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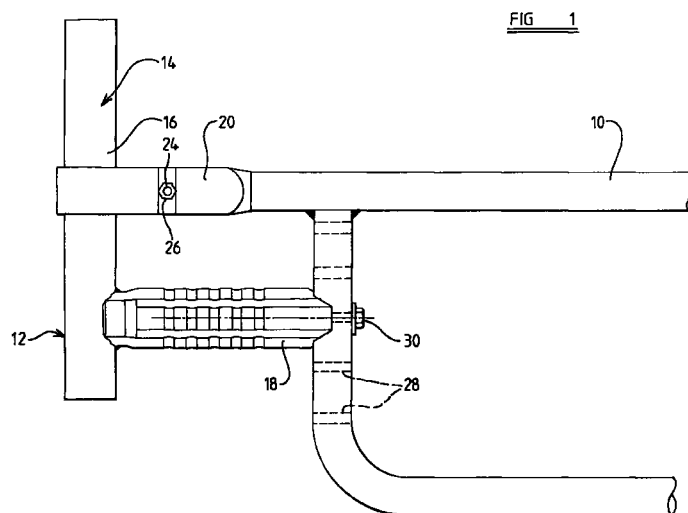
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(54) **Wheelchair**

(57) A wheelchair is described having a frame (10) and two axle assemblies (12), one for mounting each of two drive wheels to the frame by means of their associated axle. Each of the axle assemblies comprises a frame portion (14) including an axle block (18); means

for connecting the frame portion (14) to the frame in a plurality of positions; and means for securing a drive wheel axle to the axle block (18).



**FIG 1**

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## Description

**[0001]** The invention relates to an improved wheelchair, and in particular although not exclusively to a lightweight foldable wheelchair.

**[0002]** Lightweight foldable wheelchairs are known in the prior art in a wide range of forms. In some such chairs, if it is desired to change the camber of the wheels it is a lengthy job requiring the use of tools and the complete removal from the chair of an axle block retained by, for example, four nuts and bolts. The axle block is then refined with different packing washers as necessary for the required camber. In other such chairs the camber of the wheels can be altered rapidly without the use of tools, such as described in the International Patent application published under number WO 96/19961.

**[0003]** Clearly, chairs of the first kind rarely have the camber of their wheels adjusted due to the complexity of the task. Chairs of the second kind may have the camber of their wheels altered regularly if the user wishes to use them for general use and sport, but the ease of camber alteration is provided at the expense of play in the wheel.

**[0004]** It is an object of the invention to provide an improved form of wheelchair which mitigates the above described problems.

**[0005]** According to a first aspect of the invention we provide a wheelchair having a frame and two axle assemblies, one for mounting each of two drive wheels to the frame by means of their associated axle, wherein each of the axle assemblies comprise a frame portion including an axle block; means for connecting the frame portion to the frame in a plurality of positions; and means for securing a drive wheel axle to the axle block.

**[0006]** Conveniently the means for securing a drive wheel axle to the axle block comprises an axle clamp adapted to be secured around the axle block, and having an opening for receipt of an axle and means to retain the axle in the opening.

**[0007]** Further the means for securing a drive wheel axle to the axle block may also comprise a camber block which co-operates with the axle block and axle clamp to provide the desired camber for the drive wheel.

**[0008]** Preferably the axle block is approximately circular in cross section having upper and lower curved faces and between them protuberances extending laterally, which provide substantially downwardly directed datum faces.

**[0009]** Conveniently the axle clamp has a substantially U-shaped portion adapted to locate around and extend upwardly or downwardly from the axle block and having on each inner surface first and second longitudinally extending recesses, the first recesses providing first stop faces and the second recesses providing second stop faces, the first and second stop faces being directed generally in opposite directions.

**[0010]** The axle clamp may further comprise,

extending from the central portion of the U-shape, a flange through which the opening for the axle is provided.

**[0011]** Preferably the means for securing a drive wheel axle to the axle block further comprises a camber block which is substantially X-shaped in cross-section having four arms.

**[0012]** Preferably the camber block provides on the end of each arm faces adapted to engage in use with a datum face of the axle block and a stop face of the axle clamp.

**[0013]** Conveniently the four arms of the camber block comprise two pairs of arms the arms of each pair being separated by a curved face adapted to be received about the axle block.

