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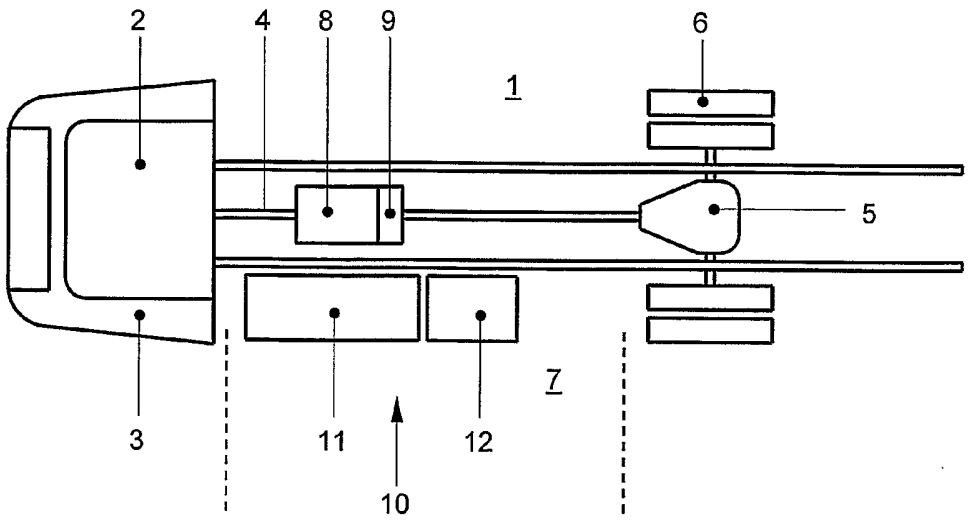
(54) Title: HYBRID VEHICLE WITH AUXILLIARY GENERATOR



(57) Abstract: A vehicle, provided with: a combustion engine; a driving gear for converting power supplied by the combustion engine into propulsion of the vehicle; an electric motor for contributing to supplied power for the propulsion of the vehicle, separately or in combination with the combustion engine; a fueloperated generating element for generating electrical energy for driving the electric motor; and sound deadening means for deadening the generator in order to provide at least a silence mode in which the vehicle is propelled by the electric motor in a low-noise manner. The noise emissions of the vehicle according to the invention can be kept low in a simple and inexpensive manner if a control system or control signal brings the vehicle in a silence mode.

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HYBRID VEHICLE WITH AUXILLIARY GENERATOR

The invention relates to a vehicle, provided with: a main drive comprising a combustion engine for driving the vehicle; and an auxiliary drive comprising an electric motor, for driving the vehicle separately or in combination with the main drive.

Such a vehicle is sometimes denoted as a vehicle with a hybrid drive, i.e. in one condition the vehicle can be propelled by a conventional, "heavy-duty" drive by means of a combustion engine; while in particular circumstances, for instance from the viewpoint of harmful emissions, the drive of the vehicle can be taken over by an electric motor which is not, or less, harmful in operation. Such a vehicle is known, for instance, from the German publication 44 44 545.

The known hybrid provisions are normally expensive and less reliable, because the electric motors are operated with the aid of electrically chargeable batteries which are heavy and voluminous, susceptible to maintenance and expensive. Further, such batteries are not reliable in operation under all circumstances and have a relatively short useful life, so that the deployment of such vehicles entails high costs.

The need for low-noise vehicles increases and to that end, in the field of noise control, much progress has been made. The conventional engines, albeit at the expense of a slight power loss, can be tuned to be much more silent than was possible previously. Even so, the noise levels are still too high in some cases, for instance in the case of truck loading and unloading during nightly hours at shops in residential areas. For such situations, the noise control requirements have been made so much more stringent that these requirements are difficult to meet without costly provisions.

The object of the invention is therefore to provide a hybrid vehicle which makes it possible, at relatively low cost, to operate an electric motor, while the emissions, in particular the noise emissions, are very low, i.e. have

such a low level that the regulations can be met and which are at least comparable to or lower than the emissions attainable with conventional engines tuned to low-noise.

This object is achieved by a vehicle of the type mentioned in the opening paragraph hereof, in which the auxiliary drive comprises a fuel-operated energy generating element which can be electrically connected with the electric motor in order to provide it directly with electrical energy. The generating element may then be arranged for having a low energy consumption with respect to the main drive. In addition, the generating element may be arranged for having a relatively low emission of harmful substances and/or noise level. Further, the vehicle can possess at least one operating condition in which the vehicle is propelled in a low-noise manner by the auxiliary drive. Preferably, the vehicle comprises sound-deadening means for deadening the energy generating element.

By such a generating element, in particular a fuel cell or generator set, the electric motor can be simply provided with electrical energy, while the generating element is further wholly arranged to keep the (noise) emissions low. It will be clear here that 'electric motor' is here understood to include at least the necessary power electronics for operating it. Because the needed operating powers for the propulsion in cases where lower emissions are specifically desired are typically relatively low, a proper balance can be found between supplied power on the one hand and emitted emissions on the other, so that it is not, or less, necessary to make the "conventional" combustion engine a low-emission engine through relatively expensive adaptations. In addition, a controlled deployment of the electric motor can reduce the total energy consumption because it is not necessary anymore to have the main combustion engine rotate protractedly in an unfavorable efficiency range, but an energy demand can incidentally be provided for by switching the electric motor on and off.

