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(54) Wheelchair.

(57) A wheelchair comprises a main frame (10) carrying front wheels (18), a battery pack (22), and a foot rest assembly (32, 34). The wheelchair is driven by means of a pair of rear wheel units each comprising a drive motor (24) and a rear wheel (20) mounted on a sub frame (42). Each rear wheel unit is removable, as a unit, by releasing fastenings (42,46) which secure the sub frame to rearwardly projecting extensions (66,68) of the wheelchair main frame. Preferably, kerb climbers are mounted on the foot rest assembly whereby the kerb climbers and foot rest assembly can be removed from the main frame as a unit. The kerb climbers are preferably pivotally mounted on the support members (34) and may be located either in a use configuration or in a storage configuration in which the kerb climbers do not extend forwardly beyond the pivotal connections with the support members (34).

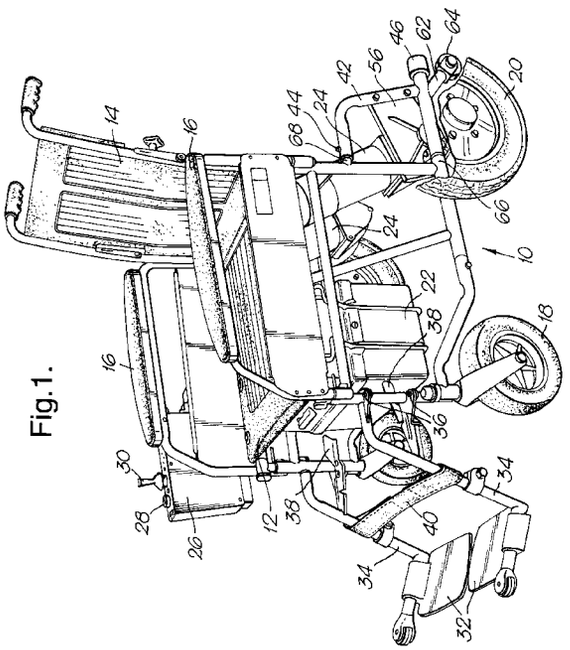

Fig.1.

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This invention relates to wheelchairs and more particularly to power driven unitary wheelchairs.

It is well known to provide power driven wheelchairs with arms, foot rests and a battery pack which can be removed from the main frame of the chair. However, the remaining main frame with the wheels and the motors is still a very heavy and bulky single item for lifting, transportation and storage.

According to one aspect of the present invention there is provided a wheelchair comprising a main frame having two front wheels, a battery pack and a drive unit, comprising two rear wheel units, each rear wheel unit being individually removably mountable on the main frame by means of quick release fastener means, and being releasably connectable to the battery pack.

Preferably, each rear wheel unit is provided with a drive motor.

In a preferred embodiment, the frame incorporates longitudinal support members which extend horizontally when the chair is in the use position, each rear wheel unit being mountable on at least one support member by means of mutual insertion in the direction of extension of the at least one support member.

In a particularly preferred embodiment, each rear wheel unit is mounted on two support members, the two members being vertically spaced apart when the chair is in the use position. Each rear wheel unit may be releasably mountable on one of the two support members by means of a spring-loaded catch.

Each rear wheel unit may be mounted on the other of the two support members by means of a screw connection.

Preferably the spring-loaded catch is provided on the upper of the two support members.

In a particularly preferred embodiment the main frame is additionally provided with removably mountable back, seat, arms and foot rests.

According to another aspect of the present invention there is provided a wheelchair comprising a number of components including a main frame having two front wheels, a battery pack, and two rear wheel units, each rear wheel unit being provided with a drive motor, wherein said components are detachable for dismantling the wheelchair into its component parts.

According to a further aspect of the invention there is provided a wheelchair comprising a main frame having two front wheels, a battery pack, a drive unit comprising two rear wheel units, and two swinging quadrant kerb climbers, each kerb climber being adapted to be pivotable about a respective pivot joint between a first operative position and a second inoperative position wherein each pivot joint comprises a torsion bush.

Preferably the torsion bush is formed of an annular rubber sleeve held between inner and outer rigid cylindrical sleeves which may be made of metal.

Each kerb climber is preferably connected to one of said inner and outer cylindrical sleeves of a respective pivot joint, the other of said inner and outer sleeves being supported on the main frame.

Each pivot joint preferably additionally comprises locking means and biassing means for biassing its respective kerb climber to engage with said locking means to hold the respective kerb climber in the first or second position.

In a particularly preferred embodiment, each kerb climber is connected to the inner cylindrical sleeve, the outer cylindrical sleeve being mounted on a foot rest which is removably mountable on the main frame.

