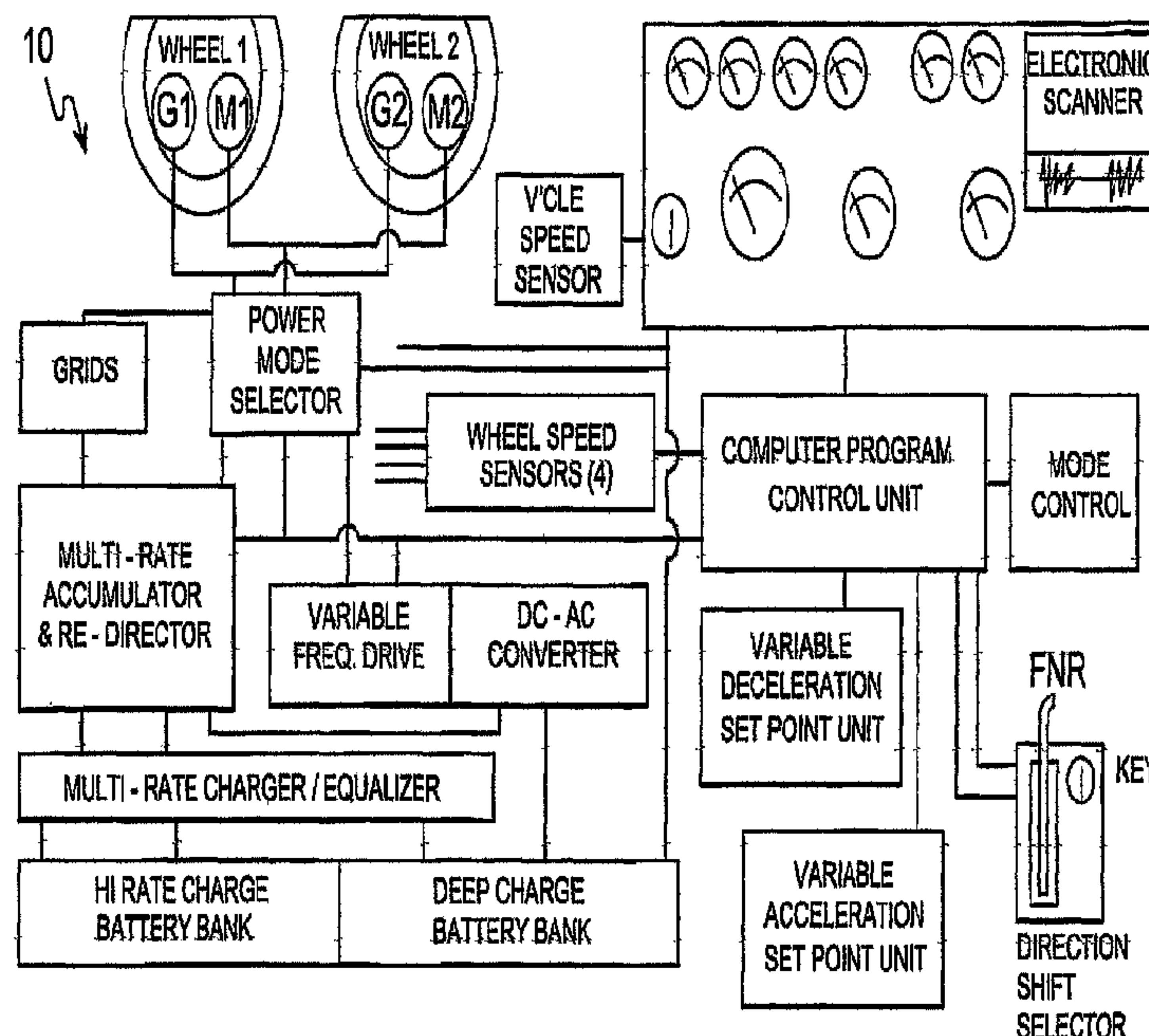




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(54) **Titre : SYSTEME DE PILOTAGE DE COURANT ALTERNATIF/COURANT CONTINU DE CHARGE ELECTRIQUE
INTERMITTENTE**
(54) **Title: INTERMITTANT ELECTRICAL CHARGING AC/DC DRIVING SYSTEM**



(57) **Abrégé/Abstract:**

An electrical system for providing a continuous source of energy AC/DC within a vehicle includes a device for charging the batteries for exerting a natural braking effect on the motor at those times when it is desired to slow the forward motion of the vehicle, such as when going down hill or needing to come to a stop. Due to the batteries being intermittently charged, smaller batteries than may what otherwise be necessary may be used, and the recharging interval can be lengthened.



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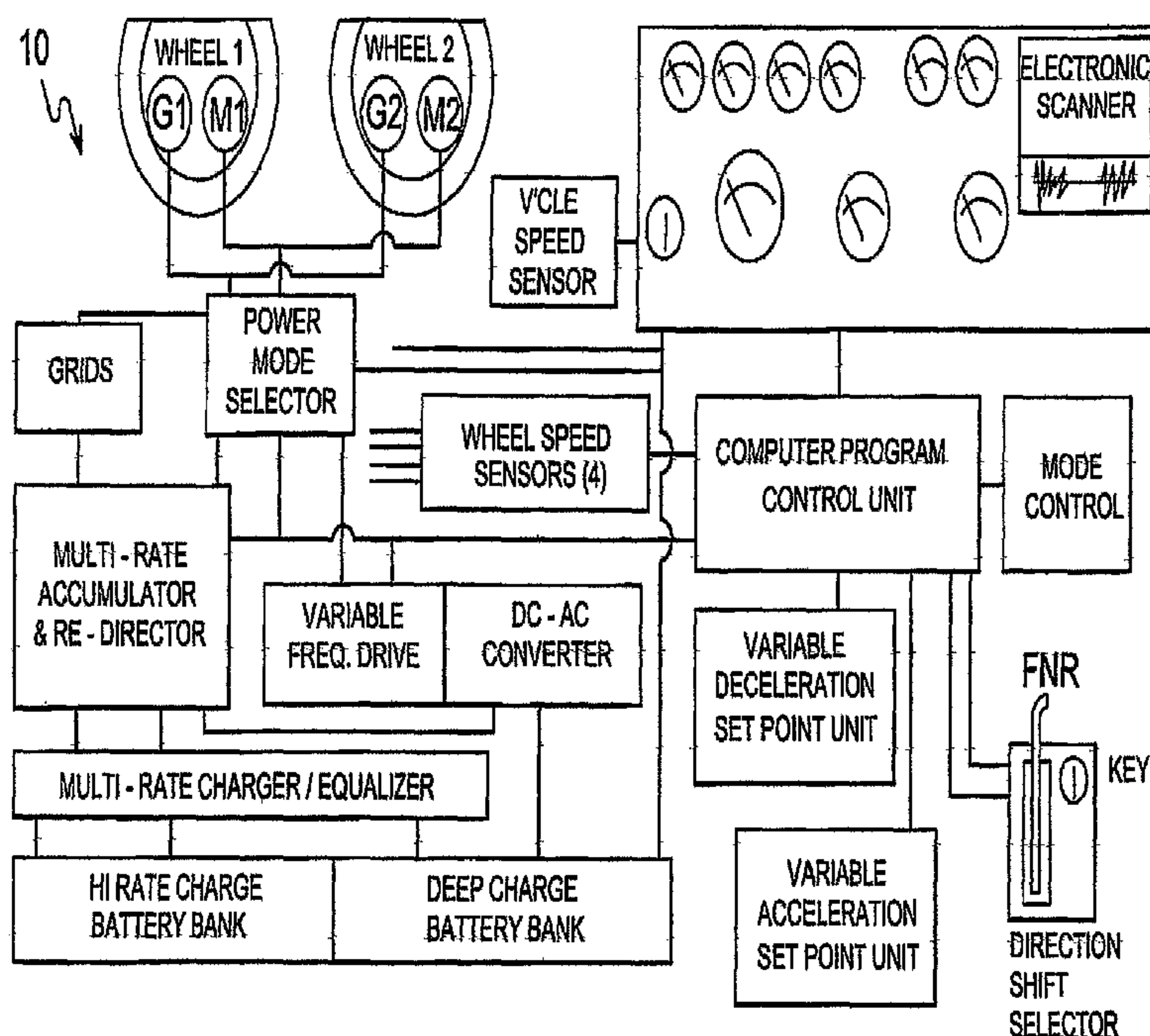
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(57) Abstract: An electrical system for providing a continuous source of energy AC/DC within a vehicle includes a device for charging the batteries for exerting a natural braking effect on the motor at those times when it is desired to slow the forward motion of the vehicle, such as when going down hill or needing to come to a stop. Due to the batteries being intermittently charged, smaller batteries then may what otherwise be necessary may be used, and the recharging interval can be lengthened.