In order to specifically provide a low-noise hybrid vehicle, the vehicle is preferably provided with sound-deadening means for deadening the generating element in order to provide at least a silence mode in which the vehicle is propelled in a low-noise manner by the electric motor.

According to a preferred embodiment, the vehicle is provided with a control system for setting an operating condition in which the electric generating element and/or the combustion engine is switched on. In particular, the operating condition comprises at least a silence mode in which the noise emission of the vehicle is low. The control system can comprise an input for receiving control signal which forces the vehicle in a desired operating condition. Such a control signal is useful if according to the control data that are utilized by the automatic control system an undesired outcome is reached. In particular, if the speed of a vehicle is still relatively high, or a required engine torque is relatively high, the control system can switch to a mode in which the (less low-emission) main combustion engine becomes active. If from the viewpoint of emission control, this is undesired, the system can be forced to go to or remain in the low-emission mode, in which case possibly concessions are made in respect of the engine power to be supplied. The vehicle may here possess a provision for generating the control signal. A driver himself can then decide whether the vehicle is to be brought into a low-emission mode. Supplementarily, or alternatively, it is possible that the provision comprises a transponder or a sensor which is tuned to the reception of a signal originating from an external source, with the aid of which the vehicle is forced into a particular operating condition. In this way, for instance in a residential area, in which shops are located that are to be supplied at night, provisions can be made, so that vehicles equipped with such a system according to the invention automatically switch to a desired silence mode. In this context, also, a gradual scale can be utilized, whereby, acting on the instructions from the environment, the vehicle is brought into such an operating condition that

not more than a maximum desired emission level is realized. Through an optionally gradual application of this system, a need can be accommodated on the one hand to deploy a heavier main combustion engine and on the other hand to force a vehicle into a low-emission mode in a highly focused manner, there where necessary.

According to a further preferred embodiment, the control system can apply the control on the basis of a vehicle speed and/or combustion engine torque. These values, and others that can also be used for this functionality in the control, may also be derived from other sensors in the vehicle, for instance speed of the main combustion engine, selected acceleration and accelerator pedal position. The control system can then accomplish a flowing transition in time, between deployment of the electric motor and the combustion engine, so that a user does not experience any unpleasant shocks upon switching from and to the silence mode. In addition, the vehicle can comprise an electric energy storage and a brake device for braking mechanically and/or electrically, whereby kinetic energy is converted into electrical energy, the control system being arranged for determining such a setting for the provision of propulsive power by the electrical energy storage, the fuel-operated generating element and/or the combustion engine, that the energy consumption and/or the emission of harmful substances and/or the noise level of the vehicle at a required engine torque and/or vehicle speed is minimal.

Naturally, the energy generating element can also be operated for obtaining electrical energy for the purpose of the drive of accessories, such as air conditioning.

The invention further relates to a system for controlling a vehicle according to the invention, comprising a source for transmitting a control signal which brings the vehicle in a desired operating condition.

Further, the invention relates to a unit for coupling with and/or assembly into a vehicle provided with a main drive which comprises a

combustion engine for driving the vehicle; which assembly unit comprises an electric motor for forming an auxiliary drive for driving the vehicle separately or in combination with the main drive; and a fuel-operated energy generating element which can be electrically connected with the electric motor in order to provide it directly with electrical energy. Such a unit is relatively simple to integrate into existing vehicles, and thus constitutes an attractive manner of adapting such vehicles to stringent local emission requirements.

The invention will be further elucidated with reference to the drawing. In the drawing:

Figure 1 is a schematic top plan view of a vehicle according to the invention;

Figure 2 is a schematic representation of transmission lines of the vehicle of Figure 1;

Figure 3 shows a time diagram including a transition from a normal operating mode to a silence mode;

Figure 4 shows a diagram with a torque characteristic of a hybrid vehicle provided with a control system according to the invention;

Figure 5 shows a functional diagram for an example of a control system according to the invention; and

Figure 6 is a schematic representation of a unit for coupling with and/or assembly into a conventional vehicle.

In the Figures, the same or corresponding elements are denoted with the same reference numerals.

Fig. 1 shows a vehicle 1, such as a truck, bus, van or other type of transportation means in which the invention can be applied, in a schematic representation from above. The vehicle possesses, for the purpose of propulsion, at least one main combustion engine 2, for instance a heavy-

duty conventional gasoline, diesel or LPG engine. The engine 2 is included in the front part of the truck 1, under the driver's cabin 3. This main combustion engine 2 drives, by way of a transmission (not shown), a drive shaft 4 and a differential 5, in a manner otherwise known per se, in this case the rear wheels 6 of the vehicle 1, so that power supplied by the combustion engine can be converted to propulsion of the vehicle 1.

Represented in broken lines is an intermediate space 7 between front and rear wheels (in many trucks, there is an empty, unused space there), in which an electric motor 8 is arranged. According to this exemplary embodiment, the electric motor 8 likewise engages the cardan shaft 4 via a coupling 9, which can be set to contribute separately, or in combination with the combustion engine, to supplied power for the propulsion of the vehicle 1. This coupling can be mechanical, in the form of, for instance, a possibly shiftable-design gearbox, but may also comprise other kinds of couplings, such as a viscous coupling, an electric motor mounted coaxially around the drive shaft, or the like. For instance by the use of so-called dry or wet plate clutches, the main drive and auxiliary drive can be completely uncoupled.

