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(54) **Support wheel assembly for wheel-chairs**

(57) A support wheel assembly suited for wheel-chairs is described. The assembly includes a support wheel (7) which is mounted on an arm which again is fastened to the chassis of the chair. Said arm is vertical and includes a first part (2) and a second part (3), wherein the first part (2) and the second part (3) are hinged together, the hinging being spring loaded.

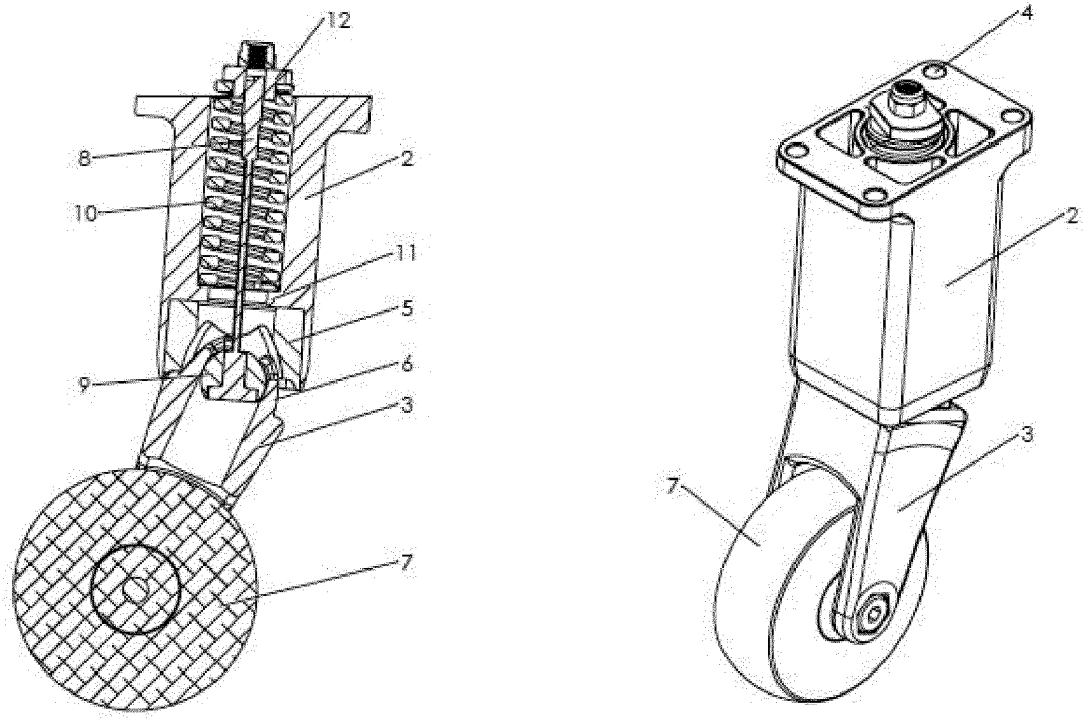

Fig. 6

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Description

Field of the Invention

[0001] The present invention relates to a support wheel assembly for wheel-chairs.

Background

[0002] Currently there are public standards and test procedures for wheel-chairs and their stability. Electric wheel-chairs in particular are heavy and may cause harm to both the user and the surroundings if tipping over. Often the user is sitting in an elevated, but balanced position between the wheels of the wheel-chair. If the person is to pass an obstacle on the ground, such as the edge of a pavement (US: sidewalk), the centre of gravity of the wheel-chair and user may come so far outside the axis between the wheels that the chair will tilt backward or forward. Many wheel-chairs are thus equipped with support wheels to obtain the required stability to prevent it from tipping over. The support wheels shall limit the angle the wheel-chair may have relative to the ground. When mountingsupport wheels to a wheel-chair there may arise a "geometrical" problem between the maximal allowable tilt angle and the desire that the chair shall be able to pass obstacles normally met in society, such as pavement edges. A pavement edge may be 7-12 cm high. If the chair shall be able to pass a 7 cm high edge, the support-wheels must be mounted correspondingly high. The stability requirements then dictate that the wheels must be mounted far out from the chair so that they hit the ground when the chair reaches the maximum tilt angle. The result of these requirements is that the wheels must be mounted on arms projecting far outside the chair. This forms a nuisance, both for the user as he/she may easily hit objects around the chair and the chair being less manoeuvrable in narrow passages, and for external persons that easily may hit the wheels and stumble. If the support wheels are mounted nearer the chair, they must be lowered correspondingly towards the support in order to satisfy the stability requirement. The support wheels will then be mounted too low to allow the chair to pass common pavement edges and the chair will be less functional in the city. There are thus conflicting requirements to stability and functionality.

