



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
07.11.2001 Bulletin 2001/45

(51) Int Cl.7: **A61G 5/04**

(21) Application number: **01201584.8**

(22) Date of filing: **01.05.2001**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR
 Designated Extension States:
AL LT LV MK RO SI

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(30) Priority: **01.05.2000 NL 1015070**

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(54) **Wheelchair and undercarriage for a wheelchair**

(57) Described is an undercarriage comprising two bearing arms which extend parallel to each other and near at least one end thereof are each provided with a rotatable wheel, which bearing arms are connected to a first carriage part in a rotatable manner, and the bearing arms are interconnected at a distance from the first

carriage part by a first substantially rigid connecting arm which is connected to the two bearing arms in a vertically pivoting manner. The connecting arm is connected to the carriage, with the interposition of at least one spring element. An undercarriage for such a wheelchair is also described.

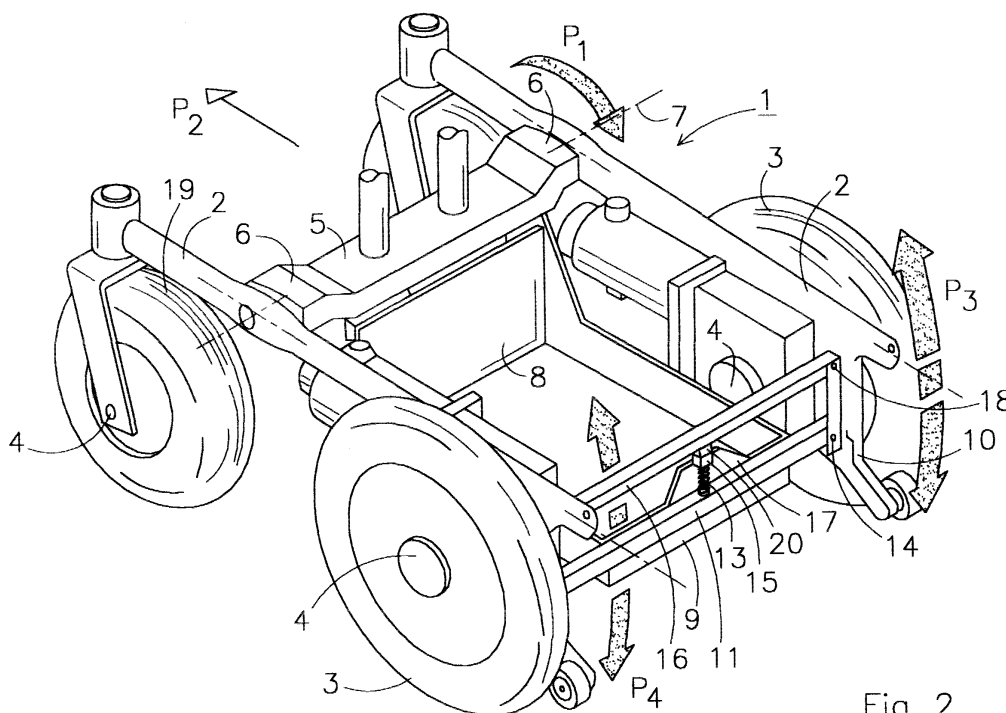


Fig 2

Description

[0001] The invention relates to a wheelchair, provided with an undercarriage comprising two bearing arms which extend parallel to each other and near at least one end thereof are each provided with a rotatable wheel, which bearing arms are connected, in a manner rotatable about an axis running crosswise to the bearing arms, to a first carriage part connected to the chair, and the bearing arms are interconnected at a distance from the first carriage part, and the wheels are movable vertically under spring tension relative to the carriage. The invention also relates to an undercarriage for such a wheelchair. A chair, in which a user can sit, can be mounted on this undercarriage.

[0002] Such a wheelchair is known from Dutch Patent NL-1002601. The two bearing arms are connected to each other by way of a leaf spring, the leaf spring also being connected in the centre to a rigid part of the undercarriage. Although uneven surfaces can be handled with such a wheelchair during travel, it appears that the leaf spring can come loose during travel, with the result that all comfort is lost. The leaf spring comes loose mainly during jerky movement of the wheelchair, for example when coming down from a kerb.

[0003] The invention provides a wheelchair in the case of which uneven surfaces are handled well without the abovementioned disadvantages. To this end, the wheelchair is characterized in that the wheels are interconnected by a first, substantially rigid connecting arm, which is connected to the two bearing arms in a vertically pivoting manner, which connecting arm, with the interposition of at least one spring element, interacts in a pivoting manner with the abovementioned first carriage part, or with a second carriage part rigidly connected to the abovementioned first carriage part. Such a rigid connecting arm between the bearing arms causes virtually no torsion near its fixing to the bearing arms, so that the abovementioned problem of coming loose is avoided. In order to retain comfort, the connecting arm is connected by way of a spring element to the carriage, and in this case it has been found that the uneven surfaces are handled even better than is the case with the wheelchair from the prior art.

