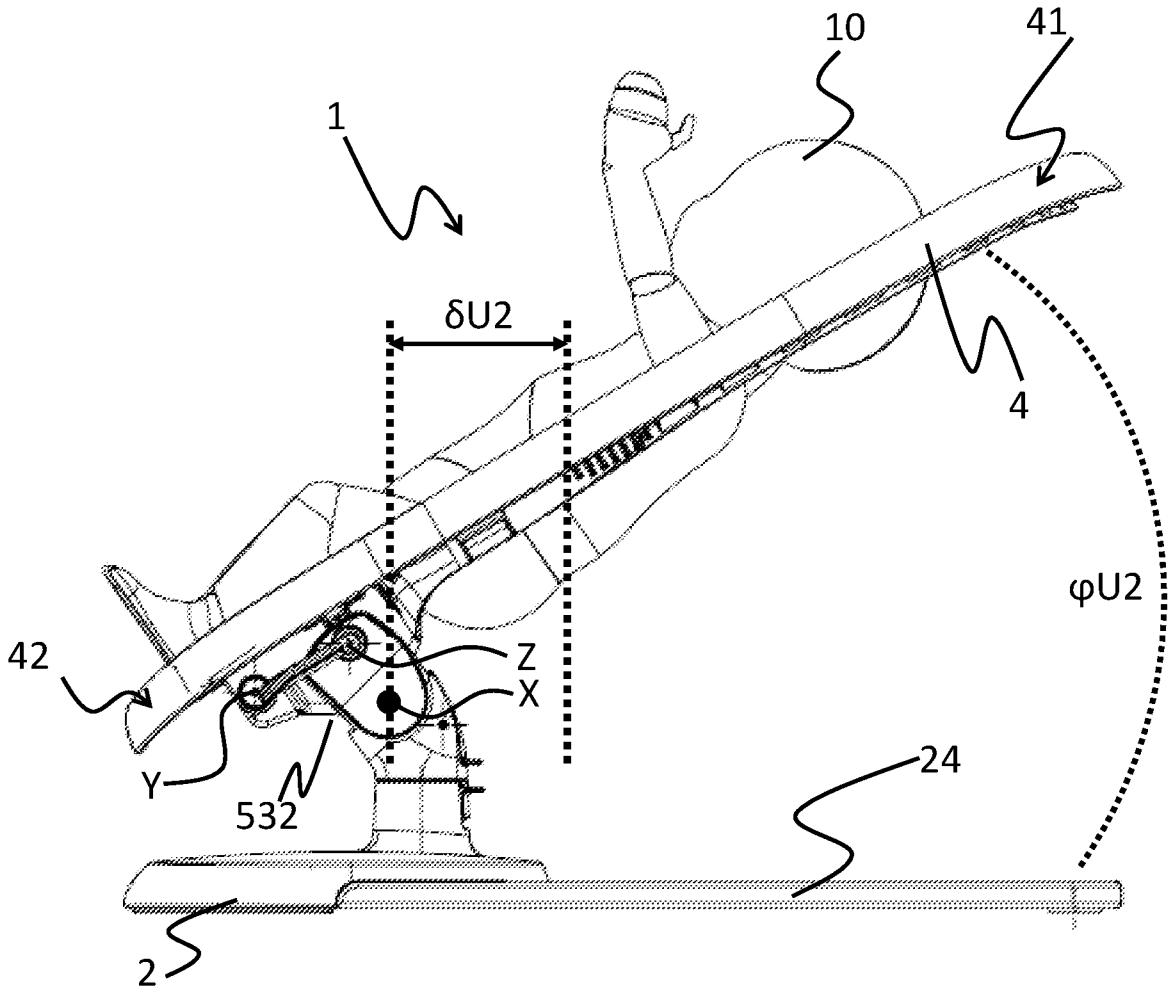

Fig. 5B

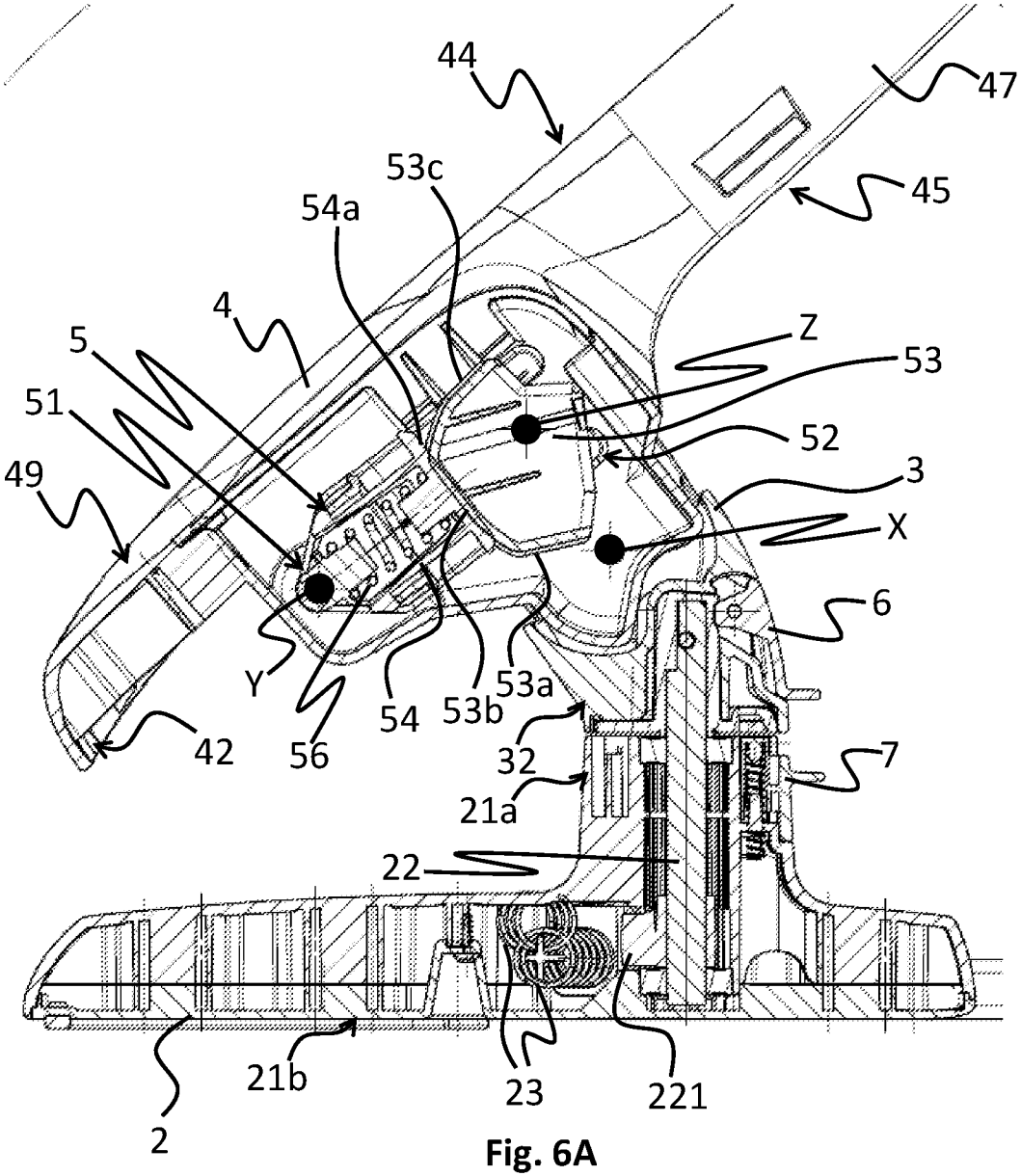
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Fig. 6A