FIG. 4

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INTERMITTANT ELECTRICAL CHARGING

AC/DC DRIVING SYSTEM

BACKGROUND OF THE INVENTION

Technical Field of the Invention

The present invention relates, generally, to a self-charging AC/DC and driving system for electrical vehicles and, more particularly, to a system in which the self-charging is done at times when the vehicle is either coasting down hill or is having its brakes applied in order (in each case) to slow its forward motion.

Description of the Prior Art

To date, electrically powered vehicles have required large batteries (e.g., liquid acid) which have needed to be plugged in for long periods of time to recharge them.

Accordingly, there has been a long-felt demand for a regenerative power system for electric-powered vehicles.

SUMMARY OF THE INVENTION

It is a feature of one embodiment of the present invention to provide an intermittently self-charging electrical AC/DC system that will allow smaller batteries to be used, lengthen the time between battery recharges and reduce brake wear, thus overcoming some of the shortcomings of the prior art devices.

Another feature of one embodiment provides a continuous flow of electrical energy (AC/DC) from a sealed battery (jelly or alkaline) through cables, main switch, diodes, capacitors, accumulators and related components.

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Yet another feature of one embodiment of the present invention is to provide a safe charging system from AC to DC through, for example, a regulator and other components (in a special locked panel box) which control power charge.

Still yet another feature of the present invention, according to one embodiment, provides cooling of the system load through grids which have blowers to disperse some of the heat generated by the operation of the motor. The remaining heat passes through a special filter to heat the interior of the vehicle.

Another feature of one embodiment of the present invention is to provide a vehicle which has zero emissions and is economical in cost to manufacture.

The foregoing and related features are achieved by the present invention in which a self-charging AC/DC and driving system for electrical vehicles is provided and, more specifically, to a system in which the self-charging is done at times when the vehicle is either coasting down hill or is having its brakes applied in order (in each case) to slow its forward motion.

More specifically, the present invention is an intermittently self-charging AC/DC and driving system for battery powered vehicles. This invention takes advantage of those times when it is desired to slow the forward motion of the vehicle such as when going down hill or braking to a stop. By converting the mechanical energy of the forward motion of the vehicle to electrical energy and using that electrical energy at those times to recharge the batteries (which exerts a natural braking action on forward motion), not only can smaller batteries be used to power the vehicle, and the interval at which the batteries must be recharged lengthened, but also wear and tear on the brakes is reduced.

When the brakes are applied or the potential meter is released, a belt attached to the front axle is engaged by the pulley of an AC generator and the rotational energy of the rotating front axle is converted by the AC generator to electrical energy which is then used to charge the batteries. This conversion of rotational energy to electrical energy

effectively retards the rotation of the front axle thus causing a braking action which slows the vehicle.

In accordance with one embodiment of the present invention, there is provided an electrical charging and driving system for an electric powered vehicle, comprising: a battery; a motor powered by the battery; an axle having a belt; wheels rotatively turned by the axle; generating means for converting the rotatable turning of the axle into electrical current, the generating means having a pulley; generator engaging means for enabling the belt on the axle for engaging the pulley of the generating means, the pulley being capable of being rotatably turned via the belt on the axle; acceleration means for accelerating the electric powered vehicle, the acceleration means comprising an acceleration applied state and an acceleration non-applied state; braking means for retarding forward movement of the electric powered vehicle, the braking means comprising a braking applied state and a braking non-applied state; means responsive to the acceleration means and the braking means for causing the generator engaging means to enable the belt on the axle for engaging the pulley of the generating means when the acceleration means is in the acceleration non-applied state or the braking means is in the braking applied state; means for using the electrical current from the generator for charging the battery; and a cooling system in the electric powered vehicle comprising a blower in a front portion of the electric powered vehicle for blowing air to the motor and the generator, and further comprising a fan for directing heat into an interior of the electric powered vehicle.

Another embodiment of the present invention provides an electrical charging and driving system for an electric powered vehicle, comprising: a battery; a rear axle; a motor powered by the battery and directly connected to the rear axle of the electric powered vehicle; a front axle of the electric powered vehicle having a belt; rear wheels rotatably turned by the motor through the rear axle; generating means for converting the rotatable turning of the front axle into electrical current, the generating means having a pulley; generator engaging means for enabling the belt on the front axle to engage the pulley of the generating means, the pulley being capable for being rotatably turned by the belt on the front axle; acceleration means for accelerating the electric powered vehicle, the acceleration means comprising an acceleration applied state and an acceleration non-applied state; braking means for retarding forward movement of the electric powered vehicle, the braking means comprising a braking applied state and a braking non-applied state; means comprising a single charging system responsive to the acceleration means and the braking means

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for causing the generator engaging means for enabling the belt on the front axle to engage the pulley of the generating means when the acceleration means is in the acceleration non-applied state or the braking means is in the braking applied state; means for using the electrical current from the generating means for charging the battery; and a cooling system in the electric powered vehicle comprising a blower in a front portion of the electric powered vehicle for blowing air to the motor and the generator, and further comprising a fan for directing heat into an interior of the electric powered vehicle.

Yet a further embodiment of the present invention provides an electrical charging and driving system for an electric powered vehicle, comprising: front wheels; rear wheels with each of the rear wheels having an axle with a reversible AC/DC motor mounted thereon and positraction for driving the rear wheels; a bank of batteries mounted in a rear portion of the electric powered vehicle; a special panel mounted in a forward section of the electric powered vehicle adjacent a side body panel thereof; a reversible AC generator mounted in a forward position of the electric powered vehicle, the AC generator having a pulley connection thereto; a plurality of electrical cables connecting the bank of batteries to the special panel for receiving and sending power to the bank of batteries, the plurality of electrical cables further including a first electrical cable for delivering electrical power to the reversible AC/DC motor from the special panel and a second electrical cable for delivering electric power from the AC generator to the special panel when the AC generator is driven; a front axle connected to the front wheels; a driving belt fixedly attached to the front axle; an acceleration pedal for transferring electric power from the bank of batteries to the special panel for converting DC power received to AC power for delivery over the first electrical cable to the reversible AC/DC motor for driving the rear wheels; a brake pedal for reducing speed of the electric power vehicle; a single charging system comprising means for connecting the belt to the pulley for driving the AC generator when a driver releases a foot from the accelerator pedal or the driver depresses the brake pedal for delivering AC electrical power to the special panel over the second electrical cable, the special panel converting power received to DC and transferring DC over the plurality of electrical cables to the bank of batteries for recharging the bank of batteries; a cooling system in the electric powered vehicle comprising a blower in a front portion of the electric powered vehicle for blowing air to the AC/DC motor and the AC generator, and further including a fan for directing heat into an interior of the electric powered vehicle; and a control system wherein wheel speed and objective speed set points are compared using a software error reducing algorithm for optimizing achievement of the objective speed set point.

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Other features of the present invention will become apparent when considered in view of the following detailed description of the invention, which provides certain preferred embodiments and examples of the present invention.