[0004] Special embodiments are described in the dependent claims.

[0005] The invention will be explained in greater detail with reference to the drawings, in which:

Figure 1 shows a perspective view of an undercarriage of a wheelchair according to the invention,
 Figure 2 shows a perspective view of a wheelchair according to another embodiment of the invention, in the disassembled state,
 Figure 3 shows a perspective view of a disassembled undercarriage of a wheelchair according to the invention,
 Figure 4 shows a perspective view of another un-

dercarriage of a wheelchair according to the invention,

Figure 5 shows a rear view of a wheelchair according to the invention, with a carriage according to Fig. 4,

Figure 6 shows a perspective view of a further undercarriage of a wheelchair according to the invention, and

Figure 7 shows a rear view of a wheelchair according to the invention, with a carriage according to Fig. 6.

[0006] Figure 1 shows an undercarriage 1 of a wheelchair, the chair of which, for the sake of clarity, is not shown. The undercarriage 1 comprises two arms 2, which extend parallel to each other and near each end are provided with a driven wheel 3. The wheels 3 are mounted in bearings 4 in such a way that they are rotatable relative to the arms. Swivelling wheels 19 are mounted on the other end of the two arms 2. The arms 2 are interconnected by means of a crossbar 5, which extends crosswise to the arms 2, each arm 2 being fixed in a pivoting manner to an end 6 of the crossbar 5, and being capable of pivoting relative to the crossbar 5 about an axis 7 running crosswise to the arms in a direction indicated by arrow P1. A chair (not shown) can be fixed on the crossbar 5. This fixing can be a rigid connection, but the chair can also be fixed to the crossbar 5, or to another part rigidly connected to the crossbar, with the interposition of spring elements. A second carriage part, battery container 8, is rigidly fixed to the crossbar 5. A battery can be accommodated in the battery container 8, for powering an electric motor, by means of which the wheels 3 can be driven. The battery container 8 extends from the crossbar 5 to beyond two wheels 3 situated opposite each other. A rigid connecting arm 11, which extends substantially parallel to the crossbar 5, is fixed between ends 10 of the arms 2. The connecting arm 11 is connected to the two arms 2 in a vertically pivoting manner by means of pivots 14. A coil spring 13 is provided in the centre of connecting arm 11, which coil spring is accommodated in a tight fit between arm 11 and a spring accommodation element 15, which is rigidly connected to a raised part 17 of edge 9 of the battery container 8. It is also possible for the ends of spring 15 to be fixed to element 15 and arm 11 respectively. Spring accommodation element 15 may, if desired, be fixed rotatably on edge 9, parallel to the face of edge 9. Although a coil spring is provided in the instance illustrated, other spring elements may also be used, such as, for example, a gas spring.

[0007] In another embodiment, shown in Figure 2, the bearing arms 2, just as in the exemplary embodiment of Figure 1, are connected by a first connecting arm 11, but are also connected by a second, rigid connecting arm 16 running substantially parallel to connecting arm 11. As in the instance shown in Figure 1, a spring element 13 is provided in the centre of arm 11, which spring

element is accommodated in a tight fit between spring accommodation element 15 and arm 11. Spring 13 interacts with spring accommodation element 15, which is rigidly connected to the raised part 17 of the edge 9 of battery container 8. A rotatable connection between spring accommodation element 15 and the battery container, as explained in the case of Figure 1, is also possible. For greater comfort during travel, a shock-absorbing element 20, made of a resilient material such as rubber, is fixed on spring accommodation element 15, on which shock-absorbing element arm 16 rests. Spring 13 thus rests on bar 9, and spring accommodation element 15, and consequently battery container 8, rests on spring 13. Bar 16 rests on shock-absorbing element 20. Connecting arm 11 is connected to bearing arms 2 by way of pivots 14, just as in Figure 1. Bearing arm 16 is connected to the two bearing arms 2 by way of pivots 18.

[0008] The embodiment shown diagrammatically in Figure 2, for the sake of clarity is shown in detail in the disassembled state in Figure 3, and requires no further comment.