Although it is represented in the drawing that the electric motor 8 engages the cardan shaft 4 of the main combustion engine 2, numerous variants are possible, including, for instance, a variant with a separate cardan shaft, which engages the front or rear wheels or a variant whereby the electric motor is mounted on a shaft or wheel of the vehicle. Of course, the main combustion engine 2 may also engage the front wheels, optionally in combination with the rear wheels. Such variants are understood to fall within the scope of the invention.

Accommodated in the same intermediate space 7 is a generator set 10. The generator set 10 comprises a combustion engine 11 and a generator 12 for generating electrical power. The generator 12 is electrically connected with the electric motor 8 in order to provide it directly with electrical energy. The thus configured truck can be propelled in a discrete operating

mode, a so-called silence mode, by the electric motor, which in turn is provided with electrical energy by the generator set 10. Because according to this exemplary embodiment the generator set comprises a relatively light combustion engine 11 which is tuned to have a very low noise emission, and which, if necessary, enables the use of a very effective noise insulation which can encapsulate substantially all noise-causing parts, specifically the mechanically moving parts, of the auxiliary drive in a closed-off construction, this mode is indeed "silent", i.e. the vehicle can be driven with a very low noise emission.

Although in this example the intermediate space 7 between the wheels is utilized for placing the generator set 10, it can naturally be arranged at other positions of the vehicle as well, as for instance between the cabin 3 and a loading space, on the roof or any other favorable position where mounting is possible; naturally, it is even possible to place it, for instance, in a trailer. Of course, such variants are also protected by the invention.

Fig. 2 represents the transmission lines of the embodiment shown in Fig. 1. Represented is a main combustion engine 2 which, via what is generally designated as "driving gear", in this example consisting of transmission 13, cardan shaft 4 and differential 5, drives the rear wheels 6 via a first, main drive line 14. A second drive line 15 is formed by the generator set 10, the electric motor 8, coupling 9, cardan shaft 4, differential 5 and rear wheels 6. The drive lines 14 and 15 come together at the coupling 9, which can be coupled-on by means of a control further elucidated with reference to Fig. 3. Through this coupling 9, the transmission lines 14 and 15 can act separately or in combination on the rear wheels, thus enabling a normal operating mode in which transmission line 14 is active, a combined operating mode in which both lines 14 and 15 are active, and a silence mode, in which only the line 15 is active.

Although the coupling 9 of the electric motor 8 may also be arranged before transmission 13, a position placed after transmission 13 provides the advantage that a synchronization of the speed of the electric motor 8 is not dependent on the speed of the combustion engine 2, which simplifies synchronization and tuning between the electric motor 8 and the speed of the vehicle 1. Also, especially if the system is designed with a coupling which can interrupt the torque transfer between the electric motor and the transmission, a noise-reducing effect and an efficiency improvement will arise in that no power is dissipated and/or converted to noise in the transmission 13. In the normal operation, the torque interruption that is experienced during shifting can be partly or wholly taken up by switching on the electric motor.

In the silence mode, via the coupling 9, the transmission to the main combustion engine can be switched off entirely, so that the main combustion engine can be off, as a result of which the vehicle is active in the silence mode and has a minimal noise emission. Through a suitable actuation of the coupling 9, it is possible to accomplish a flowing transition in time between the normal operating mode, via drive line 14, and the silence mode, via drive line 15.

Fig. 3 shows for this purpose a torque characteristic of the main combustion engine 2 (denoted by VM1 in the characteristic), and the electric motor 8 (denoted by EM). In the diagram, the magnitude of the supplied torque is represented over time, in arbitrary units. The Figure shows that the total torque, i.e. the summation of the torque characteristics of VM1 and EM forms a line flowing in time, in this example a line of a constant value, representative of a transition at constant vehicle speed. Owing to the flowing transition, steering the vehicle feels pleasant, and the vehicle, also in the combined mode, can be driven accurately. In the reverse situation (not shown), if it proves necessary to raise the propulsive power and this is not blocked by external control signal to be further described hereinbelow,

the torque of the electric motor 8 can be reduced, whereby at the same time the supplied torque of the main combustion engine 2 is raised. In addition, the electric motor 8 can function as starter motor, i.e. by coupling the main combustion engine 2 in a gradual transition onto the drive of the electric motor, it can be started, in a manner known to those skilled in the art, not to be further elucidated here. Further, the electric motor 8 can also function as a braking energy regenerator or dissipator. In this latter case, the braking energy can be dissipated in a dissipation resistance or by utilizing the generator set 10 as an electric motor and dissipating energy by braking on the combustion engine 11 by driving it.

Fig. 4 shows an example of a torque characteristic of the main combustion engine 2 (again denoted with VM1) and the electric motor 8 (EM). In the diagram, the relation torque-engine speed is represented, in arbitrary units. Such a torque characteristic is characteristic of a combustion engine and an electric motor, respectively. Characteristic of a combustion engine is the increase of torque with higher speed, after which the torque starts to decrease slightly upon still further increase. By contrast, an electric motor typically possesses a relatively constant torque, which upon further increase of the speed begins to fall, until it is virtually zero. The exact forms of the characteristic, of course, vary depending on the type of combustion engine (depending *inter alia* on the type of fuel) and type of electric motor (varies *inter alia* depending on the type of electric motor such as DC or AC motors, induction, permanent magnet, switched reluctance, etc.). In addition, per drive line, of course, several engines/motors may be deployed, those in the main drive line 14 being of a heavier type and typically having a higher emission, and those in the drive line 15 having a lower emission and typically possessing a somewhat lower driving power. This assembly can be controlled as has been elucidated, for instance, with reference to Fig.5; if a vehicle enters the range where the speed and torque are relatively low, the system can switch from a normal

operating mode to the silence mode and thereby follows the torque characteristic of the electric motor 8, denoted in the Figure by EM.

