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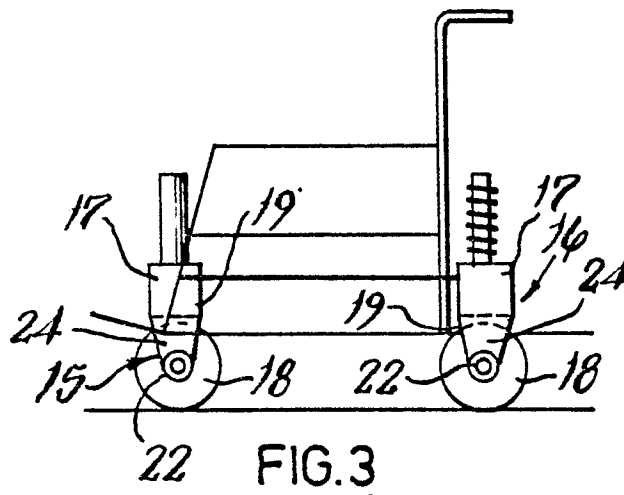
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(54) **Adapting vehicles to powered drive.**

(57) There is provided a method for adapting a vehicle to powered drive comprising fitting to the vehicle a self-contained drive unit (15,16) including a motor (17) driving a ground-engaging wheel (18).



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ADAPTING VEHICLES TO POWERED DRIVE

This invention relates to adapting vehicles to powered drive. Typical vehicles to which this invention relates are wheel-chairs.

Powered wheel-chairs are of course well known, but they are expensive and in general suitable more for outdoor than indoor use. Many of them do not fold for transportation, and negotiating kerbs is a problem for others.

The present invention provides means by which a non-powered wheel-chair or other non-powered vehicle such as a goods trolley as might be used for stacking supermarket shelves can be adapted to powered drive.

The invention comprises a method for adapting a vehicle to powered drive comprising fitting to the vehicle a self-contained drive unit including a motor driving a ground-engaging wheel.

Such self-contained drive units may be fitted to both front and rear of the vehicle.

At least one of such units may be steerable and may include a suspension arrangement. The drive unit or units may be applied additionally to a wheel-chair or by removing some wheels thereof and fitting the unit or units in place thereof. A steerable drive unit fitted to the front of the vehicle may be adapted to be steered by the occupant of the wheel-chair or by an attendant controlling the wheel-chair from behind. The steering may be powered by a reversible motor acting through a gear arrangement.

The motor, like all wheel-chair motors, is desirably an electric motor, and provision needs also to be made to carry battery power therefor.

The invention also comprises a drive unit for adapting a vehicle to powered drive comprising a casing or framework housing an electric motor and a ground-engaging wheel driven thereby said casing being adapted for fitting to a vehicle to be adapted.

A drive unit for a wheel-chair may comprise a resilient suspension between the motor and ground wheel on the one hand and an attachment arrangement to the vehicle on the other.

An additional ground wheel or wheels may be provided which are not driven by the motor. Said additional wheel or wheels may be mountable on an attachment arrangement to the vehicle and may also have a resilient suspension.

In particular, a drive unit for converting a wheel-chair to powered drive may comprise a motor driving a ground-engaging wheel and mounted on a plate or beam with a resilient suspension from attachment means for attaching the plate or beam at the positions of attachment of the rear wheels of the wheel-chair and in place thereof, and, addi-

tional, non-driven ground-engaging wheels having a free castor action also attached to said attachment means by a resilient suspension. Said resilient suspension may include coil spring means as well as shock absorber means in the form of a gas strut.

Another drive unit for converting a wheel-chair to powered drive may comprise a motor driving a ground-engaging wheel attached to plate or beam connected to the wheel-chair at the position of attachment of the front wheels thereof and in place of the same, said motor and ground-engaging wheel being mounted for rotation about a vertical axis and being connected to a steering arrangement, which may comprise a column with a wheel or tiller located for the occupant and may also comprise a transmission to a wheel or tiller at the rear of the wheel-chair for use by an attendant. Such an arrangement may have resilient suspension means between the plate and the wheel-chair.

It will be understood that the adaptation of other vehicles can be effected in similar fashion to wheel-chairs, though it will not always be necessary or even desirable to remove existing wheels, and the adaptation of the unit to be fitted to different vehicles will not necessarily be universal so that special sizes and arrangements will be required to suit the vehicles to be adapted.

The adaptation of existing un-powered wheel-chairs is however seen as being particularly beneficial particularly when two drive units are arranged fore and aft, which makes it very much easier to negotiate kerbs than with any existing kind of powered wheel-chair, for which special attachments (known as Kerb Riders - a trade mark) are sometimes resorted to.