According to yet another aspect of the present invention there is provided a foot rest for releasably mounting on a power driven wheelchair, the foot rest comprising a support member, a foot plate and swinging quadrant kerb climber mounted on the support member at a pivot joint comprising a torsion bush, the kerb climber being pivotable about the joint between a first operative position and a second inoperative position.

The present invention will now be described in more detail by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a general perspective view of a power-driven wheelchair;

Figure 2 shows a part of a rear wheel drive unit in detail;

Figure 3 shows in detail a further part for connecting a rear wheel drive unit to the wheelchair;

Figure 4A illustrates a front portion of a wheelchair showing a kerb climber in the operative position;

Figure 4B illustrates a front portion of a wheelchair showing a kerb climber in the inoperative position;

Figure 5 shows an exploded view of the kerb climber of Figures 4A and 4B;

Figure 6 shows a sectional view of the pivot joint of the kerb climber of Figure 5; and

Figure 7 shows an end view of the pivot joint of Figure 6.

Figure 1 illustrates a typical power driven wheelchair comprising, in general, a main frame 10, a seat 12, a back 14, arms 16, front wheels 18 and rear wheels 20. A battery pack 22 provides the power for two motors 24, one motor being associated with each rear wheel 20 to drive that rear wheel. A control unit 26 supported on one of the arms 16 provides a stop/start switch 28 and a directional control lever 30. Foot rest plates 32 are mounted on support members 34 for releasable attachment to the main frame 10 by means of pins 36 and a latch assembly 38. A strap 40 is provided between the support members 34 for preventing the feet of an occupant of the wheelchair from slipping down between the front wheels 18.

In accordance with the present invention, each rear wheel 20 and its associated drive motor 24 are supported on a rear frame portion 42 releasbly connectable to the main frame by way of a spring-biassed pin 44 and a screw locking connection 46. The rear frame portion can be seen in more detail in Figure 2, and comprises a straight tube 48 and an angled tube 50 attached to the straight tube 48, by welding or any other suitable means, at one end of one leg 52 of the angled tube. The other leg 54 of the angled tube extends parallel to the straight tube 48.

A plate 56 (see Figure 1) is connected to the rear frame portion 42 by means of bolts through holes 58 in the angled tube 50 and by means of mounting bracket 60 fixed to the straight tube 48. The plate 56 supports both a rear wheel 20 and its associated drive motor 24, such that the motor and rear wheel form a single unit. A further support member 62 may extend from the straight tube 48 to provide support for a rear anti-tipping wheel 64.

The main frame has rearwardly extending members 66 and 68 positioned to align with tubes 48 and 54 respectively such that the rear frame portion 42 can be slid over members 66 and 68. The spring-biassed pin 44 on member 66 is biassed to pass through hole 69 in the tube leg 54 to lock the rear frame portion 42 to the main frame 10. Because the connection between the rear frame portion and the main frame is formed by horizontally cooperating members and tubes, the connection is very firm and the spring-biassed pin is sufficient to maintain the connection. However, in order to provide a yet stronger connection with an additional degree of security, the screw locking connection 46 should also be utilised.

A sectional view of the locking connection 46 is shown in Figure 3. The rearwardly extending member 66 of the main frame is fitted with a plug 70 having a screw-threaded central bore 72. The locking connection comprises a cylindrical cap 74 having a knurled outer surface for ease of gripping, the cylindrical cap having an internal threaded stem 76. A washer 78 is slid over the threaded stem followed by a stepped bush 80. A nut 82 is then threaded on to the stem 76 and set with a preselected gap between the nut 82 and the bush 80. The bush 80 is chosen such that it is a press fit in the end of tube 48. The cap 74 can then be turned to screw the threaded stem into the bore 72 to lock the rear frame portion 42 to the main frame 10.

The rear frame portion 42, the rear wheel 20 and motor 24 are thus readily removable and reconnectable to the main frame by means of the spring-biassed pin 44 and the locking connection 46. Because the rearwardly extending member 66 extends further than the rearwardly extending member 68, it is easy for the tube 48 to be first located on member 66, the tube 54 then being aligned with member 68 for full connection.

The ability to remove each of the rear wheel units (rear frame portion 42, rear wheel 20 and motor 24) separately means that the wheelchair can be more easily carried or fitted into smaller spaces for storage or transportation, for example in the boot of a car.

In a particularly preferred embodiment, the arms 16, the back 14, the seat 12 and the battery pack 22 are each individually removable from the main frame 10, and the main frame itself is foldable to occupy minimum storage space.