Summary of the Invention

[0003] It is an objective of the present invention to provide a support wheel assembly avoiding the drawbacks mentioned above. This is achieved in a support wheel assembly for a wheel-chair according to the appended claims. In particular, the assembly according to the invention includes a support wheel which is mounted on an arm. The arm is mounted with a small angle relative the vertical direction of the wheel-chair whereupon the arm will become parallel with a normal force from a support in case the chair is tilting. The arm includes a first part and a second part, the first part and the second part being hinged together. The hinging is spring loaded. The first and second part are adapted to lock together if influenced by a force in the longitudinal direction of the arm and bend back if influenced by a force in the transverse direction of the arm.

[0004] This allows the support wheel to bend when hitting a pavement edge or another obstacle in the direction of movement, but also if moving sideways. Simultaneously it will also work as a support wheel if the chair should tilt.

[0005] According to a preferred embodiment, the first part includes a first end with means for attaching the part to the chassis and a second end with a cup-shaped depression. The second part includes a first end which is attached to the support wheel and a second end that is shaped correspondingly to the second end of the first part. The arm further includes a spring assembly elastically holding the first part together with the second part.

[0006] This is a design which assures that the first part is locked to the second part when vertically loaded, i.e. in situations where the support wheel shall prevent the chair from tipping over.

[0007] Said spring assembly may be realized in several ways, but according to a preferred embodiment this includes a flexible cable with a first end that is attached to a ball and a second end that is adjustably attached to a disc. Further, there is a helical spring surrounding the cable, the cable is jointed to the second part by this gripping around the ball and the second end of the cable being attached to the disc, so that the spring is prestressed between an internal flange in the first part and the disc. The disc moves freely inside the first part.

[0008] By this design of the spring assembly, the tensioning of the spring may easily be adjusted by changing the position of the disc on the cable, e.g. by tensioning a nut at the end of the cable.

Brief Description of the Drawings

[0009] The invention is now to be described in detail in reference to the appended drawings, in which:

Fig. 1 is a schematic sketch showing how support wheels may be mounted in the prior art,

Fig. 2 shows the mounting of support wheels on a wheel-chair according to the invention,

Fig. 3, 4 and 5 show the support wheels in detail, and

Fig. 6 is a section through the support wheel according to the invention and the support wheel in perspective view.

Detailed Description of an Embodiment of the Invention

[0010] Fig. 1 shows a wheel-chair with the maximum allowable tilt angle α indicated. The line A shows the possible position of the underside of the support wheel if the tilting of the chair is to be limited to this angle α. If the chair is to pass a pavement edge B or another sharp obstacle of the same height, the support wheel must be located in position C. The support wheels will then project far from the chair, to significant nuisance for both the user and other persons nearby. If the support wheels are mounted nearer the chair, e.g. in position D, the support wheels must be lowered to obtain the same tilt-limiting angle α. However, with such a low location of the support wheels, it is impossible to pass the pavement edge, as the wheels will hit the edge.

[0011] Fig. 2 shows the chassis of an electric wheel-chair equipped with support wheel assemblies according to the invention. The wheels are mounted much closer to the wheel-chair than what is usual, but it is nevertheless fully possible to pass pavement edges and other sharp obstacles of normal height.