[0009] The undercarriage 1 works as follows. When the wheelchair travels over uneven surfaces in the direction of arrow 2, the right wheel 3 of right bearing arm 2 moves in a direction indicated by arrow P3, and the left wheel 3 of the other bearing arm 2 situated opposite moves in a direction indicated by arrow P4, in the opposite direction to that of the arrow P3, in which process the crossbar 5 pivots about axis 7 in the direction indicated by arrow P1. The arms 2 in this case are moved in opposite directions to each other about axis 7. In this process, connecting arm 11 and, if present, connecting arm 16 will spring in or spring out relative to connecting point 15, connecting point 15 also acting as a pivot point. During the pivoting movement of the connecting arms 11 and 16, spring 13 can deform slightly, in other words it can describe a slightly arcuate movement in one plane, parallel to that of edge 9.

[0010] Figure 4A shows another undercarriage according to the invention. Bearing arms 42 are connected to a rigid first carriage part, battery container 48. Bars 46, on which swivelling wheels 43 are mounted, are rigidly fixed to battery container 48. Bearing arms 42 are rotatably mounted at the position of 47, along wall 49 of battery container 48. Ends 50 of bearing arms 42 are connected to driven wheels 51, only one of which is shown in the case illustrated. The drive is not shown. Near the ends 50, the bearing arms 42 are connected by way of substantially vertically extending rods 52 to a rigid connecting arm 53. Connecting arm 53 is connected to a downwardly extending V-shaped bracket 57, which is flattened off on the underside. A spring accommodation element 55 is fixed to the rear wall 56 of battery container 48. A spring 54 is accommodated in a tight fit between spring accommodation element 55 and the flat underside of bracket 57. The ends of spring 54 can also be fixed to bracket 57 and spring accommodation element 55 respectively.

[0011] Where there is a raised uneven surface at the position of the driven wheel that is not shown, said wheel is moved upwards, with the result that arm 53 is tilted about point 55 and sprung by spring 54, so that the opposite, shown wheel 51 is forced downwards and ensures a stable travel movement, in the case of which tilting of the chair (not shown) is minimized. All the above is shown in Figure 4B. This is also shown in the following Figure 5a. Here a wheelchair according to the invention is travelling over a flat road surface. Connecting arm 53 is situated in the virtually horizontal position. When the wheelchair travels over an uneven surface, as shown in Figure 5b, the right wheel 51 is moved upwards, with the result that connecting arm 53 is tilted, so that spring 54 is deformed. In this process, the left wheel 51 is forced downwards and thus remains in contact with the road surface, during which the chair 58 with seat 59 undergoes virtually no lateral tilting movement. After the uneven surface, arm 53 will be returned to the position shown in Fig. 5a by the spring action of spring 54.

[0012] Figure 6 shows an embodiment with two connecting arms 53 and 60, the carriage otherwise being substantially the same as that of Figure 4A. In Figure 6 the same reference numerals as those in Figure 4A are therefore used for the same or similar parts. This embodiment is characterized by the presence of two connecting arms 53 and 60, connected to each other by substantially vertically extending rods 62. Spring 54 is wedged between spring accommodation element 55 and the centre of connecting arm 60, while the ends of the spring 54 can also be fixed to the element 55 and/or arm 60 respectively. Spring accommodation element 55 is fixed to rear wall 56 of battery container 48. A shock-absorbing element 58, on which arm 53 rests in a shock-absorbing manner, is fitted on the spring accommodation element 55. The advantage of two connecting arms lies in obtaining increased firmness and stability during travel over uneven surfaces. The wheels can be fixed on the end of bearing arms 42, but can also be fixed to rods 62. The functioning during travel over an uneven surface is illustrated in Figure 6B, in the case of which the same happens as is described in the case of Figure 4B.

[0013] Figures 7a and 7b show a rear view of the carriage according to Figures 6A and 6B, in this case a chair 68 with seat 69 also being shown.

[0014] It goes without saying that the invention is not limited to the exemplary embodiments shown in the figures; for instance, the carriage can also be provided with only one swivelling wheel. Furthermore, instead of swivelling wheels, other types of controlling wheels may be fitted.

Claims

1. Wheelchair, provided with an undercarriage (1) comprising two bearing arms (2) which extend par-

allel to each other and near at least one end (10) thereof are each provided with a rotatable wheel (3), which bearing arms are connected, in a manner rotatable about an axis (7) running crosswise to the arms, to a first carriage part (5) connected to the chair, and the bearing arms are interconnected at a distance from the first carriage part, and the wheels (3) are movable vertically under spring tension relative to the carriage (5, 8), **characterized in that** the wheels (3) are interconnected by a first, substantially rigid connecting arm (11), which is connected to the two bearing arms (2) in a vertically pivoting manner, which connecting arm (11), with the interposition of at least one spring element (13), interacts in a pivoting manner with the abovementioned first carriage part, or with a second carriage part (8) rigidly connected to the abovementioned carriage part.