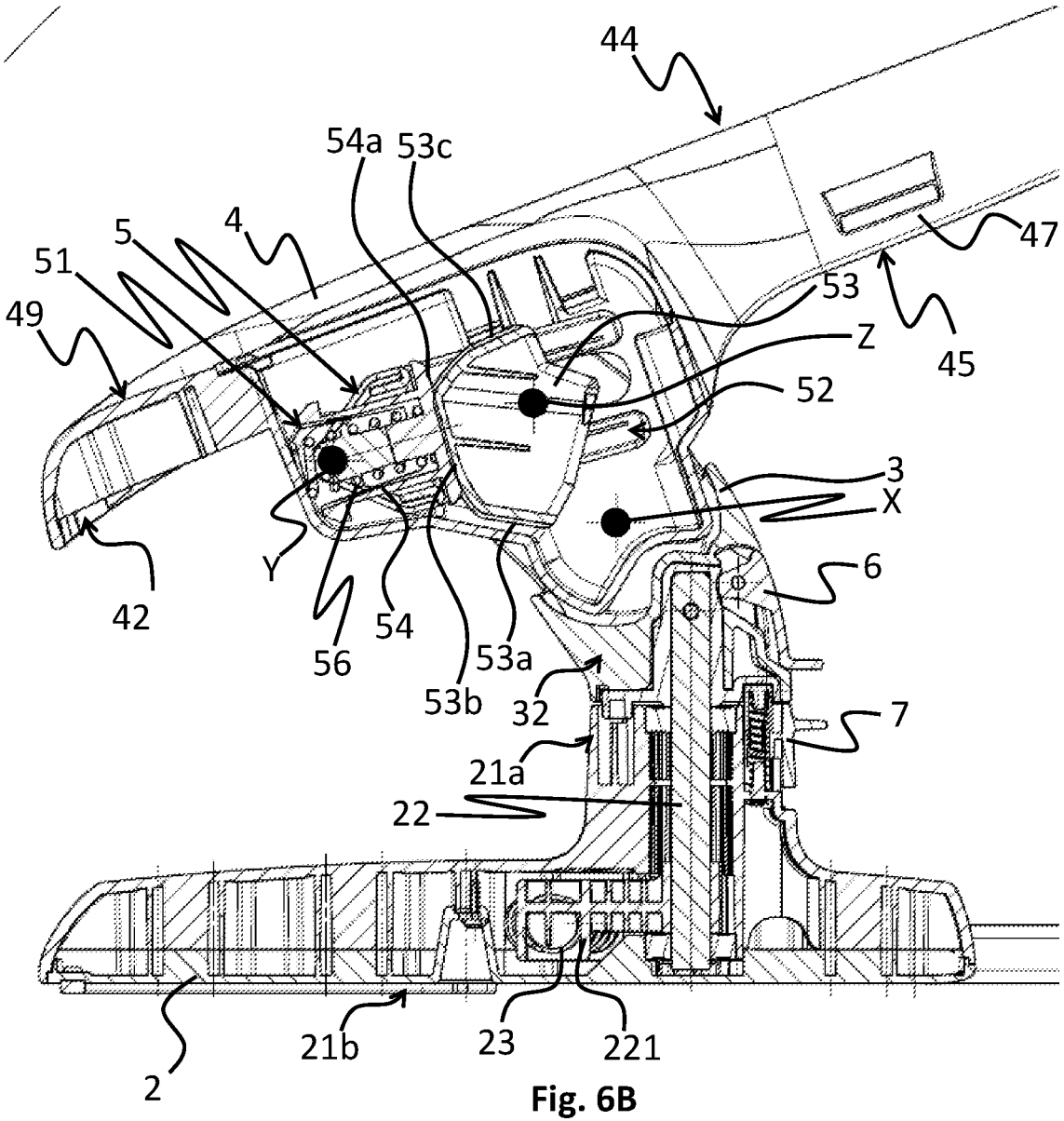
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Fig. 6B

