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(54) **Self-supporting sitting support and wheelchair equipped therewith, and method for manufacturing same**

(57) The invention relates to a self-supporting sitting support and a wheelchair equipped therewith, wherein the sitting support comprises at least one frame, which frame is rigid to such an extent that it can maintain other parts fastened to the frame, for instance a substructure of a wheelchair, upright, and can absorb forces acting, during use, on the sitting support. The frame is for instance manufactured from one or more metal, double bent tube-shaped segments and is at least partly covered with a flexible, preferably somewhat elastic material, the arrangement being such that a profiled sitting support is obtained. The sitting support can further be provided with a transverse axis, which connects a bottom supporting part and a back supporting part with each other, such that between said parts a desired sitting angle can be set.

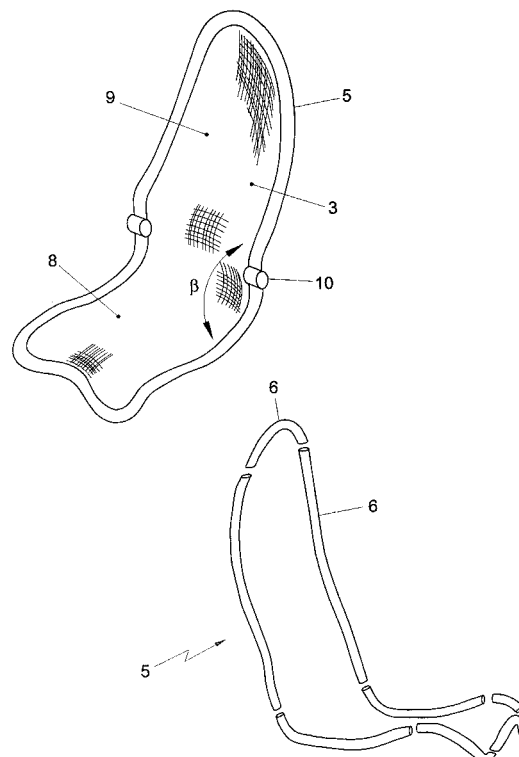


Fig. 1

Description

[0001] The invention relates to a wheelchair, in particular a foldable wheelchair and a sitting support for same.

[0002] From practice, wheelchairs are known which can be folded in a direction transverse to the main driving direction. Such wheelchairs are built-up from two parallel frame parts, interconnected by means of a cross frame and between which a sitting support is provided in the form of a cloth which is suspended between the frame parts. Further, each frame part is provided with at least one wheel. The wheelchair can be brought into a folded position by moving the frame parts with the wheels parallel towards each other, with the cross frame hinging and the sitting support, at least the cloth, being folded together between the frame parts. A disadvantage of this known wheelchair is that, as to design, the sitting support is poorly adjusted to the anatomy of the human body. Therefore, the wheelchair offers little comfort and consequently, is unsuited for long-term use. Moreover, the cross-frame under the sitting support hinders the building-in of comfort-enhancing provisions such as suspension, damping, or a tilting mechanism with which the position of the sitting support can be varied.

[0003] Further, from practice, wheelchairs are known whose sitting support is foldable about a horizontal axis extending at right angles to a main driving direction. Due to this folding direction, the sitting support can be provided with a profiled sitting surface, for instance by means of sitting cushions. As a result, a user can be comfortably supported for a longer period of time. However, this comfort is at the expense of the transportability of the wheelchair, as the sitting support is relatively voluminous, even in folded condition. Further, such wheelchairs are often overdimensioned as the rigidities of the frame and the sitting support are not adjusted to each other and, hence, partly overlap. As a result, the wheelchair as a whole has an unnecessary, because redundant, rigidity, which results in a voluminous, heavy chair with a supporting substructure taking up an unnecessarily large amount of space, both in unfolded and in folded condition.

[0004] The invention contemplates a wheelchair, in particular a foldable wheelchair, wherein the referred-to drawbacks are obviated while maintaining its advantages. To that end, a wheelchair according to the invention is characterized by the features of claim 1.

[0005] By providing the sitting support of the wheelchair with a relatively rigid frame, preferably manufactured from double bent tubes, a self-supporting sitting support is obtained. As a result, the sitting support can absorb forces acting thereon during use without, to that end, a separate supporting frame being required. Moreover, the sitting support can function as a carrier of other wheelchair parts. For instance, one or more wheels can be suspended from the sitting support directly or with the aid of only minimal frame parts. As a result, the ri-

gidity of the sitting support is optimally utilized and frame parts which do not add rigidity but only provide additional weight can be left out. As a result, a very light and yet sufficiently rigid wheelchair can be constructed. Moreover, through the absence of a supporting frame, additional space is formed under the sitting support. This offers a user, for instance, the freedom of movement to advance the wheelchair by making a walking movement with the feet (tiptoeing). The space can also be filled-up with, for instance, a tilting provision for the sitting support or a spring system for absorbing shocks and vibrations, so as to enhance the driving and sitting comfort.

[0006] In a further embodiment, a wheelchair according to the invention is characterized by the features of claims 5 and 6.

[0007] By covering the double bent frame with a flexible material, a three-dimensionally curved sitting surface can be created, whose curves follow the body shapes of a user. With this, this user can be optimally supported, while the frame provides sufficient rigidity and the preferably somewhat resilient upholstery provides for a uniform pressure distribution over the body of the wheelchair user. Moreover, the resilient upholstery enhances the suspension and damping of the sitting support, which, in particular with dynamic wheelchair use, enhances the driving and sitting comfort. Further, the frame offers space and hold for various adjusting provisions, for instance for the back, in particular the loins, with which the body of the user can be positioned in a desired position. All this results in a highly comfortable sitting support, suitable for long-term wheelchair use. Moreover, the sitting support is compact in shape and light in weight.

[0008] In an advantageous embodiment, a wheelchair according to the invention is characterized by the features of claim 7.

[0009] By combining the frame with one or more sitting cushions, in a simple manner, a diversity of seats can be created with one frame, while the frame provides for rigidity and the or each cushion for enhanced sitting comfort. The or each cushion can be an orthopedic cushion especially manufactured for a specific person, or a standardized cushion.

[0010] In a particularly advantageous embodiment, a wheelchair according to the invention is characterized by the features of claims 8 - 11.

[0011] As the sitting support is foldable about a horizontal transverse axis, a wheelchair is obtained which is both foldable to a compact, light and transportable package and suitable for long-term use, due to the excellent support offered by the sitting support. Due to the location of the transverse axis at the height of the hip joint of a user seated in the sitting support, this transverse axis can also be used to set a sitting angle between the bottom and the back supporting part. With this, a still better positioning of the body is possible and the sitting comfort is increased still further. For setting and fixing the sitting angle in a desired position, the

transverse axis is preferably provided with a detent plate. This plate can be operated in a simple manner both by a user and an assistant.

[0012] In a further elaboration, a wheelchair according to the invention is characterized by the features of claims 15 and 16.