2. Wheelchair according to claim 1, **characterized in that** the arms are interconnected by the first and a second substantially rigid connecting arm (11 and 16 respectively), which arms run substantially parallel to each other. 20
3. Wheelchair according to any of the preceding claims, **characterized in that** the spring element (13) is connected in a pivoting manner to the first or second carriage part (5, 8). 25
4. Wheelchair according to any of the preceding claims, **characterized in that** the spring element comprises a coil spring (13). 30
5. Wheelchair according to any of the preceding claims, **characterized in that** at least one of the connecting arms interacts with shock-absorbing means, which shock-absorbing means are connected to the first or second carriage part. 35
6. Wheelchair according to any of the preceding claims, **characterized in that** the first carriage part is rigidly connected to a chair (58, 59). 40
7. Wheelchair according to any of the preceding claims, **characterized in that** the wheels (3, 51) interconnected by the connecting arm (11) are driven. 45
8. Wheelchair according to any of the preceding claims, **characterized in that** the two bearing arms (2) which extend parallel to each other are each provided near both ends (10) thereof with rotatable wheels (3, 19), which bearing arms are connected in a pivoting manner by a crossbar (5), and the connecting arm (11) is connected at a distance from the crossbar (5) to a part (8) rigidly connected to the crossbar, with the interposition of the spring element (13). 50
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9. Wheelchair according to any of the preceding claims, **characterized in that** the spring element is connected to the connecting arm near the centre of the connecting arm.

