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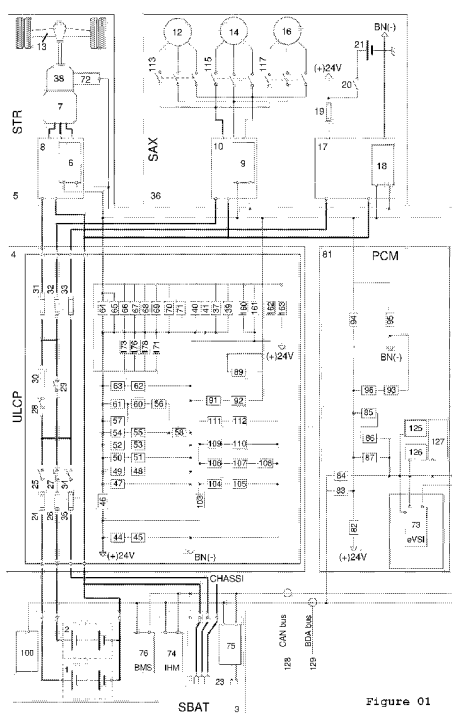


Figure 01

(57) Abstract: The present invention relates to a power management system of a pure electric vehicle powered exclusively by batteries which allows the vehicle to carry a load of up to 13 tons, where the system of the present invention is provided with five blocks: a battery system (SBAT) (3), a control and power logic unit (ULCP) (4), a traction system (STR) (5), an auxiliary system (SAX) (36), and a driver's control panel (PCM) (81), where such blocks are interconnected by two buses, CAN bus (128) and Digital/Analogical BDA (129). The battery system has two battery banks (1) and (2) in parallel which are monitored by the BMS (76). The BMS (76) checks whether the voltages at the output of the batteries are the same as the input of the inverter (8) and manages the use of the battery banks in conjunction with the eVSI (73) by operating the battery bank (1) or the battery bank (2) or both depending on the load conditions of each bank. The eVSI (73) coordinates the control and power logic unit (ULCP) (4) which, through its components, controls the flow of energy between the battery banks, the traction system (STR) (5) and the auxiliary system (SAX) (36).

ELECTRIC VEHICLE POWER MANAGEMENT SYSTEM

APPLICATION FIELD

The present invention applies to pure electric vehicles with a load capacity of from 8 to 13 tons.

5 STATE OF THE ART

With the frequent increase in pollution of the planet, mainly caused by greenhouse gases, there is an increasing need to make the exchange of fossil-fuel vehicles fueled by vehicles that do not emit greenhouse gases.

10 One of the most effective solutions to greenhouse gas emissions is purely electric vehicles because they do not work with the burning of any fuel and therefore do not emit gases.

In the state of the art there are already many
15 electric vehicles and technologies involved, but the electric vehicles of the art, applied to automobiles, have been developed to serve small loads because one of the main limitations of the electric vehicles are the batteries because to have an electric vehicle with a great autonomy,
20 many batteries are necessary, which makes the project unfeasible.

The advancement of battery technologies has allowed the development of vehicles with greater autonomy, however, large vehicles for the transportation of loads are still
25 limited by the management of batteries.

BR102014006100A2 describes an electric vehicle system containing two engines, one for vehicle traction and another auxiliary for performing tasks such as plowing and lifting materials. In this document the system only
30 describes the interaction between the electric motors and the power source or power sources through commutator under the management of a controller. There is no description of the management of the capacity of the energy sources, their temperature and managed power. This document does not

specify and does not teach how this system can be adopted in load vehicles such as trucks, i.e., it does not describe a power management system for a load between 8 and 13 tons.

CA2836450A1 describes an adaptive power management
5 and driver control system for modifying the driver output of the electric vehicle in real-time, comprising input sensors mounted on a vehicle which measures a plurality of conditions for the vehicle between the mass of the vehicle, road, vehicle speed, vehicle acceleration and door position,
10 along with a digital electronic controller mounted on the vehicle that receives data from the input sensors, performs an algorithm using the data and produces efficient energy results for an electric motor vehicle. The sensors measure at least the mass of the vehicle and the degree of
15 inclination of the road. Energy efficiency and reduced charging requirements result for the batteries in a certain route to the electrically driven vehicle.

EP2680434A1 discloses an electric vehicle which includes a motor unit which drives the wheels. The electric
20 vehicle also includes a control system that controls the engine unit. The control system includes an inverter. The electric vehicle also includes a temperature sensor (S_{ma}) for measuring the temperature T_{mc} of the engine coil (78) of the engine unit (6) or a temperature sensor (S_{ia}) to gauge
25 the T_{ic} temperature of the inverter. The electric vehicle also includes a limiter so that if the temperature T_{mc} measured by the sensor (S_{ma}) exceeds the temperature limit of the motor coils, reduce the motor unit current to the derivative of T_{mc}/dt of the measured temperature T_{mc} with
30 time t drops to zero or below, or to, if the temperature T_{ic} measured by the sensor (S_{ia}) exceeds the temperature limit of the inverter, limiting the current control to the inverter until the derivative $d_{T_{ic}}/dt$ of the temperature measured T_{ic} with time t fall to zero or below.

US2013/0175022A1 discloses a thermal management system for an electric vehicle including a motor circuit for cooling a thermal load of a motor circuit, a cabin heating circuit for heating a cabin heater and a heating circuit
5 battery to manage the temperature of a thermal load of a battery circuit. All these circuits can communicate fluidly with each other and a single radiator can cool the fluid of all these circuits.

US2013/0221916A1 discloses a operating multi-mode
10 system for electric vehicles. The system includes means for the user to select the preferred mode of operation within a plurality of modes of operation which include at least one Battery Life Mode and a Standard Mode where the Battery Life Mode is configured to select parameters operation and load
15 that emphasize the health and life of the battery in view of the vehicle's range and/or its performance. The system includes a thermal management system for maintaining the battery pack within a plurality of temperature ranges, and a charging system for recharging the battery pack of the
20 vehicle for a plurality of minimum and maximum charge levels and a plurality charge rates.

US2014/0046524A1 discloses a battery control system for an electric vehicle including a battery pack which includes a dew point calculation module which receives at
25 least a first signal indicative of moisture in the battery pack and a second signal indicative of the temperature of the battery pack, and calculating the dew point in the battery pack based on humidity and temperature. A cooling system control module receives the dew point and a required
30 cooling temperature, sets a desired cooling temperature based on the dew point at the required cooling temperature, and selectively operates the cooling system of the battery pack based at the desired refrigeration temperature.