[0013] With an adjustable wheelbase, the road-holding of the wheelchair can be adjusted to the driving conditions, so that, as desired, a more stable or less stable road-holding is obtained. As the sitting support is self-supporting, such a provision can be provided directly between the respective wheels and the sitting support, for instance in the form of a series of wheel attachment points located, viewed in the driving direction, one behind and/or above the other on the sitting support, or a slide mechanism in which the sitting support can slide relative to, at least, a number of the wheels. As a result, with relatively simple means, a wheelbase can be constructed which can be adjusted in a simple manner.

[0014] In a further advantageous embodiment, a wheelchair according to the invention is characterized by the features of claim 17.

[0015] As it is not dependent on a supporting construction, a self-supporting sitting support can be arranged so as to be pivotable about a horizontal pivot axis extending at right angles to a driving direction. The pivot axis can be arranged such that the sitting support can be fixed in several pivotal positions, or can freely oscillate about this pivot axis for absorbing shocks and vibrations during active wheelchair use.

[0016] In the further subclaims, further advantageous elaborations of a wheelchair are described, and a sitting support suitable for use in this wheelchair and a method for manufacturing a wheelchair according to the invention.

[0017] In clarification of the invention, a wheelchair according to the invention and a sitting support suited to it will be described with reference to the drawing. In the drawing:

Fig. 1 shows a perspective view of a first embodiment of a sitting support according to the invention;
 Fig. 2 shows a perspective view of a foldable sitting support in unfolded and folded position;
 Fig. 3 shows a cross-section of a detent plate;
 Fig. 4 shows a perspective view of a second embodiment of a sitting support according to the invention;
 Fig. 5 shows a foldable wheelchair according to the invention;
 Fig. 6 shows a first embodiment of a provision for an adjustable wheelbase;
 Fig. 7 shows a second embodiment of a provision for an adjustable wheelbase;
 Figs. 8a-d show a foldable lying support according to the invention, in four different positions; and
 Fig. 9 shows embodiments of a sitting support according to the invention, in which the frame, apart

from being self-supporting, offers suspension and damping.

[0018] In this description, a sitting support 1 of a wheelchair is understood to mean that part of the wheelchair in which the wheelchair user is seated during use. This can be only a bottom supporting part, but also comprise a bottom supporting part with a back supporting part, a head support, arm supports and/or leg supports.

[0019] Fig. 1 shows an embodiment of a sitting support 1 for a wheelchair according to the invention, wherein a double bent frame 5 is covered with an upholstery 3. The upholstery 3 follows the curves of the frame 5, so that a profiled sitting support 1 is formed. As to shape, it follows the anatomy of the human body and hence, can offer support or, conversely, space, where the body requires it, for instance at the location of the tuberosities of the ischium. The double bent design of the frame 5 enhances its rigidity to all directions. As a result, a self-supporting sitting support 1 is obtained, which is at least understood to mean that forces acting, during use, on the sitting support 1 are preferably completely absorbed by this sitting support 1, in particular the frame 5. Moreover, the sitting support 1 can function as a 'coat stand' from which other wheelchair parts, for instance the wheelchair wheels, can be suspended. This will be elucidated further.

[0020] The frame 5 can be manufactured from one single piece, but is preferably composed of several modular single or double bent frame parts 6, as shown in Fig. 1b. With this, the frame 5 and thus the sitting support 1 can be adjusted in a simple manner to the different body dimensions of various users or to a still growing user. The single or double bent frame parts 6 can be manufactured from metal, such as corrosion resistant steel or aluminum, of wood or of plastic, reinforced or not reinforced with glass fibers. The choice of a particular material influences the desired end rigidity and the weight of the frame and will, inter alia, be motivated by the intended field of use of the sitting support 1. Generally, the use of aluminum, aluminum alloy or steel tubes is preferred. The three-dimensionally curved shape of the frame 5 and the frame parts 6 can be realized by utilizing computer-controlled manufacturing techniques such as bending, extrusion or injection-molding.

[0021] For covering the frame 5, a flexible and preferably slightly elastic material is used. The material can be stretched over the frame 5 in one single layer and be fastened around the tubes of this frame 5, but is preferably pulled over the frame 5 in the shape of a cover. Such a cover can be easily fitted and, moreover, through the air layer enclosed by the cover, provides for a good insulating effect.

[0022] The material is stretched over the frame 5 with a particular, preselected bias. A high bias results in a sitting support 1 offering the user much support, while a low bias is favorable to a uniform pressure distribution over the body of the user. The optimal bias depends,

inter alia, on the intended use of the sitting support and the personal preference of the user. It will be directly clear to the skilled person which bias to select in the given situation.

[0023] The material to be used can be a foil-shaped material, but is preferably a woven material, for instance nylon, canvas, elastomeric foil or a woven of latex-encapsulated threads, for instance of the brand Türkskin. Woven material can be easily biased and, moreover, can be differently biased in different directions. Moreover, it has good ventilating and moisture-permeable properties.

[0024] Optionally, prior to the fitting of the cover 3, the frame 5 can be covered with a relatively soft material to prevent high contact pressures between the frame and the user. Also, at the side proximal to and/or the side remote from the user, the cover 3 can be finished with a layer of resilient and/or damping material, for instance foam rubber. With this, additional profile can be provided in the sitting support 1 and vibrations, generated in the sitting support 1 during dynamic wheelchair use, can be damped.

[0025] The thus formed sitting support 1 is comfortable, light in weight and compact in shape. The ergonomic seat shape provides for a uniform support of the body, which, moreover, allows for some movement so that the risk of decubitus is reduced. The upholstery, in particular when this is formed from a woven cover, has good insulating and moisture-absorbing properties and hence contributes to a favorable microclimate between the sitting support and the user. Further, the sitting support 1 can relatively easily be adapted to the conditions and individual desires of a user, due to the above-mentioned modular structure of the frame parts 6 and the settable bias of the upholstery 3. In addition, the frame offers space and hold for various comfort-enhancing adjustment provisions, such as, for instance, a lumbar and/or head support adjustment (not shown), or a sitting angle adjustment (shown) with which the body, or parts thereof can be brought into a desired position. The sitting angle adjustment is formed by a transverse axis 10 along which a bottom supporting part 8 and a back supporting part 9 are pivotally connected to each other. This transverse axis 10 can be a real or a virtual axis or, for instance, a biomechanical axis, known from, inter alia, applicant's Japanese patent application 3-100920. With the aid of an adjustable hinge, for instance a detent plate 12 shown in Fig. 3, a sitting angle β can be set about this transverse axis 10, between the seat parts 8, 9. With this, the sitting angle β can be adjusted to the sitting position desired for a particular activity, so that the user is always adequately supported. Also, the sitting support 1 can be folded double along this transverse axis 10 to a position wherein both seat parts 8, 9 are approximately moved against each other, as shown in Fig. 2. In this position, the ergonomic curves of the back supporting part 9 are virtually fittingly situated in the profile of the bottom supporting part 8, so that a very compact pack-

age is obtained which can be easily transported. The detent plate 12 maintains the sitting support 1 locked in the folded condition. The operation of the detent plate 12 will be elucidated with reference to the cross-section shown in Fig. 3.