It should, however, be noted that the accompanying drawing figures and detailed description thereof is intended to discuss and explain only certain embodiments of the claimed invention and is not intended as a means for defining the limits and scope of the invention.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

In the drawing, wherein similar reference numerals denote similar features throughout the several views:

FIG. 1 is a diagrammatic perspective view of a vehicle with parts broken away showing the location of the bank of eight batteries at the rear;

FIG. 2 is a cross-sectional view of the vehicle showing the batteries in the battery bank connected by cable to the special panel;

FIGS. 3A and 3B present illustrative views of the present invention;

FIG. 4 is a further illustrative view of the present invention;

FIG. 5 is a cross-sectional view of the special panel which contains the power regulator along with other components;

FIG. 6 is a diagrammatic perspective view of the grids filter with parts broken away illustrating the grids filter and the pipe through which warm air is conducted to the interior of the vehicle; and,

FIG. 7 is a diagrammatic perspective view of the vehicle with parts broken away.

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DETAILED DESCRIPTION OF THE DRAWING FIGURES
AND PREFERRED EMBODIMENTS

Turning now, in detail, to the accompanying drawing figures, in FIG. 1, behind the rear seat of the vehicle, can be seen the bank of eight batteries **12**, which are all either 96-volt or 124-volt batteries. Also shown is the filter access door **54**, which may be opened when it is desired to change the grids filter **50**.

Referring to FIG. 2, the battery bank **12** is shown at the rear of the vehicle. Power is carried through the cables **14** to the special panel box **18**. From there it passes to the motors **22** and the positraction **38**. Rotation of the rear axle **84** causes the wheels **60** to rotate and the vehicle to move. The headlights **62** are, preferably, 12-volt.

With respect to FIGS. 3A and 3B, when the ignition (contact) key is turned on at the main switch, the bank of eight batteries **12** supplies, via cables **14** attached to the positive and negative terminals of the head battery of the battery bank, power to the special panel box **18**, which houses the special panel **46** (shown in FIG. 5.) Within the special panel **46**, which has a positive and negative terminal for receiving power from (or, during a recharge phase, sending power to) the battery bank, the DC power from the battery bank **12** is converted to a suitable form for and supplied, via cable **34**, to two brushless motors **22** (which are reversible) (AC/DC.) When a lever is moved to the "forward" position from "neutral", these motors **22**, cause the positraction **38** to rotate the rear axle **84** and thus the rear wheels **60**. Acceleration takes place by utilizing six contacts for "Forward." For "Reverse," only one contact is used. When the driver releases his foot from the acceleration pedal such as when the vehicle is coasting down hill, or when the driver presses the foot brake, the pulley **24** of the AC generator **26** (which is also reversible) engages belt **20**, which is fixedly attached to the front axle **28**, and the AC generator thus converts the rotational energy of the front axle **28** to AC electrical energy. This AC electrical energy in turn is conducted via cable **36** to the

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special panel 46 inside the special panel box 18. The special panel 46 converts this electric current from AC to DC. Cables 14 attached to the positive and negative terminals of the special panel 46 then conduct this current to the battery bank 12 where the DC current partially recharges these batteries. Thus it can be seen that the mechanical energy of the rotating front axle is converted to electrical energy by the AC generator at those times when it is desired to slow the forward motion of the vehicle. By utilizing this electrical energy to recharge the battery bank, a large mechanical drag is placed on the forward rotation of the front axle thus slowing the vehicle. This leads to two useful results: First, the battery bank is somewhat recharged leading to an increased travel range for the vehicle. Second, there is somewhat reduced wear and tear on the brakes.

During operation, a separately mounted motor provides power for power steering, power brakes, air conditioning and the blower 42. The blower 42 blows air to both motors/generators 22 and the generator 26 for cooling purposes. The grids 44 prevents overloading of the electrical system when the vehicle is in operation, and also prevent power overload due to overheating during operation. A small fan directs some heat into the interior of the vehicle through a pipe 52 and the grids filter 50, which pipe and grids filter are illustrated in FIG. 6.

Referring to FIG. 4, shown is the Drive Power System and Regenerative Charging System, M1 and M2 represent two chassis mounted wheel drive motors configured to receive electric power from the Variable Frequency Drive (VFD) multi-phase AC power system via the Power Mode selector unit, responding to the Variable Acceleration Set Point parameter instantaneously determined by the computer. DC potential energy stored in battery banks is translated into AC voltage power by the electronic chopper/converter unit, outputting drive power to wheels in efficient multi-phase, variable frequency AC format via the VFD unit. Wheel speed is instantaneously targeted as a multiple of VFD frequency, and set via computer from the variable accelerator set point parameter. Wheel

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speed and VFD frequency are computed and VFD compared to produce a speed-target difference signal, used by a software error reducing algorithm to optimize achievement of objective speed set point. Under constant vehicle velocity objective conditions, light power is applied to balance frictional or gravity losses, with zero application of the regenerative energy reclaim system. For low rate deceleration objectives, drive power is reduced to balance frictional and gravity gains to the point where, drive power is removed and regenerative energy reclaim applied. Wheel speed and VFD frequency target are compared to proportionally set the Variable Accumulator unit, with difference signal again used by software to optimize response time in achieving speed set point. Under rapid deceleration objective conditions, the immediately proceeding process is maximized, resistive dissipation added as necessary, and mechanical braking applied at over threshold conditions.

G1 and G2 represent two wheel-driven physically linked generators, or the generator component of combination motor-generator units, configured to return regenerative power to the system via the Power Mode selector, in proportional response to the variable Deceleration set point parameter. The multi-rate accumulator is specially designed to receive regenerated energy at variable rate and distribute it appropriately to high and low rate energy storage or emergency dissipation devices. A fundamental system component is the variable/multi-rate (energy) Accumulator/Redirector. This compound fast and low rate energy absorber is to relay short term stored energy to the appropriate storage device, including over-threshold energy to the dissipation grid, as well as the converter directly. Mixed characteristic battery banks are utilized, featuring individual high rate and deep charge characteristics. The high rate characteristic essential to maximizing system energy reclaim, while deep charge being important to initial charge storage density. System control involves the dashboard status and key lockup panel reporting electric drive performance, regenerative or charge power processed (stored

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and/or dissipated), power reclaim efficiency, Battery bank charge state, Charger performance, vehicle speed and miscellaneous electrical systems Trouble/Alarm/Normal status. A lockable gear selector switch provides Forward, Reverse or Neutral command to system electronic control. A variable set point parameter device, functionally similar to a conventional vehicle accelerator, is intended to cause, via computer, drive power to be applied to one or both wheels (depending on 'Posi-traction' Mode Control switch setting). Regenerative charge output is system inhibited under all acceleration conditions, and proportionally enabled as set point is lowered below measured vehicle speed. A variable set point parameter device, functionally similar to a conventional vehicle brake pedal, is intended via computer to provide proportional generator output to Accumulator, and Grids as necessary, utilizing vehicle and wheel speed sensor input. Regenerative output is ideally balanced per wheel contingent on four wheel speeds independently sensed. Wheel drive is disabled and optionally dynamically 'plugged' (reverse powered) under certain deceleration conditions. Overall control of power applied/ recharge received is a computerized function designed to maximize conservation and reclaim of stored energy, and minimize escape energy due primarily to incidental and applied friction. Recognizing that the power output/battery recharge cycle is an inherent net loss process, regenerative power is only claimed when drive power is not required, or when kinetic energy is desired to be recaptured as potential energy, without resort to mechanical and electrical heat energy production.

Referring to FIG. 5, shown is a cross-sectional view of the special panel 46 which contains the power regulator 48, contacts, AC/DC diodes, capacitors, breaker accumulator and many additional small components. This panel receives electrical energy from the batteries and converts it prior to supplying it to the motors. This panel also contains a converter to convert power to 12 volts for headlights 62 (shown in FIG. 2) and other instruments, and a converter to convert power for the purpose of intermittently charging

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the bank of batteries **12** at those times when the accelerator pedal has been released and/or the brakes have been applied.