In another preferred embodiment as shown in Figures 4A and 4B, each foot rest support member 34 also provides support for a swinging quadrant kerb climber 100.

Because the foot rests are removably mountable on the wheelchair main frame 10, the kerb climbers are also removably mountable on the wheelchair.

Each kerb climber comprises an arm 102 and an arcuate foot 104, the foot being provided with a rubber shoe 106 in the conventional way. The arm 102 is connected to the support member 34 at a pivot joint 108 to be described in more detail hereinafter. When the arm is in the operative position shown in Figure 4A and the front wheels 18 of the chair approach a kerb, the foot 104 will meet the kerb before the wheels and act to lift the front wheels smoothly over the kerb, as is already well known.

The present invention allows the kerb climbers to be moved from the operative to the inoperative position as shown in Figure 4B when the kerb climbing facility is not required e.g. indoors.

Referring now to Figures 5 to 7, the pivot joint 108 comprises a cylindrical housing 110 fixed to the support member 34 by welding or any other suitable means. A further cylindrical housing 112 is formed at the proximal end of the arm 102, having substantially the same outer diameter as housing 110 and having an extending portion 114 of smaller diameter which fits inside housing 110. A torsion bush connector 116 fits inside housing 110. The connector 116 has protruding stem 118 with flats 120 which fits through a cooperating aperture in housing 112, such that the stem 118 engages with the housing 112 and rotates with the housing 112. A nut 122 engages with screw threads 124 on the stem 118 to secure the connector 116 inside housings 110 and 112.

A pair of diametrically opposed slots 126 are provided in the free end of the housing 110, and two angularly spaced apart pairs of diametrically opposed slots 128 and 130 are provided in the corresponding free end of connector 116. A locating or locking strip 132 locates in the pair of slots 126 in the housing and in one of the two pairs of slots in the connector. An end cover 134 fits behind the locking strip 132 and is held in place by a pin 136 which extends through the locking strip, through the connector and into the interior of housing 112. Alternatively, the locking strip could be held to the end cover by welding or in any

other suitable way. A helical spring 138 is located between the nut 122 and a further nut 140 fitted on to the threaded end 142 of the pin 136. A press fit plug 144 is fitted into the end of the housing 122 to cover the internal parts of the pivot joint.

As can be seen most clearly in Figure 6, the connector 116 comprises an inner sleeve 146 extending to form the stem 118, and an outer sleeve 148, incorporating the slots 128 and 130, the inner and outer sleeves being connected together by means of an annular rubber bush 150.

When the pivot joint is in the position shown in Figure 6, any rotary movement of the kerb climber arm 102 about the axis 152 of the pivot joint rotates housing 112 and thus rotates inner sleeve 146 via flats 120. The locking strip 132 is located in the slots on both the outer sleeve 148 and on the housing 110 thus locking the outer sleeve to the housing to prevent rotation of the outer sleeve. The rubber bush 150 between the inner and outer sleeves 146 and 148 acts as a resilient torsion member resisting excessive rotation of the inner sleeve but permitting about 45 degrees of rotation between the inner and outer sleeves when the arm 102 rotates during kerb climbing, the rubber torsion bush then restoring the arm 102 to its operative rest position after kerb climbing is completed.

The use of such a rubber torsion bush produces a very smooth kerb climbing movement and the bush has proved to have a very long life.

When the kerb climber arm 102 is in the operative position shown in Figure 4A, the locking strip 132 is located in slots 126 on the housing 110 and in slots 128 in the connector 116, as shown in Figure 7, where the end cover 134 has been removed. In order to move the arm 102 to the inoperative position shown in Figure 4B, the arm and housing 112 are pulled longitudinally along axis 152 in the direction of arrow 154 against the bias of spring 138. This also pulls connector 116 in the direction of arrow 154 since the connector is joined to the housing 112 by the nut 122. Once the slots 128 in the outer housing 148 of the connector have disengaged from the locking strip 132, the whole connector is free to rotate with the arm 102 about axis 152 until the slots 130 in the outer housing are aligned with the locking strip 132. Spring 138 then biasses the connector 116 in the direction opposite to that of arrow 154 to locate slots 130 over the locking strip to hold the connector, and therefore the housing 112 and the arm 102 in the inoperative position shown in Figure 4B.

Although the kerb climbers of the present invention have been described with reference to a unitary collapsible wheelchair, clearly they could be fitted with only minor modifications to any other power-driven wheelchair. However, the embodiment of the invention described above is particularly preferred since it provides a wheelchair which can be fully dismantled into easily Portable component parts for storage and transportation.