Fig. 5 gives a functional diagram of a control system 16 according to the invention. The control system 16 controls the drive and deployment of the required and supplied powers, as are generated by the main combustion engine 2 (VM1) and the generator set 10 (GSR), an optional electrical energy storage 17 (BMS) and an electrical conversion system 18 (EBS) for recovering and/or dissipating braking energy, and are supplied to the propulsion and any accessories such as cooling system, air compressors (*inter alia* for door control, springing, braking system) and hydraulic pumps (*inter alia* power steering or driving system for, for instance, a tipper or a press) and the like. The electrical energy storage 17 will be generally designated in the following as "accumulator" but can also comprise alternatives such as batteries, a supercapacitor, flywheel (for instance electrically driven), a hydraulic reservoir fed by an electric pump, etc.

The core of the control system is formed by a signal processing system 19, operated with the aid of a processor, which detects signals and sends them to and from, by way of example, the main combustion engine 2, the generator set 10 and other components, to be further elucidated that play a role in the operation and/or drive of the vehicle. According to the embodiment described, a driver of the vehicle, by means of an accelerator pedal 20 (GP) and/or brake pedal 21 (RP), can demand a particular engine power for the propulsion of the vehicle.

In addition, an accessory system 22 (ACC) for operating accessories, such as a cooling system, an air conditioning, or a brake-pressure system, can require power for driving these elements. According to this example, therefore, the total power demand can be recorded in the signal processing system 19, while further additional signal data 23 (SG), such as the speed of the vehicle, index data of the engine such as speed and/or the shift position of a transmission may be known to the control system 16.

Further, index data may be retrievable, which record a power availability of power from, for instance, an accumulator 17 or braking energy converter system 18 and may be involved in a deployment of main combustion engine and/or generator set 10. Thus, for instance, the electric motor 8 may already supply full power on the basis of available energy from accumulator 17; in the case where it appears that this source threatens to be exhausted, the generator set can be adjusted to output, so that it can take over this power demand. In addition, the energy of the generator set 10 can be deployed for driving the accessory systems.

It is possible for the control system, in the presence of an accumulator 17, depending on the need, to be active in a varied number of operating modes. Thus, if no accumulator is available, it is possible to drive in a mode in which the generator set 10 directly supplies energy for the drive of the electric motor 8. Further, in another mode, the storage 17 may be used only for accommodating power peaks. These may be peaks in power supply, for instance in the use of the electric motor 8 as braking energy regenerator, whereby a temporary surplus of electrical energy can be stored in the accumulator 17. Also, any peaks in the power demand can be accommodated with the aid of the accumulator 17. On the other hand, with the aid of the accumulator 17, it is also possible to drive (temporarily) without the generator set 10, and the generator set 10 may be used only for accommodating peaks in power demand and/or for recharging the accumulator 17.

The control system may further comprise an input 24 (TG) which is capable of receiving a control signal that forces the vehicle in a desired operating condition. That is, independently of the further power demand, by means of such a control signal, the signal processing system can be brought in a condition in which the vehicle can operate only in silence mode. Such a control signal can originate from an operating switch 25 which is operated by the driver, or from an external source 26, for instance a wireless signal

source which transmits a signal that is picked up by a receiver present in the vehicle. The receiver proceeds to deliver a control signal to the control system. Of course, it is also possible to work with other forms of signal transfer, for instance a transponder 27 which transmits a particular signal when it is introduced into a particular radio field, or the like. A special implementation of this is a GPS receiver which, on the basis of a GPS signal, identifies a geographical position of the vehicle and on the basis of this position controls the operating mode. Another form can be a clock signal, which during particular times of the day (for instance in the nightly hours) forces the vehicle in the silence mode. Such forms of signal transfer are also understood to belong to the domain of the invention, which in one embodiment relates to a system for controlling a vehicle according to the above-mentioned aspects, comprising a source for transmitting a control signal which brings the vehicle in a desired operating mode.

It is then possible that the system, upon reception of the control signal, is set in the silence mode gradually, for instance after delivering a warning signal to the driver, and/or after the elapse of some time. In addition, it is possible, for reasons of safety, that a driver is able to override such a signal, that is, such that the driver is for instance given a brief extra opportunity to continue driving in the normal operating mode.

For the interaction with the driver, the system includes a display 28, on which control data can be displayed, and via which the driver can execute any adjustments to the control.

Fig. 6 finally gives a schematic representation of a unit 29 for assembly into a vehicle. The assembly unit comprises an electric motor 8 for contributing separately, or in combination with a combustion engine 2, to supplied power for the propulsion of a vehicle. The unit 29 further comprises a generator set 10 for generating electrical energy. Normally, the electric motor 8 and the generator set 10 are separate elements, allowing, for instance, the generator set 10 to be accommodated at a different location in