Turning to FIG. 6, there is presented is a diagrammatic perspective view of the grids filter **44** with parts broken away illustrating the grids filter **50** and the pipe **52**, through which warm air is conducted to the interior of the vehicle.

Finally, referring to FIG. 7, when the ignition (contact) key is turned on at the main switch, the bank of eight batteries **12** supplies, via cables **14** attached to the positive and negative terminals of the head battery of the battery bank, power to the special panel box **14**, which houses the special panel **46** (shown in FIG. 5.) Within the special panel **46**, which has a positive and negative terminal for receiving power from (or, during a recharge phase, sending power to) the battery bank, the DC power from the battery bank **12** is converted to a suitable form for and supplied, via cable **34**, to two brushless motors **22** (which are reversible) (AC/DC). When a lever is moved to the "forward" position from "neutral," these motors **22** (see FIGS. 3A and 3B) cause the positraction **38** to rotate the rear axle **84** and, thus, the rear wheels **60**. Acceleration takes place by utilizing six contacts for "Forward." For "Reverse," only one contact is used. When the driver releases his foot from the acceleration pedal such as when the vehicle is coasting down hill, or when the driver presses the foot brake, the pulley **24** of the AC generator **26** (which is also reversible) engages belt **20**, which is fixedly attached to the front axle **28**, and the AC generator thus converts the rotational energy of the front axle **28** to AC electrical energy. This AC electrical energy, in turn, is conducted via cable **36** to the special panel **46** inside the special panel box **18**. The special panel **46** converts this electric current from AC to DC. Cables **14** attached to the positive and negative terminals of the special panel **46** then conduct this current to the battery bank **12**, where the DC current partially recharges these batteries. Thus we see that the mechanical energy of the rotating front axle is converted to electrical energy by the AC generator at those times

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when it is desired to slow the forward motion of the vehicle. By utilizing this electrical energy to recharge the battery bank, a large mechanical drag is placed on the forward rotation of the front axle thus slowing the vehicle. This leads to two useful results: First, the battery bank is somewhat recharged leading to an increased travel range for the vehicle. Second, there is somewhat reduced wear and tear on the brakes.

While only several embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that many modifications may be made to the present invention. The scope of the claims should not be limited by the preferred embodiments set forth herein, but should be given the broadest interpretation consistent with the description as a whole.

List of Reference Numerals

- 10 self-charging AC/DC driving system for electric vehicles
- 12 battery bank
- 14 cables connecting the battery bank to special panel box for supplying power to the motors or for recharging the batteries
- 18 special panel box
- 20 belt attached to front axle
- 22 motors (AC/DC) reversible
- 24 AC generator pulley
- 26 generator (AC) reversible
- 28 front axle
- 34 cable from special panel box to brushless motors
- 36 cable from generator to special panel box
- 38 positraction (not shown – controlled by computer)
- 40 cooling conduit
- 42 blower

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44	grids
46	special panel
48	power regulator
50	grids filter
52	pipe
54	filter access cover
58	front wheels
60	rear wheels
62	headlights
64	panel electronics
66	AC & DC diode switches
68	breakers
70	capacitors and other components
72	contacts
74	battery charger/accumulator
76	cooling conduit supports
78	access panels
80	rear axle box breathers
82	front axle air breathers
84	rear axle
86	mechanical parking brake

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The embodiments of the present invention for which an exclusive property or privilege is claimed are defined as follows:

1. An electrical charging and driving system for an electric powered vehicle, comprising:
 - a battery;
 - a motor powered by said battery;
 - an axle having a belt;
 - wheels rotatively turned by said axle;
 - generating means for converting the rotatable turning of said axle into electrical current, said generating means having a pulley;
 - generator engaging means for enabling said belt on said axle for engaging said pulley of said generating means, said pulley being capable of being rotatably turned via said belt on said axle;
 - acceleration means for accelerating said electric powered vehicle, said acceleration means comprising an acceleration applied state and an acceleration non-applied state;
 - braking means for retarding forward movement of said electric powered vehicle, said braking means comprising a braking applied state and a braking non-applied state;
 - means responsive to said acceleration means and said braking means for causing said generator engaging means to enable said belt on said axle for engaging said pulley of said generating means when said acceleration means is in the acceleration non-applied state or said braking means is in said braking applied state;
 - means for using the electrical current from said generator for charging said battery; and
 - a cooling system in said electric powered vehicle comprising a blower in a front portion of said electric powered vehicle for blowing air to said motor and said generator, and further comprising a fan for directing heat into an interior of said electric powered vehicle.
2. The electrical charging and driving system for an electric powered vehicle according to Claim 1, wherein said motor is a brushless motor.

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3. The electrical charging and driving system for an electric powered vehicle according to Claim 2, wherein said brushless motor is a reversible motor.

4. The electrical charging and driving system for an electric powered vehicle according to Claim 1, wherein said generating means is an AC generator.

5. The electrical charging and driving system for an electric powered vehicle according to Claim 4, wherein said AC generator is a reversible generator.

6. An electrical charging and driving system for an electric powered vehicle, comprising:

a battery;

a rear axle;

a motor powered by said battery and directly connected to said rear axle of said electric powered vehicle;

a front axle of said electric powered vehicle having a belt;

rear wheels rotatably turned by said motor through said rear axle;

generating means for converting the rotatable turning of said front axle into electrical current, said generating means having a pulley;

generator engaging means for enabling said belt on said front axle to engage said pulley of said generating means, said pulley being capable of being rotatably turned by said belt on said front axle;

acceleration means for accelerating said electric powered vehicle, said acceleration means comprising an acceleration applied state and an acceleration non-applied state;

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breaking means for retarding forward movement of said electric powered vehicle,
said breaking means comprising a braking applied state and a braking non-applied state;

means comprising a single charging system responsive to said acceleration means
and said breaking means for causing said generator engaging means for enabling said belt
on said front axle to engage said pulley of said generating means when said acceleration
means is in the acceleration non-applied state or said braking means is in the braking
applied state;

means for using the electrical current from said generating means for charging
said battery; and,

a cooling system in said electric powered vehicle comprising a blower in a front
portion of said electric powered vehicle for blowing air to said motor and said generator,
and further comprising a fan for directing heat into an interior of said electric powered
vehicle.

7. The electrical charging and driving system for an electric powered vehicle
according to Claim 6, wherein said motor is a brushless motor.

8. The electrical charging and driving system for an electric powered vehicle
according to Claim 7, wherein said brushless motor is a reversible motor.

9. The electrical charging and driving system for an electric powered vehicle
according to Claim 6, wherein said generating means is an AC generator.

10. The electrical charging and driving system for an electric powered vehicle
according to Claim 9, wherein said AC generator is a reversible generator.

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11. An electrical charging and driving system for an electric powered vehicle, comprising:

front wheels;

rear wheels with each of said rear wheels having an axle with a reversible AC/DC motor mounted thereon and positraction for driving said rear wheels;

a bank of batteries mounted in a rear portion of said electric powered vehicle;

a special panel mounted in a forward section of said electric powered vehicle adjacent a side body panel thereof;

a reversible AC generator mounted in a forward position of said electric powered vehicle, said AC generator having a pulley connection thereto;

a plurality of electrical cables connecting said bank of batteries to said special panel for receiving and sending power to said bank of batteries, said plurality of electrical cables further including a first electrical cable for delivering electrical power to said reversible AC/DC motor from said special panel and a second electrical cable for delivering electric power from said AC generator to said special panel when said AC generator is driven;

a front axle connected to said front wheels;

a driving belt fixedly attached to said front axle;

an acceleration pedal for transferring electric power from said bank of batteries to said special panel for converting DC power received to AC power for delivery over said first electrical cable to said reversible AC/DC motor for driving said rear wheels;

a brake pedal for reducing speed of said electric power vehicle;