US2016/0159339A1 discloses a method and control system of operation of an idle motor are provided to improve the fuel efficiency of a vehicle by maintaining an efficient SOC of the battery and charge control during the engine connection for heating a vehicle. The method includes receiving an engine connection request to warm the vehicle and determining the condition of the road. A destination load power is determined and set as a value corresponding to the road condition and battery condition information. A basic idle RPM configured as a value corresponding to the road condition, destination load power, and external temperature are determined. A compensation RPM and a target inactivity RPM are determined by compensating the basic idle RPM by the compensating RPM to adjust the idle engine in the RPM of inactivity of the target determined during vehicle heating.

US2016/0318501A1 describes an adaptive power management and driver control system for modifying the output of the motor electric vehicle in real-time, including input sensors mounted on a vehicle which measures a plurality of vehicle conditions from the mass vehicle, highway slope, vehicle speed, vehicle acceleration and door position, together with a vehicle-mounted digital electronic controller that receives data from the input sensors, executes an algorithm using the data and produces resultant results energy-efficient with power output controls for an electric motor of the vehicle. The sensors measure at least the mass of the vehicle and the incline of the road. Energy efficiency and reduced charging requirements for the battery result from a particular route to the electrically driven vehicle.

US2013166119A1 discloses a method for thermal management of an electric vehicle and said vehicle. A controller is configured to regulate the temperature of a

traction battery within an operating temperature range when the vehicle is in operation. The battery temperature is set within a charge temperature range when the battery is connected to the charger and power source and the ambient temperature is outside an ambient temperature range. The battery is pre-conditioned to the temperature of a battery when the ambient temperature is outside the ambient temperature range and the battery is connected to the charger and the power source. The cabin in the vehicle is preconditioned at cabin temperature when the vehicle is connected to the charger and the power source and the ambient temperature is outside the ambient temperature range.

However, none of the above referenced art documents describes a power management system applied to a pure electric propulsion electric vehicle; with powered exclusively by batteries; with regenerative electric braking; with a gross vehicle weight of between 8 and 13 tons; with net vehicle load capacity of between 4 and 6 tons; with a vehicle power consumption of 0.8 to 1 kWh/km; with autonomy between 80 and 120 km; taking into account the maximum ramp inclination between 20 and 25%; with recharge time of the batteries in up to 80% of the load in 2 to 3 hours; with recharge time of the batteries in up to 100% of the load in 3.5 to 4.5 hours; with a maximum speed of 80 km/h; and, being the vehicle equipped with automatic gearbox, air conditioning, and power steering.

SUMMARY OF THE INVENTION

The present invention aims to provide a power management system of a pure electric vehicle powered exclusively by batteries which allows the vehicle to carry a load of up to 13 tons.

To this end, the system of the present invention is provided with five blocks: a battery system (SBAT) 3, a

control and power logic unit (ULCP) 4, a traction system (STR) (5), an auxiliary system (SAX) 36, and a driver's control panel (PCM) 81, where such blocks are interconnected by two buses, CAN bus (128) and Digital/Analog BDA (129).

5 The battery system has two battery banks (1) and (2) in parallel which are monitored by the BMS (76). The BMS 76 checks whether the voltages at the output of the batteries are the same as the input of the inverter (8) and manages the use of the battery banks in conjunction with the eVSI
10 (73) by operating the battery bank (1) or the battery bank (2) or both depending on the load conditions of each bank. The eVSI (73) coordinates the control and power logic unit (ULCP) (4) which, through its components, controls the flow of energy between the battery banks, the traction system
15 (STR) (5) and the system (SAX) (36).

The system is driven and monitored by means of the driver's control panel (PCM) (81) located in the cab of the vehicle from which the features of the electric vehicle are driven.

20 The effectiveness of the present system is a result of the control logic of the control and power logic unit (ULCP) (4) which commutator the connection of the traction inverter (8), the auxiliary inverter (10), and the converter DC /DC (17) and the power to be applied to the traction
25 motor according to the state of the battery banks (1) and (2), as well as the control of the state of charge and temperature of the batteries, where the minimum limit of load of the battery banks is 20% for vehicle operation and in case of detecting a charge below the system alerts the
30 driver for the batteries to be charged.

BRIEF DESCRIPTION OF THE FIGURE

Figure 01 shows the functional diagram of the power management system of the electric vehicle of the present invention. The diagram shows the blocks that make up the

electric vehicle system and the connections and interactions of the elements of each block.

DETAILED DESCRIPTION OF THE INVENTION

The system of the present invention contains five
5 blocks.

The Block (3) represents the battery system (SBAT) containing: two banks of batteries in parallel bank (1) and bank (2), a BMS module (*Battery Monitoring System*) (76), an IHM display (74), a plug (23) for connection to the external
10 battery charger, an interface module (75) and battery fans (100).

The Block (4) represents the control and power logic unit (ULCP) containing: a control (53); an emergency contact (44); the contacts (25), (27), (28), (29), (34), (39), (40),
15 (41), (46), (48), (51), (55), (58), (59), (60), (62), (66), (67), (68), (69), (70), (71), (103), (112), (163), (176), (178); contactors (49), (50), (52), (54), (61), (64), (65), (104), (106), (109); fuses (24), (26), (31), (32), (33), (35); relays (37), (45), (47), (63), (89), (91), (105),
20 (107), (108), (110), (160), (161), (162), (171), (173); a resistor (30); a brake sensor (92); a timer preload (57); and a relief valve for starting the compressor (111).

In the control and power logic unit (ULCP), the relay (45), when energized, connects the supply of the coils
25 of the contactors and relays of the ULCP (4), as well as controls the control of the auxiliary inverter (10), contact of the drive (68), contact of the BMS (69) and contact (70) of the DC/DC converter. The emergency contact (44), when actuated by the emergency button (83), turns off the relay
30 (45), which in turn, opens the contact (46) and commutator off all contactors and relays, in this way all vehicle system will be keyed off.

In this ULCP unit are the protection fuses of the battery banks (24) and (26), the STR drive system (31), the

SAX auxiliary system (32), the dc/dc converter (33) and the charger batteries (35).

The relay (47), when energized, enables commuted on the contactors of the motors of the auxiliary system (12) (14) (16). The contactors (49) and (50) of the battery banks (1) and (2) will be energized respectively through the contacts (48) and (51) after checking the condition of the batteries by the BMS (Battery Monitoring System), being normal, the contactors (49) and (50) will be energized, closing the contacts (25) and (27), and the battery banks (1) and (2) will be connected to the ULCP.

