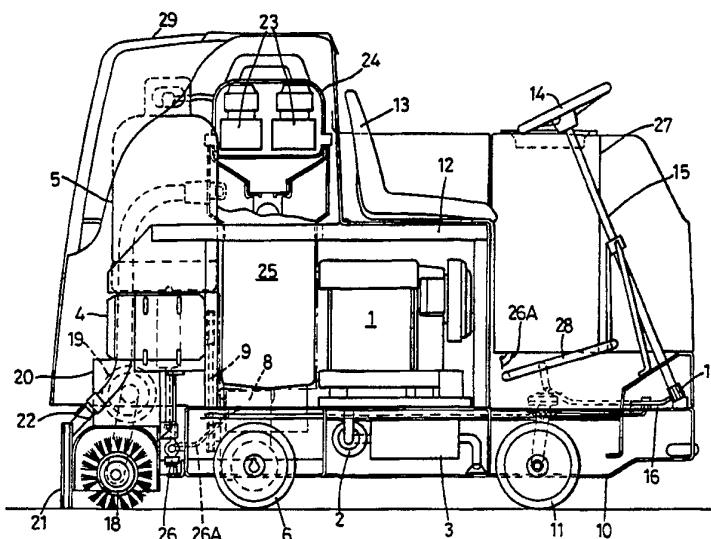




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<p>(21) International Application Number: PCT/GB96/02104 (22) International Filing Date: 27 August 1996 (27.08.96) (30) Priority Data: 9517508.9 25 August 1995 (25.08.95) GB (71) Applicant (for all designated States except US): TARNEX LIMITED [GB/GB]; Rosemarie House, Wreakes Lane, Dronfield, Sheffield S18 6PN (GB). (72) Inventor; and (75) Inventor/Applicant (for US only): ELFLEET, Robert [GB/GB]; Tradewinds, Cowley Lane, Holmesfield, Sheffield S18 5SD (GB). (74) Agents: HOUGHTON, David et al.; Hulse & Co., Eagle Star House, Carver Street, Sheffield S1 4FP (GB).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p>Published <i>With international search report.</i></p>

(54) Title: MOTOR DRIVEN MEANS



(57) Abstract

The invention relates to driven means and particularly a driven means capable of use indoors. Indoor transportation means such as are used in hospitals, airports and other large public buildings, and floor cleaning equipment for use in such locations have the disadvantage of requiring large and/or multiple banks of batteries, with limited life between charges and a limited range. Mains driven, e.g., cleaning devices have the disadvantage of requiring an extremely long cable, and are cumbersome to use and are slow. Outdoors, known electric vehicles solve pollution problems but need large or multi-bank batteries and again have limited life between charges and a limited range. The invention seeks to overcome these disadvantages by providing a driven means comprising an electric motor connected to driven wheels, a generator to power the motor, and a gas driven engine to drive the generator. Any ancillary items of equipment on the driven means may also be driven by the electric motor.

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MOTOR DRIVEN MEANS

This invention relates to motor driven means.

There are many forms of equipment where a motor is required to provide a motive force, and where electrical power is required to activate various items of ancillary equipment. For use outdoors a variety of petrol, diesel and electric motors are known. Small items of equipment can utilise an engine with a simple clutch and direct drive to driven wheels, with a relatively small battery provided to power ancillary equipment. Equally, a relatively small battery can be used to power an electric motor with a direct drive to driven wheels, and the same battery used to power ancillary equipment. However, with equipment of any appreciable size, larger and more powerful engines are needed with attendant clutch and reduction gearing between the motor and the driven wheels. Alternatively large and/or multiple banks of batteries are needed. Petrol and diesel engines are environmentally unfriendly, and large and/or multiple banks of batteries have limited life between charges, and give the equipment involved a limited range.

In addition to the above, there are the problems that need to be attended to when heavy equipment is required to be used indoors. In large establishments such as airport terminals and hospitals there are transport means for passengers and patients, and for equipment. Here, petrol and diesel engines cannot be used because of the pollutants emitted from their exhausts. This limits choice to battery powered vehicles with their limited range and need to be recharged. Other equipment albeit heavy has hitherto been powered from mains, with the inconvenience of trailing cables and the need for multiple power points. One example of such equipment is heavy duty carpet cleaning machines, that hitherto have been pulled across a carpet by an operative, with either mains power or heavy duty batteries driving the cleaning equipment.