Embodiments of drive units and methods for adapting a vehicle to powered drive will now be described with reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic side elevation of an unpowered wheel-chair,

Figure 2 is a diagrammatic front elevation of the wheel-chair illustrated in Figure 1,

Figure 3 is a diagrammatic side elevation of the wheel-chair of Figures 1 and 2 adapted to powered drive,

Figure 4 is a diagrammatic rear elevation of the wheel-chair of Figure 3,

Figure 5 is a diagrammatic front elevation showing a forward drive unit,

and Figure 6 is a diagrammatic plan view showing a fore and aft steering arrangement.

The wheel-chair illustrated in Figures 1 and 2 comprises a frame 11 of a type which is foldable by moving the sides in towards each other for

storing or transportation for example in a car boot, and front and rear wheels 12, 13 respectively, of which the front wheels 12 are essentially castors and the rear wheels 13 are of larger diameter. Handles 14 at the top of the seat back are provided for an attendant, and the rear wheels 13 have handrims 10 for manual propulsion by the occupant.

The adaptation involves removing the wheels 12 and 13 and replacing them with drive units.

Self-contained drive units 15, 16 each including an electric motor 17 driving a ground-engaging wheel 18 are fitted in place of the regular wheels 12, 13. The drive units 15, 16 each comprise a casing or framework 19 housing the motor 17 and a bearing 22 for the ground-engaging wheel 18 (which will have a suitable tyre) and a belt or chain or gear transmission 24. The casing or framework 19 is adapted for attachment to the wheel-chair by having locating and fixing holes for bolts or other fixture means and is attached thereby to a plate or beam 25.

The rear drive unit is fixedly, mounted on its plate or beam 25 which in turn is mounted via a coil spring suspension arrangement 26 at each end to attachment members 27 fixed to the wheel-chair framework in place of the rear wheels 13. Also mounted in resilient suspension arrangements 28 in said attachment members 27 are free, castor type wheels 29. The suspension arrangements 28 can comprise gas strut or like shock absorbing devices.

The front drive unit 15 is mounted for steering movement about a vertical axis in a bearing 31 in the centre of the forward beam or plate 25 which is attached to the frame of the wheel-chair in place of the original castors 12. The plate or beam 25 is here slidable on vertical shafts 32 fixed in the wheel-chair and is constrained by further gas strut or like shock absorbing devices 33.

A steering column 34 projects upwardly from the bearing 31 connected directly to the casing 19 of the forward drive unit 15 and terminating in a wheel or tiller 35 at a position convenient for operation by the occupant. For operation by an attendant, a similar arrangement is installed at the rear on a cross-member 36 which has a bar 37 mounted for rotation on vertical axis, the bar 37 being connected to a like bar 38 fixed to the casing or framework 19 of the forward drive unit 18 by wires or pivoted rods 39 so that movement of the bar 37 about its vertical axis will be reflected in the like movement of the bar 38. A steering column and wheel or tiller like the arrangement already described can be fitted at the back - or for preference a single such column and wheel or tiller can be provided which is readily engaged in the front or rear mounting as desired.

Further castors (not shown) can be provided in

place of the original castors 12 at the front for improved stability - or the original ones refitted if this is still possible.

A battery compartment (not shown) can be fitted beneath the wheel-chair seat or in any other conventional position, and the usual motor controls and braking arrangements also installed.

It will be appreciated that the arrangement described can be manufactured to adapt many different manually driven wheel-chairs to powered drive and it will be found that the fore and aft motor arrangement will contribute greatly to the ease of negotiating kerbs. The arrangement can be made readily attachable and removable from the wheel-chair so that the whole may still be folded and packed into a car boot for transportation. The modifications do not add greatly to the bulk of the wheel-chair which may as a result still be used indoors but may also now be driven outdoors without requiring an attendant. Above all, the adaptation is inexpensive compared to the cost of commercially available powered wheel-chairs.

As mentioned above, like adaptation to powered drive can be made using similar drive units to other kinds of vehicle such as supermarket trolleys which are frequently required to be manhandled in confined spaces whilst heavily laden by often slightly built female staff.

Where a steering facility is provided such may be powered by a reversible electric motor operating through a gear arrangement.

Claims

1. A method for adapting a vehicle to powered drive comprising fitting to the vehicle a self-contained drive unit including a motor driving a ground-engaging wheel.

2. A method according to claim 1, comprising fitting such self-contained drive units to both front and rear of the vehicle.

3. A method according to claim 1 or claim 2, wherein said drive unit or at least one of said drive units is steerable.

4. A method according to any one of claims 1 to 3, wherein said self-contained drive unit or at least one of said self-contained drive units includes a suspension arrangement.