An auxiliary contact of each of the contactors of the batteries (64) and (65) communicates through the control panel of the PCM driver (81) that the seat or the seats are connected.

The load contactor (52) will be energized through the control (53) when the system assumes the "Battery load mode" and the contact (34) will be closed to connect the external charger (not shown) to the ULCP (4).

The contactor (54) is the main contactor of the system and will be controlled by the contactor (55) to be energized when the input voltage in the traction inverter (8) is equal to the voltage of the battery banks (1) and (2), this same contact (55) also controls the contactor (54) to deenergize if a fault occurs in the traction inverter (8) through the relay (37).

The timer (57) shuts off the preload system in the event of a failure to start the vehicle starting logic. If after 3 seconds the voltage at the input of the inverter (8) does not reach the voltage value of the battery banks (01) and (02) the preload contactor (61) will be de-energized.

Therefore, the main contactor (54) will not be energized. When the load mode is selected, the contact (58) does not allow contactor energizing (54). The auxiliary

relay (63) is energized by the contact (62) of the relay (56) which is parallel to the main contactor (54), this relay releases the energizing of the auxiliary and traction inverters (08) through the contacts (66) and (67).

5 The Block (5) represents the traction system (STR) comprising: a traction inverter (8), an inverter controller (6), an traction electric motor (7), a gearbox (38), an exchange controller (72), and a tractor shaft (13).

 The Block (36) represents the auxiliary system (SAX)
10 comprising: an auxiliary inverter (10), an inverter controller (9), a hydraulic pump motor and air conditioning compressor (12), an air compressor motor (14), a motor of the cooling system water pump (16), contacts (113), (115) and (117), a DC/DC converter (17), a converter controller
15 (18), a battery protection fuse (19), a general battery key (20), and an auxiliary battery (21).

 The Block (81) represents the driver's control panel (PCM) comprising: a chassis and body control system (eVSI) (73), a CAN bus (CAN) (128), a Digital/Analogical bus (BDA)
20 (129), a ignition key (82), an emergency button (83), a "Battery Load mode" selector (84), a manual electro-fan key (85), an electro-fan relay (86), a button (87) of traction inverter enable (87), a relay (93) [PCM] of parking brake, an enabled traction contact (94), a contact (95), a parking
25 brake (96), a brake pedal (125), an accelerator pedal (126), and a gear (127).

 The system of the present invention manages the entire power system of an electric charging vehicle, such as a truck, this electric vehicle being pure.

30 The technical characteristics of the vehicle managed by the system are:

- Pure electric propulsion;
- Battery powered;
- Regenerative electric braking;

- Gross vehicle weight of 8 to 13 tons;
- Net load capacity of the vehicle between 4 and 6 tons;
- Vehicle power consumption of 0.8 to 1 kWh/km;
- 5 - Autonomy between 80 and 120 km;
- Maximum ramp between 20 and 25%;
- Charging time of the batteries in up to 80% of the load in 2 to 3 hours;
- Recharge time of batteries up to 100% of the
- 10 charge in 3.5 to 4.5 hours;
- Maximum speed of 80 km/h;
- Vehicle equipped with automatic gearbox;
- Vehicle equipped with air conditioning; and
- Vehicle equipped with power steering.

15 **Description of System Operation**

Logical Sequence of energizing the Electric Truck Systems

Operation Mode:

20 All communications via CAN bus are represented on the CAN bus (128) and digital and analog communications are represented on the bus BDA (129).

 When the ignition key (82) on the driver's control panel [PCM] is keyed on, the relay (45) of the power control logic unit [ULCP] is energized.

25 The relay (45) [ULCP], when energized, connects the contactor and relay coil supply via the contact (46) [ULCP] as well as powers the auxiliary drive controller (9) of the auxiliary system [SAX] and the controller of the traction inverter (6) of the traction system [STR] through contact (68) [ULCP], BMS (76) [SBAT], contact (69) [ULCP], DC/DC

30 converter (17) [SAX] and contact (70) [ULCP].

 At the output of the DC/DC converter (17) [SAX] there is a protection fuse (19) and a general battery key (20) [SAX], this general key when disconnected, turns off all control feeds vehicle.

Therefore, the relay (45) [ULCP] is the relay that initiates the energizing logic of the systems and also shuts off the entire system, the contact (44) [ULCP] actuated by the emergency button (83) [PCM] is in series with the relay (45) [ULCP] to turn off the entire system in the event of an emergency. The BMS (76) of the battery system [SBAT] when energized, checks the condition of the batteries and, if these are with their standard loads, energizes the relays (160) and (161) [ULCP] that, through the contacts (48) and (51) [ULCP] energizes the contactors (49) and (50) [ULCP] by connecting the battery banks through power contacts (25) and (27) [ULCP].

Since there are two parallel battery banks, the BMS (76) [SBAT] checks the state of charge and voltage of the battery banks (1) and (2) [SBAT] and connects the two banks only if these parameters are equal to or within the pre-set threshold, such as, for example, 20% of the load capacity.

If there is an imbalance between the banks, the BMS (76) [SBAT] only powers one bank through the relay (48) or the relay (51) [ULCP], the highest voltage and the load state.

In this condition, as there is only one battery bank operating, the traction system must be adjusted with less power (limited operation), in this case the contacts (40) and (41) [ULCP] request the inverter controller module (6) [STR] a reduction of power in the traction electric motor (7) [STR].

When one of the power contacts (25) or (27) [ULCP] or both contacts are closed, the DC/DC converter (17) [SAX] is energized and starts supplying power to the 24V_{DC} system and keeps charging the auxiliary batteries (21) [SAX].

The preload timer (57) [ULCP] is energized as soon as the ignition key (82) [PCM] is keyed on. The timer contact (60) [ULCP] energizes the preload contactor (61)

[ULCP] which in turn closes the contact (28) [ULCP] and, through the preload resistor (30) [ULCP], loads the filter capacitors (not shown) of the inverters (8) [STR] and (10) [SAX], when the capacitor voltage reaches the same voltage level as the battery banks, the relay (37) [ULCP] is energized by the inverter controller [6] [STR] and its contact [ULCP] energizes the main contactor [54] [ULCP] which connects the battery bank to the system via the power contactor [ULCP].