the vehicle than the electric motor. As no mechanical coupling with the vehicle 1 is necessary, the generator set 10 can be encapsulated relatively simply, so that it can be made of very low-noise design. The generator set 10 and electric motor 8 are coupled with each other via an electrical connection 30 in order to enable the electric motor 8 to be provided directly with electrical power from the generator set 10. In one embodiment, the generator set 10 can consist of a fuel cell, which is encapsulated in a sound-insulating casing. In the embodiment represented, the generator set 10 comprises a combustion engine 11 and a generator 12. The vehicle, particularly the unit, more particularly the generator set 10, here comprises sound-deadening means, such as a sound-deadening casing 31. The casing 31 according to Fig. 6 consists of a double-walled formwork having an inner wall of damping material and an outer wall of an insulating laminate. In addition, the combustion engine 11 has been given a relatively light and low-noise tuning, and comprises an exhaust 32 which may be provided with emission-limiting elements 33, such as a catalyst and exhaust gas filter for limiting the emission. When the main combustion engine 2 is switched off, it is possible, with the aid of the assembly unit 29 shown, thus to provide a silence mode in which the vehicle is propelled by the electric motor 8 in a low-noise manner. The incorporation of the assembly unit 29 into existing vehicles is relatively simple. It consists in the steps of replacing a part of the drive shaft (cardan shaft) of a vehicle with an adapted drive shaft, to which an electric motor can be coupled-on; a generator set 10 is placed as one whole at a suitable position in the vehicle, for instance in the intermediate space discussed with reference to Figs. 1 and 2; the accelerator pedal is equipped with a sensor for recording the power demand; the electric motor 8 is coupled-on to the adapted drive shaft; a signal processor is programmed and installed for executing the control tasks for the deployment of the electric motor in the drive of the vehicle; in the electrical system, adaptations are made in order for the vehicle to be suitably provided with

the signal lines needed for the signal processor; and a control interface is installed for a user to be able to control the hybrid system. The cooling can be shared with the cooling system of the main combustion engine 2, in particular by sharing the radiator 34, or an additional radiator can be mounted. In both cases, an electrical fan 35 can be used, which, because of the slight amount of heat to be dissipated, compared with the main combustion engine, radiates less noise. It will be evident here, however, that the assembly unit can form an integral part of a new vehicle to be possibly constructed.

An alternative embodiment involves the possibility that the unit forms a separate unit 29 for coupling with a vehicle 1 and is not assembled into it. The vehicle 1 may then be provided with a main drive line 14 for driving the vehicle. The main drive line possesses a power take-off 36 which can draw power for driving the wheels 6. Accordingly, in this example, the drive line 14 is formed by a power line 37 from a driving engine, not shown, to the wheels 6, a power line 38 from the driving engine to the power take-off 36 and a power line 39 from the power take-off 36 to the wheels 6. Although in most cases the power lines 38 and 39 are normally present, they are not necessary for application of the invention. Further, the skilled person will understand that although the power lines are depicted schematically, they are understood to mean the measures for transmitting the mechanical energy from the main combustion engine to the wheels 6, including the above-discussed driving gear. According to the example of Fig. 6, the electric motor 8 forms an auxiliary drive which, via the power take-off 36, can engage the drive line 14 of the vehicle. Fig. 6 further represents power electronics 40 for operating the generator set, the power electronics 41 for operating the electric motor, and a control unit 42 with a control loop 43 for driving *inter alia* the electrical control unit 41, 42, the fan 35.

The invention has been elucidated on the basis of the exemplary embodiments represented in the drawing, but may also encompass variations or modifications thereof. As has already been elucidated, the electrical drive can be effected by a large variety of electric motors, in type and number. In addition, the electrical energy can be generated by a generating element, such as a fuel cell, or a conventional generator set. The fuels of the main drive and the generating element can be of the same kind or of different kinds. These elements can be present in combination, optionally supplemented with an energy storage such as a battery and/or a braking energy storage system. All these variations are understood to fall within the scope of the invention as defined in the following claims.

CLAIMS

1. A vehicle, provided with:

- a main drive comprising a combustion engine for driving the vehicle; and
- an auxiliary drive comprising an electric motor, for driving the vehicle separately or in combination with the main drive;
- wherein the auxiliary drive comprises a fuel-operated energy generating element which can be electrically connected with the electric motor in order to provide it directly with electrical energy.

2. A vehicle according to claim 1, characterized in that the generating element is arranged for having a lower energy consumption with respect to the main drive.

3. A vehicle according to claim 1 or 2, characterized in that the generating element is arranged for having a relatively low emission of harmful substances and/or noise level.

4. A vehicle according to at least one of the preceding claims, characterized in that the vehicle possesses at least one operating condition in which the vehicle is propelled by the auxiliary drive in a low-noise manner.

5. A vehicle according to at least one of the preceding claims, characterized in that the vehicle comprises sound-deadening means for deadening the energy generating element.

6. A vehicle according to at least one of the preceding claims, characterized in that the energy generating element comprises a combustion engine with an electrical generator system and/or an electrical fuel cell.

7. A vehicle according to at least one of the preceding claims, characterized in that the main drive comprises a driving gear for driving the wheels of the vehicle, which driving gear comprises a transmission and a coupling for coupling the auxiliary drive, the coupling engaging a part of the driving gear situated between transmission and the wheels.

8. A vehicle according to claim 7, characterized in that the coupling is a coaxial clutch.

9. A vehicle according to at least one of the preceding claims, characterized in that the vehicle is provided with a control system for setting an operating condition in which the main drive and/or the auxiliary drive is switched on.

10. A vehicle according to claim 9, characterized in that the control system possesses an input for receiving control signal which forces the vehicle in a desired operating condition.

11. A vehicle according to claim 10, characterized in that the vehicle possesses a provision for generating the control signal.

12. A vehicle according to claim 11, characterized in that the provision comprises a transponder or a sensor which is tuned to receiving a signal originating from an external source with the aid of which the vehicle is forced to a particular operating condition.