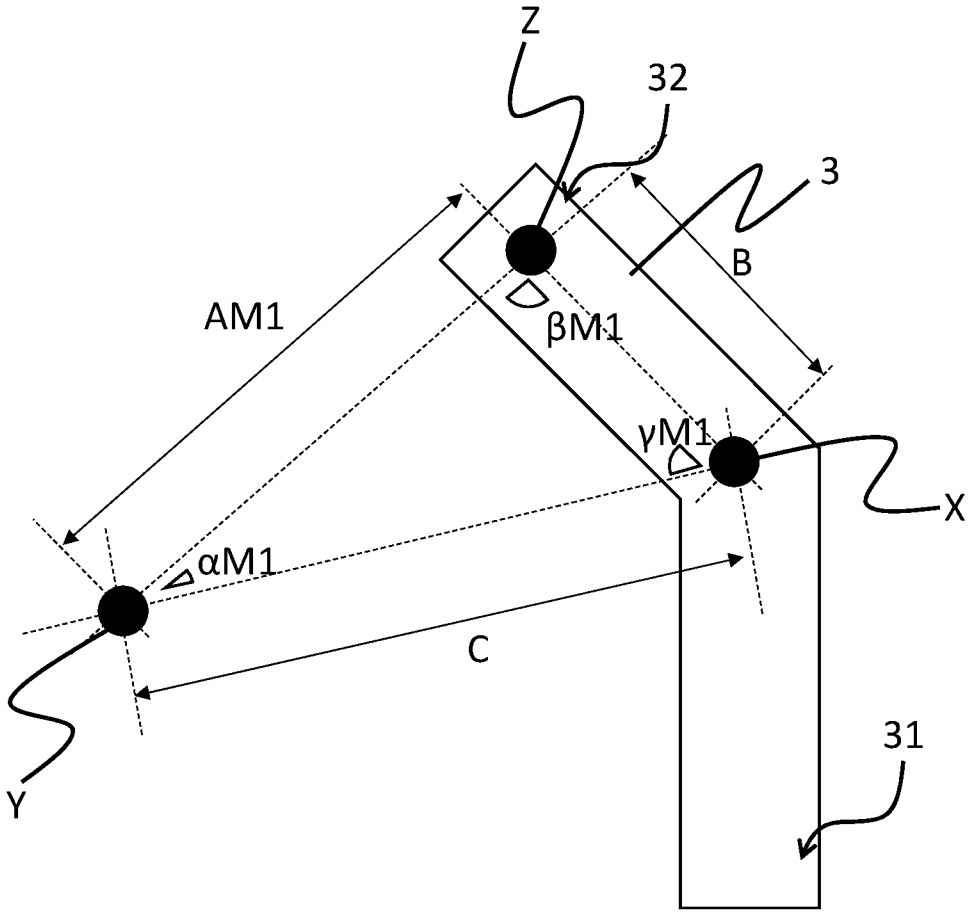


Fig. 7A

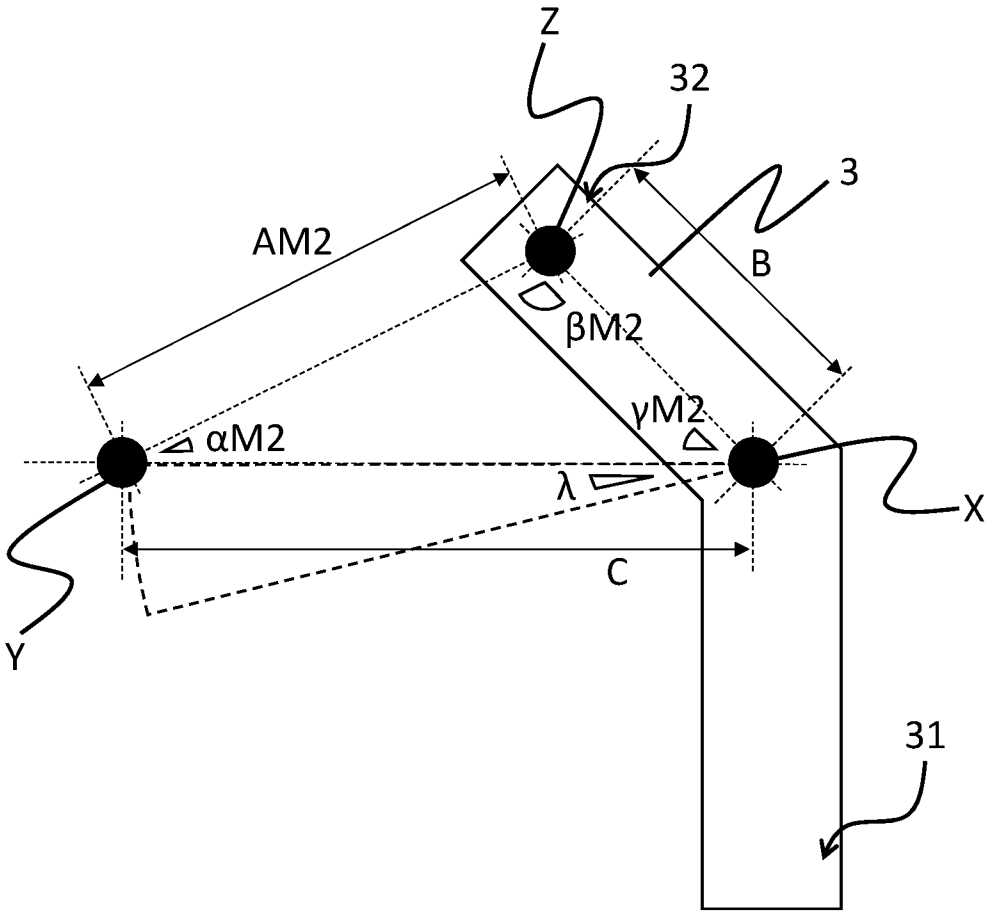


Fig. 7B