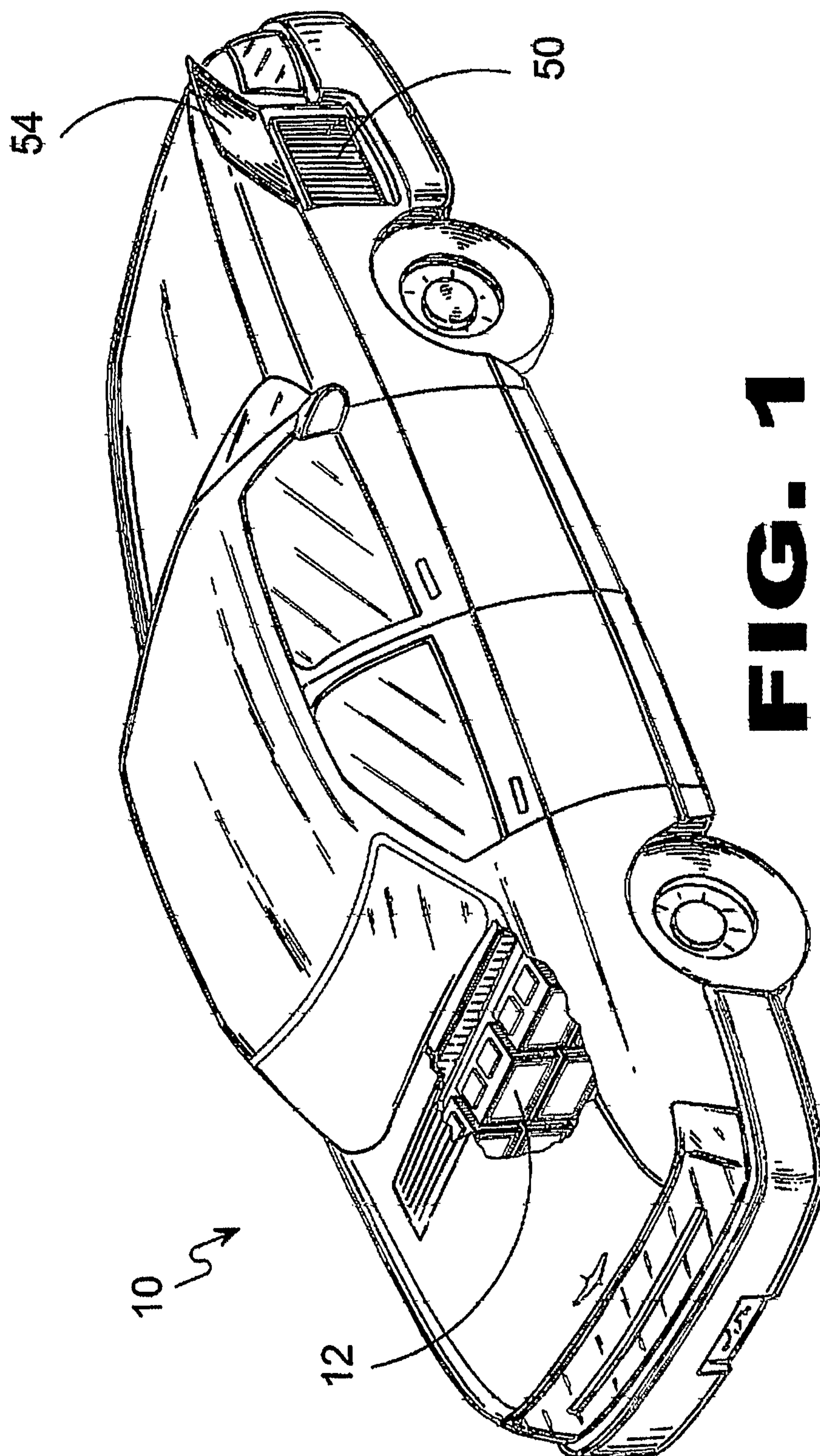
a single charging system comprising means for connecting said belt to said pulley for driving said AC generator when a driver releases a foot from said accelerator pedal or the driver depresses said brake pedal for delivering AC electrical power to said special panel over said second electrical cable, said special panel converting power received to DC and transferring DC over said plurality of electrical cables to said bank of batteries for recharging said bank of batteries;

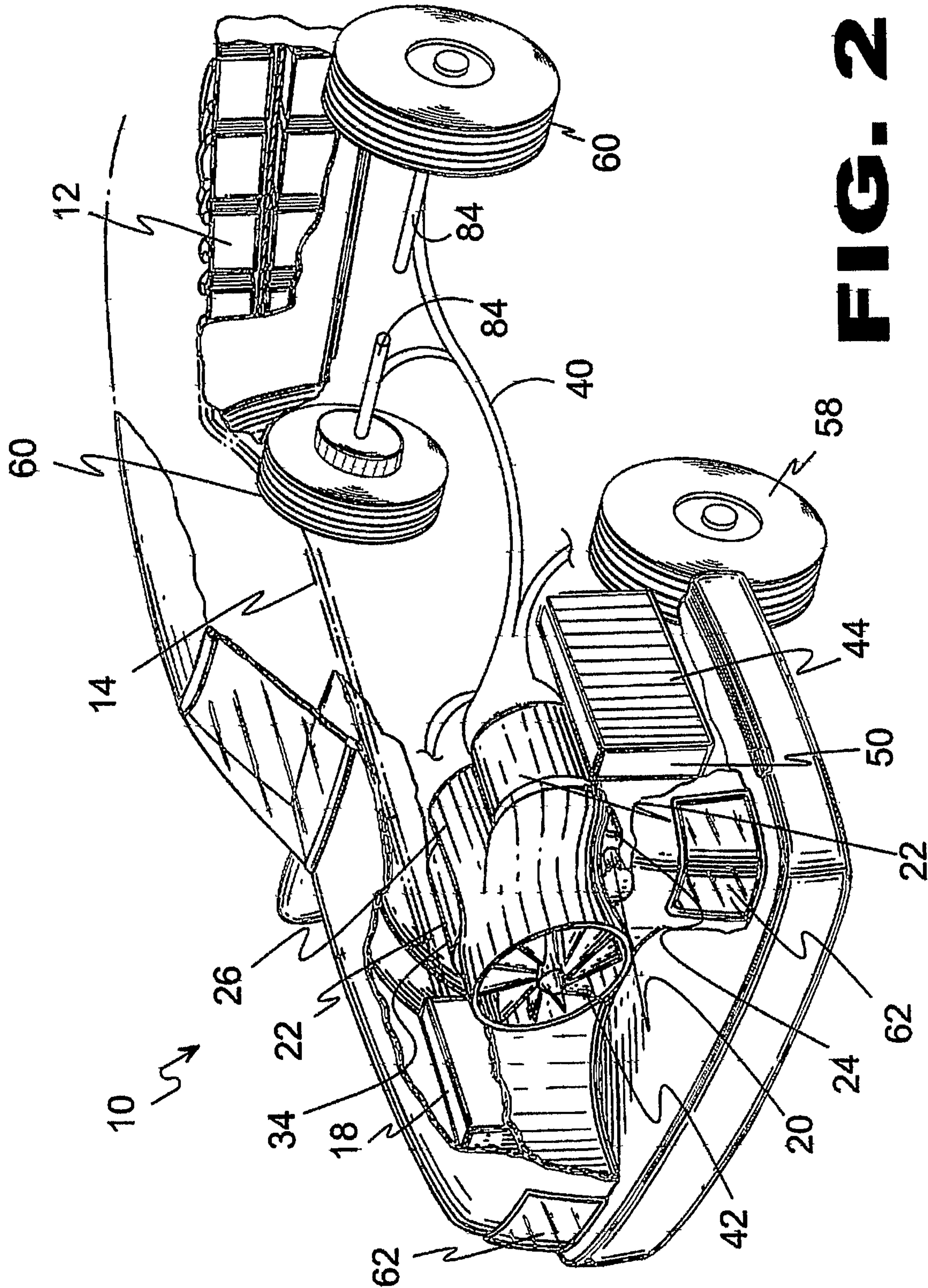
-15-

a cooling system in said electric powered vehicle comprising a blower in a front portion of said electric powered vehicle for blowing air to said AC/DC motor and said AC generator, and further including a fan for directing heat into an interior of said electric powered vehicle; and,

a control system wherein wheel speed and objective speed set points are compared using a software error reducing algorithm for optimizing achievement of the objective speed set point.