**[0014]** Preferably the stop faces and curved face of the two pairs of arms are adapted to provide for the axle clamp to be secured to the axle block at different angles thus providing different wheel cambers.

**[0015]** The two pairs of arms of the camber block may provide wheel cambers of 0 degrees and 3 degrees respectively.

**[0016]** An example of a wheelchair according to the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

FIGURE 1 is a lateral view of a rear portion of a frame of a wheelchair according to the invention;

FIGURE 2 is a cross-section through an axle assembly of a wheelchair according to the invention;

FIGURE 3 is a lateral view of the axle assembly of Figure 2, and

FIGURE 4 is a cross sectional view of a camber block of the axle assembly of Figures 2 and 3.

**[0017]** Referring to the Figures a lightweight foldable wheelchair has a frame 10, of which a rear portion is shown in lateral view in Figure 1. An axle assembly 12 comprises a frame portion 14 which includes a substantially upright member 16 and a substantially horizontal axle block 18 and which can be secured to the frame 10. The frame portion 14 is secured to the frame 10 by means of a frame connection member 20 which provides an opening through which the upright member 16 is passed, the frame connection member having a single hole 24 for receipt of a bolt 26 or the like. The frame connection member 20 may conveniently further include a nut retaining means (not shown) for a nut to co-operate with the bolt 26, and such that the minimum number of tools is required for connection to be effected. The frame connection member 20 is formed of resilient material and of such form so that when the bolt 26 is lightened up the frame connection member 20 grips the upright member 16 and retains it in the required position. The frame connection member 20 may conveniently be made of aluminium.

**[0018]** One end of the axle block 18 is attached to

the upright member 16 by welding or other appropriate means dependent upon the materials involved. The frame 10 has a plurality of spaced apart through holes 28. The other end of the axle block 18 is secured to the frame 10 by means of a screw 30 which is received in one of the holes 28 and then in a threaded hole located in the end of the axle block 18.

**[0019]** Thus the frame portion 14 can be attached to the frame 10 at a plurality of positions, as determined by the holes 28, which each locate the axle block 18 at a different height with respect to the frame 10. This enables the height of the frame 10 with respect to the wheels to be altered as appropriate for the user of the chair, and this is done simply by slackening bolt 26 and removing screw 30 for each of the two frame portions 14, adjusting their positions and re-tightening the bolts 26 and replacing screws 30.

**[0020]** The rigidity of the frame 10 and frame portion 14 once assembled is ensured by the use of the bolt 26 and the screw 30 being located at right angles to each other, and by the inherent stiffness of the components. Further the end of the axle block 18 is shaped to fit around the frame 10, thus locating securely.

**[0021]** In Figures 2 and 3 an axle clamp 32 and camber block 34 are shown in place wound an axle block 18. The axle block 18 is roughly circular in cross-section but two protuberances 36 extend laterally, one on either side. Each protuberance 36 provides a substantially upwardly directed datum face 37 and a substantially downwardly directed datum face 38.

**[0022]** The axle clamp 32 comprises a substantially U-shaped portion 33a, which is shown located over and around the axle block 18, with its arms extending downwardly on either side. The inner surface of the arms each have first and second longitudinally extending recesses 39, 40. The first recesses 39, which are uppermost in Figure 2, provide first stop faces 41 which are directed generally into the U-shape. The second recesses 40, which are shown lowermost in Figure 2, provide second stop faces 42 which are directed generally in the opposite direction to the first stop faces 41.

**[0023]** The arms of the U-shaped portion 33a have aligned holes 31 through them for receipt of a bolt (not shown) as will be described later.

**[0024]** The axle clamp 32 further comprises, extending from the central part of the U-shaped portion 33a, in a direction away from the arms of the U-shaped portion 33a, a flange 33b. The flange 33b provides an opening 44 for receipt of an axle (not shown) associated with a wheel.

**[0025]** The camber block 34 is generally of X-shape in cross-section, as best seen in Figure 4, with four legs, in two pairs 45, 46. Each pair of legs 45, 46 is separated by a curved face 47, 48 shaped to fit around the axle block 18, either above or below. Each leg 45, 46 terminates in a foot 49 providing an inwardly directed stop face 50 or 52, and an outwardly directed stop face 51 or 53. The legs 45 are symmetrical about the centre of the

camber block 34 whilst the legs 46 are not, one being longer than the other. The inwardly directed stop faces 50, 52 are for engagement with the first and second stop faces 41, 42 as shown in Figure 2. The outwardly directed stop faces 51, 53 are for engagement with the datum faces 38 as shown in figure 2, or datum faces 37.