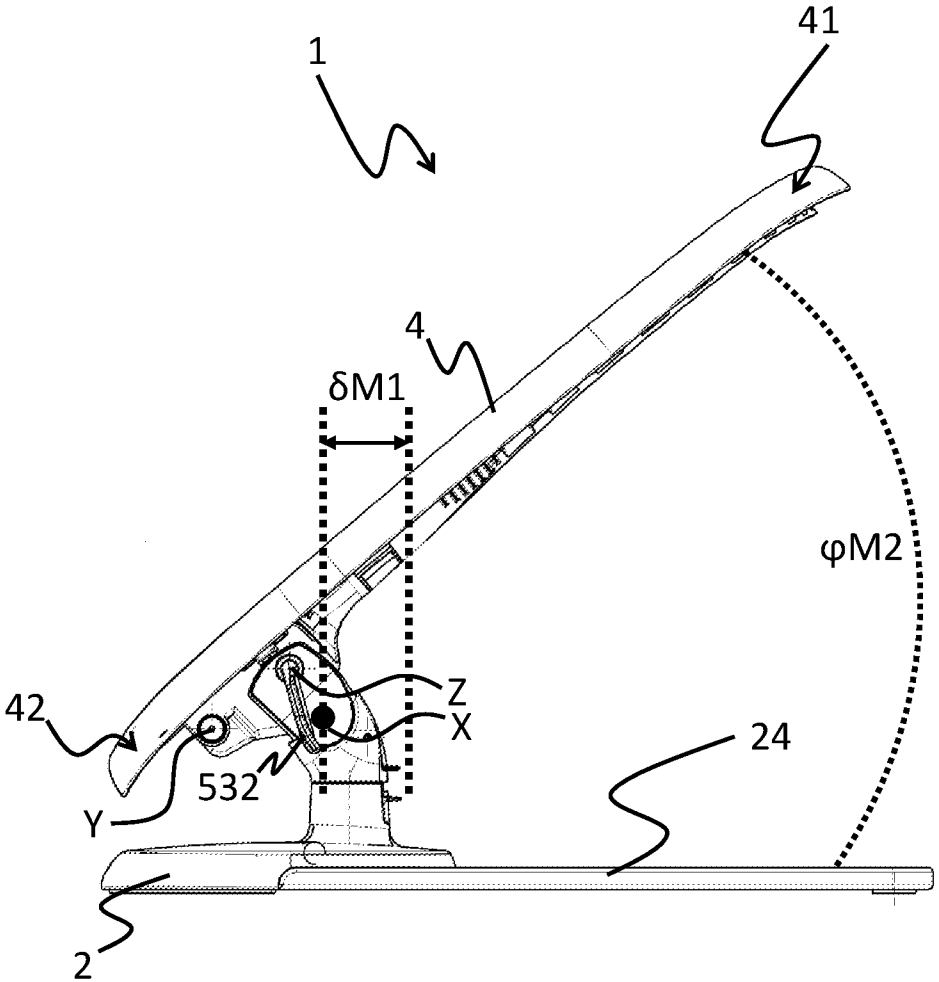


Fig.8A

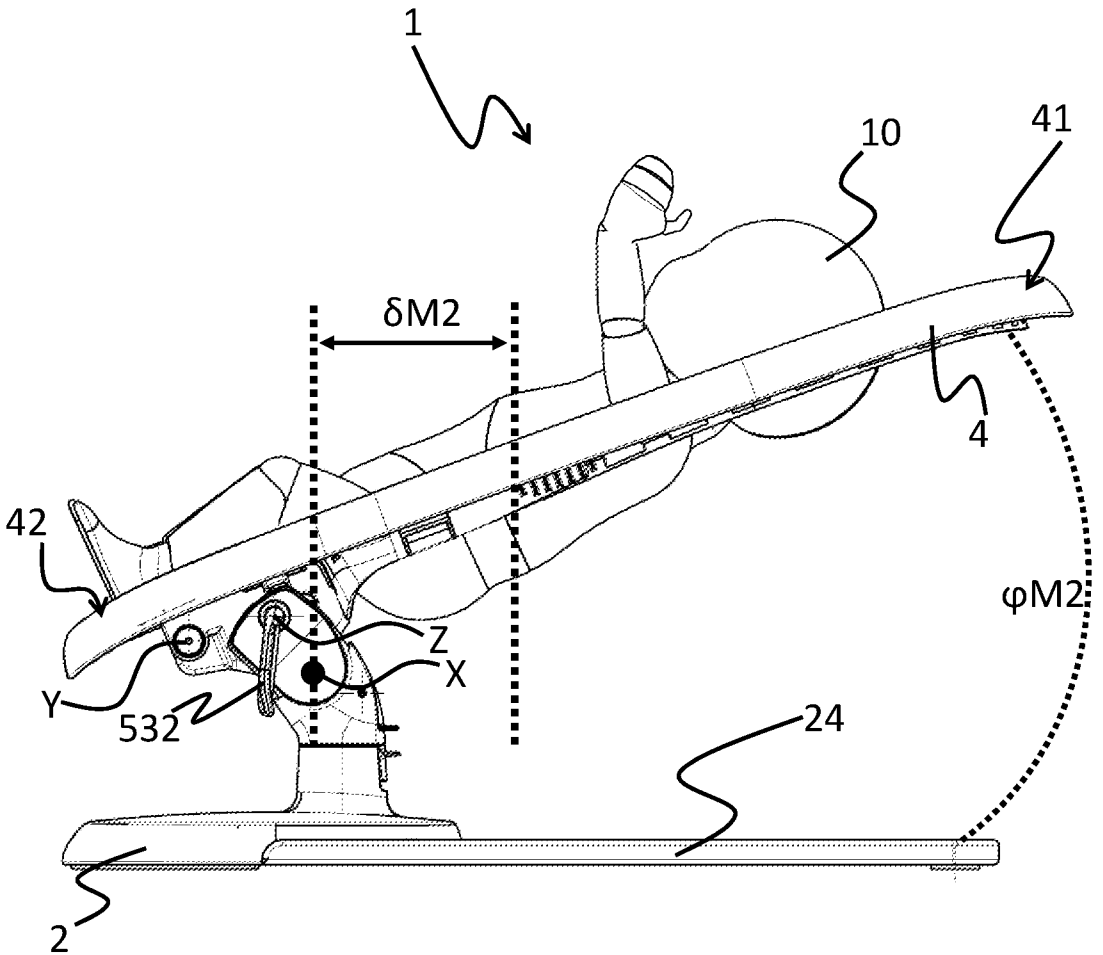
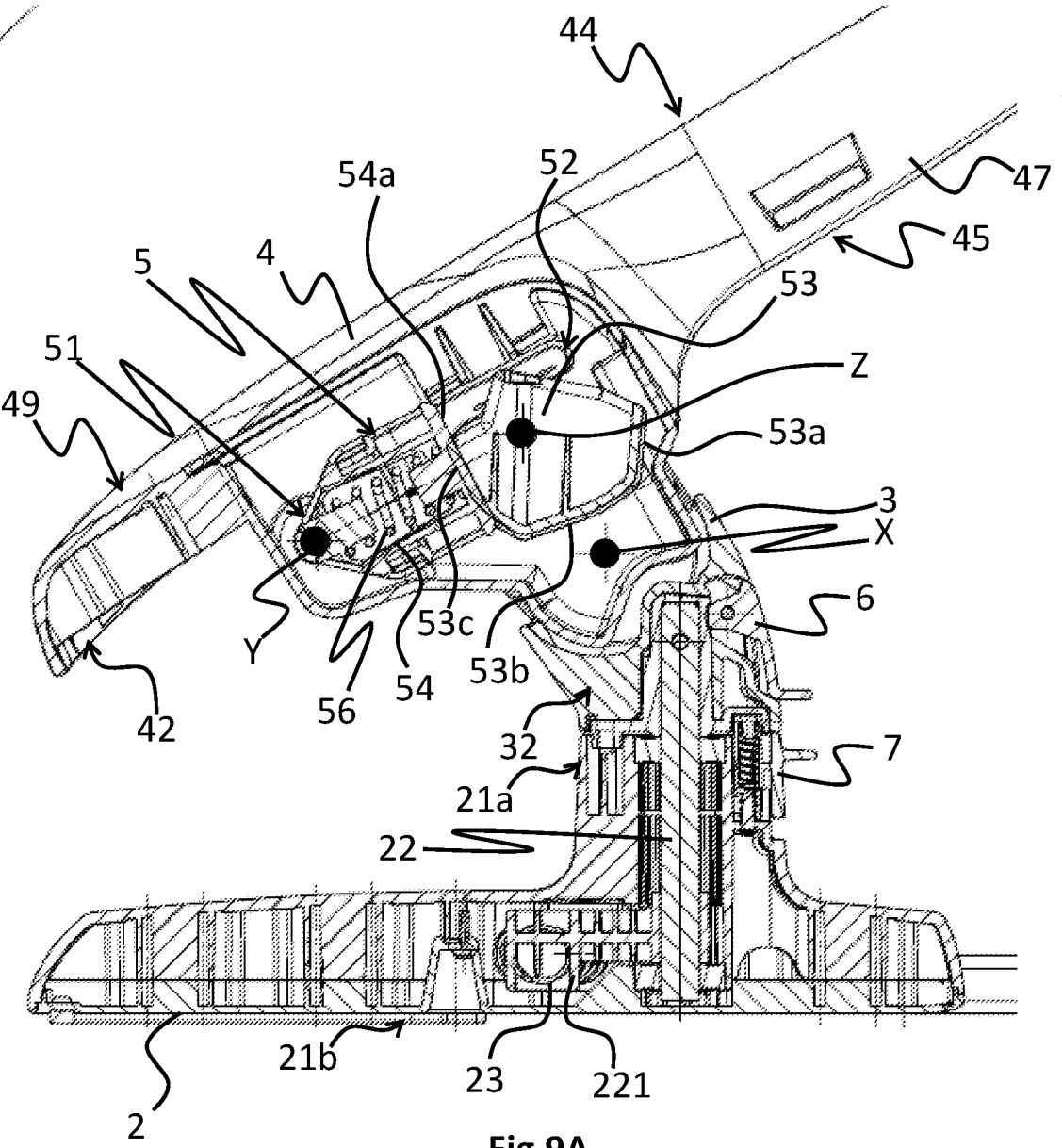