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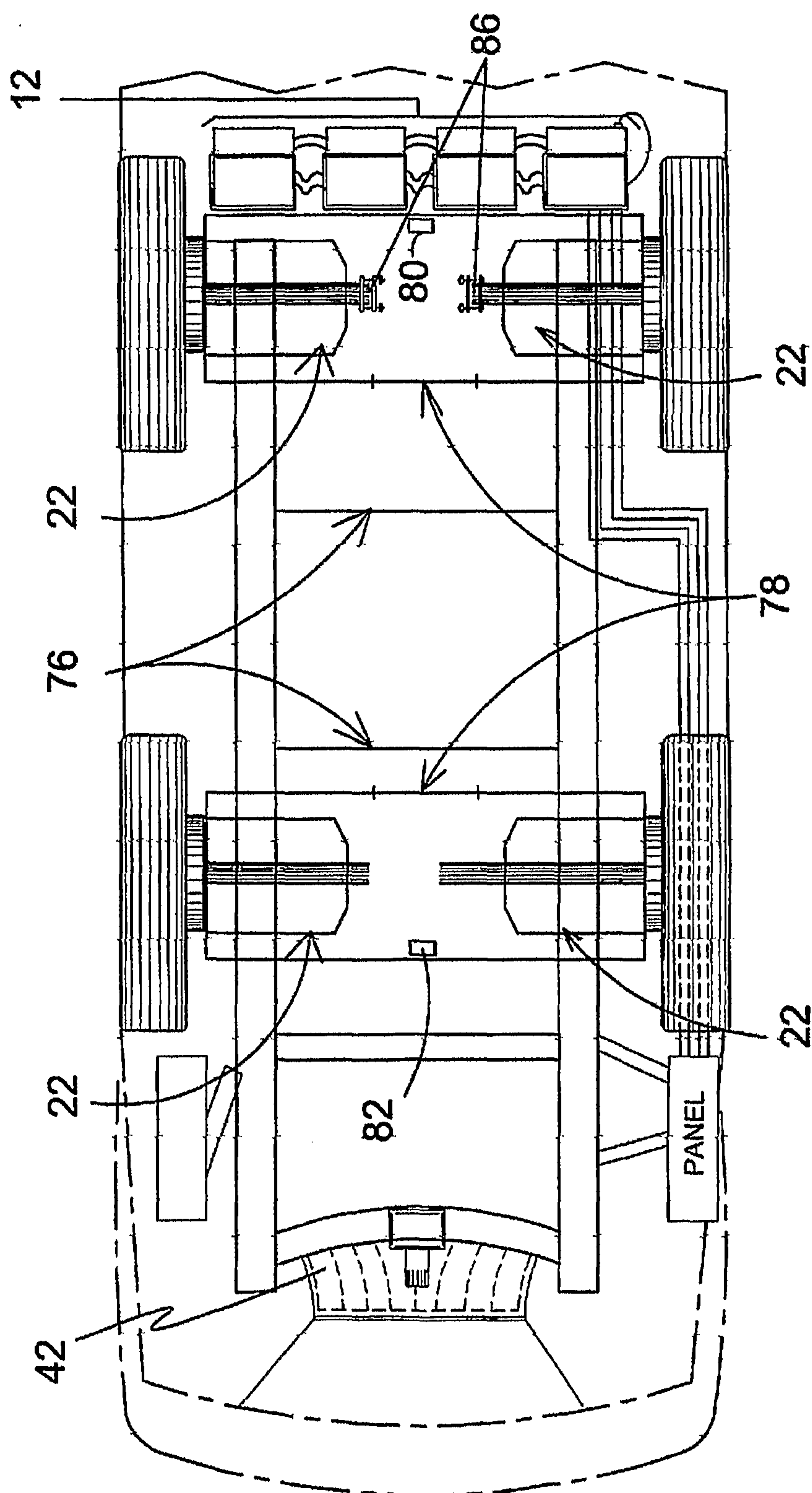
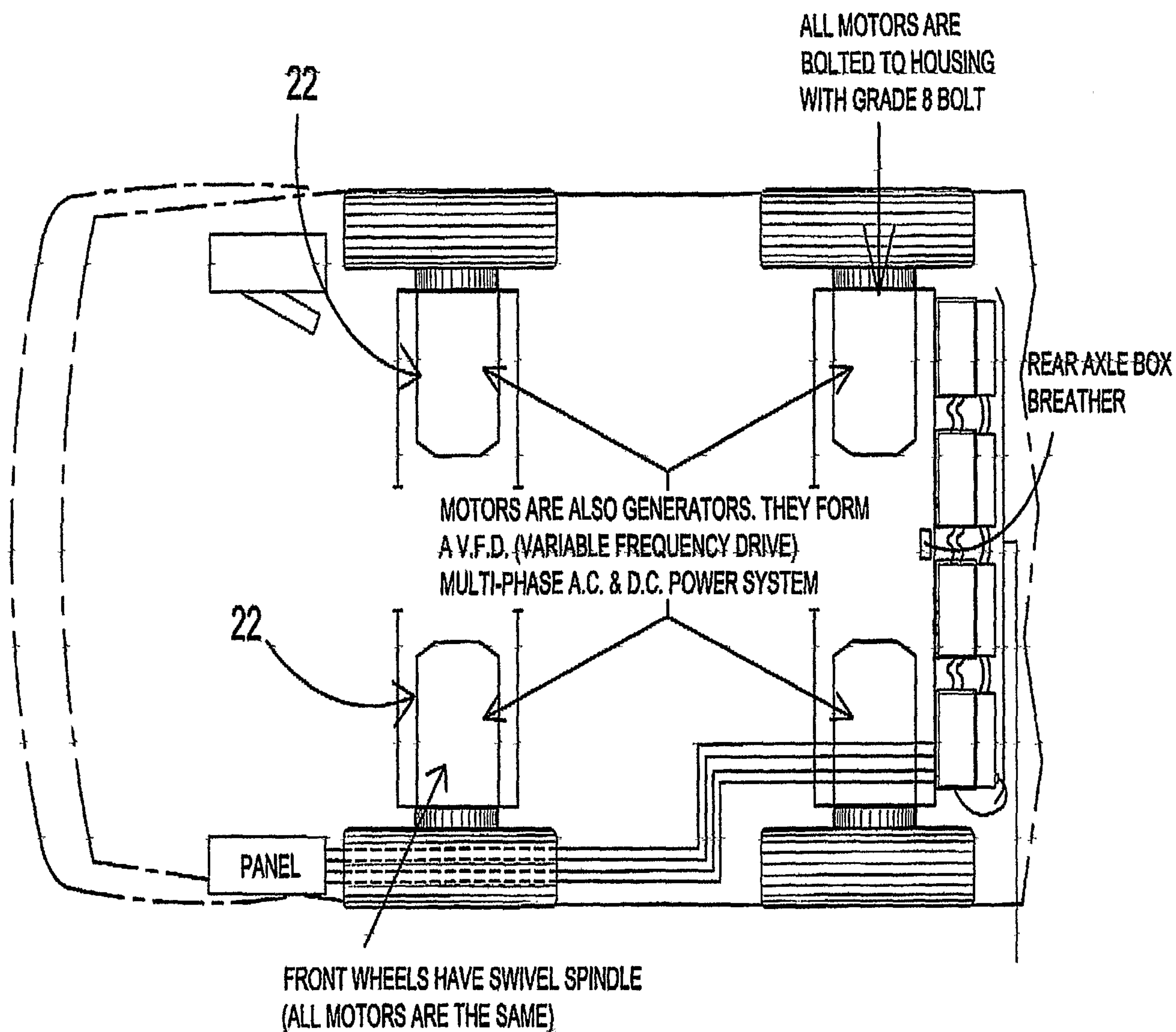
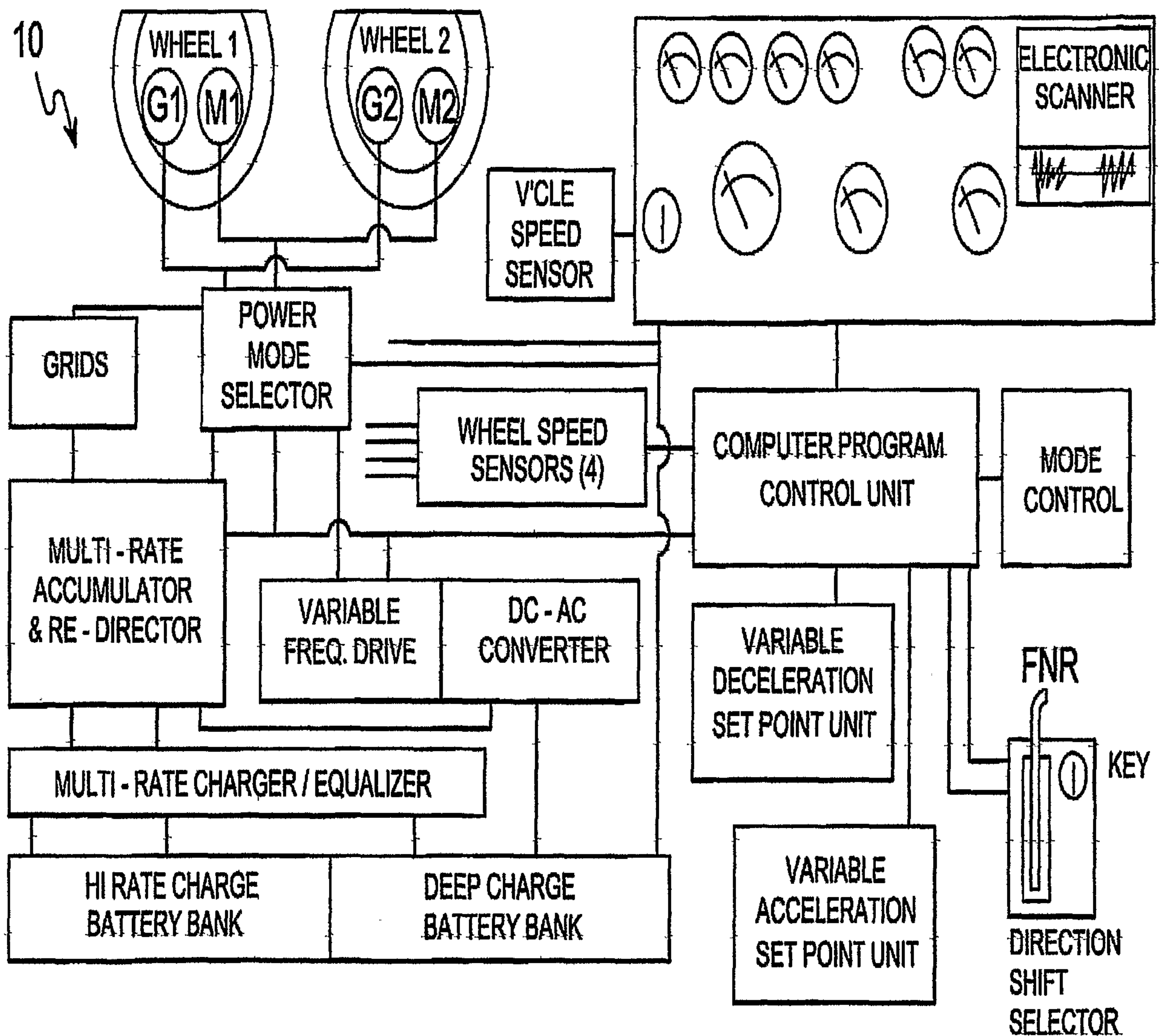