Claims

1. A wheelchair comprising: a main frame having two front wheels; a battery pack; and two rear wheel units, each rear wheel unit including a wheel and a drive motor which, in use, drives the wheel by means of power derived from the battery pack, the rear wheel units being individually removably mounted on the main frame by means of quick release fastener means, and being releasably connected to the battery pack.

2. A wheelchair according to Claim 1 wherein the frame incorporates longitudinal support members which extend horizontally when the chair is in the use position, each rear wheel unit being mountable on at least one support member by means of mutual insertion in the direction of extension of the at least one support member.

3. A wheelchair according to Claim 2 wherein each rear wheel unit is mounted on two said support members, the support members being vertically spaced apart when the chair is in the use position.

4. A wheelchair according to Claim 3 wherein each rear wheel unit is releasably secured to one of its associated support members by means of a spring loaded catch.

5. A wheelchair according to Claim 3 or Claim 4 wherein each rear wheel unit is releasably secured to the other of its associated support members by means of a screw-threaded connection.

6. A wheelchair comprising: a main frame having two front wheels; a battery pack; drive means comprising two rear wheel units; and two swinging kerb climbers, wherein each kerb climber is pivotable about a respective pivot axis between a first operative position and a second inoperative position.

7. A wheelchair according to Claim 6 wherein each kerb climber is mounted by means of a torsion bush comprising an annual rubber sleeve held between inner and outer rigid cylindrical sleeves, which may be of metal, one of the inner and outer sleeves being secured to the kerb climber and the other of the inner and outer sleeves being secured to the portion of the wheelchair on which the kerb climber is mounted.

8. A wheelchair according to Claim 7 wherein the said other of the inner and outer sleeves is securable to the portion of the wheelchair on which the kerb climber is mounted in two alternative positions to provide, respectively, the first and second positions of the kerb climber.

9. A wheelchair according to any one of Claims 6 to 8 wherein each kerb climber is connected to a foot rest assembly of the wheelchair which, in turn, is removably mounted on the main frame whereby each kerb climber and its associated foot rest assembly may be removed, as a unit, from the remainder of the wheelchair.

10. A wheelchair comprising a frame and at least one foot rest assembly releasably mounted on the wheelchair frame, the foot rest assembly comprising a support member, a foot plate, and a swinging kerb climber mounted on the support member by a pivot joint comprising a torsion bush, the or each kerb climber being pivotable about the pivot joint between a first operative position and a second inoperative position.

Fig.1.

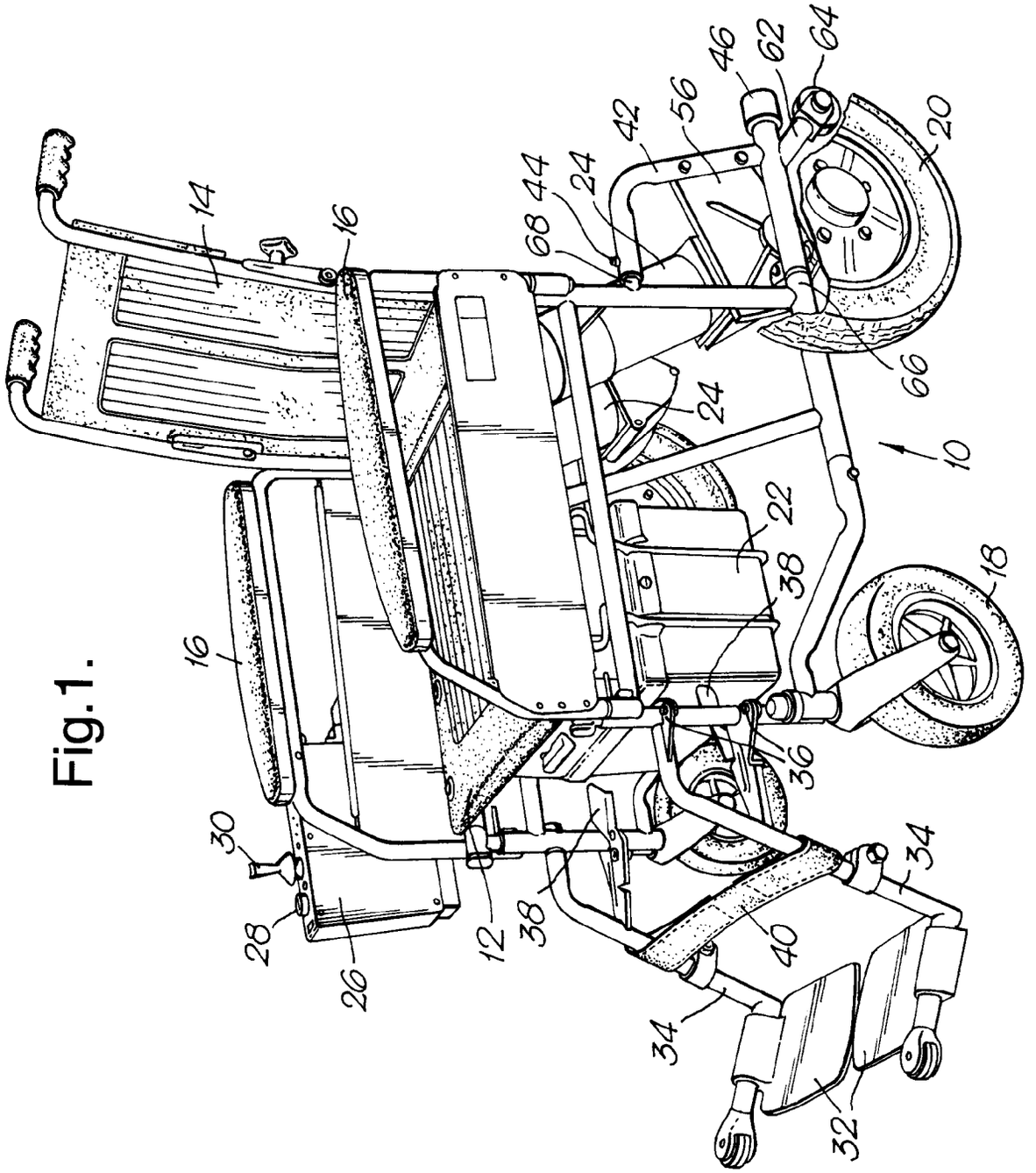
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Fig.2.