It has long been known that gas can be used as the fuel for engines, with the advantage that the exhaust emissions are substantially free of harmful constituents, which can be reduced still further

with the fitting of such as a catalytic converter, but only recently has a small and efficient gas engine been produced that can be used to drive a generator, and provide an alternate form of portable generator to compete with known small petrol and diesel engined portable generators.

The object of the invention is to provide a driven equipment that avoids the limited range of known battery driven types and can be used indoors with ample electrical power to provide mobility and to drive all ancillary items on the equipment.

According to the present invention, a driven means comprises an electric motor connected to driven wheels, a generator to power the motor and to provide power to any ancillary items on the equipment, and a gas driven engine to drive the generator.

The electric motor may be directly connected to the driven wheels such as by way of a chain or belt, or may be indirectly connected to the driven wheels such as by way of a hydrostatic or the like drive. Equally, the generator which may for example be a dynamo or an alternator may be separate from and suitably connected to the gas driven engine, or the gas driven engine and the generator may be an integrated unit.

In an outdoor usage, a driven means of the invention can be used in place of considerable forms of battery driven equipment at present known and used, but with no limit to the range of the equipment, and with the ability of the generator to drive ancillary equipment such as lights, and possibly a freezer when the equipment is such as a milk float. Equally, and taking advantage of the benefit of low emission levels in respect of both sound and pollutants, it can be used in place of some forms of petrol or diesel engined equipment, without the cost penalty of clutches and gearboxes.

Of potentially greater importance is the ability of such equipment to be used indoors, both for the carrying of people and equipment, and for the powering of equipment that has hitherto been manually handled. With a tractor unit pulling trailers with seats for passengers, or for carrying

goods, the range provided by a conventional large gas bottle is considerable, and a spare gas bottle can easily be carried, and the range of the equipment doubled.

Such a gas fuelled internal combustion engine and generator provides for the first time a means of providing motive power to equipment that has hitherto had the disadvantage of requiring a considerable strength on the part of the operative, and trailing wires from the nearest power point. By providing such equipment with an electric motor connected to driven wheels, and a gas fuelled internal combustion engine and generator, an operative can walk with the equipment only being required to steer it, or the equipment can be structured such as to allow the operative to ride the equipment, and the equipment provided with steerable wheels. Not only can the generator provide a sufficient power for the drive motor, but also to power all ancillary items.

A typical example of such equipment is an industrial carpet cleaner that hitherto has had to be pushed or pulled by the operative, and given the nature of industrial carpet cleaners, they are of a considerable weight requiring a considerable effort by the operative to move the cleaner across a carpeted area. With the invention, it will be possible to provide a tractor means with a sit-on driver facility, the tractor means being provided with all required manual controls. Also located on the tractor means is an electric motor of a sufficient power to enable it to drive such as the driven wheels of the driven means e.g. by way of a belt drive, the motor being controlled by such as rheostat to enable the direct drive of the axle without the need for any intervening clutch or gearing, the motor being switchable to provide for forward and rearward drive. Equally, the drive may be by way of a hydrostatic transaxle able to control the speed and direction of travel without the need for any intervening clutch or gearing. The power requirement for the motor is provided by a generator strategically positioned on the tractor means, the generator having an attendant liquid petroleum gas source. The liquid petroleum gas can be contained in conventional gas bottles such as are currently readily available with one or more such gas bottles positioned on the tractor means.

Either on the tractor means or on a trailer attached to the tractor are all of the required facilities to enable the cleaning of carpets such as the power supply of water/detergents from suitable tanks, vacuum extraction means for the removal of surplus water, driven brushes etc. Given the nature of the generator, arrangements will be made for its air cooling. Thus, the generator may be contained in a housing having an air inlet and an air outlet with two essential further advantages thereby being provided, first the still further reduction in noise from what is already a quieter drive for a generator than with current conventional portable generators, and the warm air produced by the cooling of the generator can be directed from the outlet from the housing to the carpet area that is being cleaned, to provide a drying effect on the carpet.

Three embodiments of the invention will now be described with reference to the accompanying drawings in which:

Figure 1 is a schematic representation of a driven means in accordance with the invention with a direct drive from the electric motor to the driven wheels;

Figure 2 corresponds to Figure 1 but illustrates a driven means with an indirect drive from the electric motor to the driven wheels; and

Figure 3 is a schematic side elevation of a driven means in accordance with the invention adapted as a carpet cleaning machine;

In Figures 1 and 2 a driven means is illustrated having an internal combustion engine combined with an electric generator 1 the exhaust system of which has a catalytic convertor 2 and a silencer box and attendant tail pipe 3. An electric motor 4 is provided to be driven by current produced by the generator, and a gas bottle 5 is provided for the supply of gas to the internal combustion engine. It is preferred that a second gas bottle is also provided with an appropriate switching means between the gas bottles to connect the second gas bottle to the engine as the first gas bottle becomes exhausted.