The main contactor (54) also energizes the relay (63) which controls the energizing of the auxiliary inverter (10) [SAX] via the contact (66) [ULCP], so that the auxiliary inverter (10) is energized and passes to generate a three-phase network 220V_{AC}. This network feeds auxiliary motors (12), (14) and (16) [SAX] which are energized through the contacts (113), (115) and (117) [SAX] and the contactors (104), (106), and (109) [ULCP] respectively. The contactor control will depend on the contact (103) of the relay (47) [ULCP] that is energized when the ignition key (82) [PCM] is keyed on. In the event of an overload on the auxiliary motors (12), (14) and (16), the thermal relays (105), (107), (108) and (110) will turn off their respective contactors (104), (106) and (109).

The relief valve for starting of the air compressor (111) is energized by the timed contact in 12 seconds (112) of the auxiliary inverter (10). This time ensures that the compressor will accelerate without load, avoiding the "hydraulic wedge". Therefore, when the compressor is energized the valve directs the compressed air to the atmosphere and only after the compressor reaches nominal rotation the valve is de-energized and the compressed air starts to pressurize the pneumatic system of the truck.

The vehicle is then with the auxiliary system (36) [SAX] in operation, the DC/DC converter (17), the hydraulic

pump (12), the air compressor (14), and the cooling system and air conditioning (16) (if connected by the system operator).

For the electric motor (7) to be activated, two conditions must be fulfilled by the traction inverter controller (6) [STR]. The first condition is accomplished by closing the contact [ULCP] of the relay (63) [ULCP] that occurs when the main contactor (54) [ULCP] is energized when the condition of the batteries (1) and (2), the second condition is accomplished by actuation of the button (87) [PCM] so that a digital signal is sent to the eVSI module [73] [PCM] and this sends via the CAN bus (128) a signal for the inverter control module (6) [STR] is enabled, and the vehicle will be able to drive by selecting the gear (127) [PCM] and activating the accelerator pedal (126) [PCM].

In this condition, the relay (89) [ULCP] will be energized through the contacts (94) and (95) which indicate that the traction inverter (06) [STR] is enabled with the energizing of the relay (89), the coolant system electric fan will start (system not shown in the figure). If there is a need to key off the electric fan, the key (85) may inhibit the relay circuit (89).

Between the electric motor (07) and the tractor axle (13) there is an automatic gearbox (38) of 6 forward speeds, neutral and reverse. The gearbox multiplies the torque required for the vehicle to achieve ramp-up and final-speed climb performance, the tractor shaft (13) has a reduction and transfers the output torque of the electric motor set (7) and automatic gearbox (38) for the tires.

The control module (72) communicates with the traction inverter control module (6) to synchronize the gear shifts, i.e., for each gear change, the control module (72) sends a signal to the inverter module (6) which inhibits traction, thus smoothing the gear shifts.

When the vehicle is moving, when it takes off the foot of the accelerator (126) [PCM] a small electric braking rate is applied and the traction system (5) begins to regenerate energy for the batteries (1) and (2). By pressing
5 the brake (125) this rate increases proportionally to the position of the pedal, increasing regeneration or energy recovered in the brakes.

This kinetic energy recovery system is known by the acronym KERS (Kinetic Energy Recovery System). This system
10 allows to recover up to 30% of the energy consumed by the vehicle.

With the vehicle in operation, the BMS (76) [SBAT] is always active by monitoring the balance of the battery bank cells (1) and (2) [SBAT], current and temperature. In
15 the event of a fault, the BMS (76) [SBAT] energizes the relays (160) and (161) [UPCL] that turn the contactors (49) and (50) [UPCL] by disconnecting the battery banks (1) and (2).

If the temperature in the batteries reaches the temperature between 41 and 50 °C, preferably 45 °C, the BMS
20 (76) [SBAT] controls the relay (162) [ULCP] which through the contact (163) [ULCP] energizes the fans of the batteries (100) [SBAT] and when the temperature drops to 40 °C the fans will be turned off.

When the energy of the battery banks (1) and (2) reaches 20% an alert signal will warn the driver of the vehicle in relation to the state of charge, and when it reaches 10% the BMS (76) controls the turned off of the
25 vehicle.

30 Load mode of the Batteries:

In mode charge of the batteries, the ignition key (82) [PCM] must be keyed on, the load mode selector (84) [PCM] must be pressed, the relay (93) [PCM] must be energized with the applied parking brake (96) [PCM] and the

relay contact (92) (93) energizes the relay (91) which energizes the relay (171) [ULCP], the plug (23) (SBAT) connected and the battery banks (1) and (2) after checking of the BMS (76) [SBAT] must be connected via the contacts
5 (25) or (27) [ULCP] or both.

In load mode relay (171) [ULCP] will be energized and relay contact (58) [ULCP] (171) will not allow main contactor (54) [ULCP] to energize, while maintaining contact (29) [ULCP] is open, so the traction and auxiliary system
10 will not be energized.

When the battery banks (1) and (2) are connected, the respective contacts (176) and (178) [ULCP] send a digital signal to the eVSI module (73) which in turn, via the CAN network (128), informs the interface module (75)
15 [SBAT] that the external charger (not shown) can be turned on, and the vehicle is ready to recharge the batteries (1) and (2).

The interface module 75 [SBAT] informs the BMS (76) [SBAT] that it is in the load mode through relay (173) [ULCP] and also operates the relay (171) [ULCP] which by its
20 connects the external charger to the vehicle through the power contactor 34 [ULCP], which in turn gives the feedback to the interface module (75) through the contact (71) that the contactor (34) is energized.

25 The BMS (76) [SBAT] sends via CAN (128), the limits of load, current and voltage to the interface module (75) [SBAT] which, in turn, sends this information to the external loader.

When the battery charge (1) and (2) reaches 100%,
30 the BMS (76) [SBAT] sends this message to the interface module (75) [SBAT] which, in turn, disconnects the external charger.

After charging is completed, the plug (23) is disconnected from the external charger and the load mode selector (84) is deactivated.

At this time, the vehicle is capable of traction.

- 5 In the event of a load interruption, the load mode selector (84) [PCM] is deactivated, the vehicle key (82) [PCM] is keyed off and the plug (23) [SBAT] is disconnected.