[0012] The solution according to the invention is to mount each support wheel on a hinged arm. If the wheel-chair should tilt backwards or forwards, the support wheels will touch the ground whereupon a pressure is applied onto the arm in its longitudinal (vertical) direction, as shown in the detailed drawing in Fig. 4. The arm will then lock. The support wheels will therefore act as intended and stabilize the chair.

[0013] In case the support wheels should hit a pavement edge, there will arise a force transverse to the longitudinal direction of the arm. This force will bend the arm in its hinging, Fig. 3, causing the lower part with the support wheel to bend back. The chair will then be able to pass pavement edges.

[0014] In Fig. 5 it is shown how the support wheel also may bend sideways. This function is desirable, to prevent becoming stuck when turning the chair hitting obstacles at the side of the chair.

[0015] Fig. 6 shows the arm and support wheel in cross section. The arm includes two hollow parts 2, 3 which are hinged to each other. The first (upper) part 2 has mounting ears 4 in its first end for fastening the arm to the chair. In the other end the first part has a rounded or cup-shaped depression 5 designed to receive a correspondingly rounded first end 6 of the other part 3. The other end of the second part 3 is fastened to the support wheel 7. The cup-shaped depression 5 in the first part may include an elastic material, e.g. as a lining, allowing some compression of the hinge if loaded vertically.

[0016] As mentioned, the first part 2 is hinged to the second part 3. The hinging may include a flexible wire or cable 8. Alternatively, the cable may be replaced with a bolt, but it is preferred to use a cable to provide some additional flexibility to the hinge. The cable is located inside the hollow parts, and is in one end terminated in a ball 9 which is held inside the second part 3. The second part 3 is folded around the ball 9 and thus gripping the ball 9 and the cable 8 preventing them from being pulled from the part. The cable 8 passes through the cavity in the first part 2 and is surrounded by a spring 10. One end of the spring 10 rests on a flange 11 inside the first part 2. In the other end it abuts against a disc 12 fastened to the second end of the cable 8. The disc 12 may slide freely inside the first part 2 and may be regulated relative the cable 8 providing a proper pre-stress (compression) to the spring.

[0017] If the arm is loaded in its longitudinal direction, the second part 3 will be pressed into the first part 2 and hit the flat lower end of the first part. The hinging will become stuck or locked with the arm in a linear configuration. If loaded transverse to the longitudinal direction of the arm, the second part 3 will become disengaged from the first part 2 and retract.

Claims

1. A support wheel assembly for a wheel-chair including a support wheel (7) which is mounted on an arm, **characterized i n** that the arm is mounted with a small angle relative the vertical direction of the wheel-chair whereupon the arm will become parallel with a normal force from a support in case the chair is tilting, the arm including a first part (2) and a second part (3), the first part (2) and the second part (3) being hinged together, the hinging being spring loaded, wherein the first and second parts are adapted to lock together if influenced by a force in the longitudinal direction of the arm and bend back if influenced by a force in the transverse direction of the arm.

2. A support wheel assembly according to claim 1, wherein the first part (2) includes:

   a first end with means (4) for fastening the part to a chassis (1) of the chair,
   a second end with a cup-shaped depression (5),

   wherein the second part (3) includes:

   a first end which is fastened to the support wheel (7),
   a second end which is shaped correspondingly the second end of the first part (2), and

   the arm further includes a spring assembly (8-12) elastically holding the first part (2) to the second part (3).

3. A support wheel assembly according to claim 2, wherein the parts (2, 3) are hollow and the spring assembly (8-12) includes:

a cable or bolt (8) with a first end with a ball (9), a second end which is fastened to a disc (12), and a helical spring (10) surrounding the cable or bolt (8),
wherein the cable or bolt (8) is turnably fastened to the second part (3) by the second part (3) gripping around the ball (9), the second end of the cable or bolt (8) is fastened to the disc (12), and the spring (10) is pre-stressed between a flange (11) inside the first part (2) and the disc (12), the disc (12) sliding freely inside the first part (2).