10. Undercarriage for a wheelchair according to one or more of the preceding claims.

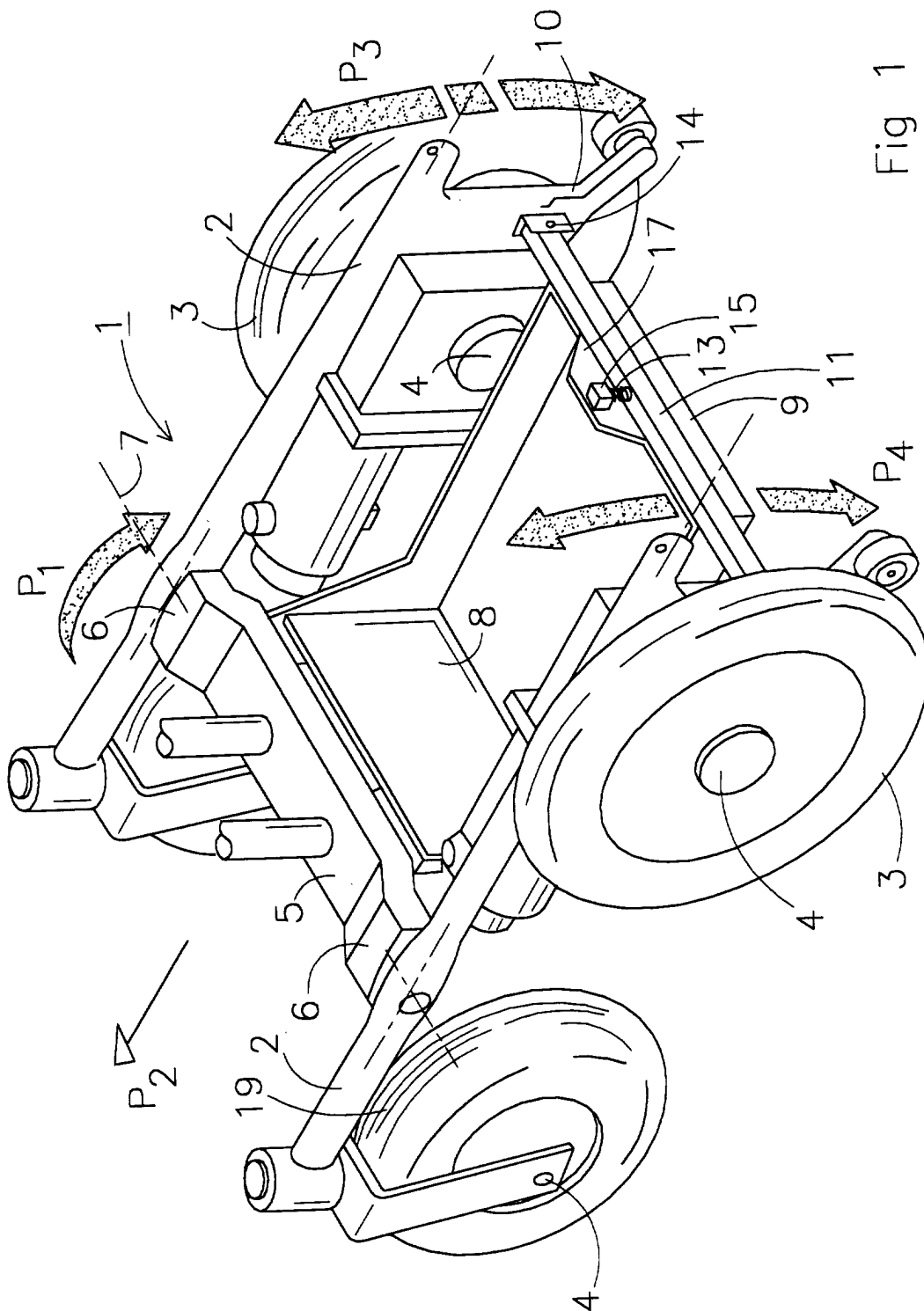


Fig 1

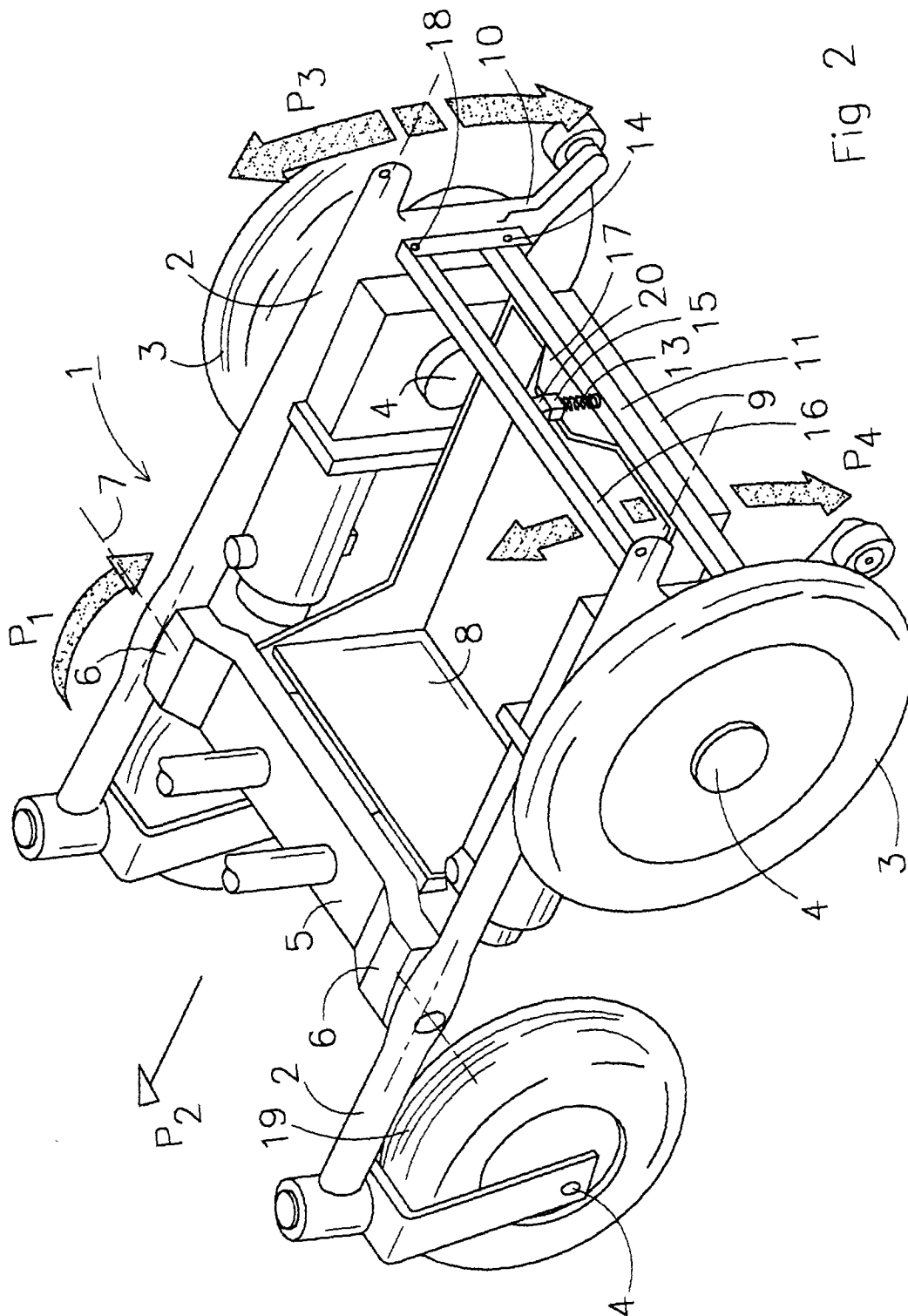