- If the battery banks (1) and (2) are unbalanced, the BMS (76) [SBAT] connects the bank of lower load and voltage and starts charging. When this bank reaches the same load state as the other bank, the BMS (76) [SBAT] connects the second bank in parallel and the two banks continue to be reloaded.
- 10

- During the charging, the BMS (76) [SBAT] monitors the current, the voltage and the temperature, in the event of an error, it sends a message to interrupt the load and opens the power contacts (25) and (27) [ULCP].
- 15

Component Listing

No.	Item	Block
(001)	Batteries	SBAT
(002)	Batteries	SBAT
(003)	Batteries system	SBAT
(004)	Control and power logic unit	ULCP
(005)	Traction system	STR
(006)	Controller of the traction inverter	STR
(007)	Traction electric motor	STR
(008)	Traction inverter	STR
(009)	Auxiliary inverter controller	SAX
(010)	Auxiliary inverter	SAX
(012)	Hydraulic pump motor and air conditioning compressor	SAX
(013)	Tractor shaft	STR
(014)	Air compressor motor	SAX
(016)	Auxiliary motor of the cooling system water pump	SAX
(017)	Converter DC/DC	SAX
(018)	Converter controller	SAX
(019)	Fuse of the battery	SAX
(020)	General key of the batteries	SAX
(021)	Auxiliary battery	SAX
(023)	Plug for connection	ULCP

(024)	Fuse	ULCP
(025)	Power contact	ULCP
(026)	Fuse	ULCP
(027)	Power contact	ULCP
(028)	Power contact	ULCP
(029)	Power contact	ULCP
(030)	Preload resistor	ULCP
(031)	Fuse	ULCP
(032)	Fuse	ULCP
(033)	Fuse	ULCP
(034)	Power contact	ULCP
(035)	Fuse	ULCP
(036)	Auxiliary system (SAX)	SAX
(037)	Relay	ULCP
(038)	Gearbox	STR
(039)	Contact	ULCP
(040)	Contact	ULCP
(041)	Contact	ULCP
(044)	Emergency contact	ULCP
(045)	Relay	ULCP
(046)	Contact	ULCP
(047)	Relay	ULCP
(048)	Contact	ULCP
(049)	Contact of the battery bank	ULCP
(050)	Contact of the battery bank	ULCP
(051)	Contact	ULCP
(052)	Load contactor	ULCP
(053)	Control	ULCP
(054)	Main contactor	ULCP
(055)	Contact	ULCP
(056)	Relay	ULCP
(057)	Timer preload	ULCP
(058)	Contact	ULCP
(060)	Timer contact	ULCP
(061)	Preload contactor	ULCP
(062)	Contact	ULCP
(063)	Relay	ULCP
(064)	Battery contactor	ULCP
(065)	Battery contactor	ULCP
(066)	Contact	ULCP
(067)	Contact	ULCP
(068)	Traction contact	ULCP
(069)	Contact of the BMS	ULCP
(070)	Contact of the converter DC/DC	ULCP
(071)	Contact	ULCP
(072)	Exchange controller	STR
(073)	Body and chassis control system eVSI(<i>Electric Vehicle System Integrator</i>)	PCM
(074)	Display IHM of the battery system	SBAT

(075)	Interface module with the charger external	SBAT
(076)	BMS (Battery Monitoring System)	SBAT
(081)	Driver's control panel	PCM
(082)	Ignition key	PCM
(083)	Emergency button	PCM
(084)	"Load mode" selector	PCM
(085)	Manual electro-fan key	PCM
(086)	electro-fan relay	PCM
(087)	Button "Enable traction"	PCM
(089)	Relay of the automatic electro-fan	ULCP
(091)	Relay of "Load mode"	ULCP
(092)	Applied parking brake sensor	ULCP
(093)	Relay of parking brake	PCM
(094)	Enabled traction contact	PCM
(095)	Contact	PCM
(096)	Parking brake	PCM
(100)	Battery fans	SBAT
(103)	Contact	ULCP
(104)	Hydraulic pump contactor and air conditioning	ULCP
(105)	Thermal relays	ULCP
(106)	Air compressor contactor	ULCP
(107)	Thermal relay	ULCP
(108)	Thermal relay	ULCP
(109)	Water pump contactor of the inverter cooling system	ULCP
(110)	Thermal relay	ULCP
(111)	Relief valve for starting the compressor	ULCP
(112)	Contact	ULCP
(113)	Contact	SAX
(115)	Contact	SAX
(117)	Contact	SAX
(125)	Brake pedal	PCM
(126)	Accelerator pedal	PCM
(127)	Gear	PCM
(128)	CAN bus (CAN)	PCM
(129)	Digital/Analogical bus (BDA)	PCM
(160)	Relay	ULCP
(161)	Relay	ULCP
(162)	Relay	ULCP
(163)	Contact	ULCP
(171)	Relay	ULCP
(173)	Relay	ULCP
(176)	Contact	ULCP
(178)	Contact	ULCP

CLAIMS

1. ELECTRIC VEHICLE POWER MANAGEMENT SYSTEM characterized by containing

5 - a battery system (SBAT) (3) containing: two banks of batteries in parallel bank (1) and bank (2), a BMS module (*Battery Monnitoring System*) (76), an IHM display (74), a plug (23) for connection to the external battery charger, an interface module (75) and battery fans (100);

10 - a control and power logic unit (ULCP) (4) containing: a control (53), an emergency contact (44), contacts (25), (27), (28), (29), (34), (39), (40), (41), (46), (48), (51), (55), (58), (59), (60), (62), (66), (67), (68), (69), (70), (71),
15 (103), (112), (163), (176), (178), contactors (49), (50), (52), (54), (61), (64), (65), (104), (106), (109), fuses (24), (26), (31), (32), (33), (35), relays (37), (45), (47), (63), (89), (91), (105), (107), (108), (110), (160), (161), (162), (171),
20 (173), resistor (30), a brake sensor (92), a timer preload (57), and a relief valve for starting the compressor (111),

wherein the relay (45), when energized, connects the supply of the contactor and relay coils of the ULCP (4), as
25 well as powers the control of the auxiliary inverter (10), the traction contact (68), contact BMS (69) and DC/DC converter contact (70), and the emergency contact (44), when actuated by the emergency button (83), turns off the relay (45) which, in turn opens the contact (46), and commutates
30 off all contactors and relays, turning off all vehicle systems,

where the relay (47), when energized, allows to connect the contactors of the motors of the auxiliary system (12), (14), (16),

where the contactors (49) and (50) of the battery banks (1) and (2) are respectively energized via the contacts (48) and (51) after checking the condition of the batteries by the BMS 76 (Battery Monitoring System), being
5 normal, the contactors (49) and (50) are energized, closing the contacts (25) and (27), and the battery banks (1) and (2) are connected to the ULCP, and a auxiliary contact of each battery contactor (64) and (65) communicates via the driver's control panel PCM (81) that the seat or seats are
10 connected,

where the load contactor 52 is energized through the control (53), when the system assumes the "Load mode of the batteries" and the contact (34) is closed to connect the external charger to the ULCP (4),