13. A vehicle according to at least claim 12, characterized in that the sensor is a GPS sensor for picking up a GPS signal, in order to identify the geographical position of the vehicle and, depending on the geographical position, to bring the vehicle in a particular operating condition.

14. A vehicle according to at least one of the claims 9-13, characterized in that the control system applies the control on the basis of a vehicle speed and/or combustion engine torque.

15. A vehicle according to at least one of the claims 9-14, characterized in that the control system accomplishes a transition flowing in time, between deployment of the electric motor and the combustion engine.

16. A vehicle according to claim 15, characterized in that this transition is accomplished during the shifting of the transmission in order to reduce a temporary loss of torque when shifting.

17. A vehicle according to at least one of the claims 9-15, characterized in that the vehicle comprises an electrical energy storage and that the control system is arranged for determining a setting for the provision of propulsive power by the electrical energy storage, the fuel-operated generating element and/or the combustion engine, at which the energy consumption and/or the emission of harmful substances and/or the noise level of the vehicle at a required engine torque and/or vehicle speed is minimal.

18. A vehicle according to at least one of the claims 9-17, characterized in that the vehicle comprises a brake device for electrically braking, whereby kinetic energy is converted into electrical energy.

19. A vehicle according to at least one of the preceding claims, characterized in that the energy generating element is further operated for obtaining electrical energy for the purpose of the drive of accessories, such as air conditioning.

20. A system for controlling a vehicle according to at least one of the preceding claims, comprising a source for transmitting a control signal which brings the vehicle in a desired operating condition.

21. A unit for coupling with and/or assembly into a vehicle provided with a main drive which comprises a combustion engine for driving the vehicle; which assembly unit comprises an electric motor for forming an auxiliary drive for driving the vehicle separately or in combination with the main drive; and a fuel-operated energy generating element which can be electrically connected with the electric motor in order to provide it directly with electrical energy.

22. A unit according to claim 21, characterized in that the energy generating element comprises a combustion engine with an electrical generator system and/or an electrical fuel cell, while the assembly unit comprises sound-deadening means for deadening the energy generating element.

23. A unit according to claim 21 or 22, characterized in that the unit is arranged for engaging a power take-off of a main drive of a vehicle.