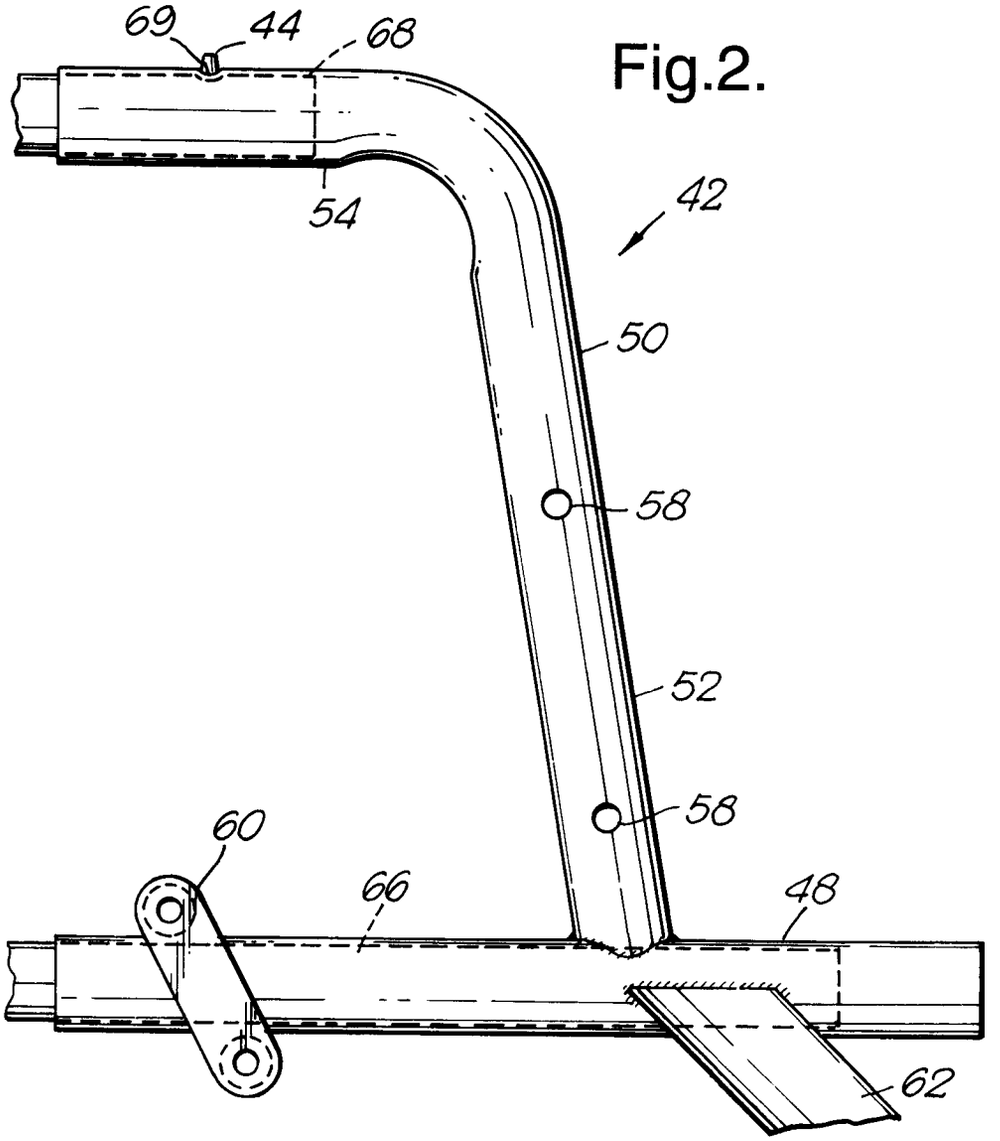

Fig.3.

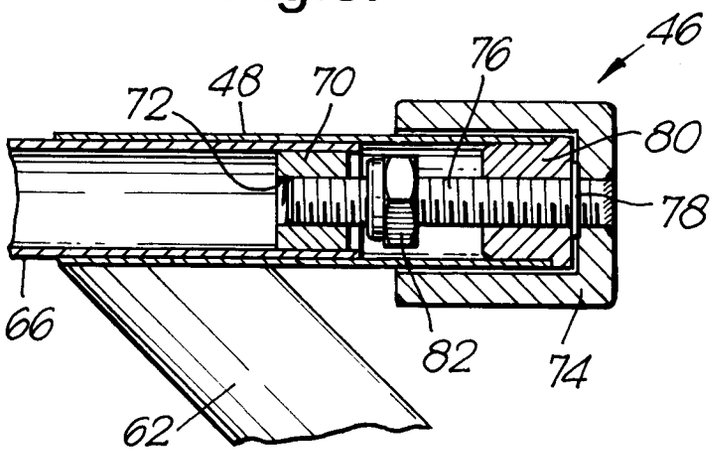