15 where the contactor (54) is the main contactor of the system and is driven by the contactor (55) to energize when the input voltage in the traction inverter (8) equals the voltage of the battery banks (1) and (2), this same contact (55) also controls the contactor (54) to deenergize,
20 if a fault occurs in the traction inverter (8), through the relay (37),

where the timer (57) keyes off the preload system in the event of a fault in the start-up of the vehicle starting logic, and if after 3 seconds the voltage at the input of
25 the inverter (8) does not reach the voltage value of the batteries banks (01) and (02) the preload contactor (61) is de-energized;

- a traction system (STR) (5) containing: a traction inverter (8), an inverter controller (6), an
30 traction electric motor (7), a gearbox (38), an exchange controller (72), and a tractor shaft (13);
- an auxiliary system (SAX) (36) comprising: an auxiliary inverter (10), an inverter controller (9), a hydraulic pump motor and air conditioning

compressor (12), an air compressor motor (14), a motor of the cooling system water pump (16), contacts (113), (115) and (117), a DC/DC converter (17), a converter controller (18), a protection fuse of the battery (19), a battery geral key (20), and an auxiliary battery (21); and

- a driver's control panel (PCM) (81) containing: a body and chassis control system (eVSI) (73), a CAN bus (128), a Digital/Analogical bus (BDA) (129), a ignition key (82), an emergency button (83), a "Battery Load mode" selector (84), a manual electro-fan key (85), an electro-fan relay (86), a button (87) of the enable the traction inverter (8), an relay of the parking brake (93) [PCM], an enabled traction contact (94), a contact (95), a parking brake (96), a brake pedal (125), an accelerator pedal (126), and a gear (127);

where the system operates in two modes, mode of operation and mode of charging the batteries.

2. **SYSTEM** according to claim 1, characterized by managing an electric vehicle containing pure electric propulsion with battery power, regenerative electric braking, vehicle gross weight from 8 to 13 tons, net vehicle load capacity from 4 to 6 tons, vehicle power consumption from 0.8 to 1 kWh/km, autonomy from 80 to 120 km, maximum ramp from 20 to 25%, recharging time of the batteries by up to 80% of the load in 2 to 3 hours, recharging time of batteries up to 100% of the load in 3.5 to 4.5 hours, maximum vehicle speed of 80 km/h, vehicle equipped with automatic gearbox, vehicle equipped with air conditioning, and vehicle equipped with power steering.

3. **SYSTEM** according to claim 1, characterized in that all digital communications are carried out through the CAN bus

(128) and the analog communications are performed through the BDA bus (129).

4. **SYSTEM** according to claim 1, characterized in that the operating mode follows the following steps:

- 5 - connect the ignition key (82) on the driver's control panel [PCM] and energize the relay (45) of the logic control unit and power [ULCP],
- connect the supply of the contactors coils and relay (4) [ULCP] through the contact (46) and supply
- 10 the auxiliary inverter controller (9) of the auxiliary system (36) [SAX] and the traction inverter controller (6) of the traction system [STR] through contact (68) [ULCP], BMS (76) [SBAT],
- contact (69) [ULCP], DC/DC converter (17) [SAX] and
- 15 contact (70) [ULCP],
- check the status and voltage of the batteries (1) and (2) [SBAT], by means of the BMS (76), and if these two parameters are equal to or within the
- minimum 20% of the load capacity of the batteries,
- 20 energize the relays (160) and (161) [ULCP] that, by the contacts (48) and (51) [ULCP] energize the
- contactors (49) and (50) [ULCP] connecting both the two banks of the battery (1) and (2) via power
- contacts (25) and (27) [ULCP], and if there is an
- 25 imbalance between the banks, energize only one of the battery banks via the relay (48) or the relay
- (51) [ULCP], the higher voltage and the load state, in this condition, adjust the traction system with
- less power, the contacts (40) and (41) [ULCP]
- 30 require the inverter controller module (6) [STR] a power reduction in the traction electric motor (7) [STR],
- energize the DC/DC converter (17) [SAX] via the power contacts (25) or (27) [ULCP] or both contacts,

depending on the condition of the battery banks, supplying power to the 24V_{DC} system and maintaining the loaded auxiliary batteries (21) [SAX],

- energize the preload timer (57) [ULCP], and energize the preload contactor (61) [ULCP] via the timer contact (60) [ULCP], which in turn closes the contact (28) [ULCP] and, through the preload resistor (30) [ULCP], loads the filter capacitors of the inverters (8) [STR] and (10) [SAX], and when the voltage of the capacitors reaches the same voltage level as the battery banks (1) and (2), the relay (37) [ULCP] is energized by the inverter controller (6) [STR] and its contact (55) [ULCP] energizes the main contactor (54) [ULCP] which connects the battery bank (1) and (2) to the system via power contactor (29) [ULCP],

- energize the relay (63) via the main contactor (54), and direct the energization of the auxiliary inverter (10) [SAX] through the contact (66) [ULCP], and generate a three-phase 220V_{AC} network by powering the auxiliary motors (12), (14) e (16) [SAX] via the contacts (113), (115) e (117) [SAX] and the contactors (104), (106) e (109) [ULCP] respectively, where the contactor control is dependent on the contact (103) of the relay (47) [ULCP] which is energized when the ignition key (82) [PCM] is keyed on, and in the event of an overload on the auxiliary motors (12), (14) and (16) the thermal relays (105), (107), (108) and (110) are turned off by opening the contactors (104), (106) and (109),

- energize the relief valve for starting the air compressor (111) by the timed contact in 12 seconds (112) of the auxiliary inverter (10) by connecting the auxiliary system [SAX], the DC/DC converter

(17), the hydraulic pump (12), the air compressor (14), and the cooling and air conditioning system (16), if connected by the system operator,

- close the contact (39) [ULCP] of the relay (63) [ULCP] after the energizing the main contactor (54) [ULCP] when the condition of the batteries state (1) and (2) is satisfied, and push button (87) [PCM] by sending a digital signal to the eVSI module (73) [PCM], which in turn, sends a signal through the CAN bus (128) to the inverter control module (6) [STR] be enabled, satisfying the conditions for the electric motor to start up, and

- select the gear (127) [PCM] and turn on the accelerator pedal (126) [PCM] by energizing the relay (89) [UPCL] through the contacts (94) and (95) indicating that the traction inverter (06) [STR] is enabled and push the electro-fan of the cooling system via the key (85).