FIG. 3A

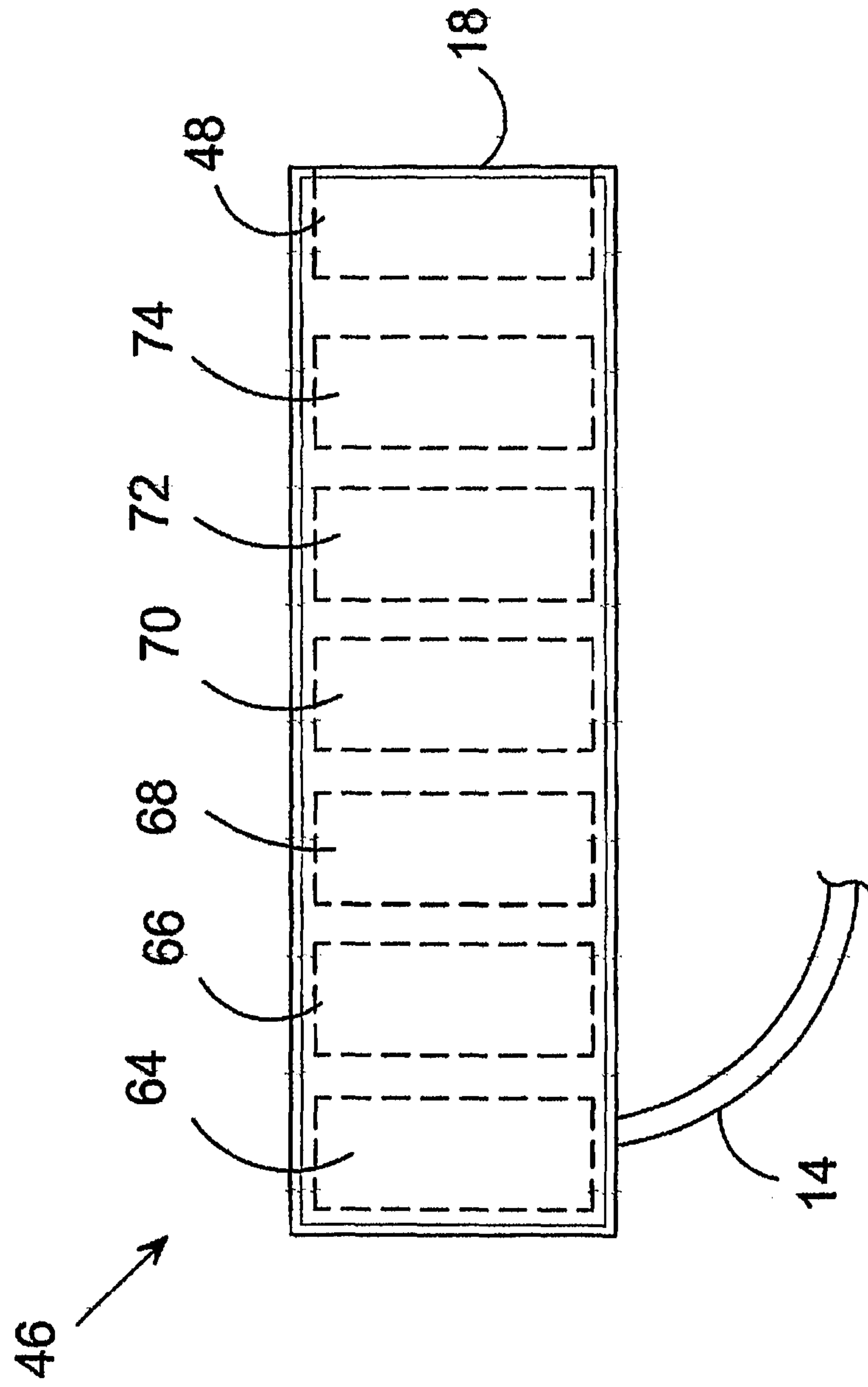
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**FIG. 3B**