Fig 2

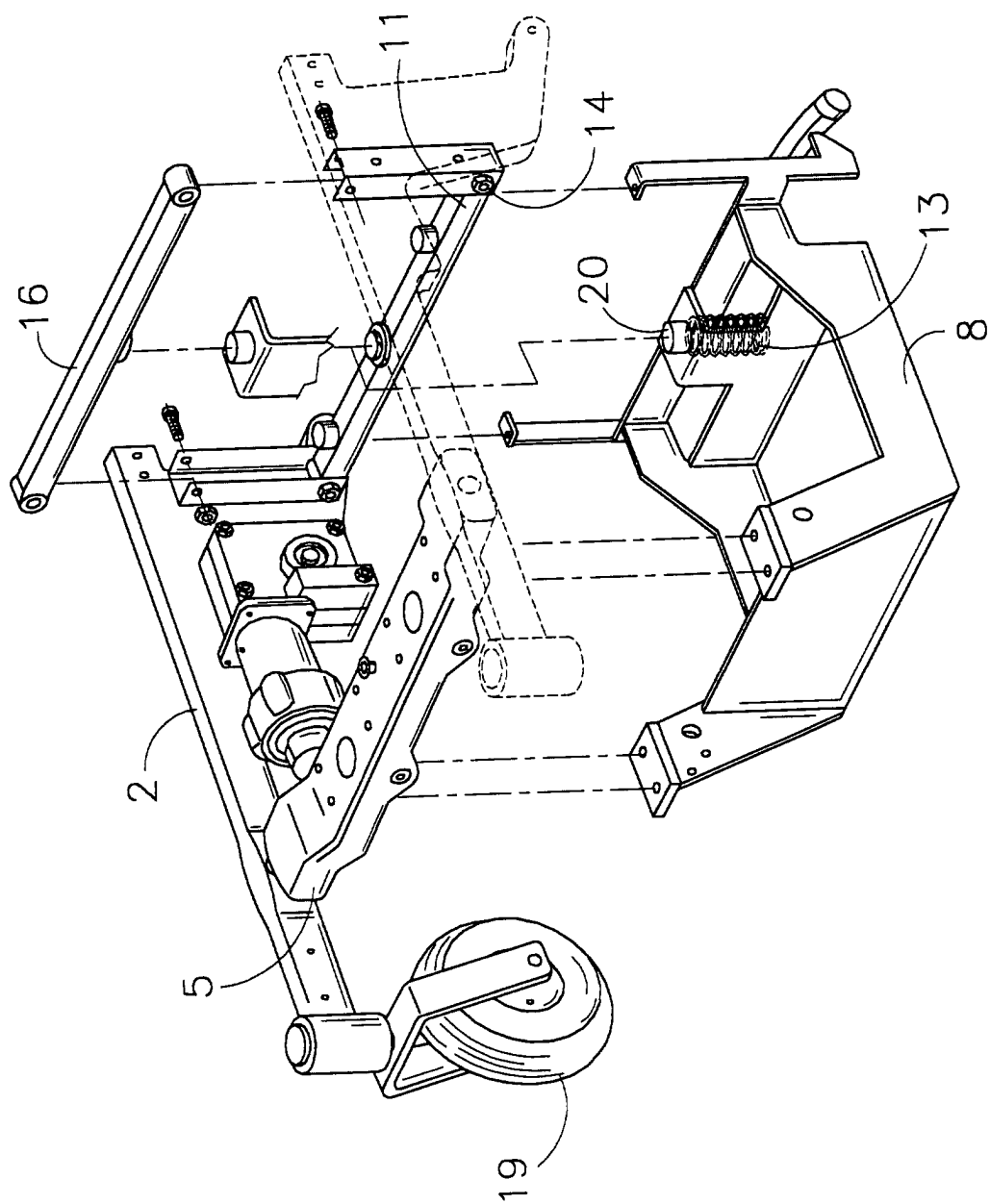


Fig 3

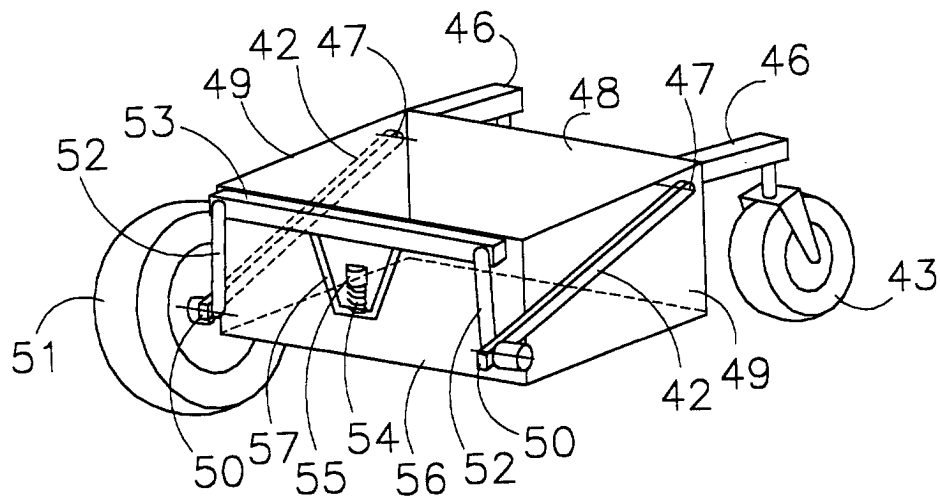


Fig 4A

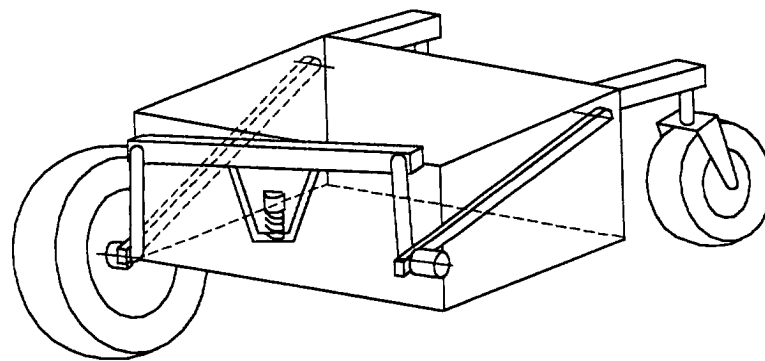