Fig.4A.

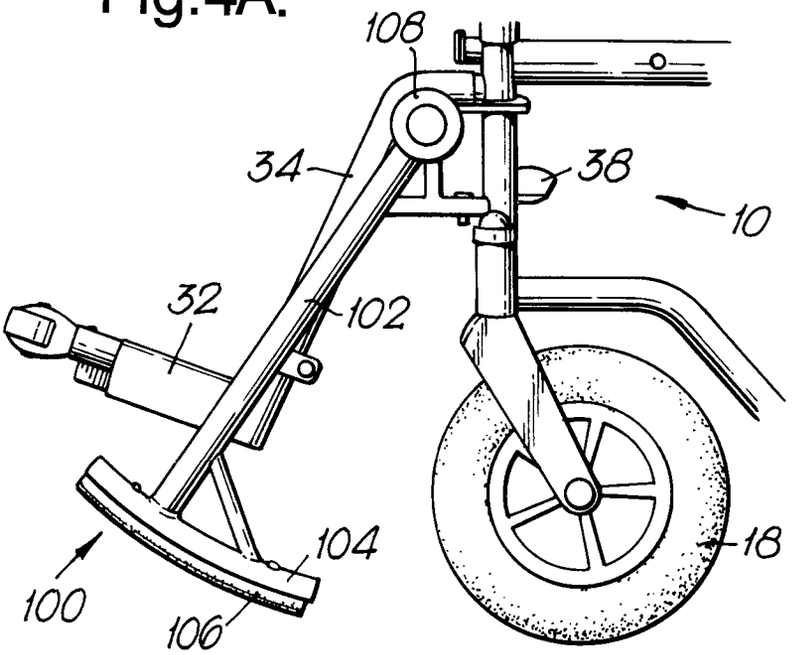

Fig.4B.