As is indicated in Figure 1, the electric motor 4 powered by the generator is directly connected to at least one driven wheel 6 by a drive belt 7, whereas as is indicated in Figure 2 the electric motor 4 powered by the generator is indirectly connected to at least one drive wheel 6 by a hydrostatic transaxle 8 driven from the electric motor by a belt drive 9. The wheels 6 of the driven means are mounted on a chassis 10 on which front steerable wheels 11 are provided.

In this basic form of construction, a driven device is provided the pollution and noise levels of which are more than adequate to enable the device to be employed indoors.

Figures 3 and 4 illustrate an adaptation of the driven device of Figures 1 and 2 as a carpet cleaning machine.

In addition to the items identified in Figures 1 and 2, there is mounted on the chassis 10 a support structure 12 on which is mounted a seat 13 for the operative. In front of the seat and mounted on the forward end of the chassis is a steering wheel connected to the front wheels 11 by way of a steering column 15, a steering plate 16 and a steering hub 17. To enable the device to serve as a carpet cleaning machine, a transverse cylindrical brush 18 is provided attached to a drive motor 19 in a housing 20 secured rearwardly of the chassis, and on the housing is mounted a squeegee 21 to which is attached a vacuum hose 22 leading to vacuum pumps 23 in a housing 24 mounted on the support structure 12, behind the driver's seat, which vacuum pumps are associated with a dirty water tank 25.

Also mounted rearwardly of the chassis are water jets 26 connected to a clean water tank 27 attached below the support structure, by a pipe 26A with, desirably, a water pump in the supply line 26A.

The transaxle 8 being connected to the drive motor by a drive belt, it enable the drive (rear) wheels to be driven without the need for any interposed clutch or gear box, in both the forward and the reverse directions determined by the direction of drive of the drive motor 4, at the discretion of

the operative using a foot pedal lever 28 to control the motor both as to its direction and speed.

In use, both a wet, cleaning of a carpet, and a dry vacuum cleaning of a carpet can be provided for. In the first instance, the brush 18 can be activated, and the vacuum pumps 23 switched on, when the squeegee 21 serves as an extraction nozzle. With water sprayed on to the carpet in advance of the brush, the carpet is scrubbed by the brush, and excess water is extracted from the carpet by the squeegee and deposited in the dirty water tank.

In the second instance, the driven means as illustrated in Figure 3 is kept substantially in its entirety, but with the squeegee removed and the brush housing replaced by one connected to the vacuum pumps, when the brush housing serves as a vacuum nozzle to remove dirt and debris dislodged from the carpet by the brush.

All of the ancilliary equipment mounted on the chassis may be contained within a housing 29 of an appropriate plastics material both for appearance and to provide sound and heat insulation.

Also to reduce noise and to provide added comfort to the operative, the front and rear wheels of the device may be cushion wheels or wheels provided with pneumatic tyres.

CLAIMS

1. A driven means characterized by an electric motor (4) a generator (1) to power the motor and to provide power to any ancillary items on the driven means and a gas driven engine (1) to drive the generator.

2. A driven means as in Claim 1, characterized in that a catalytic converter (2) is provided in the exhaust from the engine.

3. A driven means as in Claim 1 or Claim 2 characterized in that the electric motor (4) is directly connected to driven wheels (6) on the means.

4. A driven means as in Claim 1 or Claim 2, characterized in that the electric motor (4) is indirectly connected to driven wheels (6) on the means.

5. A driven means as in Claim 4 characterized in that the electric motor (4) is connected to the driven wheels (6) by way of a hydrostatic drive (8).

6. A driven means as in any of Claims 1 to 5 characterized in that the generator and the engine (1) are separate units suitably connected.

7. A driven means as in any of Claims 1 to 5 characterized in that the generator and the engine are formed as a single unit (1).

8. A driven means as in any of Claims 1 to 7 characterized in that the generator (1) is a dynamo or an alternator.

9. A driven means as in any of Claims 1 to 8 characterized in that steerable front wheels (11) are provided on the means.