4. A support wheel assembly according to claim 3, wherein the position of the disc (12) on the cable or bolt (8) may be varied to adjust the pre-stressing of the spring (10).

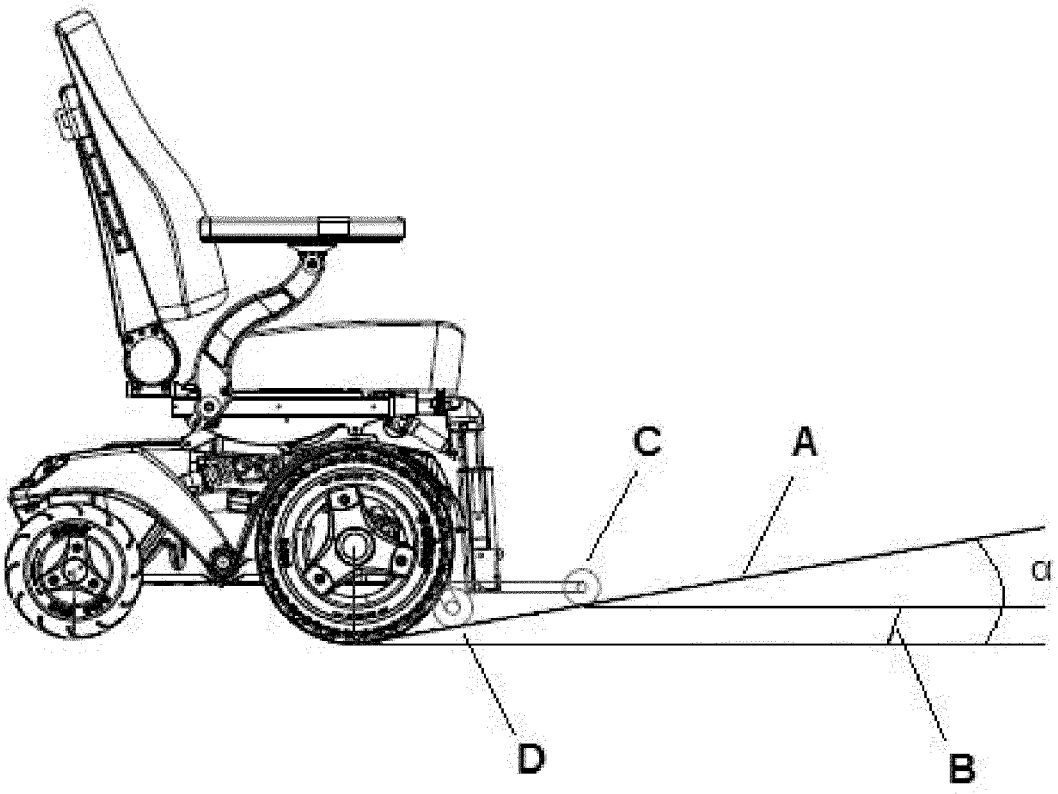

Fig. 1

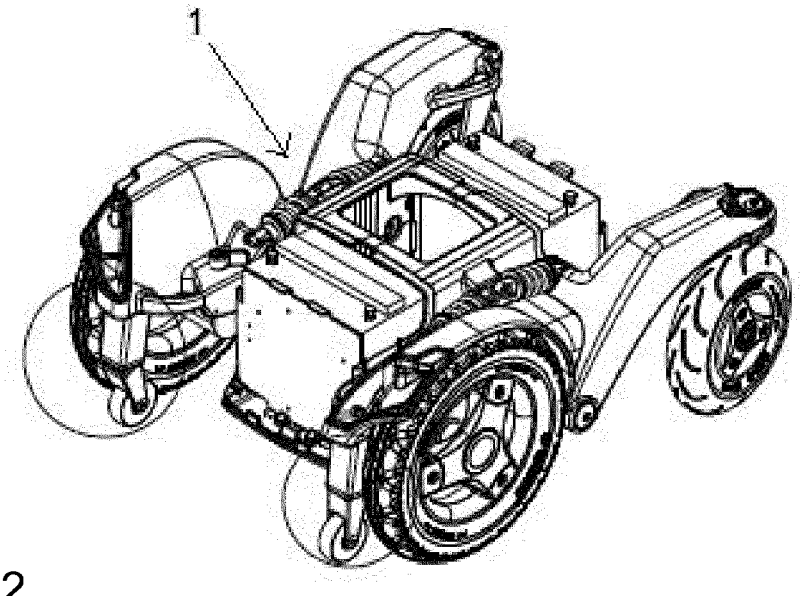

Fig. 2

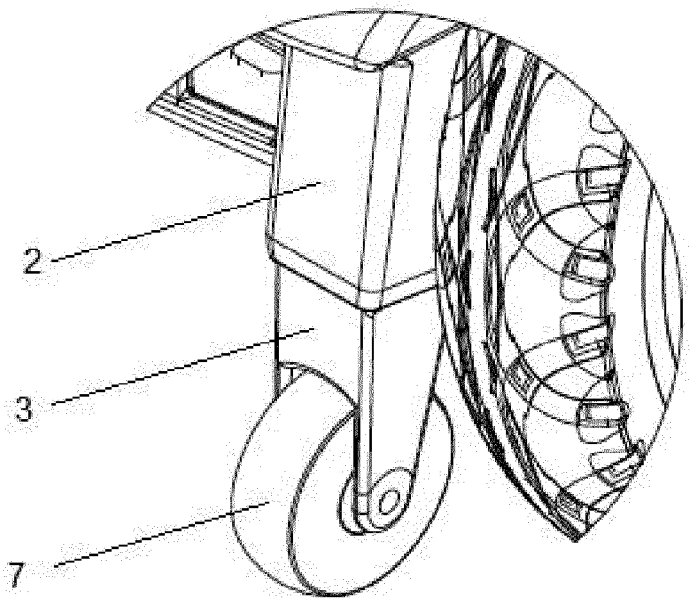

