Paper No. 17

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Ex parte ANDERS LASSON

Appeal No. 2004-0058
Application No. 09/728,518

ON BRIEF

Before ABRAMS, FRANKFORT, and NASE, Administrative Patent Judges.
NASE, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the examiner's final rejection of claims 3 to 8, which are all of the claims pending in this application.[1]

We REVERSE.

[1] Claims 3 and 8 were amended subsequent to the final rejection.

BACKGROUND

The appellant's invention relates to a method for potentiating an engine's power contribution to a hybrid electric vehicle's performance in a take-off operating condition. A copy of the claims under appeal is set forth in the appendix to the appellant's brief.

Claims 3 to 8 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,081,365[2] to Field et al. (Field).

Rather than reiterate the conflicting viewpoints advanced by the examiner and the appellant regarding the above-noted rejection, we make reference to the answer (Paper No. 15, mailed February 12, 2003) for the examiner's complete reasoning in support of the rejection, and to the brief (Paper No. 14, filed January 21, 2003) for the appellant's arguments thereagainst.

OPINION

In reaching our decision in this appeal, we have given careful consideration to the appellant's specification and claims, to the Field patent, and to the respective positions articulated by the appellant and the examiner. As a consequence of our review, we make the determinations which follow.

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[2] Issued January 14, 1992.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. Verdegaal Bros. Inc. v. Union Oil Co., 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir.), cert. denied, 484 U.S. 827 (1987).

Claims 3 and 8, the independent claims on appeal, read as follows:

3. A method for potentiating an engine's power contribution to a hybrid electric vehicle's performance in a take-off operating condition, the method comprising the steps of

initiating take-off acceleration of a hybrid electric vehicle exclusively utilizing an electric motor of the vehicle;

predicting the future demand for an engine's power contribution to the hybrid electric vehicle's immediate future power demand during take-off acceleration;

starting the engine of the hybrid electric vehicle at the time that the determination is made of future demand for the engine's power contribution during the take-off acceleration; and

increasing the speed of operation of the engine as rapidly as predetermined operating efficiency parameters permit.

8. A method for potentiating an engine's power contribution to a hybrid electric vehicle's performance in a take-off operating condition, the method comprising the steps of

initiating take-off acceleration of a hybrid electric vehicle exclusively utilizing an electric motor of the vehicle;

predicting the future demand for an engine's power contribution to the hybrid electric vehicle's immediate future power demand during take-off acceleration;

starting the engine of the hybrid electric vehicle at the time that the determination is made of future demand for the engine's power contribution during the take-off acceleration; and

starting the engine at an engine speed below a resonance speed of a drivetrain of the vehicle.

Field's invention relates to a highly efficient electric hybrid propulsion system for a vehicle, an electric hybrid propulsion system being one in which the vehicle is driven by an electric motor powered by batteries, the batteries being charged by a generator powered by a combustion engine. In Field's invention there is an electric motor that is arranged to drive a vehicle, and there are batteries to power the motor. There is a combustion engine and means for it to recharge the batteries. However, there is no generator per se coupled to the engine. Rather, the engine is releasably coupled mechanically to the electric motor so that the engine power may be selectively applied toward driving the vehicle mechanically through the motor. When so coupled, and when operating conditions are such that less power is needed to propel the vehicle than the engine can develop, its excess power may be automatically applied to charge the batteries, using the electric motor as a generator. When more propulsion power is needed than the engine can supply, means are provided whereby the electric motor working as a motor can supply the balance by drawing on the batteries. This dual use of the electric motor as a motor and a generator eliminates the need for a separate generator coupled to the engine to charge the batteries, which saves weight and cost. The efficiency loss of a separate generator is thus avoided, which adds substantially to the efficiency of the system.

Field's electric hybrid automobile has three operating modes; urban mode, highway mode and engine mode. The manner of operation is described by Field (column 5, line 45, to column 8, line 31) as follows:

> URBAN MODE
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> Urban mode uses a straight electric drive in which the batteries 24 power the electric motor 22 which drives the automobile, and the combustion engine 28 is not running. Urban mode is used to start the car from a standstill and get it up to highway speed. It is also useful for around town stop-and-go service. Driving is done conventionally. The driver first turns on master switch 78, which powers up the electric hybrid system. He or she then places the car in gear, using gear shift lever 18, foot operated clutch 20 and 4-speed transmission 16. There is a conventional foot accelerator pedal connected to accelerator potentiometer 80. Depressing the pedal directs a variable voltage from zero to 10 volts from the accelerator potentiometer 80 through the process controller 52 to the motor controller 60. The more the pedal is depressed the higher the voltage will be up to the 10-volt limit. This variable voltage causes motor controller 60 to feed a proportionate supply of current to electric motor 22 so that the car moves smoothly at a speed commanded by the driver. Forward and reverse are obtained in conventional automotive manner by shifting gears in transmission 16. When the car is moving and the driver takes his or her foot off the accelerator pedal the motor controller 60 will stop feeding current to motor 22. The still spinning motor will act like a generator and feed current back to the batteries 24, consuming some kinetic energy in so doing, which will tend to slow down the car. This so-called regenerative braking is well known. A flywheel 26 is attached to the shaft of motor 22 to maintains its angular momentum so it will not slow down too abruptly due to this dynamic braking.
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> Urban mode provides a convenient, virtually silent and essentially pollution free manner of operation. However, the range of the automobile will be limited by the capacity of the batteries 24. For cross country operation a greater range is needed, and this may be obtained by operating in highway mode or engine mode. Highway mode will be discussed next.
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> HIGHWAY MODE
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> After the car has been started in urban mode and brought up to some speed, for example 1000 RPM on the electric motor 22, the driver may elect to enter highway mode. This is done by pushing the "highway mode" button 82 on