[0026] Fig. 3 shows, in front and side view, one of the two disks 50 which together form a detent plate 12. On one side, each disk 50 is provided with cams 52, extending in radial direction in an evenly interspaced relation to each other. In a first position, the two disks 50 abut against each other by their sides provided with cams 52, with the cams 52 interlocking and the disks 50 not being able to pivot relative to each other. The disks 50 are pushed against each other in axial direction by means of, for instance, a bias spring (not shown). In this first position, the detent plate 12 is locked and seat parts 8, 9 connected to the detent plate 12 cannot be pivoted relative to each other.

[0027] To remove the locking, the detent plate 12 is provided with an unlocking mechanism in the form of, for instance, a handle, with which the disks 50 can be forced apart along the axis 10 against the pre-stressing force. As a result, the cams 52 will no longer interlock and the disks 50 can be freely pivoted relative to each other. In this second position, a desired sitting angle β can be set between the seat parts 8, 9. When, thereupon, the unlocking mechanism is released, the disks 50 will be forced against each other again under the influence of the pre-stressing force, while the cams 52 will interlock in a new position relative to each other, thus preventing further pivoting. The step size with which the desired angle β can be set depends on the shape of the interlocking cams 52 and, hence, can be affected as desired by a suitable design of the cam pattern 52 of the disks 50. However, it will be clear that the cams 52 can be designed in many other manners than as shown in Fig. 3. For instance, the cams 52 can have the shape of a toothing extending along the circumference, or interlocking pins and holes. Also, the cams 52 can be provided in the disks 50 so as to be movable in axial direction, so that the locking between the disks 50 can be removed by retracting the cams 52 instead of the entire disk 50.

[0028] A detent plate 12 as described offers the advantage that it can be operated in a simple manner with one hand, so that a user himself, seated in the sitting support 1, can set the desired sitting angle. Naturally, the hinge 12 can also be operated by an assistant, for instance when the sitting support 1 forms part of a wheelchair. Optionally, to that end, the operating mechanism can be moved to a location more suitable for an assistant, for instance adjacent the pushing brackets of the wheelchair.

[0029] Fig. 4 shows a perspective view of a second embodiment of a sitting support according to the invention. This sitting support 1' is built up around a double bent frame 5 as shown in Fig. 1. However, in this embodiment, the frame 5 is provided with a number of sit-

ting cushions 13. These can be orthopedic sitting cushions, which are completely formed following the anatomy of one specific user. However, these can also be standardized sitting cushions such as, for instance, recorded in the standards for seats *Revab*, *Jay*, *Roho*, *Sedeo* or *Postura*. The advantage of the standardized sitting cushions is that, when designing and dimensioning the frame 5, these can already be taken into account, so that the frame 5 and the or each sitting cushion 13 are compatible. The sitting cushions 13 can be attached to the frame 5 by means of mounting brackets, click mechanisms, bolt-nut connections or other attachment means known per se from practice. The thus obtained sitting support 1' can be manufactured in a simple manner. Due to the large freedom of choice in sitting cushions 13, a comfortable sitting support 1' suitable for long-term use can be realized for any user. Moreover, due to the frame 5, the sitting support 1' is rigid and self-supporting. Like the sitting support 1 shown in Fig. 1, the sitting support 1' can be provided with a transverse axis 10 for setting a sitting angle β and folding the bottom supporting and the back supporting parts 8, 9 towards each other for forming a package which can be transported.

[0030] Fig. 5 shows an example of a foldable wheelchair 16, wherein a sitting support 1 as shown in Figs. 1 and 2 is used. In addition to the sitting support, the wheelchair comprises four wheels, i.e. two relatively large rear wheels 20 and two small front wheels 21. They are connected to the sitting support 1 by means of frame parts 24, 25. Here, in an advantageous manner, the self-supporting property of the sitting support 1 is utilized. The fact is that it is capable of maintaining the frame parts 24, 25 and the wheels 20, 21 upright so that the frame parts 24, 25 themselves need not, at least not necessarily, be self-supporting and can therefore be of light and small construction. This results in a lighter and more compact foldable wheelchair 16. Moreover, due to the absence of a voluminous supporting frame, relatively much space is available under the sitting support 1. This space offers a wheelchair user the possibility to advance the wheelchair with his feet. However, the space can also be used for, for instance, a motor for driving the wheelchair 16, respirator means or an adjusting mechanism with which the position of the sitting support 1 can be varied.

[0031] In Fig. 5, an embodiment of such an adjusting mechanism is shown, in particular a tilting provision. Again, advantage is taken of the self-supporting property of the sitting support 1. The fact is that due to this self-supporting property, the sitting support 1 can be attached with any chosen part of its double bent frame 5 in any desired position to a frame part 24, 25 or wheel 20, 21 of the wheelchair 16. In the embodiment shown, the sitting support 1 is connected by a leading edge, viewed in driving direction, to the frame part 24, pivotable about a horizontal pivot axis 23 extending transversely to the driving direction. With this, the sitting sup-

port 1 can be fixed in a desired position, for instance a backwards tilted position of rest. It is also possible, by adding suspension- and damping elements, to have the sitting support 1 freely oscillate about the pivot axis. Thus, shocks and vibrations can be absorbed during active wheelchair use and the driving comfort is enhanced.

[0032] Further, it is noted that the pivot axis 23 is not bound to the position shown in Fig. 5 and can even be a virtual pivot axis. Nor is the pivot axis bound to sitting supports for wheelchairs. For instance, the pivot axis 23 can also be advantageously used in sitting supports intended for static use, for instance an office chair or easy chair. For a more detailed description of such a tilting provision and various embodiments thereof, reference is made to the non-prepublished Dutch patent application of applicant entitled: "Wheelchair provided with a pivot provision adjacent the knee of a user", which application is deemed to be incorporated herein by reference.

[0033] Further, to the self-supporting frame 5 of the sitting support 1, other wheelchair parts can be attached, such as arm supports 26, a head support 27, feet supports 28 or pushing brackets 30. These parts 26, 27, 28, 30 are preferably connected to the frame 5 such that, for the purpose of a folded condition of the wheelchair 16, they can be detached or folded inwards. Because of its greater ease of use, this last option is preferred. The wheels 20, 21 too are preferably detachably or foldably connected to the substructure. In a particularly advantageous embodiment, the wheels 20, 21, at least a number thereof, are connected to the substructure 18 or the frame 5 of the sitting support 1 such that the wheelbase (W), i.e. the distance between the axes of rotation of the rear and the front wheels 20, 21, is settable. With this, the road-holding and balance of the wheelchair can be adjusted to the driving conditions, such as the underground and the activity to be displayed. In Figs. 6 and 7, two embodiments of a wheelchair are shown whose wheelbase (W) can be set. Fig. 6 shows a wheelchair 16, wherein the rear wheels 20 are directly attached to the frame 5 of the sitting support 1. To that end, the frame 5 is provided on both sides with a wheel attachment part 31, in which a number of holes 32 is provided behind each other viewed in driving direction, for attachment of the rear wheels 20. Through selection of the hole 32, the distance between the respective rear wheel 20 and the front wheels 21, and therefore the wheel base (W), is determined. For the attachment of the rear wheels 20, preferably, use is made of a so-called 'quick-release' mechanism known from practice. The wheels 20 are therefore easily detachable and the wheelbase (W) can be set or varied simply and rapidly. As already indicated with the wheelchair 16 shown in Fig. 5, the front wheels 21 are preferably foldable. To that end, via a frame part 25, the front wheels 21 are pivotably connected to the sitting support 1 through a pivot axis 33. Optionally, during use, hence with the front wheels 21 unfolded, this pivot axis 33 can

have a similar function as the above-described pivot axis 23 of the wheelchair 16 of Fig. 5. After use, the wheels 21 can be folded-in, against the underside of the sitting support 1. Due to the above-mentioned features, i.e. the foldable front wheels 21 and the easily detachable rear wheels 20, the wheelchair 16 can be folded-in in a very simple manner to form a manageable package.