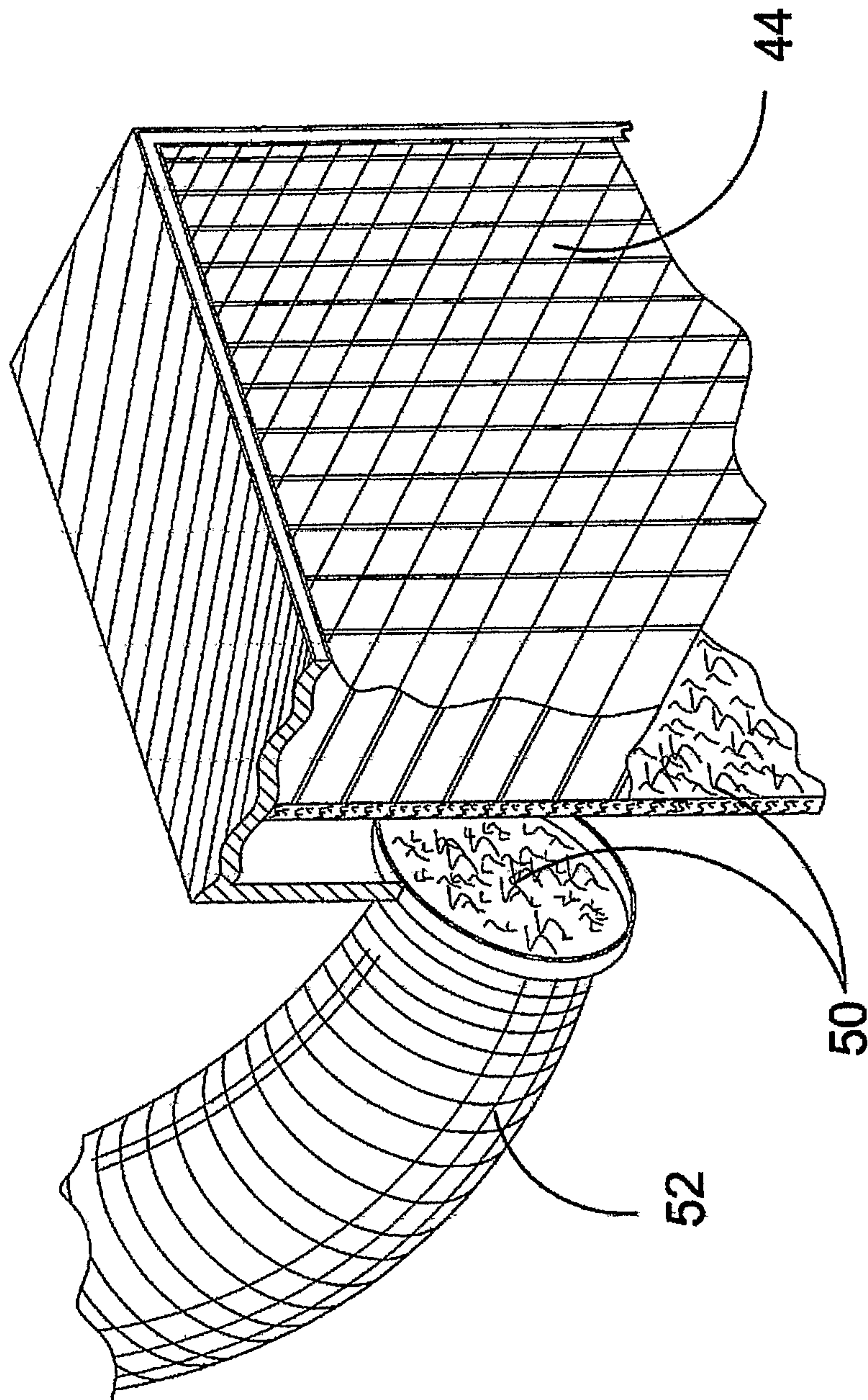
5/8

**FIG. 4**

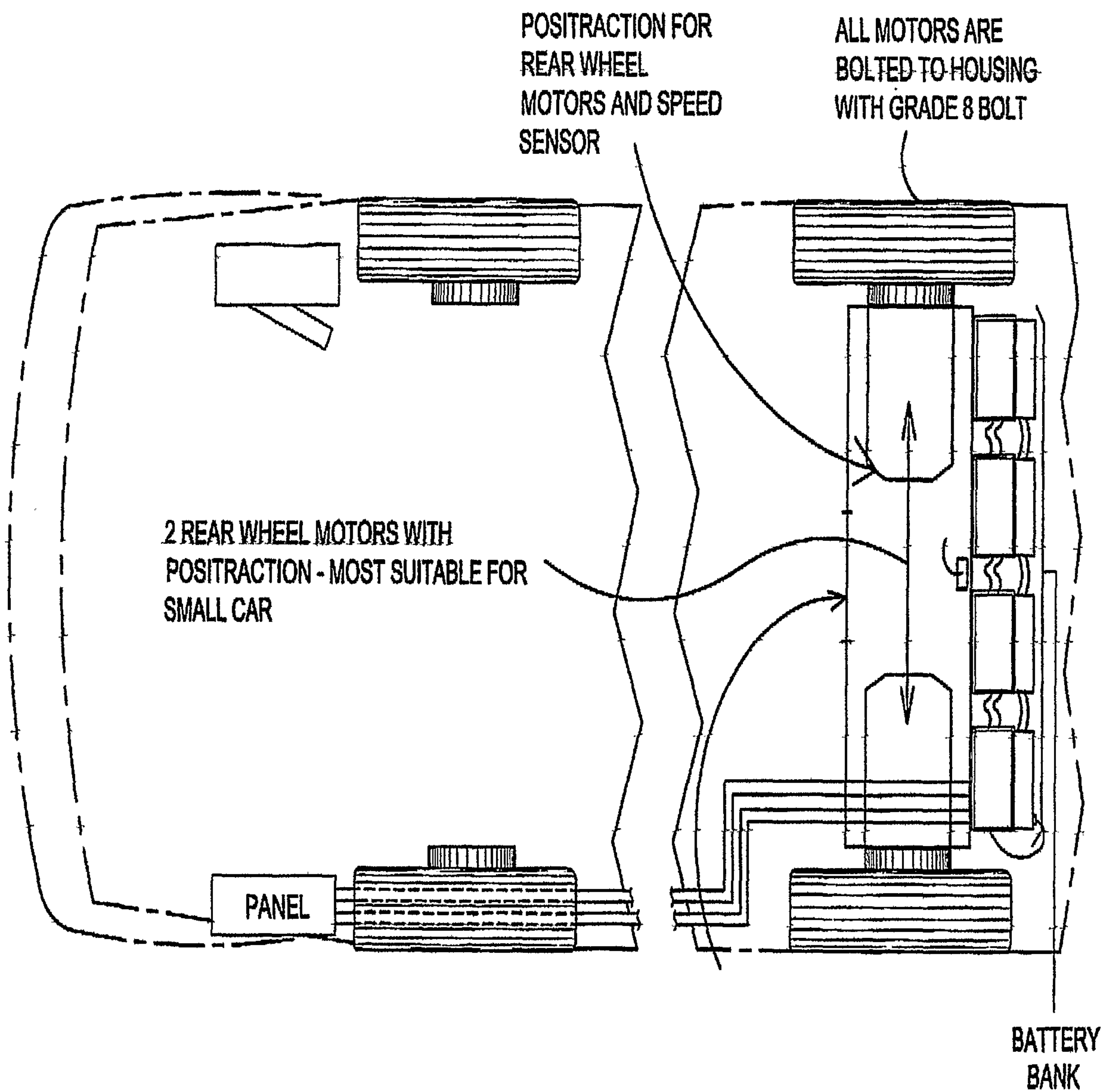
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**FIG. 5**

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**FIG. 6**

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**FIG. 7**