Fig. 8B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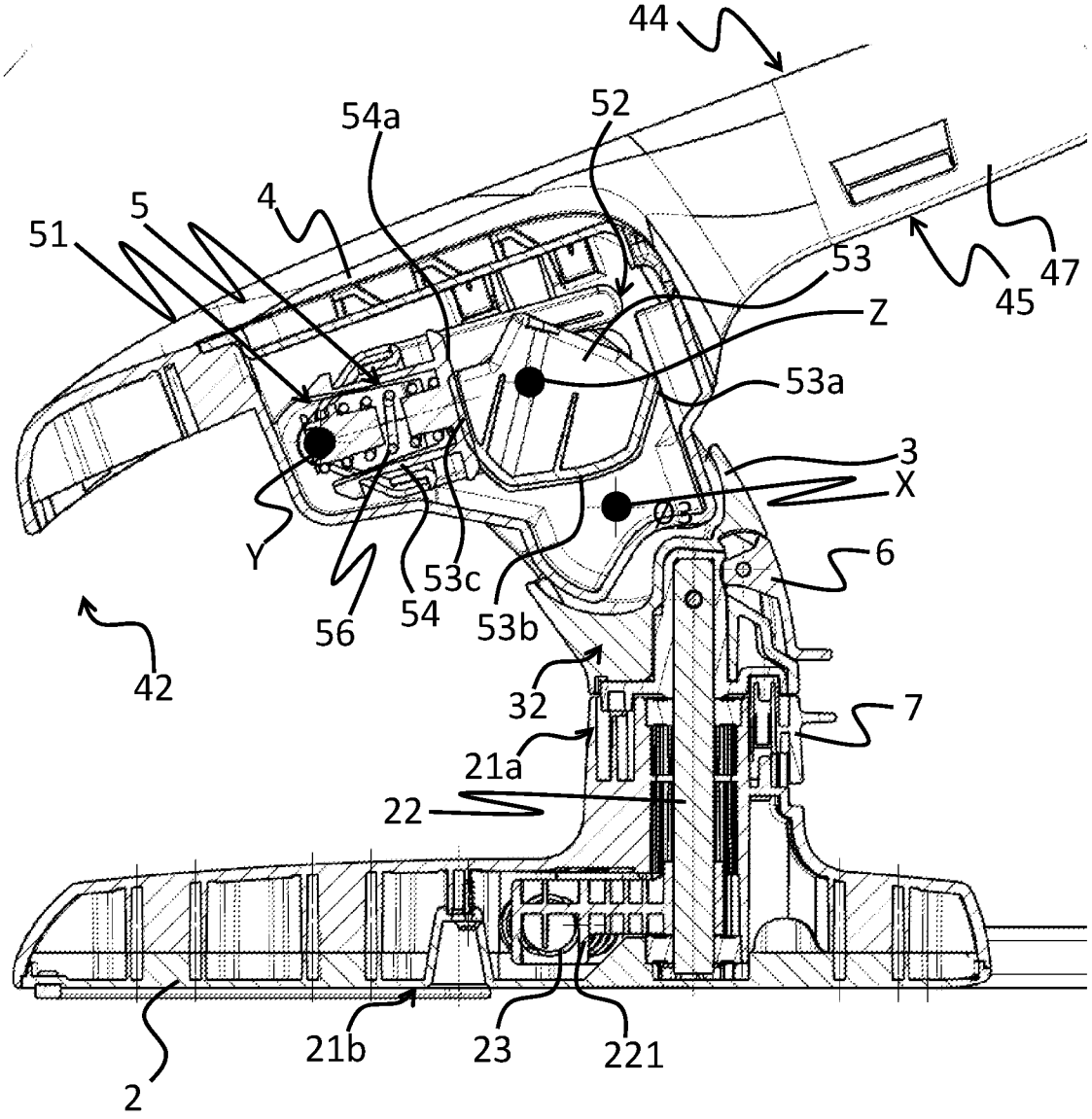
54a
52
47
45
5
4
53
51
Z
49
53a
3
X
Y
6
53c
53b
42
56
54
32
7
21a
22
21b
23
221
2

Fig.9A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42
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21a
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21b
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221
2