[0034] Fig. 7 shows, in perspective bottom view, a second embodiment of a wheelchair with an adjustable wheelbase (W). In this embodiment, the front wheels 21 are connected to the sitting support 1, at least the frame 5 thereof. By means of a sliding mechanism 34, the sitting support 1 is connected to a substructure 18, which substructure 18 (not shown) comprises at least one frame and two rear wheels 20 suspended from this frame. As the sitting support 1 is self-supporting, it can be autonomously slid along the slide 34. Then, the position of the sitting support 1 with the front wheels 21 changes relative to the rear wheels 20 and, hence, the wheelbase (W) can be varied.

[0035] The invention is not limited to sitting supports 1, but can, for instance, also be used with lying supports, as shown Figs. 8a/d. Such a self-supporting lying support 40 is obtained by elongating the back- and bottom supporting part 8, 9 of the sitting support 1 with a head, leg and feet supporting part 42, 44, 46. Like the sitting support 1, these parts 42, 44, 46 can be formed from double bent tube segments 6, which are covered with a flexible material 3. The parts 42, 44, 46 are preferably hingedly connected to the sitting support 1 and to each other. As a result, between the parts 42, 9, 8, 44 and 46, desired angles can be set, so that the lying support of Fig. 8a can also be used as a sitting support, as shown in Fig. 8b or any intermediate position as shown in Fig. 8c. Therefore, by setting the angles between the different supporting parts 42, 9, 8, 44, 46, the sitting and/or lying support 40 can be adjusted to virtually any sitting or lying position of a user desired in a particular situation. Moreover, the sitting/lying support 40 can be folded to a compact package, by folding together the different parts 42, 9, 8, 44, 46 accordion-wise, as shown in Fig. 8d. Further, the sitting/lying support 40 can be provided with front and rear wheels 21, 20, which, like the embodiments shown in Figs. 5, 6 and 7, are preferably detachably or foldably connected to the sitting/lying support 40. It will be clear that the number of supporting parts can be expanded or limited as desired.

[0036] Figs. 9A and B show two further embodiments of a sitting support, wherein the frame 5 of the sitting support 1, apart from being self-supporting, also provides suspension and damping. To that end, the frame 5 is elongated and curved near the front side of the sitting support 1, to form an arch 60 extending at least partly under the sitting support 1, the last part 64 of which extends substantially parallel to the sitting support 1. Depending on the bending stiffness of the frame 5 and the dimensioning of the arch 60 formed therewith, the sitting support 1 will bend slightly under the weight of a

user. As a result, a highly comfortable sitting support 1 is obtained. Optionally, between the sitting support 1 and a part of the curve 60 located underneath, a damping element 62 can be provided, as shown in Fig. 9A. In particular when the sitting support 1 is used in a wheelchair and, therefore, will be used dynamically, such a damping element 62 will provide for additional sitting and driving comfort. In the embodiments shown, the arched frame part 60 also serves for attaching the front and rear wheels 21, 20. As in the embodiments described hereinabove, the rear wheels 20 are preferably connected to the frame 60 with a quick release mechanism and the front wheels 21 are pivotally connected via frame parts 25 to the frame 5 so as to be pivotal about a pivot axis 33. In combination with the length of the frame part 25, the position of this pivot axis 33 adjacent the top side of the arch 60 is chosen such that when the front wheels 21 are pivoted to under the sitting support 1, the front wheels 21 come to lie between the extremities 64 of the arch 60, in which position the front wheels 21 take up hardly any additional space. Consequently, this sitting support 1 can also be folded so as to be very compact.

[0037] It will be clear that the invention is not limited to the exemplary embodiments represented in the description and the drawing. Many variations thereon are possible within the framework of the invention as outlined by the claims.

[0038] For instance, the sitting support can be provided with other hinges than the detent plate mentioned. Between the bottom and back supporting seat parts, for instance a rubber hinge can be used, so that an even lighter sitting support is obtained. Also, a second transverse axis can be provided in the sitting support, parallel to the first one and at a short distance therefrom. Thus, an even better setting of the sitting angle becomes possible and in the folded condition, some space is obtained between the seat parts situated parallel to each other in this position. In particular when the frame is provided with relatively voluminous sitting cushions, such a second transverse axis contributes to an even better foldable sitting support. The sitting support can also be used in different fields, for instance as office chair, bucket seat or car seat. In these cases also, in an advantageous manner, a horizontal pivot axis can be provided, extending adjacent a leading edge of the sitting support, preferably through the hinge point of the knees of a user seated in the sitting support. Such a pivot axis can contribute to a dynamically suspended, comfortable sitting support.

[0039] These and comparable variations are understood to fall within the framework of the invention outlined by the claims. Also, each combination of different parts as mentioned in the description is understood to fall within the scope of invention.

Claims

1. A wheelchair, comprising a mobile substructure (18) and a sitting support (1), wherein the substructure (18) comprises at least two wheels and wherein the sitting support (1, 1') comprises at least one frame (5), which frame (5) is rigid to such an extent that it can maintain other wheelchair parts attached to this frame (5), in particular the substructure (18), upright and wherein it can absorb forces, acting during use on the sitting support (1, 1') and the wheelchair parts. 5
2. A wheelchair according to claim 1, wherein the frame (5) is manufactured from one or more double bent tube-shaped segments (6). 15
3. A wheelchair according to claim 2, wherein the segments (6) are manufactured from metal. 20
4. A wheelchair according to claim 2 or 3, wherein the segments (6) are manufactured by means of a computer-controlled three-dimensional bending technique. 25
5. A wheelchair according to any one of the preceding claims, wherein the frame (5) is at least partly covered with a flexible material (3), the arrangement being such that a profiled sitting support (1) is obtained. 30
6. A wheelchair according to claim 5, wherein the material (3) stretched over the frame (5) is somewhat elastic. 35
7. A wheelchair according to any one of the preceding claims, wherein the frame (5) is provided with one or more sitting cushions (13) formed following the anatomy of an intended user. 40
8. A wheelchair according to any one of the preceding claims, wherein the sitting support (1, 1') comprises a bottom supporting part (8) and a back supporting part (9), which parts (8, 9) are pivotably connected to each other about a horizontal transverse axis (10). 45
9. A wheelchair according to claim 8, wherein the transverse axis (10) is approximately located at the height of a hip joint of a user seated during use in the sitting support (1). 50
10. A wheelchair according to claims 8 or 9, wherein a sitting angle (β) is adjustable between the bottom supporting part (8) and the back supporting part (9). 55
11. A wheelchair according to claim 10, wherein, for setting the sitting angle (β), a detent plate (12) is

provided.