5. **SYSTEM** according to claim 4, characterized in that an automatic gearbox (38) of 6 forward, neutral and reverse speeds is provided between the electric motor (07) and the tractor axle (13).

6. **SYSTEM** according to claim 5, characterized in that the gearbox multiplies the torque required for the vehicle to achieve the ramp-up and final-speed climb performance, and the tractor shaft has a reduction and transfer of the output torque of the electric motor set (7) and automatic gearbox (38) for the tires.

7. **SYSTEM** according to claims 1 to 6, characterized in that the control module (72) sends a signal to the control module of the traction inverter (6) inhibiting the traction at the time of the gear changes.

8. **SYSTEM** according to claims 1 to 7, characterized in that a small electric braking rate is applied to the moving

vehicle when the accelerator 126 [PCM] is released and the traction system (5) begins to regenerate energy to the batteries (1) and (2).

5 9. **SYSTEM** according to claims 1 to 8, characterized in that when pressing the brake (125) the energy regeneration rate for the batteries (1) and (2) increases proportionally to the position of the pedal.

10 10. **SYSTEM** according to claims 1 to 9, characterized in that, with the vehicle in operation, the BMS (76) [SBAT] monitors the balance, the current and the temperature of the cells of the battery banks (1) and (2) [SBAT], and in case of failure the BMS (76) [SBAT] energizes the relays (160) and (161) [ULCP] that turn off the contactors (49) and (50) [ULCP] by disconnecting the banks of batteries (1) and (2).

15 11. **SYSTEM** according to claims 1 to 10, characterized in that, if the temperature in the batteries (1) and (2) is between 41 and 50 °C, preferably 45 °C, the BMS (76) [SBAT] controls the relay (162) [ULCP] that by contacting (163) [ULCP] energizes the battery blowers (100) [SBAT] and, when
20 the temperature falls to 40 °C the fans are turned off.

12. **SYSTEM** according to claims 1 to 11, characterized in that if the battery bank energy (1) and (2) reaches 20%, an alert signal will warn the driver of the vehicle in relation to the state of charge, and, when it reaches 10% the BMS
25 (76) controls the vehicle shutdown.

13. **SYSTEM** according to claims 1 to 12, characterized in that the relay (45) [ULCP] initiates the logic of the energizing of the systems and also turns off the entire system.

30 14. **SYSTEM** according to claims 1 to 13, characterized in that the DC/DC converter (17) [SAX] has a protection fuse (19) at its output and a general key of the batteries (20) [SAX] which shuts off all vehicle control feeds when disconnected.

15. **SYSTEM** according to claims 1 to 14, characterized in that the emergency button (83) [PCM] actuates the contact (44) [ULCP] in series with the relay (45) [ULCP] to turn off the entire system in case of an emergency.

5 16. **SYSTEM** according to claim 1, characterized in that the load mode of the batteries follow the following steps:

- key on the ignition key (82) [PCM],
- press the load mode selector (84) [PCM],
- apply the parking brake (96) [PCM],
- 10 - energizing the relay (91) [PCM] via the contact (92) of the relay (93), which energizes the relay (171) [ULCP],
- connect the plug (23) [SBAT] after checking the battery banks (1) and (2) by BMS (76) [SBAT]
- 15 connected via the contacts (25) or (27) [ULCP] or both,
- energize the relay (171) and the contact (58) not allowing the main contactor (54) [ULCP] to energize, by keeping the contact (29) [ULCP] open, by holding
- 20 the traction (5) and auxiliary systems (36) de-energized,
- sending a digital signal to the eVSI module (73) via the contacts (176) and (178) [ULCP], which in turn informs the interface module (75) [SBAT] via
- 25 the CAN network (128) that the external charger can be keyed on, enabling the vehicle to recharge the batteries (1) and (2), where the interface module (75) [SBAT] informs the BMS (76) [SBAT] that it is in load mode through the relay (173) [ULCP] and also
- 30 actuates the relay (171) [ULCP], which in turn, connects the external charger to the vehicle through the power contactor 34 [ULCP], which in turn gives the feedback to the interface module (75) through the contact (71) that the contactor (34) is

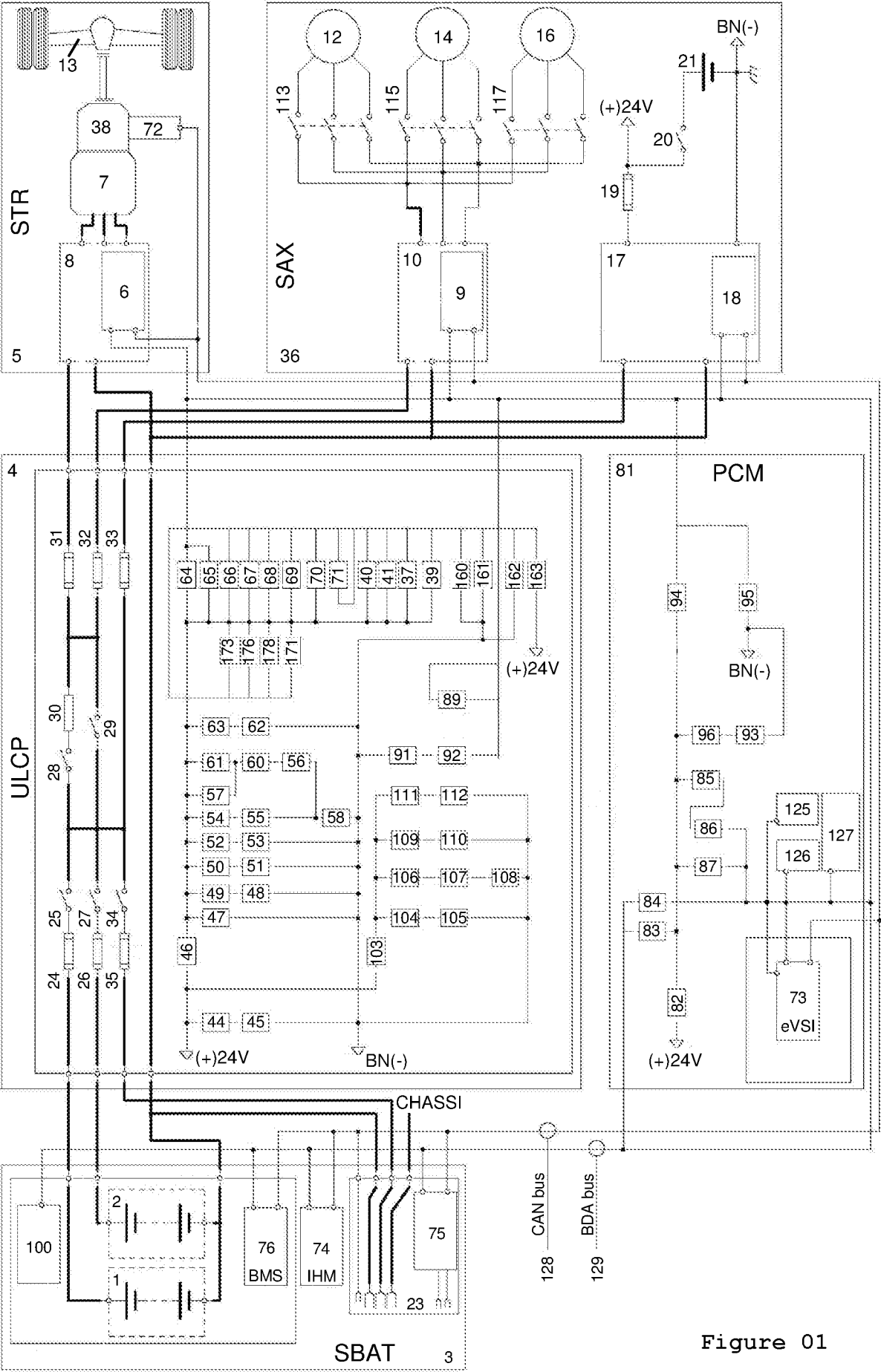
energized, and the BMS (76) [SBAT] sends, via CAN 128, the limits of load, current and voltage to the interface module (75) [SBAT] which, in turn, sends this information to the external charger,