Fig. 9B

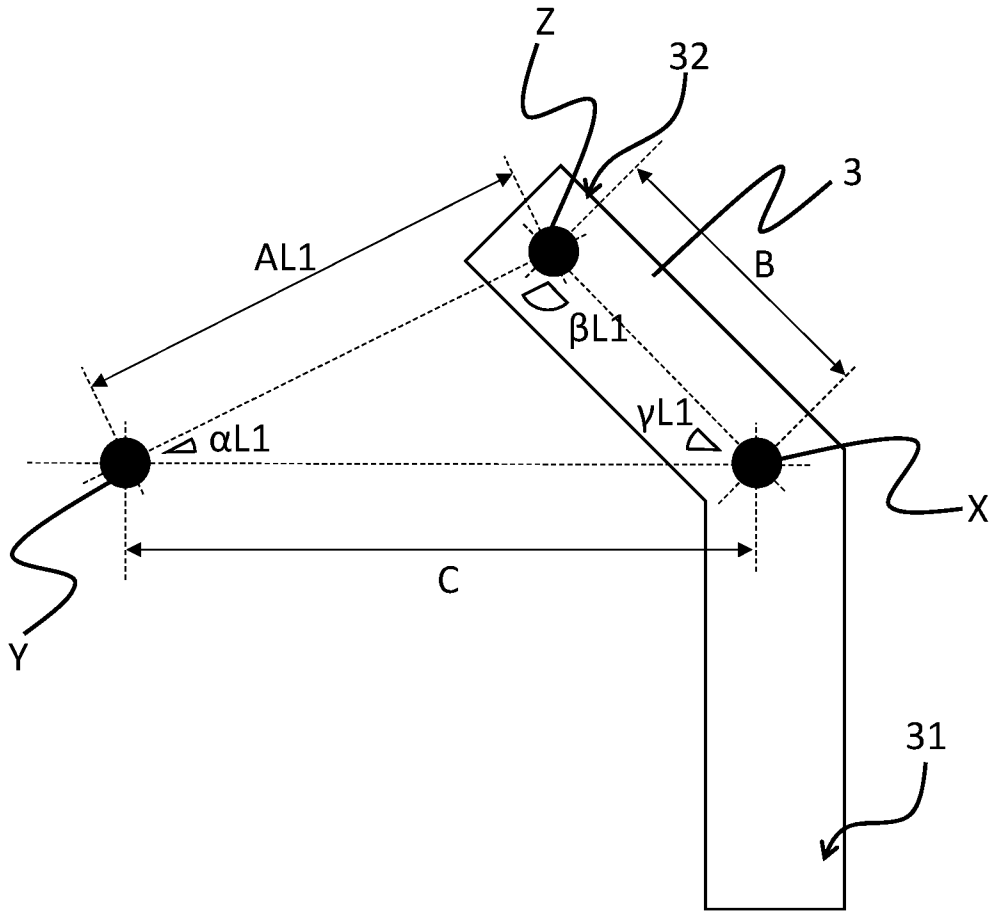

Fig.10A

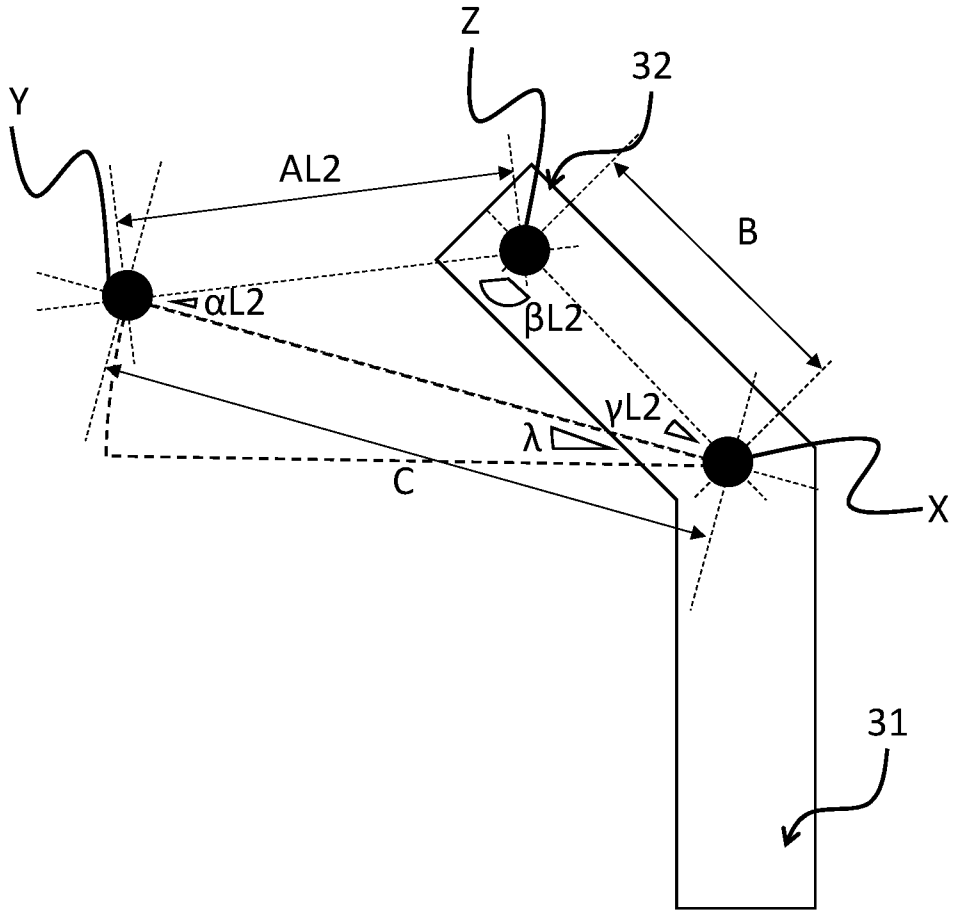

Fig. 10B

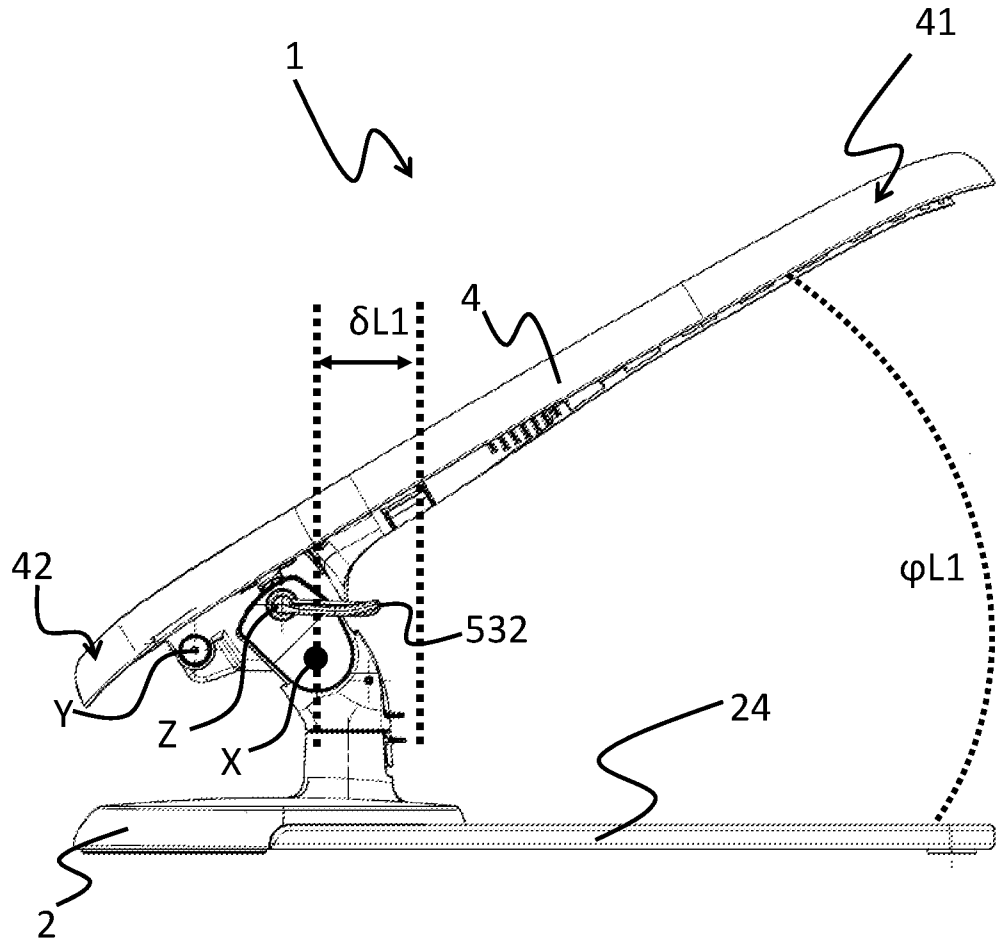

Fig.11A

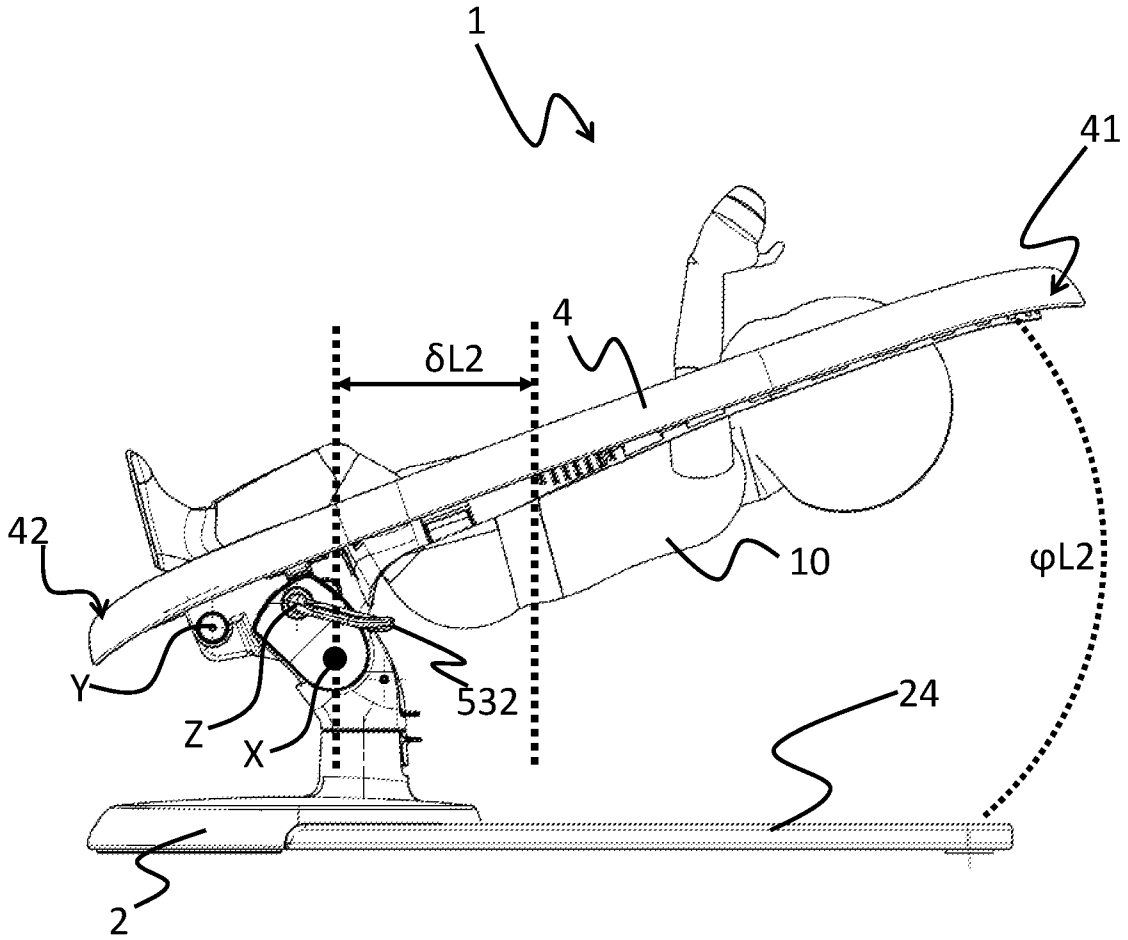