12. A wheelchair according to any one of claims 8 - 11, wherein the sitting support 1 further comprises a leg supporting part (44) and a head supporting part (42) which are pivotably connected to a side, remote from the transverse axis (10) of the bottom supporting part (8) and the back supporting part (9), respectively, and wherein, further, to the leg supporting part (44) a foot supporting part (46) is pivotably connected, the arrangement being such that by mutual pivotal movement of the supporting parts (42, 9, 8, 44, 46) the sitting support can be transformed to a lying support (40) wherein said parts (42, 9, 8, 44, 46) substantially extend in a horizontal plane.
13. A wheelchair according to any one of the preceding claims, wherein the wheels (20, 21) are detachably or foldably suspended from the sitting support (1, 1'), in particular the frame (5) thereof.
14. A wheelchair according to any one of the preceding claims, wherein the sitting support (1, 1') is further provided with retractable feet supports (28) and/or arm supports (26) and/or a retractable head support (27).
15. A wheelchair according to any one of the preceding claims, wherein the frame (5) is provided with several suspension points (32) for attaching the wheels (20, 21), the arrangement being such that the wheelbase (W) of the wheelchair (16) is settable.
16. A wheelchair according to any one of the preceding claims, wherein the sitting support (1) is connected to rear wheels (20) via a slide mechanism (34), by means of which slide mechanism (34) the sitting support (1, 1'), together with at least one front wheel (21) connected to the sitting support (1) can slide relative to the rear wheels (20) such that with this, the wheelbase (W) of the wheelchair (16) is settable.
17. A wheelchair according to any one of the preceding claims, wherein the sitting support (1, 1') is pivotable about a horizontal pivot axis (23) extending at right angles to the driving direction, which axis is located under the sitting support (1, 1') adjacent a leading edge thereof, viewed in driving direction.
18. A wheelchair according to claim 17, wherein an angle (φ), over which the sitting support (1) is pivotable, is settable.
19. A sitting support, in particular suitable for use in a wheelchair according to any one of the preceding claims, comprising a double bent frame (5), which is at least partly covered with a slightly resilient, bi-

ased material, the arrangement being such that a self-supporting, three-dimensionally profiled sitting surface is formed.

20. A sitting support according to claim 19, wherein the sitting support comprises a bottom supporting part and a back supporting part, which parts are pivotably connected to each other about a horizontal transverse axis such that, in use, a sitting angle between said parts is settable and, in a folded condition said parts are folded towards each other, wherein both parts substantially lie against each other. 5 10
21. A method for manufacturing a wheelchair (16), wherein a frame (5) tailored to an intended user is formed from double bent segments (6), wherein a slightly elastic cover (3) is fitted with a bias over at least a part of the frame (5), whereupon at least a substructure (18) with three or four wheels (20, 21) is connected or formed to the frame (5). 15 20
22. A method according to claim 21, wherein the bias is set on the basis of characteristics and/or preferences of the intended user. 25
23. A method according to claim 21 or 22, wherein the double bent segments (6) are manufactured with the aid of a computer-controlled, three-dimensional manufacturing technique. 30

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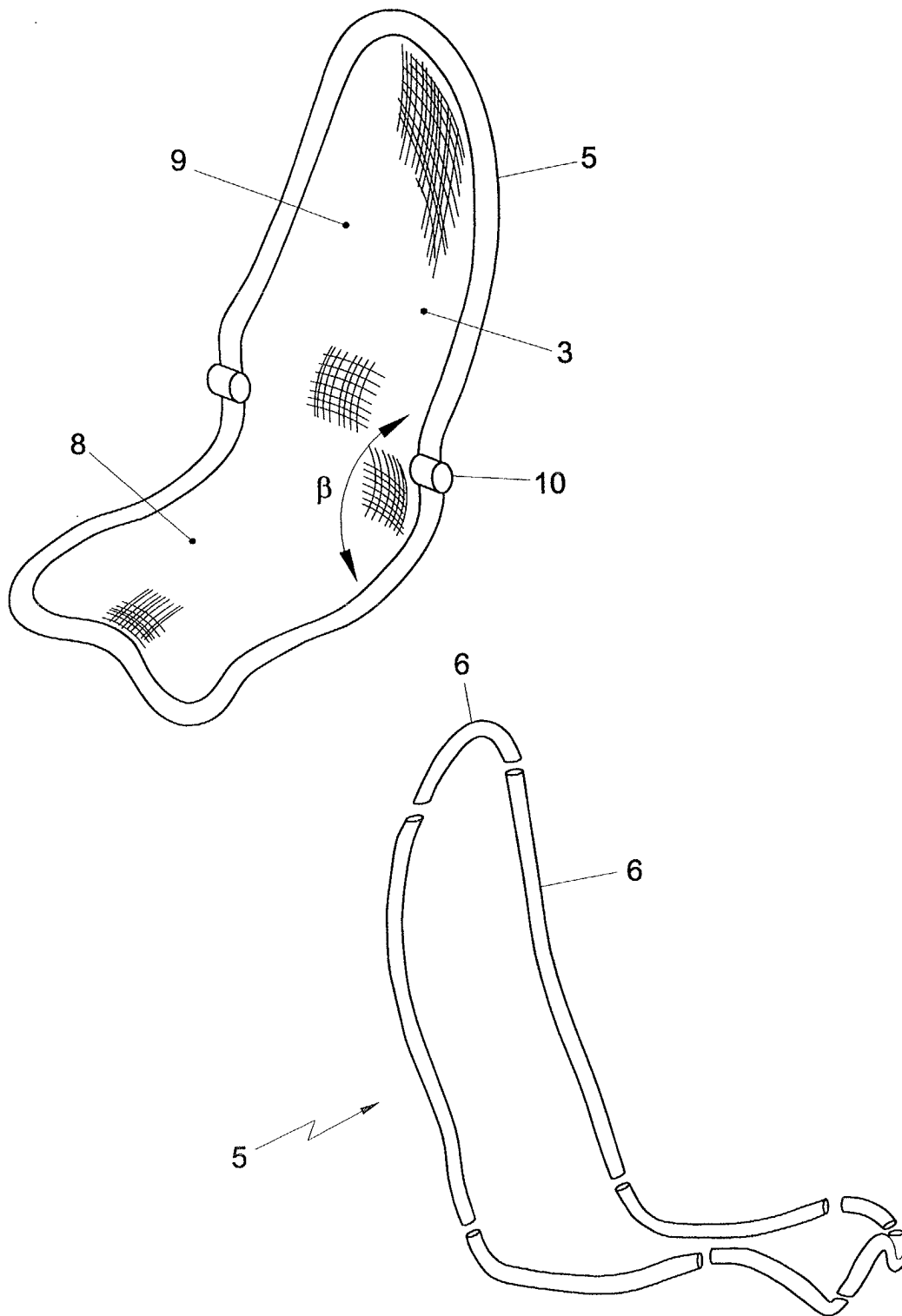