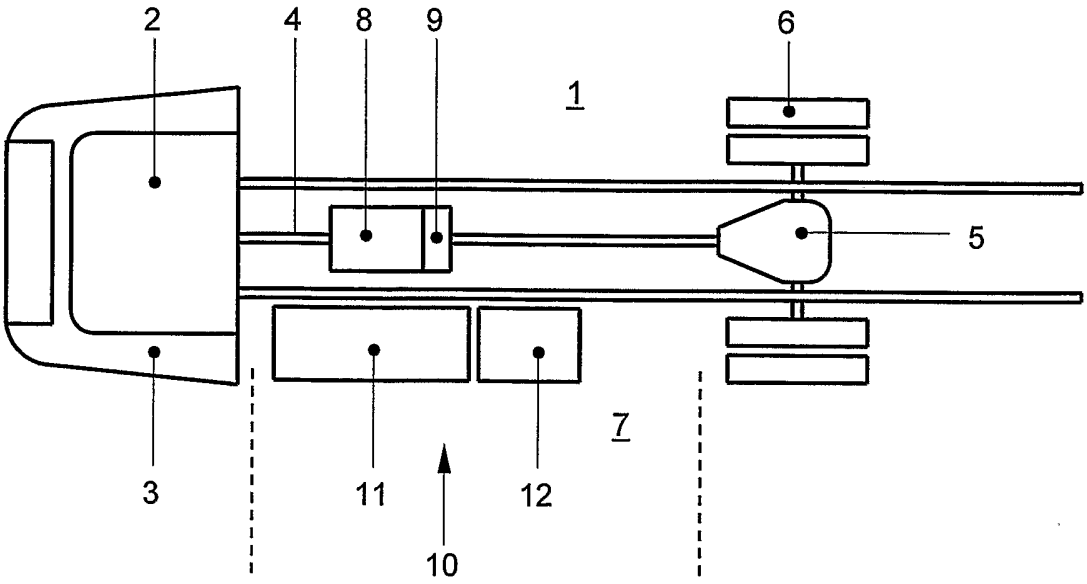


Fig. 1

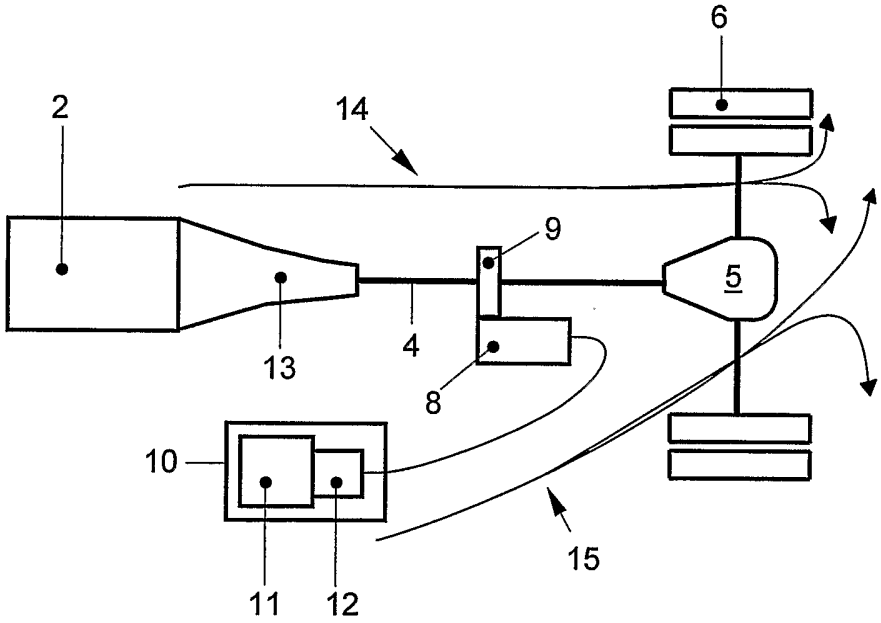


Fig. 2

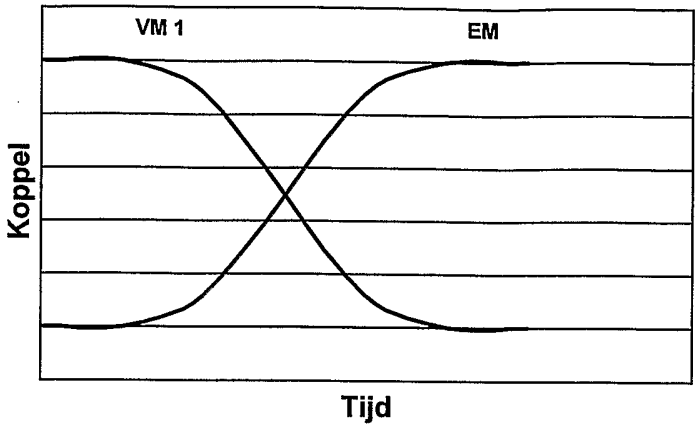


Fig. 3

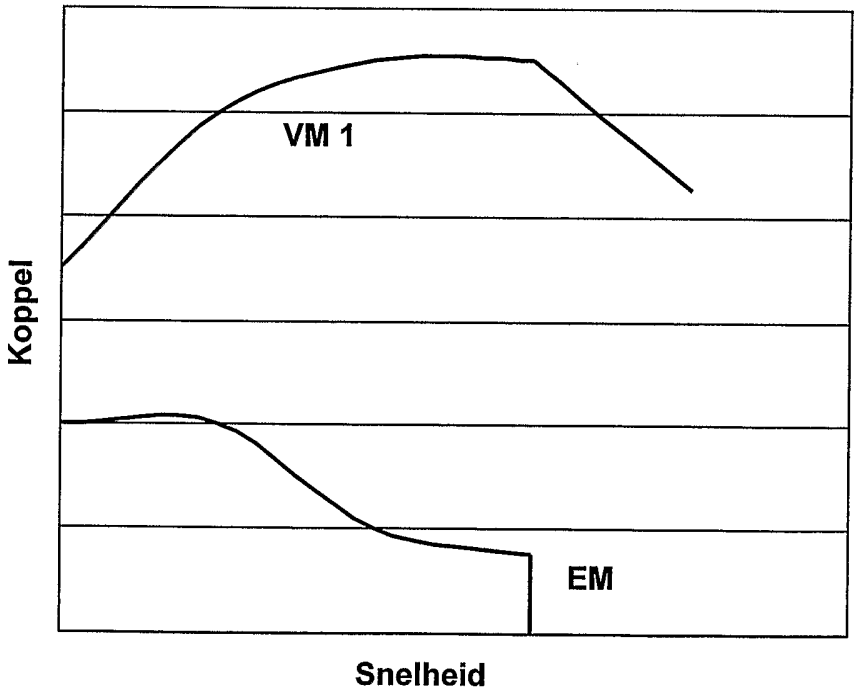
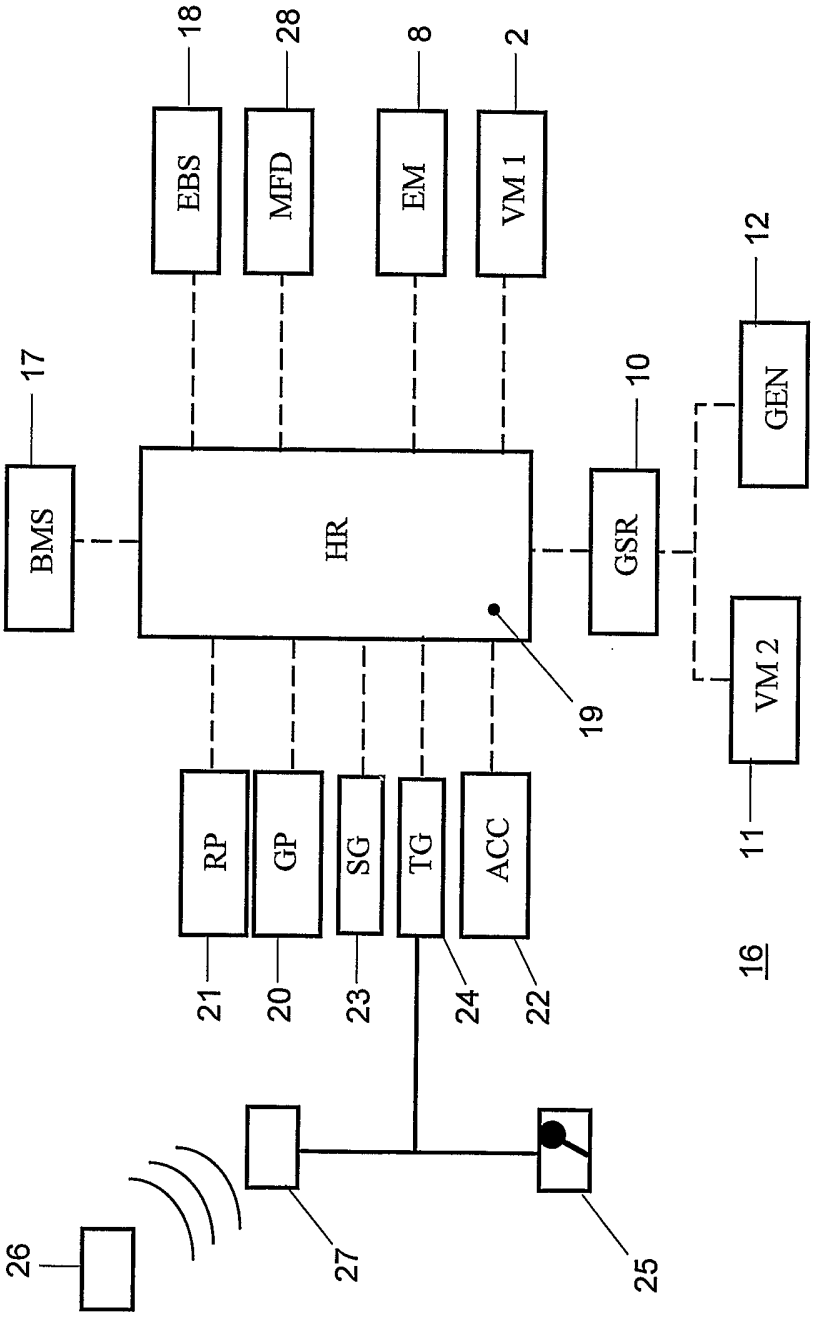