5. A method according to any one of claims 1 to 4, applied to a wheel-chair additionally or by removing some of the wheels thereof and fitting at least one self-contained drive unit in place thereof.

6. A method according to claim 5, wherein a self-contained drive unit is fitted to the front of the wheel-chair, and is steerable.

7. A method according to claim 6, wherein said drive unit is fitted with a steering device operable by the occupant of the wheel-chair.

8. A method according to claim 6 or claim 7, wherein said drive unit is fitted with a steering device operable by a person controlling the wheel-chair from behind.

9. A method according to any one of claims 1 to 8, in which said motor is electrically driven.

10. A method for adapting a vehicle to powered drive substantially as hereinbefore described with reference to the accompanying drawings.

11. A drive unit for adapting a vehicle to powered drive comprising a casing or frame-work housing an electric motor and a ground-engaging wheel driven thereby said casing being adapted for fitting to a vehicle to be adapted.

12. A drive unit according to claim 11, for a wheel-chair comprising a resilient suspension between the motor and ground wheel on the one hand and an attachment arrangement to the vehicle on the other.

13. A drive unit according to claim 11 or claim 12, comprising an additional ground-engaging wheel or wheels not driven by the motor.

14. A drive unit according to claim 13, said additional wheel or wheels being mountable on an attachment arrangement to the vehicle and having a resilient suspension.

15. A drive unit according to any one of claims 11 to 14, for converting a wheel-chair to powered drive comprising a motor driving a ground-engaging wheel and mounted on a plate with a resilient suspension from attachment means for attaching the plate at the positions of attachment of the rear wheels of the wheel-chair and in place thereof, and additional, non-driven ground-engaging wheels having a free castor action also attached to said attachment means by a resilient suspension.

16. A drive unit according to claim 15, said resilient suspension of the motor and associated ground-engaging wheel including coil spring means.

17. A drive unit according to claim 15 or claim 16, said resilient suspension of the additional wheels including gas-strut or like shock absorber means.

18. A drive unit according to any one of claims 11 to 14, for converting a wheel-chair to powered drive, comprising a motor driving a ground-engaging wheel attached to a plate connected to the wheel-chair at the positions of attachment of the front wheels thereof and in place of the same, said motor and ground-engaging wheel being mounted for rotation about a vertical axis and being connected to a steering arrangement.

19. A drive unit according to claim 18, said steering arrangement comprising a column with a wheel or tiller located for the occupant's use.

20. A drive unit according to claim 18 or claim 19, said steering arrangement comprising a transmission to a wheel or tiller at the rear of the wheel-chair for use by an attendant.

21. A drive unit according to any one of claims 18 to 20, including resilient suspension means between the plate and the wheel-chair.