Fig. 1

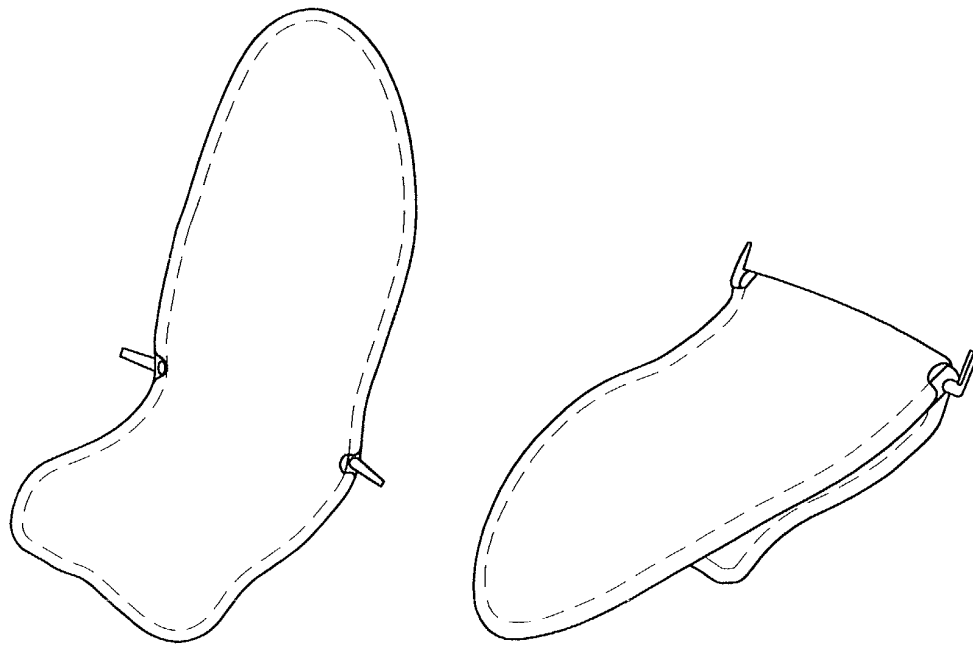


Fig. 2

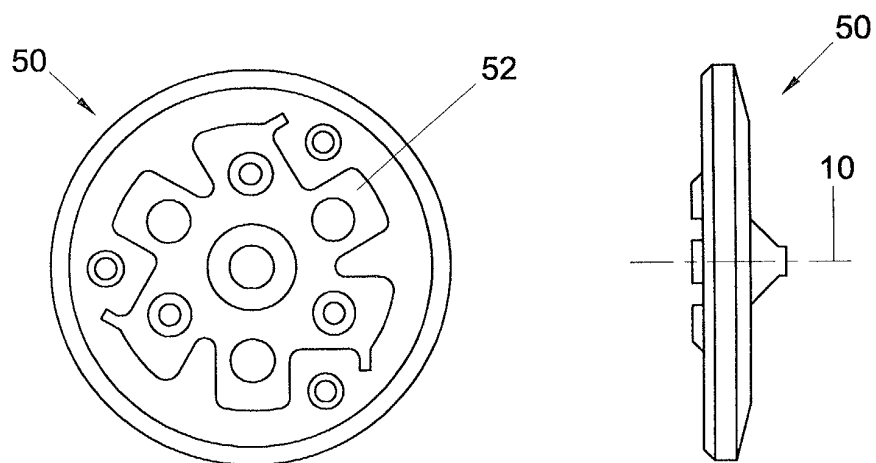


Fig. 3

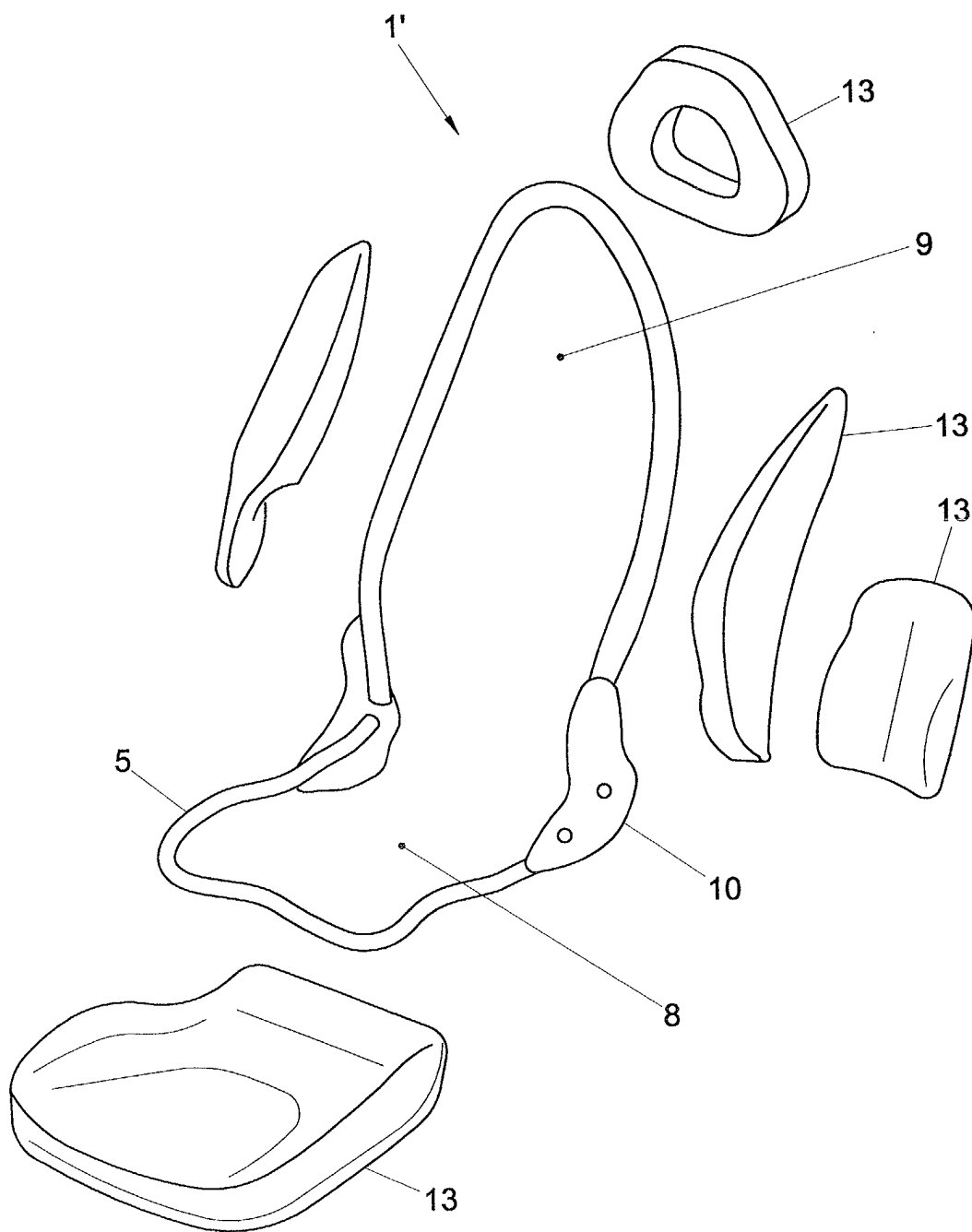


Fig. 4