Fig. 11B

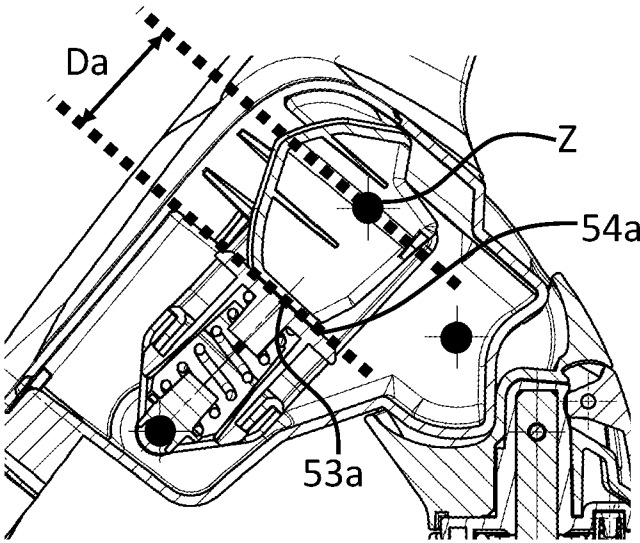

Fig.12A

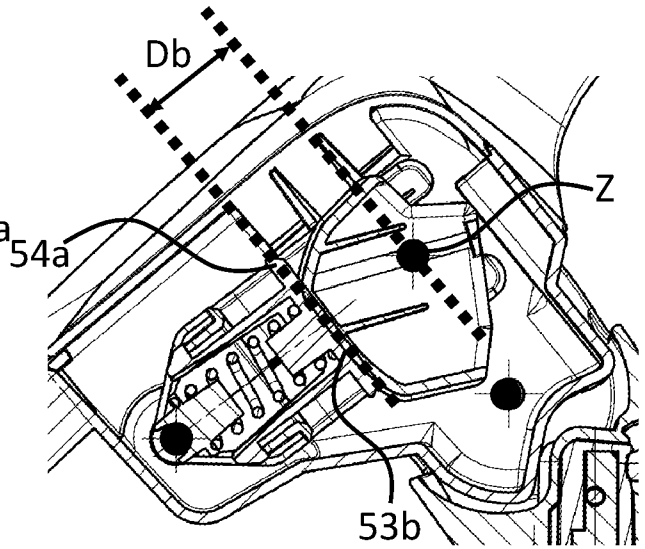

Fig. 12B

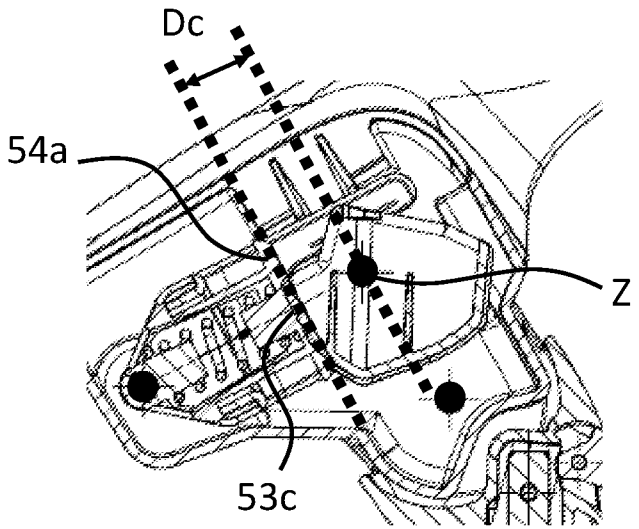

Fig. 12C