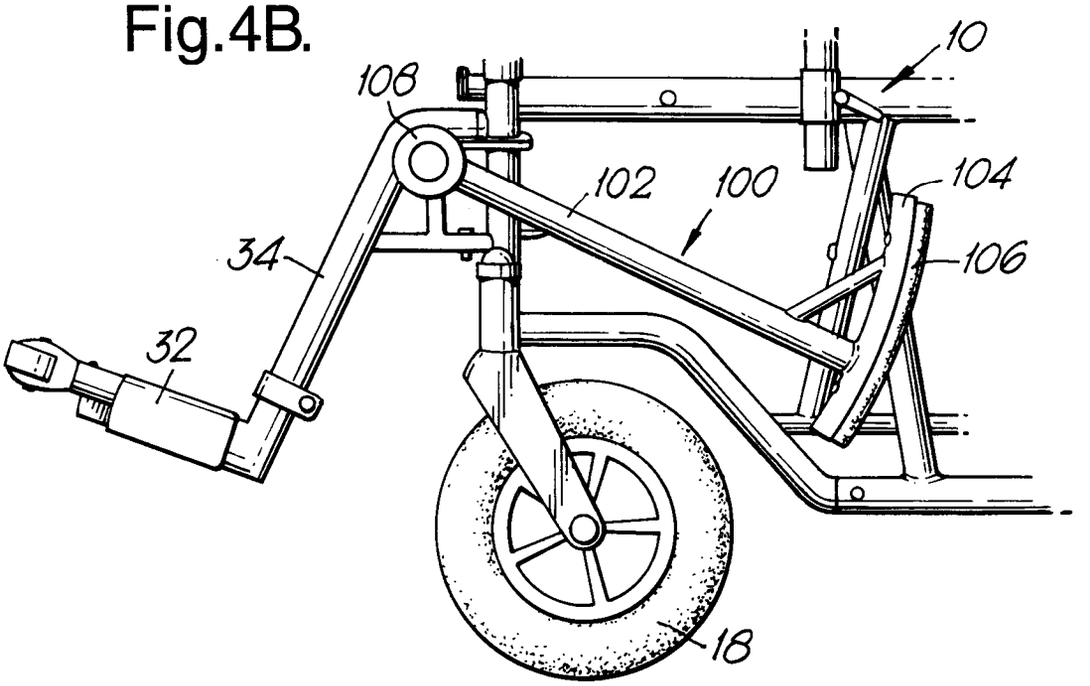

Fig.5.

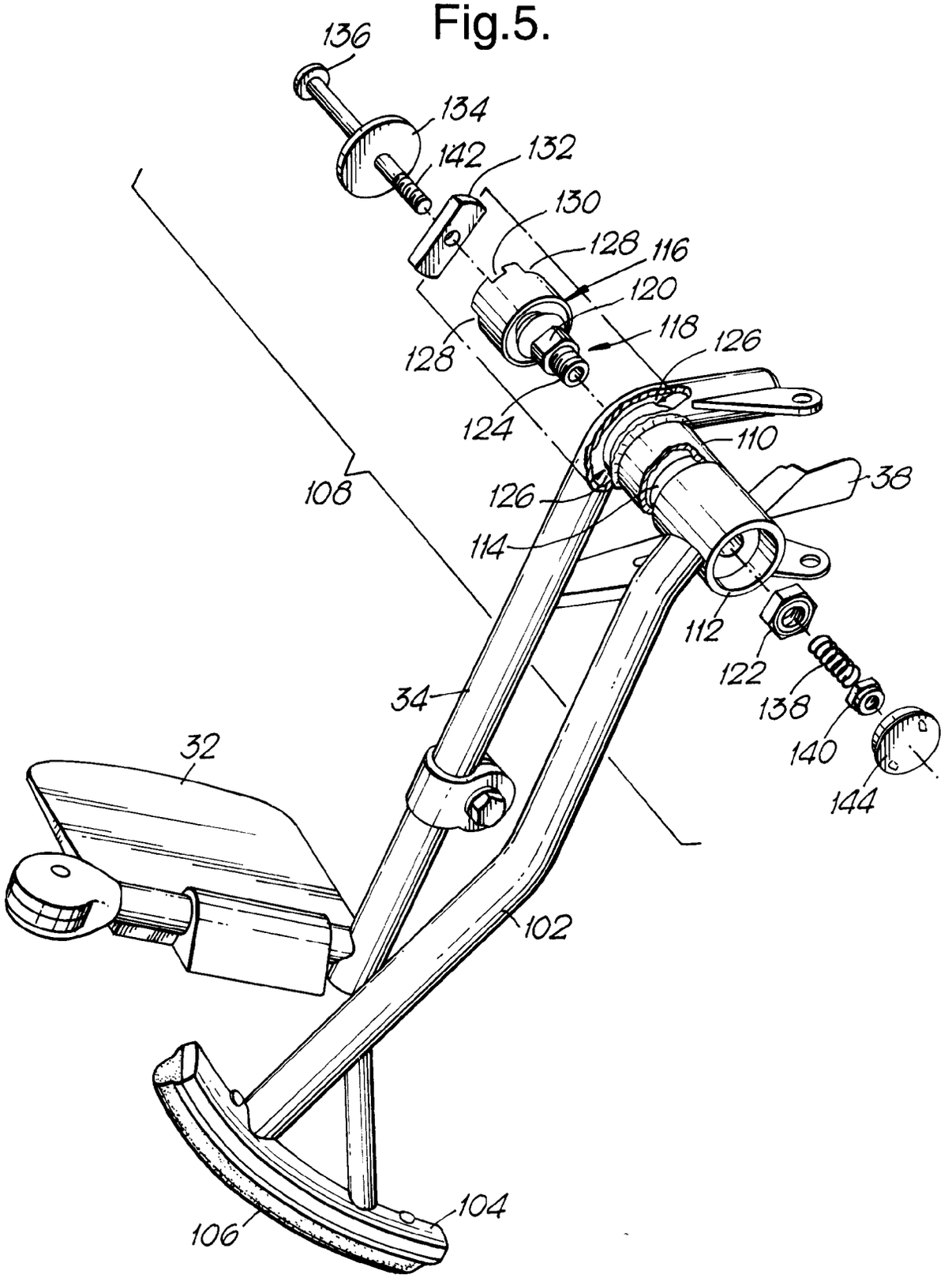
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Fig.6.