10. A driven means as in any of Claims 1 to 9 characterized in that a chassis (10) is provided on which the generator/engine (1), a gas bottle (5) for the supply of gas to the engine, the electric motor (4), the driven wheels (6), a hydrostatic transaxle (8) extending between the driven wheels, the steerable wheels (11), steering gear (15, 16, 17) for the steerable wheels and a seat (13), are all

strategically mounted on the chassis.

11. A driven means as in Claim 10, characterized in that ancillary equipment to suit the intended purpose of the driven means are also strategically mounted on the chassis and connected as appropriate to the electric motor (4).

12. A driven means as in Claim 11, in the circumstance where the driven means is a carpet cleaning system, characterized in that there is strategically mounted on the chassis (10) vacuum pumps (23) with a vacuum line extending to a squeegee (21), rotating brush means (18), a clean water tank (27) and a dirty water tank (25).

13. A driven means as in Claim 12 characterized in that the rotating brush means and the squeegee are vertically adjustable.

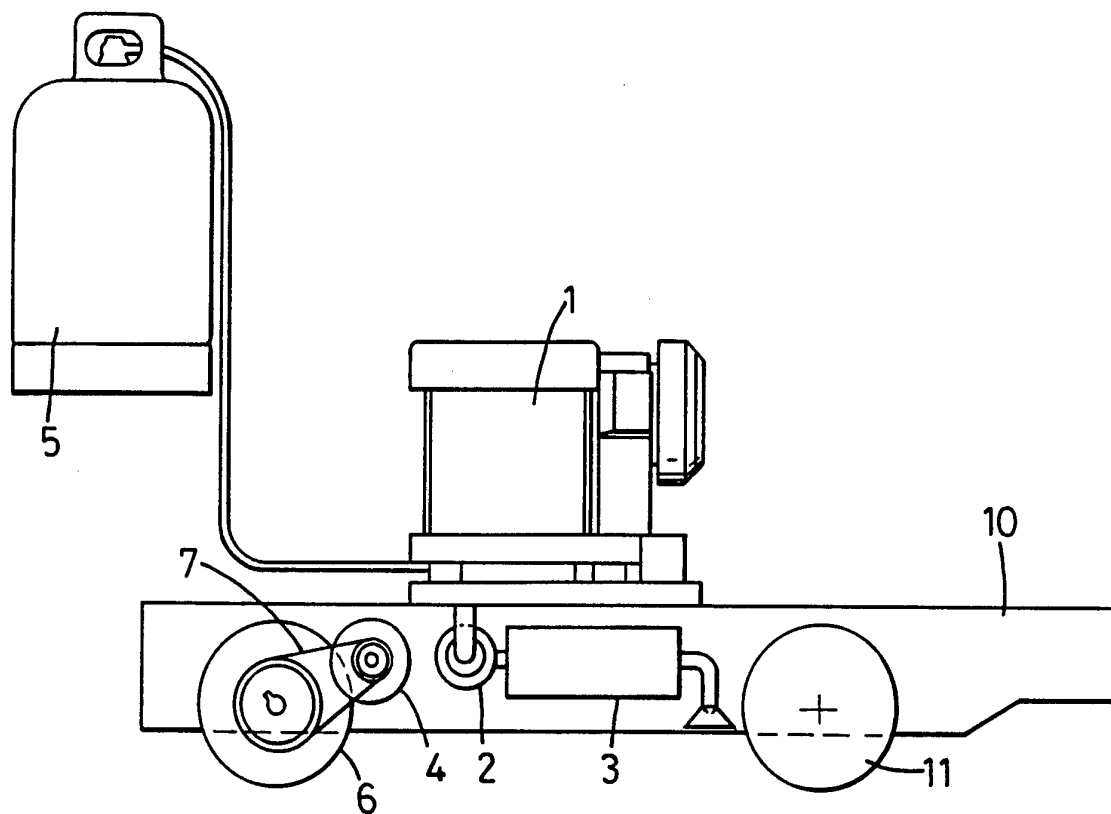


Fig. 1

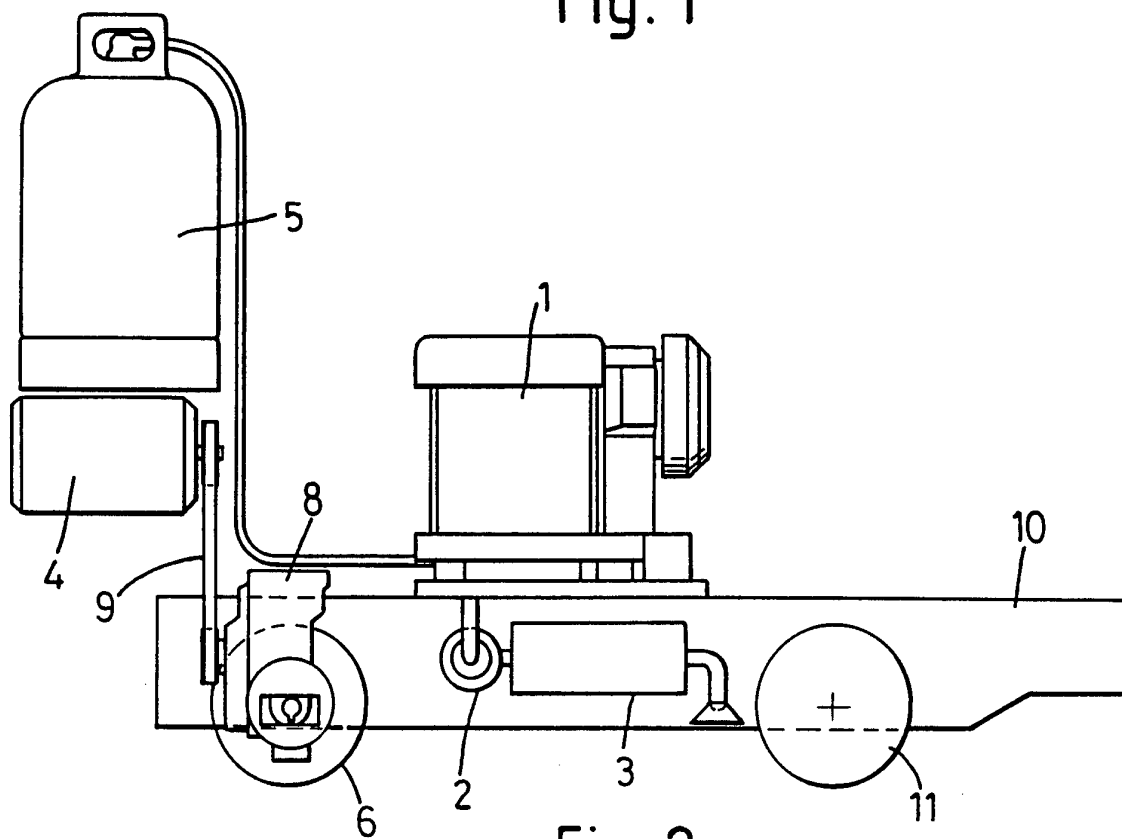


Fig. 2

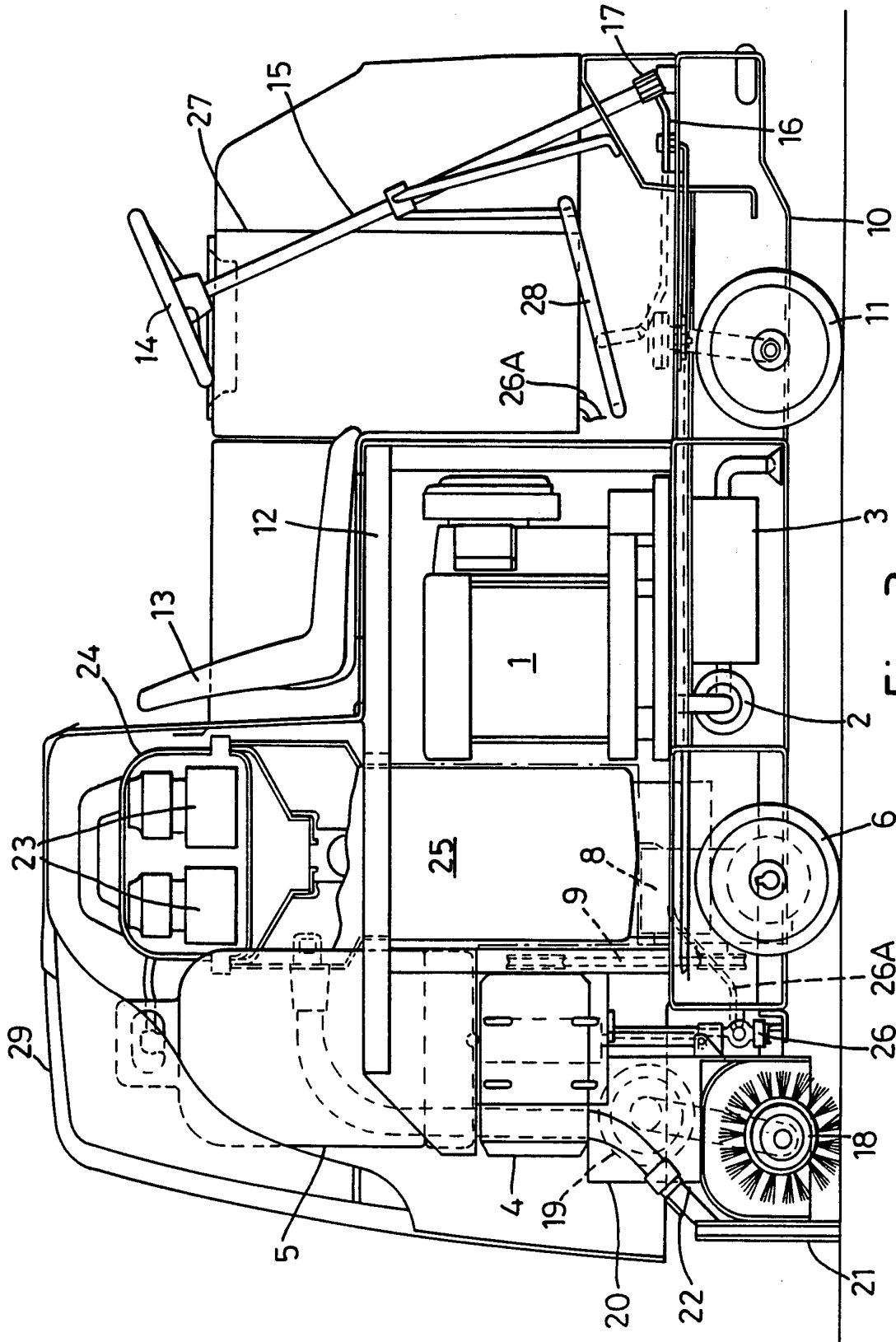