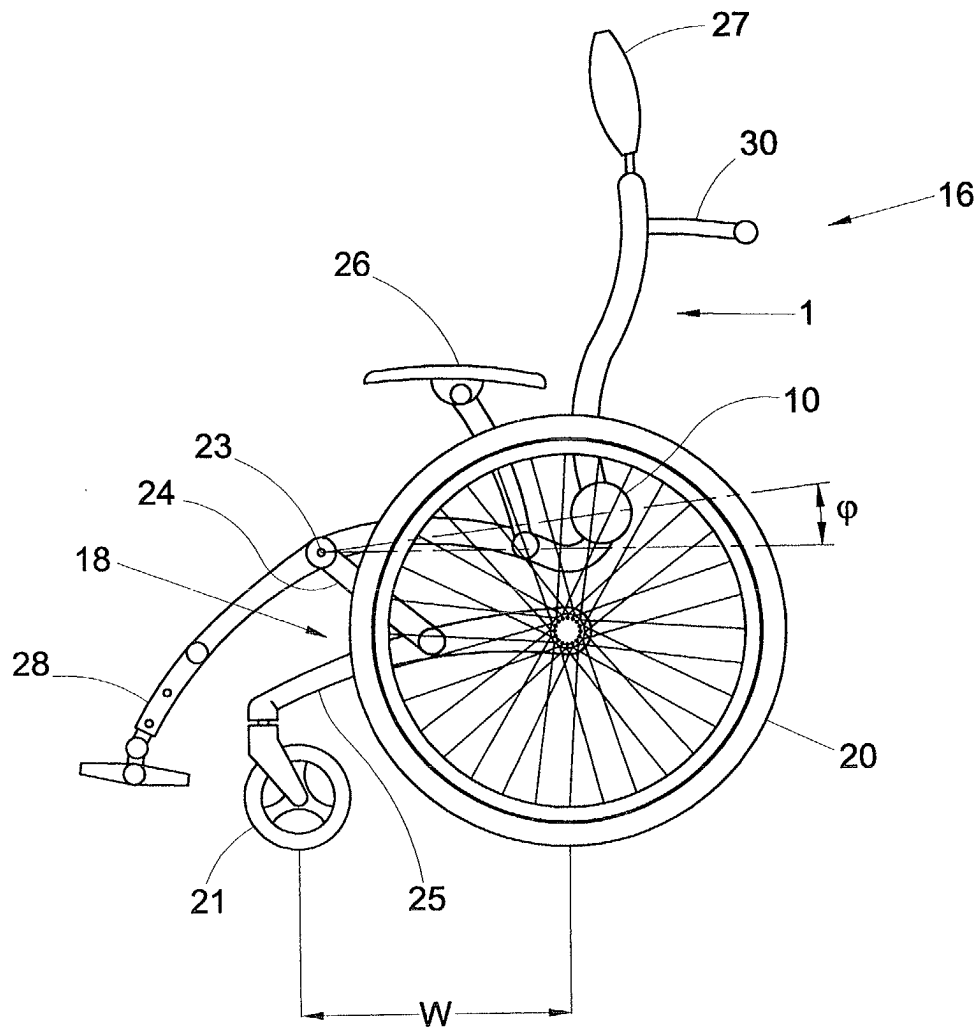


Fig. 5

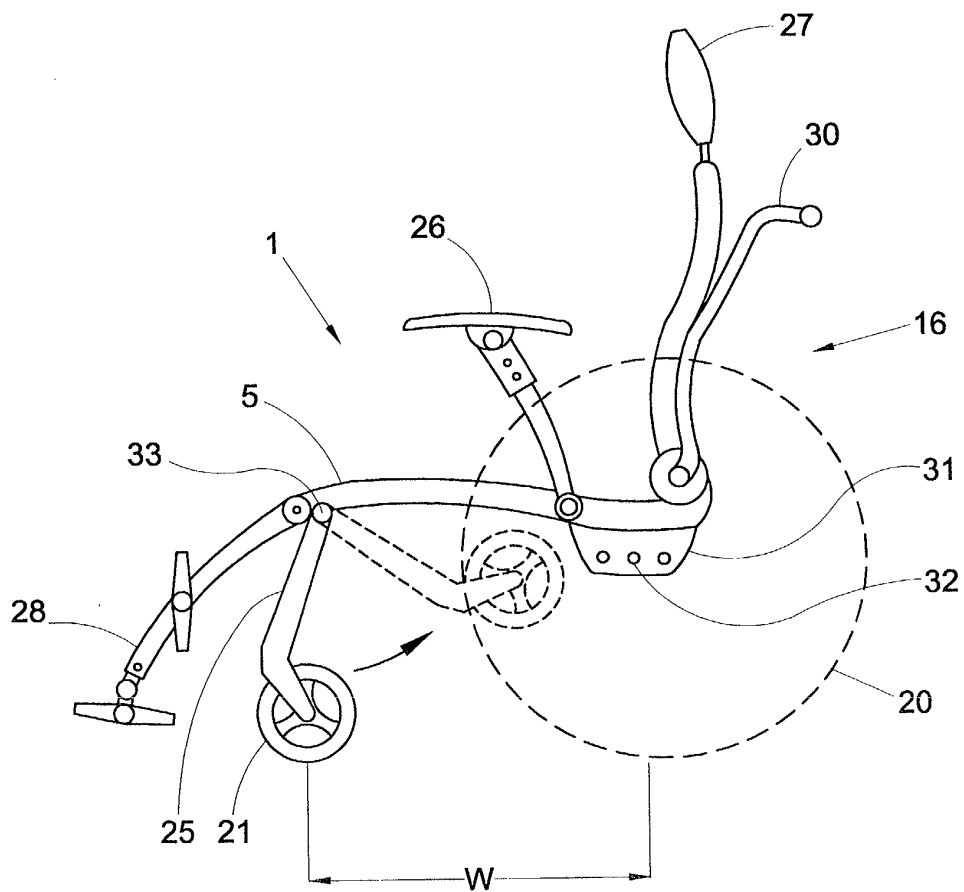


Fig. 6

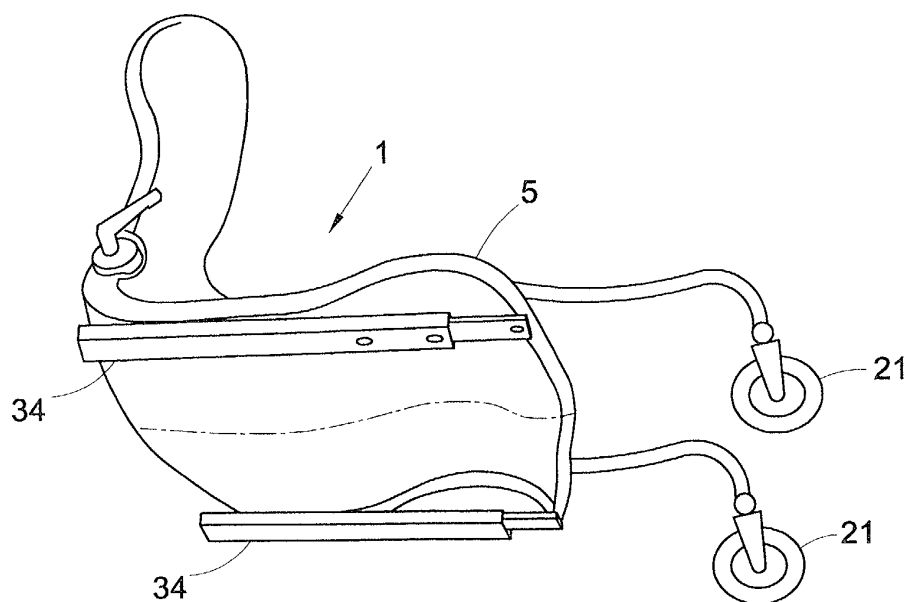


Fig. 7

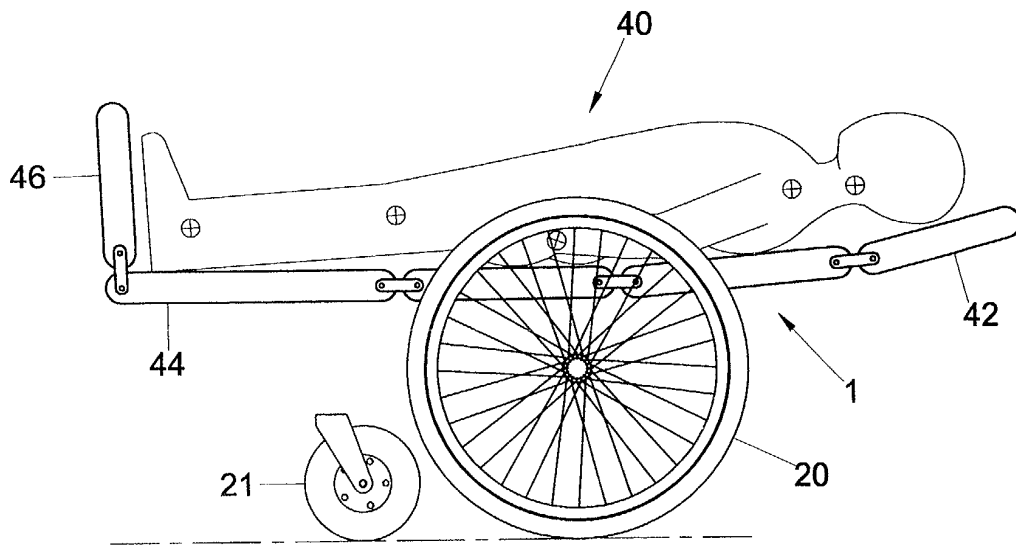