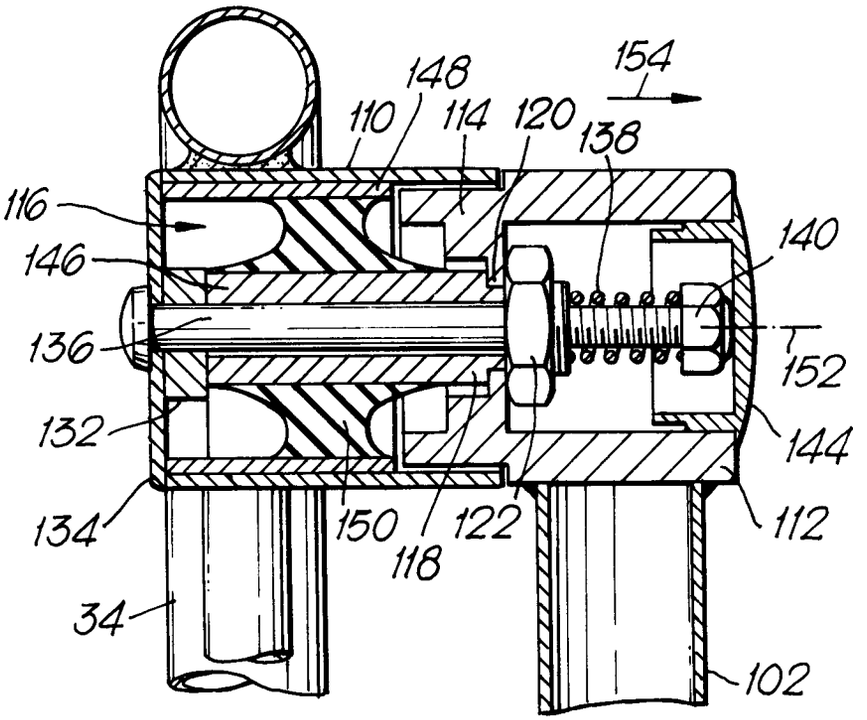
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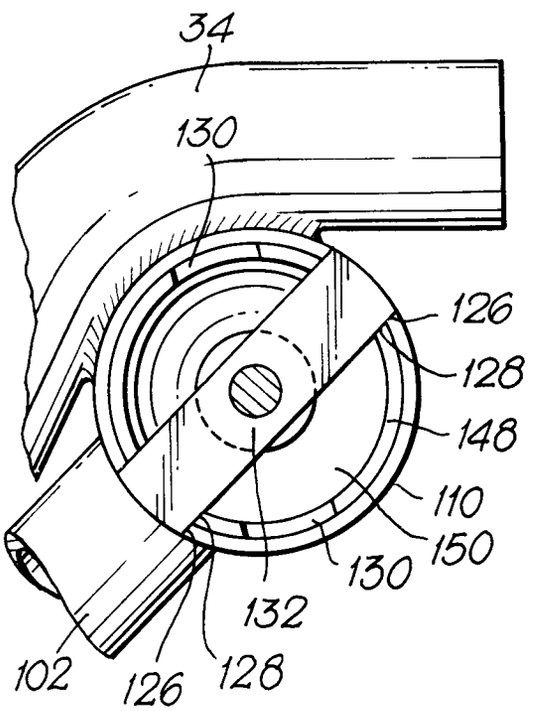
Fig.7.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