the dashboard. This command will cause process controller 52 to automatically operate the hybrid system in highway mode according to the logic shown in FIG. 3.

In FIGS. 3, 4 and 5, all of which are flow charts, blocks framed with double lines are manual operations performed by the driver, while blocks framed with single lines are automatic operations performed by process controller 52.

As shown in FIG. 3, after the driver manually selects highway mode the process controller 52 will ascertain that engine mode is not set, or cancel it if it is, and that the speed of motor 22 as sensed by speed monitor 56 is above 1000 RPM. It will then read the charge level of battery 24 as sensed by charge level sensor 66. If the battery is above a selected level, for example 70%, the process controller will stop the combustion engine 28 if it is running and disengage electric clutch 30 if it is engaged. Optionally it may be preferred not to stop the combustion engine but to slow it down to idle speed, and of course disengage the electric clutch. The process controller 52 will direct the signal from the accelerator potentiometer 80 to the motor controller 60. This will give the driver direct control of the speed of motor 22, so that he or she may drive in the same way as when using urban mode. The combustion engine will be shut off or idled, the electric clutch will be disengaged, and the electric motor 22 will drive the car, powered by batteries 24.

Every five minutes, or at some other selected time interval, the process controller will read the battery charge and when it drops below the selected level, which may be about 70%, the combustion engine 28 will be started if it is stopped, or brought up to speed if it is idling. The process controller starts the engine by opening solenoid fuel valve 48 and closing starter solenoid 42. Engine starter 40 will crank the engine until it starts, which will be indicated when engine speed monitor 54 reads a selected speed, for example 500 RPM. Starter solenoid 42 will then be opened and engine starter 40 will cease cranking. When the engine is running, the process controller can control its speed by sending a variable voltage speed signal to servo speed control 50. The process controller 52 can stop the engine 28 when that is desired by closing solenoid fuel valve 48. It should be understood that a solenoid fuel valve is used as a means of stopping a diesel engine, and that if some other type of engine were used, a different control might be used. For example, an ignition switch might be used with a gasoline engine.

After the combustion engine is running, the process controller 52 will read the speeds of the electric motor and the combustion engine from speed monitors 54 and 56 and adjust the engine speed with servo speed control 50 until the two speeds are equal. The process controller will then engage electric clutch 30, thereby coupling engine 28 mechanically to electric motor 22. The signal from accelerator potentiometer 80 will then be shifted to servo speed control 50 so that the driver can control the speed of the automobile by controlling the speed of engine 28. He or she may then continue to drive normally. Engine 28 will be powering the car.

In this condition there will be no signal from process controller 52 to motor controller 60, but motor 22 will be spinning, so motor controller 60 will call for regenerative braking. Motor 22 will act as a generator and supply current to the batteries 24. The rate of current flow will depend on the speed of the motor and the charge level of the batteries. This should be taken into account when setting the charge level at which the combustion engine is to be brought on line. A charge level of 70% seems to be suitable, but another level might be preferred.

Therefore in this condition engine 28 not only powers the car but also recharges the batteries 24. Every 5 minutes, or other selected time interval, the process controller will read the charge level of the batteries. When they are essentially fully charged, for example at 95% charge level, the process controller will disengage electric clutch 30 and stop engine 28 by closing solenoid fuel valve 48 or operating other suitable control means. Alternatively, the engine may be idled rather than stopped. The signal from the accelerator potentiometer 80 will be shifted from servo speed control 50 to motor controller 60 and operation of the car will revert to fully electric.

This alternating sequence of operating on the batteries until they are partially discharged, then operating on the combustion engine until the batteries are charged up, then back to the batteries, will continue as long as the driver keeps the car in highway mode. It is a very efficient mode of operation. It runs the combustion engine near its rated power and hence near its maximum efficiency for part of the time, then shuts it off to save fuel and uses electric power. However, the batteries are never deeply depleted, so there is always good battery capacity available for urban mode operation when needed. Range is limited only by the fuel consumption of the engine 28 and the size of the fuel tank 46. As with a conventional car, periodically refilling the fuel tank will extend the range.