22. A drive unit substantially as hereinbefore described with reference to the accompanying drawings.

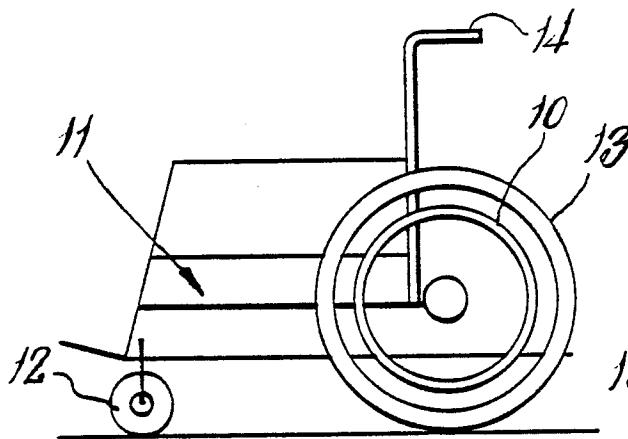


FIG. 1

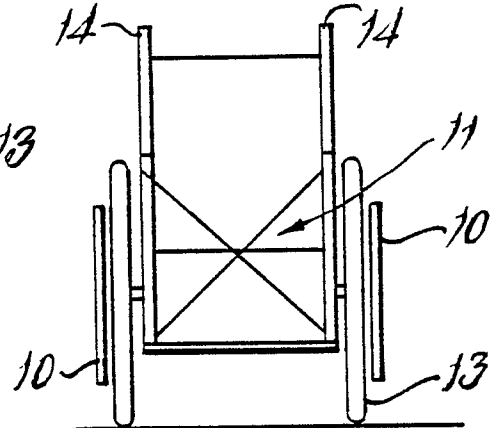


FIG. 2

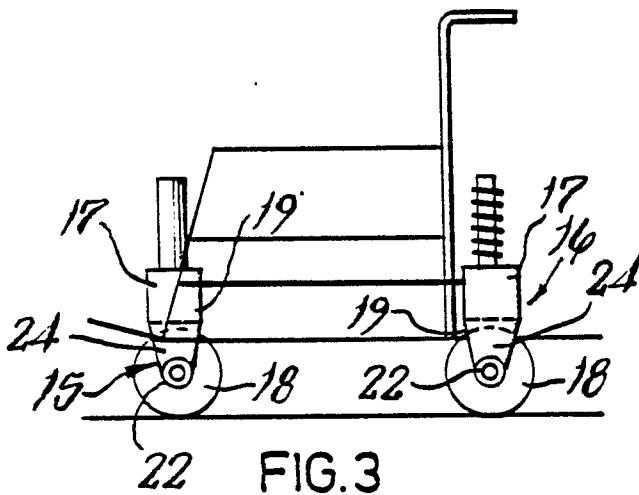


FIG. 3

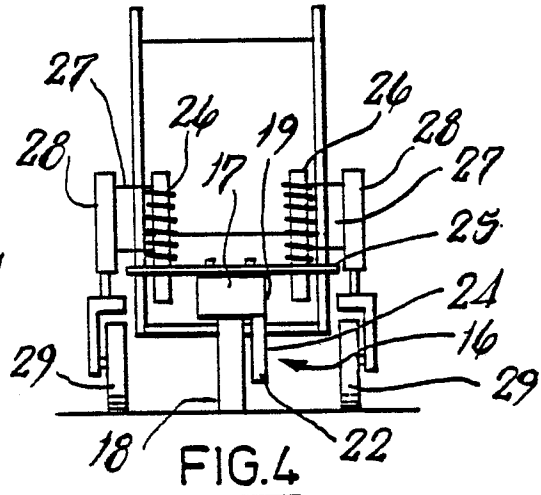


FIG. 4

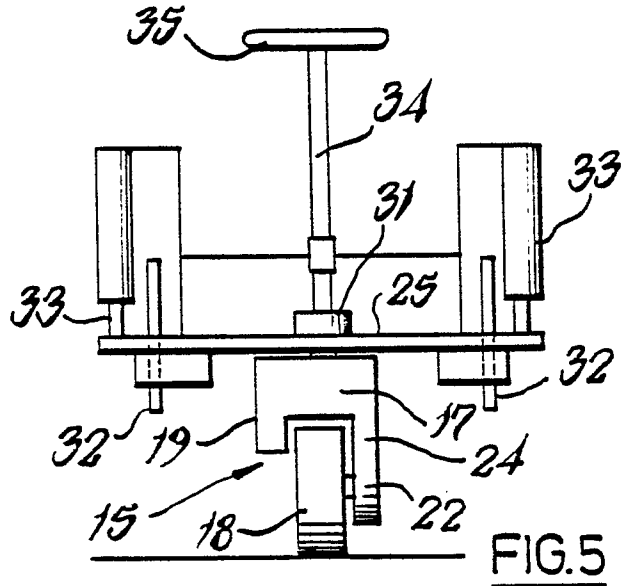


FIG. 5

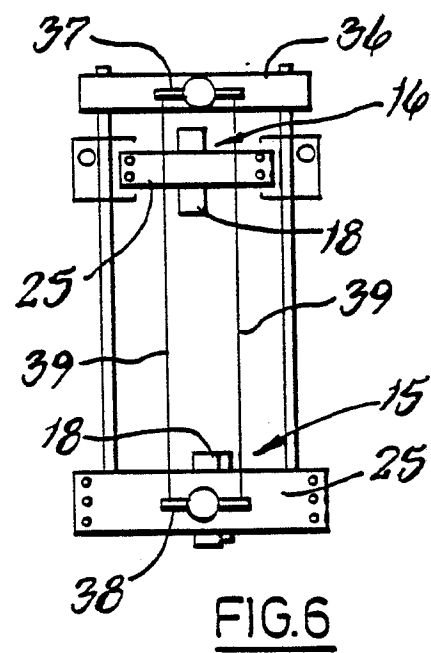


FIG. 6



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
X	GB-A-1 197 909 (RABJOHN) * Whole document *	1,3-7,9 -13,15, 16,18, 19,21, 22	A 61 G 5/04 B 60 K 1/00
X	US-A-3 023 825 (RABJOHN) * Whole document *	1,3-7,9 -13,15, 16,18, 19,21, 22	
X	GB-A- 665 928 (DUKE) * Whole document *	1	
A		2	
A	DE-A-2 709 618 (MEIER) * Claim 1; figures 1,2 *	8,20	
E	GB-A-2 181 100 (ARMSTRONG) * Whole document *	1-22	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			A 61 G B 60 K
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 25-11-1987	Examiner BAERT F.G.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			