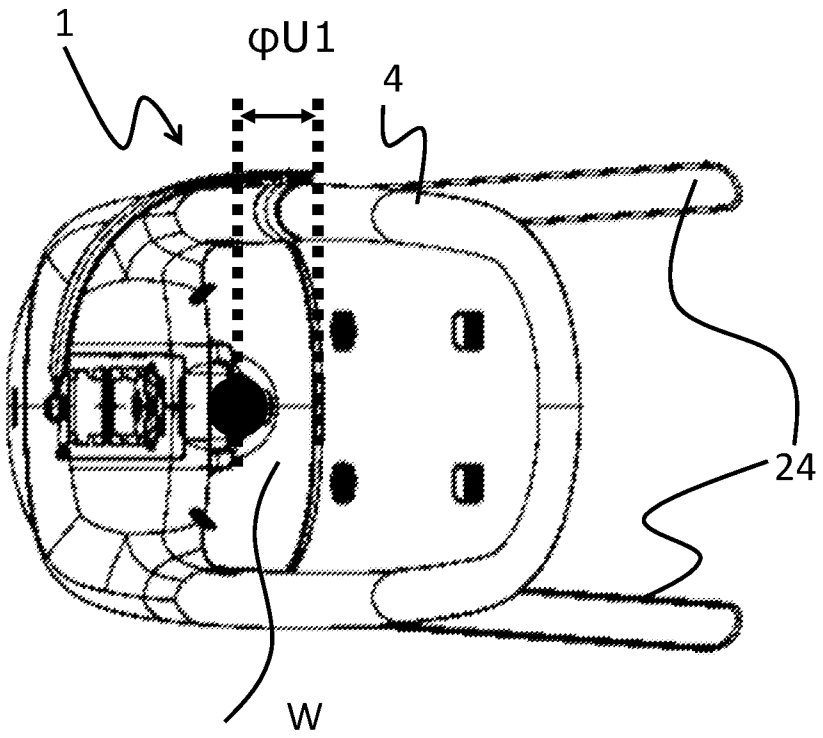

Fig.13A

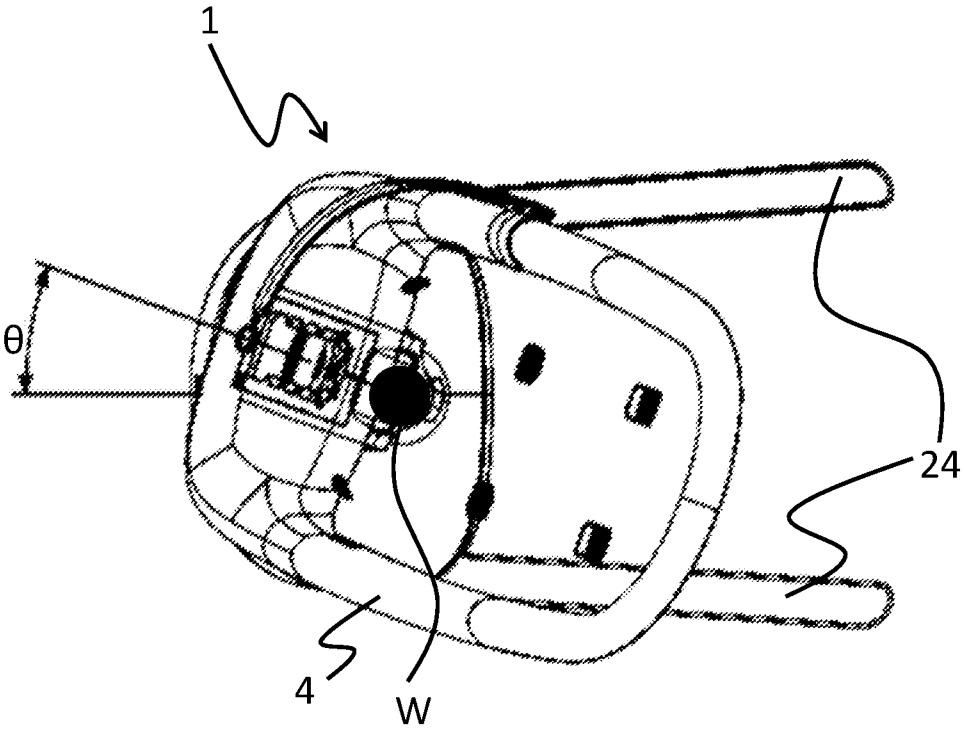

Fig. 13B

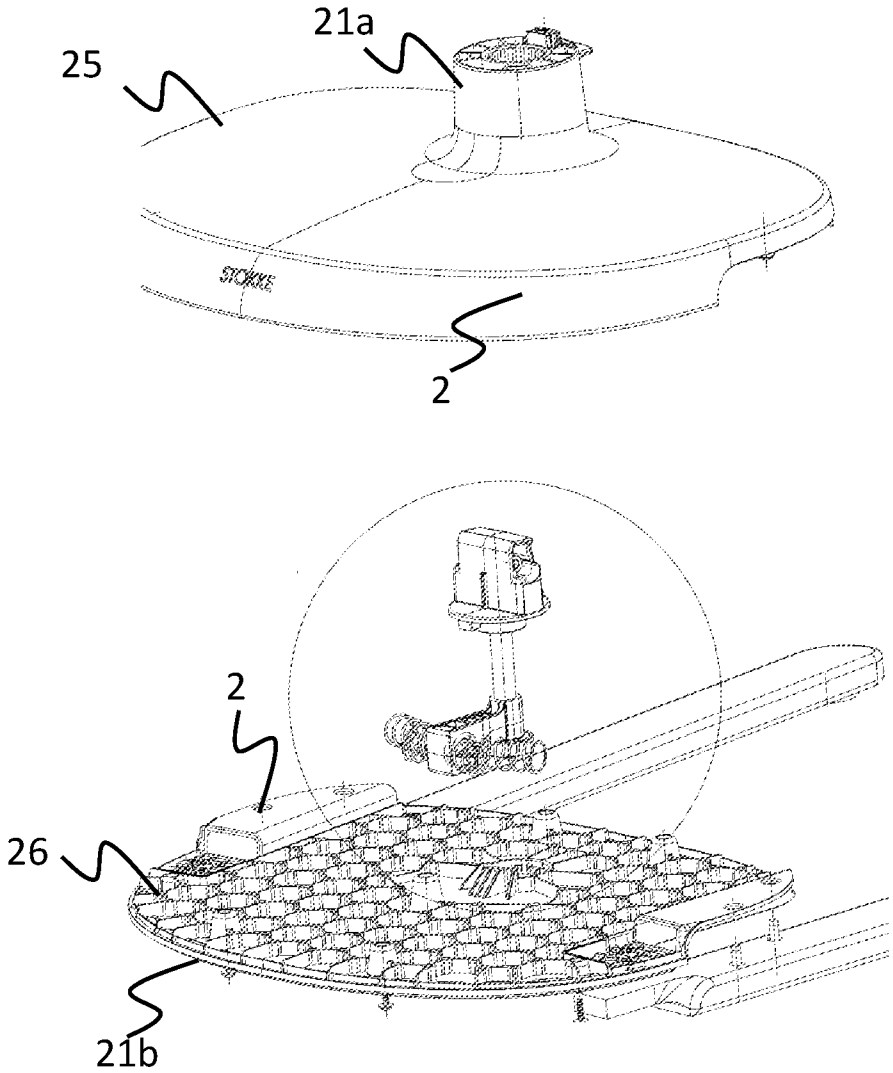

Fig.14A

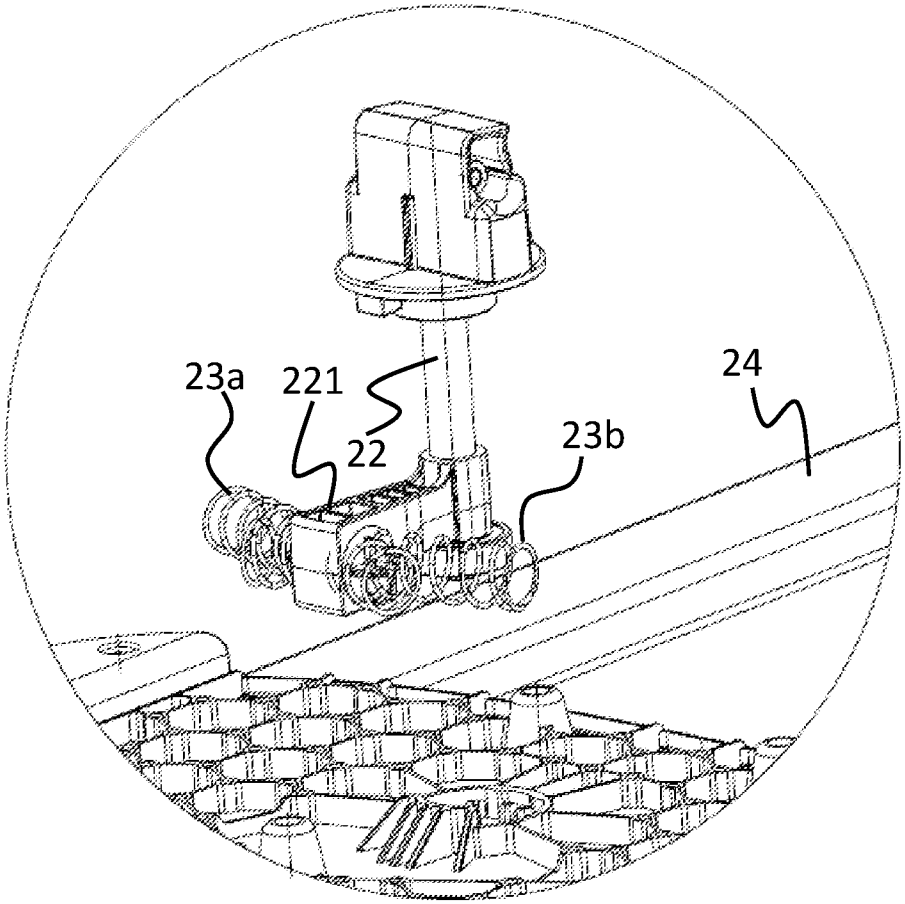

Fig. 14B