Fig. 3

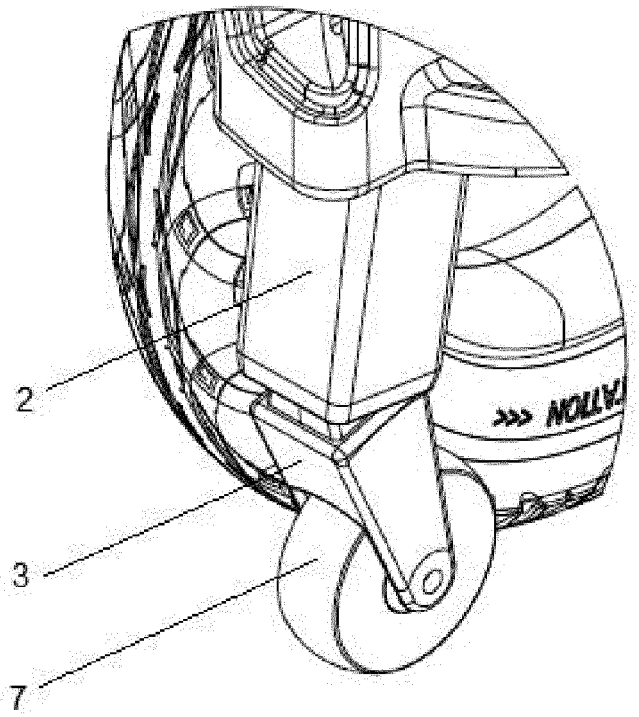

Fig. 4

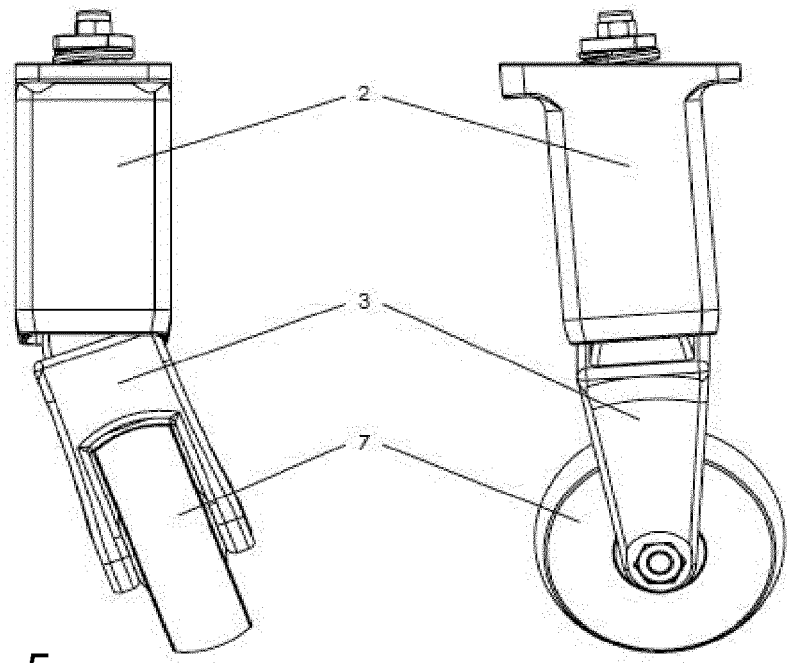

Fig. 5

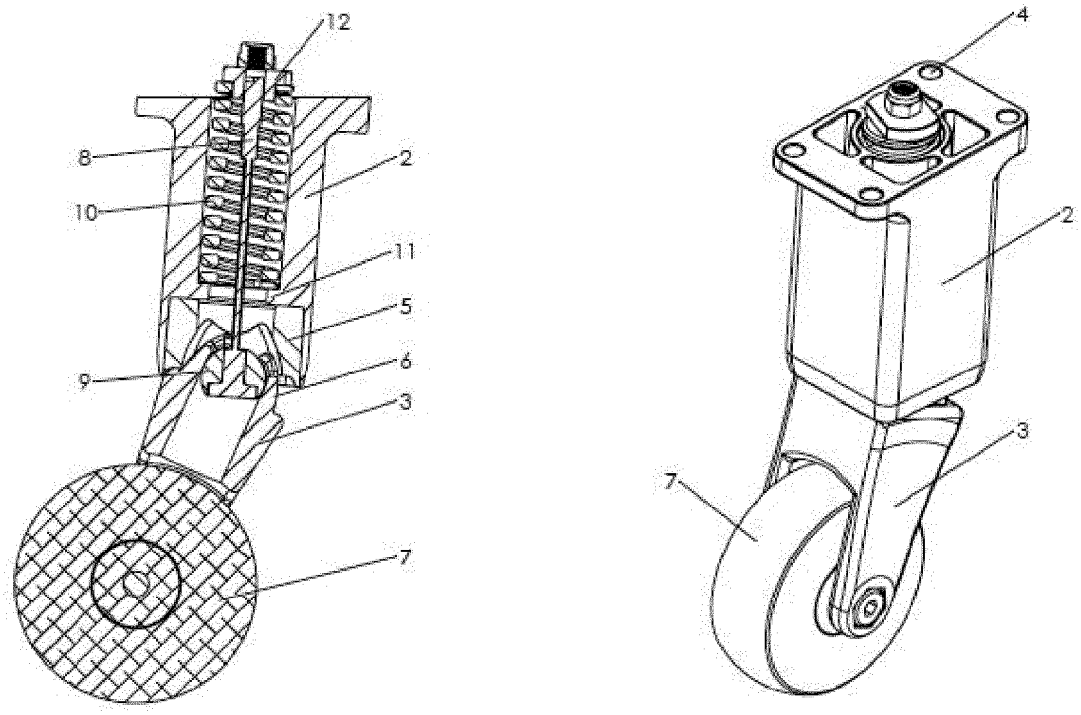

Fig. 6