- 5 - monitor the battery charge (1) and (2) via the BMS (76) [SBAT], and when the load reaches 100%, send a message to the interface module (75) [SBAT] to disconnect the charger external,
- 10 - disconnect the plug (23) from the external charger and deactivate the load mode key (84).

17. **SYSTEM** according to claim 16, characterized in that in the load mode of the batteries, in the event of a load interruption, the following are performed:

- 15 - disable the load mode selector (84) [PCM], turn off vehicle key (82) [PCM] and disconnect plug (23) [SBAT], and if battery banks (1) and (2) are unbalanced,
- 20 - connect the lowest load and voltage bank through the BMS (76) [SBAT] and start the load, and, when that bank reaches the same load state as the other bank, connect the second bank in parallel via the BMS (76) [SBAT] and the two banks (1) and (2) continue to be recharged.

18. **SYSTEM** according to claim 17, characterized in that during the charging, the BMS (76) [SBAT] monitors the current, voltage and temperature, and in the event of an error, it sends a message to interrupt the load and open the power contacts (25) and (27) [ULCP].



INTERNATIONAL SEARCH REPORT

International application N°

PCT/BR2018/050055

A. CLASSIFICATION OF SUBJECT MATTER

B60L11/18 (2006.01), B60L15/00 (2006.01), B60L3/00 (2006.01), H02P5/74 (2006.01), B60L9/18 (2006.01), H02P27/06 (2006.01)

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)

B60L, H02P

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Banco de dados INPI-BR

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, ESPACENET

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claims N°
A	US 5813487 A (AUWAERTER GOTTLOB GMBH CO [DE]) 29 September 1998 (1998-09-29) Whole document.	1-18
A	US 7147070 B2 (LECLERC GAETAN [CA]) 12 December 2006 (2006-12-12) Whole document.	1-18
A	US 7338335 B1 (MESSANO FRANK [US]) 04 March 2008 (2008-03-04) Whole document.	1-18
A	US 8256553 B2 (DE PASCHOAL ROBERTO [CA]) 04 September 2012 (2012-09-04) Whole document.	1-18

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

"A" document defining state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"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

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

03/07/2018

Date of mailing of the international search report

09/07/2018

Name and mailing address of the ISA/BR



Facsimile N°

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application N°
PCT/BR2018/050055

Patent documents cited in search report	Publication date	Patent family members	Publication date
US 5813487 A	1998-09-29	CA 2198888 A1	1996-03-14
		DE 4431305 A1	1996-03-07
		WO 9607558 A1	1996-03-14
-----	-----	-----	-----
US 7147070 B2	2006-12-12	US 2005000739 A1	2005-01-06
		CA 2418686 A1	2004-08-07
		CA 2457216 A1	2004-08-07
-----	-----	-----	-----
US 7338335 B1	2008-03-04	US 6237988 B1	2001-05-29
		US 6425625 B1	2002-07-30
		US 2002153745 A1	2002-10-24
		US 6679543 B2	2004-01-20
		US 2002096709 A1	2002-07-25
		US 6781195 B2	2004-08-24
		US 6840825 B1	2005-01-11
		US 2004207027 A1	2004-10-21
		US 6943408 B2	2005-09-13
		US 2002125736 A1	2002-09-12
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US 8256553 B2	2012-09-04	US 2011198137 A1	2011-08-18
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P-2019/16373

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

DIRECCIÓN DE NUEVAS CREACIONES

E. S. D.

Ref.: Expediente No. **NC2019/0014206**

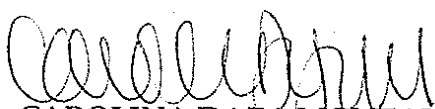
Solicitud de registro de patente de invención a nombre de **ELETRA INDUSTRIAL LTDA**

Yo, CAROLINA DAZA MONTALVO, identificada como aparece al pie de mi firma, domiciliada en la Carrera 11 No. 86-53, piso 3, obrando como apoderada de la sociedad solicitante de la patente de la referencia, **ELETRA INDUSTRIAL LTDA**, me permito allegar el siguiente documento como complemento a la respuesta al Oficio No. 89, radicada el 22 de febrero de 2019.

1. Publicación Internacional: Adjuntamos a este memorial, la Publicación Internacional realizada el 1 de agosto de 2019. En la respuesta radicada el 22 de febrero de 2019, solicitamos a esta Superintendencia que la publicación de la solicitud de la referencia se realizará una vez publicada la solicitud internacional.

Teniendo en cuenta lo anterior, cumplimos con el compromiso de allegar la publicación internacional y solicitamos que se continúe con el trámite de la presente solicitud.

Atentamente,



CAROLINA DAZA MONTALVO

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