Fig 4B

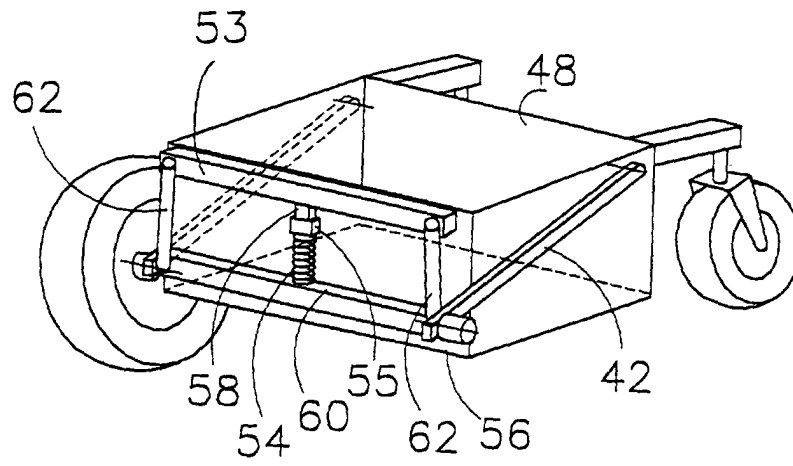


Fig 6A

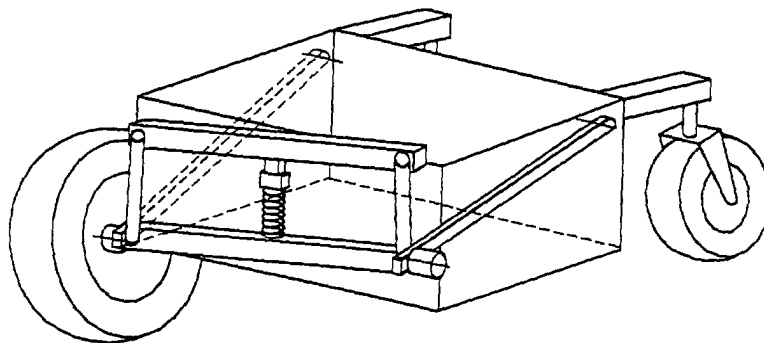


Fig 6B

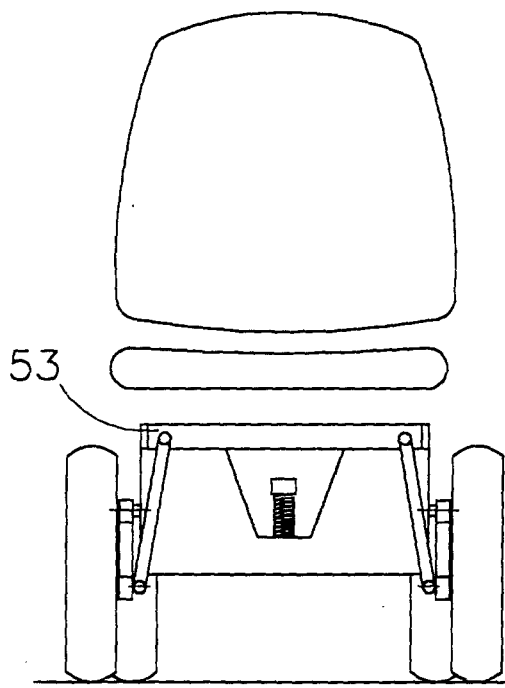