Fig.8A

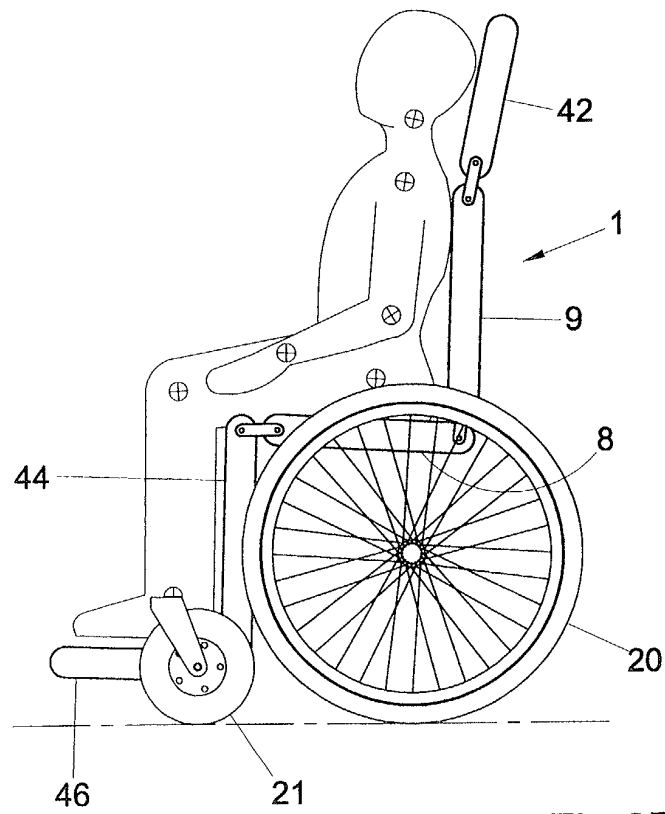


Fig.8B

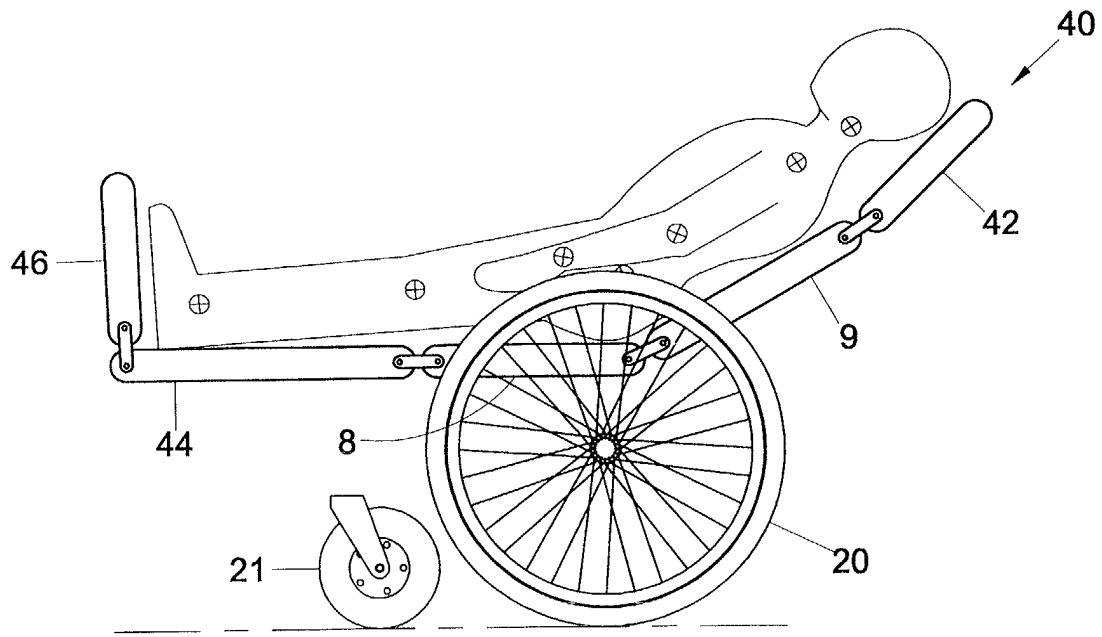


Fig.8C

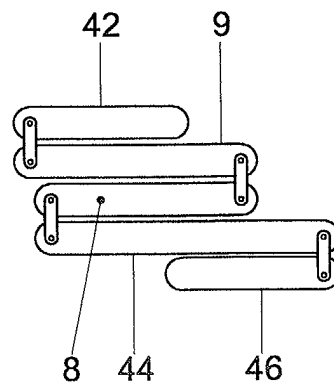


Fig.8D