**[0026]** The camber block 34 further comprises a through hole 54 which, when the axle clamp 32 and camber block 34 are in position about the axle block 18 as shown in Figure 2 align for receipt of a bolt (not shown) to secure them in place and as tightened up with a nut, to pull the various components into their correct alignment, and to "lock out" any play or looseness in the assembly. This ensures that the wheelchair feels solid and secure in use, giving the user a greater feeling of confidence.

**[0027]** The axle clamp 32 and camber block 34 can be located above the axle block 18 as described above, or below in order to provide, to provide further options for the height of the wheels relative to the frame 10. Clearly when the axle clamp 32 and camber block 34 are located below the axle block they are the other way up.

**[0028]** The camber block 34 can be used either way up relative to the axle clamp 32. As shown in Figure 2, with the legs 51 and face 47 towards the axle block 18, and the stop faces 50 and 51 in contact with the stop faces 41 and datum faces 38 (or 37), the axle clamp 32 is substantially vertically oriented and a wheel once connected will have a camber of 0 degrees.

**[0029]** If the camber block 34 is used in the opposite orientation, with the legs 46 and face 48 towards the axle block 18, and the stop faces 51, 53 in contact with the stop faces 41 and datum faces 38 (or 37), the axle clamp 32 is oriented at substantially 3 degrees to the vertical and a wheel once connected will have a camber of 3 degrees.

**[0030]** Thus to alter the camber of a wheel all that is required is the removal of the wheel's axle from the opening 44, the removal of the nut and bolt from the axle clamp 32 and camber block 34, the removal, rotation and reinsertion of the camber block 34, the replacement of the nut and bolt, and finally the replacement of the axle into the opening 44. Hence this is a relatively simple and quick task requiring only a minimum of tools and provided without an undesirable degree of play in the wheel fixing to the frame 10, in contrast to the two forms of prior art described in the introduction.

**[0031]** The camber block 34 is an example only of camber blocks which could be used in the embodiment described, which provides a choice of 0 degree or 3 degree camber. Alternative camber blocks providing e.g. 1 degree or 4 degree camber, but using the same inventive concept, could clearly be provided. In that case neither pair of legs would be symmetrical as symmetry provides a camber of 0 degrees. Instead both pairs of legs would be asymmetrical, with the difference in leg lengths being such as to provide the desired cam-

ber angles.

**[0032]** In the present specification "comprise" means "includes or consists of" and "comprising" means "including or consisting of".

**[0033]** The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

## Claims

1. A wheelchair having a frame (10) and two axle assemblies (12), one for mounting each of two drive wheels to the frame by means of their associated axle, characterised in that each of the axle assemblies comprises:
  - a frame portion (14) including an axle block (18);
  - means for connecting the frame portion to the frame in a plurality of positions; and
  - means for securing a drive wheel axle to the axle block (18).
2. A wheelchair according to claim 1 characterised in that the means for securing a drive wheel axle to the axle block (18) comprises an axle clamp (32) adapted to be secured around the axle block (18), and having an opening (44) for receipt of an axle and means to retain the axle in the opening.
3. A wheelchair according to claim 2 characterised in that the means for securing a drive wheel axle to the axle block (18) further comprises a camber block (34) which co-operates with the axle block (18) and axle clamp (32) to provide the desired camber for the drive wheel.
4. A wheelchair according to any one of claims 1, 2 or 3 characterised in that the axle block (18) is approximately circular in cross section having upper and lower curved faces and between them protuberances extending laterally, which provide substantially downwardly directed datum faces (38).
5. A wheelchair according to one of claims 2, 3 or 4 characterised in that the axle clamp (32) has a substantially U-shaped portion (33a) adapted to locate round and extend upwardly or downwardly from the axle block and having on each inner surface first and second longitudinally extending recesses, the first recesses providing first stop faces (41) and the second recesses providing second stop faces (42), the first and second stop faces being directed generally in opposite directions.
6. A wheelchair according to claim 5 characterised in that the axle clamp (32) further comprises, extending from the central portion of the U-shape, a flange (33b) through which the opening (44) for the axle is provided.
7. A wheelchair according to claim 5 or 6 characterised in that the means for securing a drive wheel axle to the axle block (18) further comprises a camber block (34) which is substantially X-shaped in cross-section having four arms (45 and 46).
8. A wheelchair according to claim 7 characterised in that the camber block (34) provides on the end of each arm stop faces (51 and 53) adapted to engage in use with a datum face (38 and 37) of the axle block and a stop face (41 and 42) of the axle clamp.
9. A wheelchair according to claim 8 characterised in that the four arms (45 and 46) of the camber block (34) comprise two pairs of arms the arms of each pair being separated by a curved face (47 and 48) adapted to be received about the axle block.
10. A wheelchair according to claim 9 characterised in that the stop faces (50 and 52) and curved face (47 and 48) of the two pairs of arms (45 and 46) are adapted to provide for the axle clamp (32) to be secured to the axle block (18) at different angles thus providing different wheel cambers.
11. A wheelchair according to claim 10 characterised in that the two pairs of arms (45 and 46) of the camber block (34) provide wheel cambers of 0 degrees and 3 degrees respectively.
12. Any novel feature or novel combination of features described herein and/or in the accompanying drawings.