Fig 5a

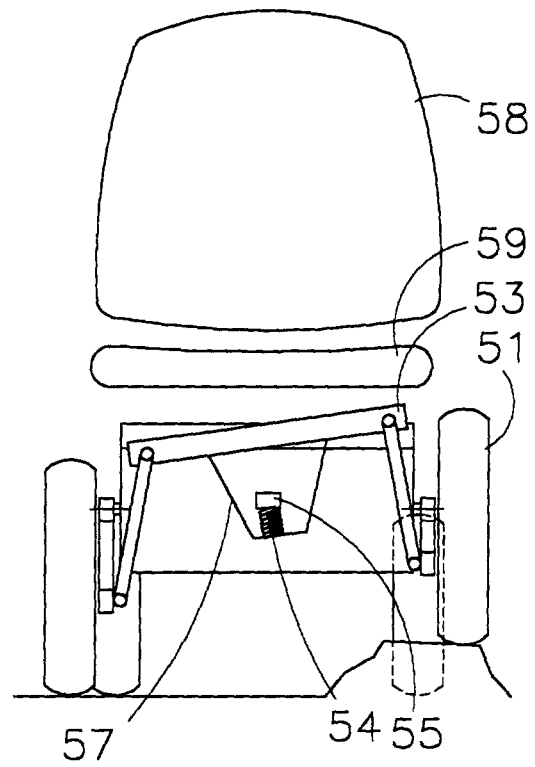


Fig 5b

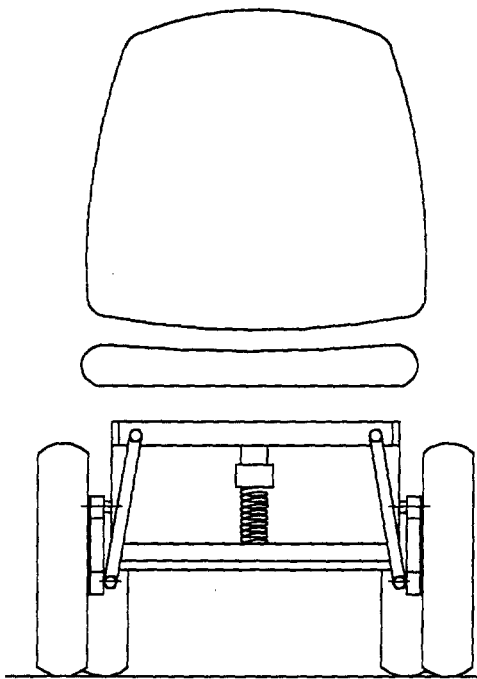


Fig 7a

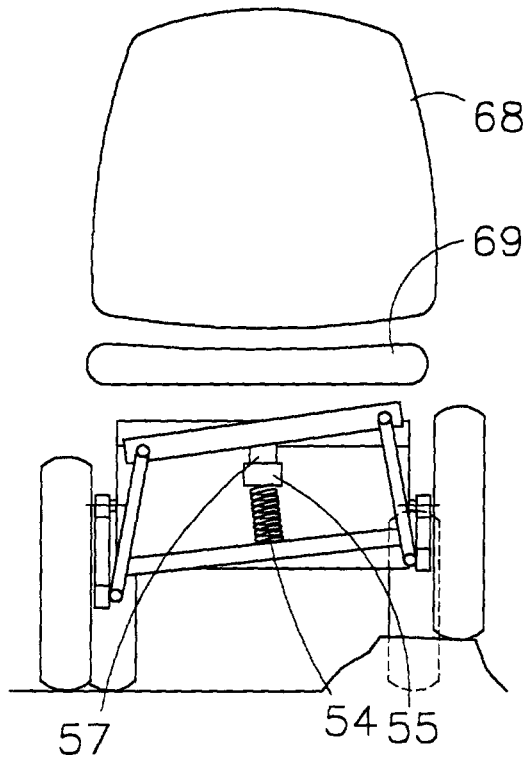


Fig 7b