Fig. 3

INTERNATIONAL SEARCH REPORT

Inter national Application No
PCT/GB 96/02104

A. CLASSIFICATION OF SUBJECT MATTER IPC 6 B60K6/02 B60K25/00 A47L11/34				
According to International Patent Classification (IPC) or to both national classification and IPC				
B. FIELDS SEARCHED				
Minimum documentation searched (classification system followed by classification symbols) IPC 6 B60K A47L				
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched				
Electronic data base consulted during the international search (name of data base and, where practical, search terms used)				
C. DOCUMENTS CONSIDERED TO BE RELEVANT				
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
Y	AUTOMOTIVE ENGINEER, vol. 19, no. 3, 1 June 1994, pages 34-36, XP000461553 BLOOM P: "HYBRID DRIVES"	1-9		
A	see the whole document	10		
Y	DE,A,41 23 843 (MAN NUTZFAHRZEUGE AG) 21 January 1993	1-9		
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Y	US,A,4 095 664 (BRAY) 20 June 1978 see the whole document	1,6,8		
	-/--			
<input checked="" type="checkbox"/> Further documents are listed in the continuation of box C. <input checked="" type="checkbox"/> Patent family members are listed in annex.				
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Date of the actual completion of the international search <p style="text-align: center; font-size: 1.2em;">9 December 1996</p>		Date of mailing of the international search report <p style="text-align: center; font-size: 1.2em;">13. 12. 96</p>		
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+ 31-70) 340-3016		Authorized officer <p style="text-align: center; font-size: 1.2em;">Topp, S</p>		

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 96/02104

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	ENERGY SYSTEMS AND POLICY IMPACT ON ENERGY, RENO, AUG. 12 - 17, 1990, vol. 4, 12 August 1990, NELSON P A;SCHERTZ W W; TILL R H, pages 116-120, XP000214824 WICKS F ET AL: "DESIGN AND BENEFITS OF A VEHICIE THAT INTEGRATES A COMBINED INTERNAL COMBUSTION AND VAPOR CYCLE ENGINE WITH ELECTRIC DRIVE AND STORAGE" see the whole document ---	1,4,6
A	US,A,4 199 037 (WHITE) 22 April 1980 see the whole document ---	1,4,8,9
A	EP,A,0 645 271 (GENERAL MOTORS CORPORATION) 29 March 1995 see abstract; figure 1 ---	1
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Information on patent family members

International Application No

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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US-A-4809396	07-03-89	NONE	