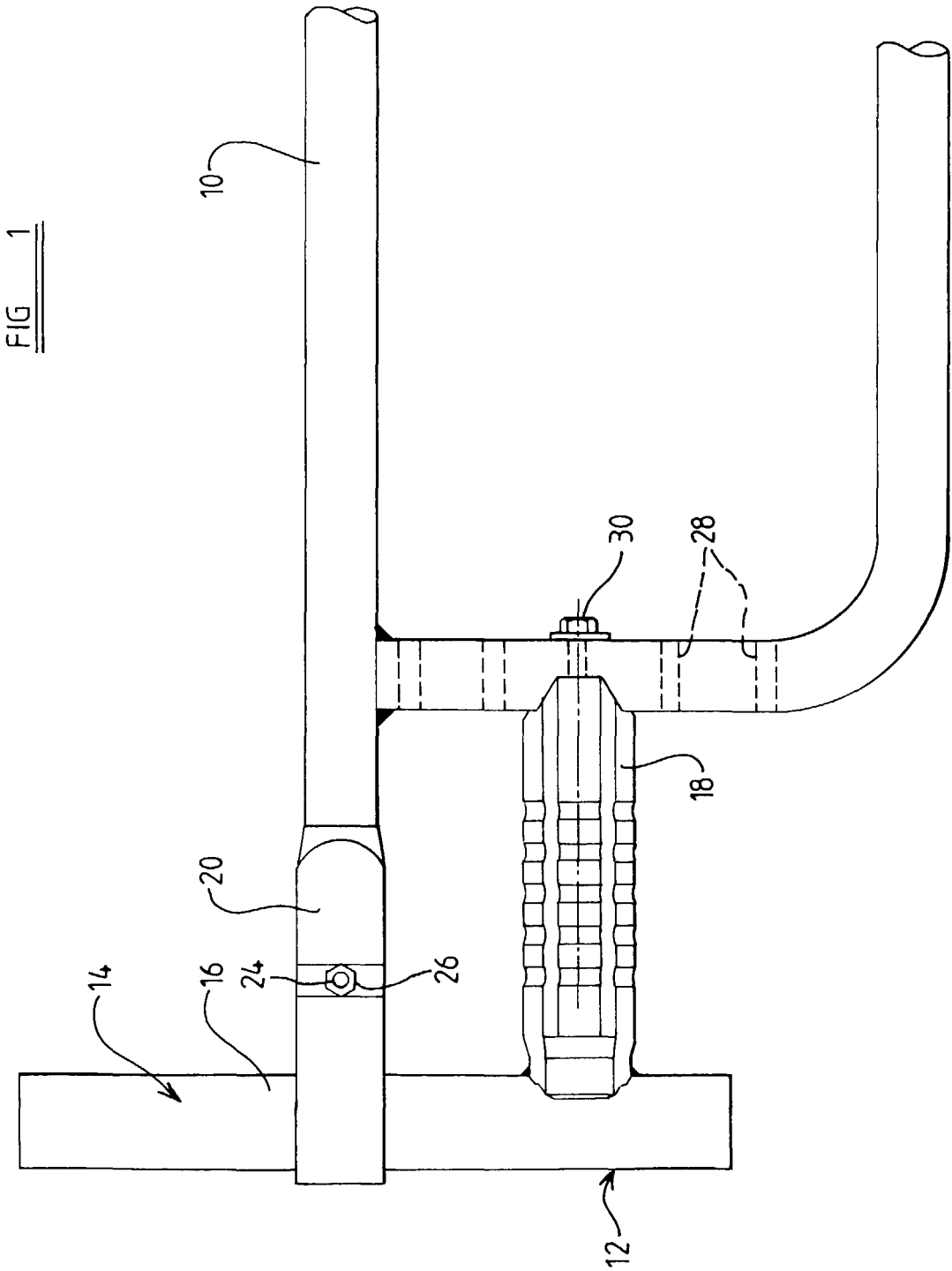


FIG 2

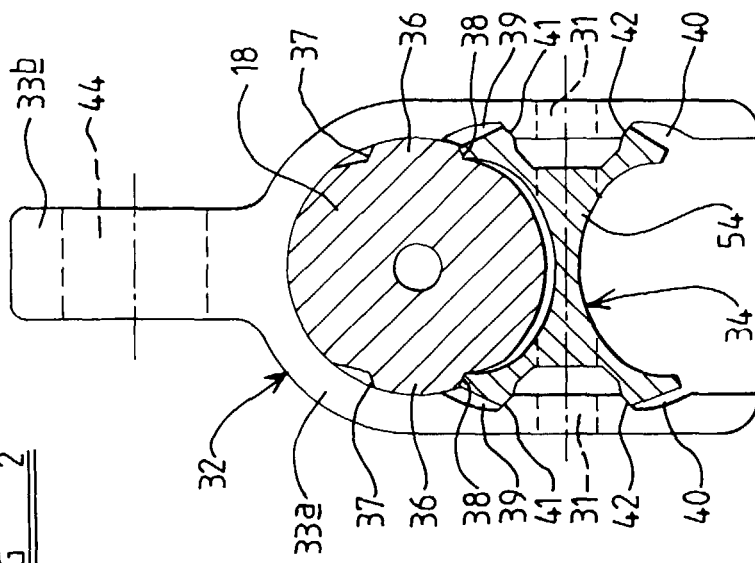