> To leave the highway mode, the driver would push the "engine mode" button. Above 1000 RPM on the electric motor the car will go into engine mode. Below 1000 RPM it will go into urban mode.
>
> ENGINE MODE
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> Engine mode may be elected by the driver after the car has reached 1000 RPM or more on the electric motor 22 by operation in either urban or highway mode. The control logic for engine mode is shown in FIG. 4. After the driver manually selects engine mode, the process controller 52 will ascertain that highway mode is not set, or cancel it if it is, and that the speed of motor 22 as sensed by speed monitor 56 is above 1000 RPM. It will then start combustion engine 28 if it is not running and bring it up to speed by the same control sequence as was described in the highway mode. Engine 28 will be brought up to the speed of electric motor 22 and mechanically coupled to it by engaging electric clutch 30. The signal from accelerator potentiometer 80 will then be connected to the engine servo speed control 50, which will give the driver control of the speed of the car by varying the speed of combustion engine 28. There will be no signal to motor controller 60, and since electric motor 22 will be spinning there will be a regenerative braking effect which will cause motor 22, acting as a generator, to charge the batteries 24. This charging will taper off as the batteries approach full charge due to the characteristics built into motor controller 60. When the batteries are fully charged the current flow from motor 22 will be negligible, and then the motor will be functioning essentially as an element in the mechanical coupling of engine 28 to transmission 16. The car will be driven like any conventional automobile with a manual transmission. Engine mode provides an economical manner of operation. The efficiency losses inherent in electric motor 22 are largely eliminated, and there is no changing back and forth from combustion engine to electric motor and vice versa. To leave engine mode the driver would push the "highway mode" button. Above 1000 RPM on the electric motor the car will go into highway mode. Below 1000 RPM it will go into urban mode.

The appellant argues (brief, pp. 5-9) that Field does not anticipate the claims under appeal since Field does not teach either (1) the step of increasing the speed of operation of the engine as rapidly as predetermined operating efficiency parameters permit as set forth in independent claim 3, or (2) the step of starting the engine at an engine speed below a resonance speed of a drivetrain of the vehicle as recited in independent claim 8. We agree. We do not agree with the examiner (see pages 3-8 of the answer) that these two limitations are inherently met by Field.

A prior art reference need not expressly disclose each claimed element in order to anticipate the claimed invention. See Tyler Refrigeration v. Kysor Indus. Corp., 777 F.2d 687, 689, 227 USPQ 845, 846-847 (Fed. Cir. 1985). Rather, if a claimed element (or elements) is inherent in a prior art reference, then that element (or elements) is disclosed for purposes of finding anticipation. See Verdegaal Bros., Inc. v. Union Oil Co., 814 F.2d at 631-33, 2 USPQ2d at 1052-54.

It is well settled that the burden of establishing a prima facie case of anticipation resides with the Patent and Trademark Office (PTO). See In re Piasecki, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984). When relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art. See Ex parte Levy, 17 USPQ2d 1461, 1464 (Bd. Patent App. & Int. 1990). When a reference is silent about an asserted inherent characteristic, it must be clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Continental Can Co. v. Monsanto Co., 948 F.2d 1264, 1268, 20 USPQ2d 1746, 1749 (Fed. Cir. 1991). As the court stated in In re Oelrich, 666 F.2d 578, 581, 212 USPQ 323, 326 (CCPA 1981)(quoting Hansgirg v. Kemmer, 102 F.2d 212, 214, 40 USPQ 665, 667 (CCPA 1939)):

> Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing *may* result from a given set of circumstances is not sufficient. [Citations omitted.] If, however, the disclosure is sufficient to show that the natural result flowing from the operation as taught would result in the performance of the questioned function, it seems to be well settled that the disclosure should be regarded as sufficient.

In this case, the examiner has not provided a basis in fact and/or technical reasoning to reasonably support the determination that the above-identified method steps necessarily flows from the teachings of Field.

With respect to the step of starting the engine at an engine speed below a resonance speed of a drivetrain of the vehicle (claim 8), the examiner's belief (answer, p. 7) that the engine speed is zero when an engine is started and is therefore below the resonance speed of the drivetrain is simply wrong. An engine whose speed is zero clearly has not started. The claim language of "starting the engine at an engine speed" refers to the engine speed (i.e., r.p.m.) that occurs immediately after the engine has been started. There is no basis from the disclosure of Field to conclude that the engine speed that occurs immediately after Field's engine has been started is below the resonance speed of the drivetrain of the vehicle. Accordingly, claim 8 is not anticipated by Field.

With respect to the step of increasing the speed of operation of the engine as rapidly as predetermined operating efficiency parameters permit (claim 3), the examiner's belief (answer, pp. 5-6) that Field's servo speed control 50 and process controller 52 will work as efficiently as possible and would not be programmed to be "inefficient" is pure speculation unsupported by any disclosure in Field. There is no basis from the disclosure of Field to conclude that the speed of operation of the engine is increased as rapidly as predetermined operating efficiency parameters permit. Accordingly, claim 3 is not anticipated by Field.

For the reasons set forth above, the decision of the examiner to reject claims 3 and 8, and claims 4 to 7 dependent thereon, under 35 U.S.C. § 102(b) is reversed.

CONCLUSION

To summarize, the decision of the examiner to reject claims 3 to 8 under 35 U.S.C. § 102(b) is reversed.

REVERSED

NEAL E. ABRAMS Administrative Patent Judge	)	
CHARLES E. FRANKFORT Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
JEFFREY V. NASE Administrative Patent Judge	)	

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