Fig. 4


18
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BMS
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Fig. 5

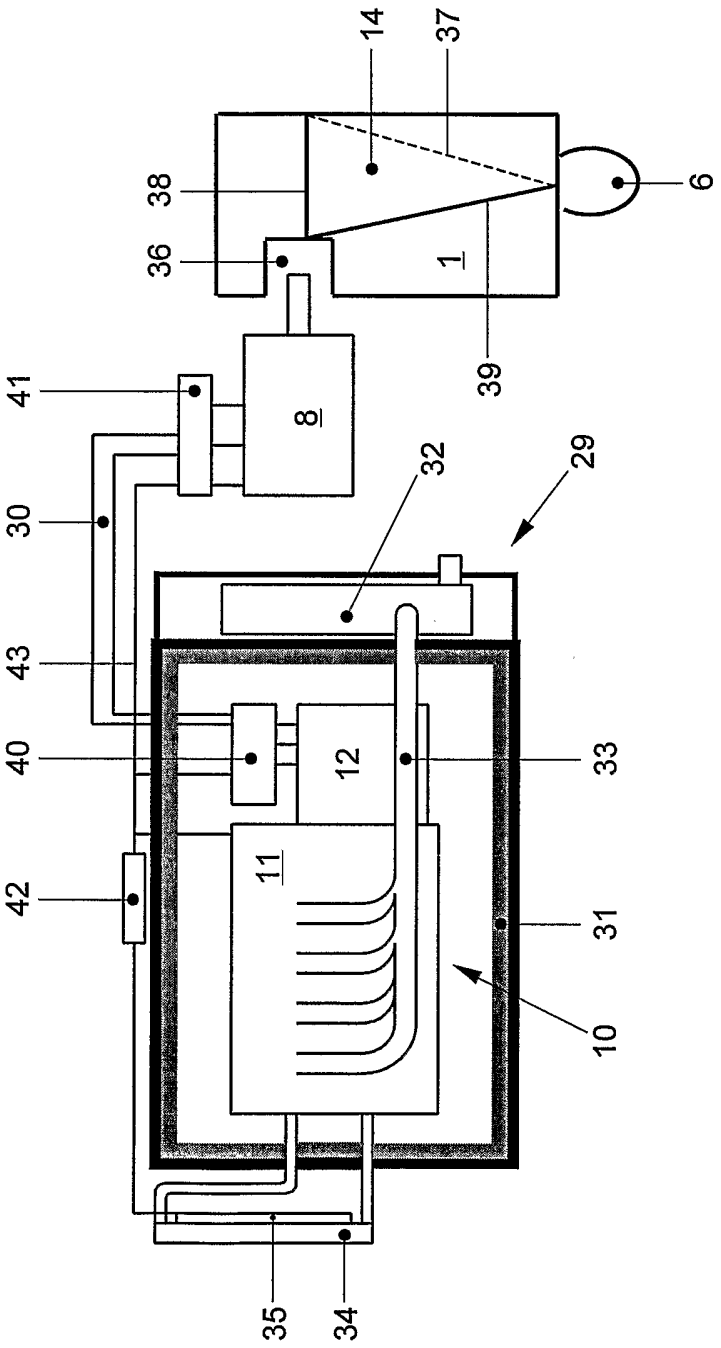

Fig. 6

INTERNATIONAL SEARCH REPORT

PCT/NL2004/000080

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B60K6/04 B60K5/08
//B60K35/00,B60K17/28,B60K25/00

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 7 B60K

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)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
2 July 2004	12/07/2004

Name and mailing address of the ISA	Authorized officer
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	Wagner, H

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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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