FIG 3

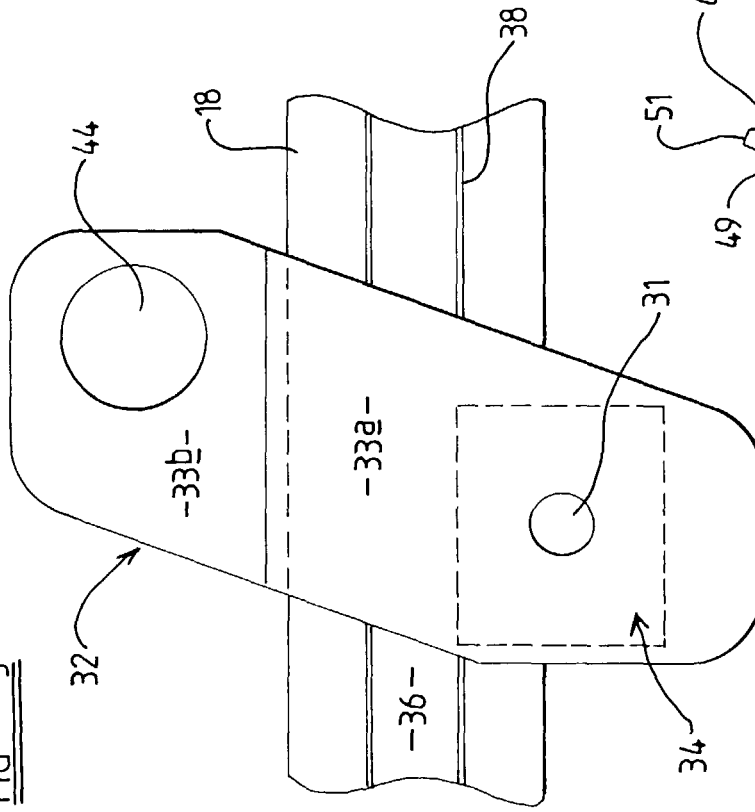


FIG 4

