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(54) Title: STORAGE CONTAINER FOR A VEHICLE

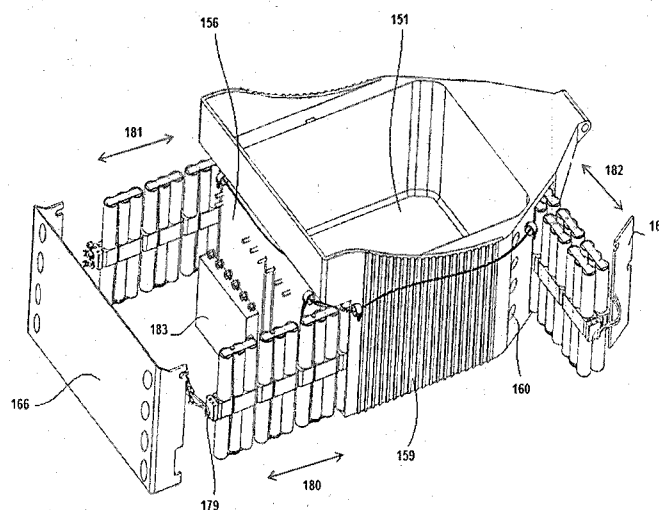


FIG. 6

(57) Abstract: The present subject matter relates to an electrical power source for a two wheeled electric or hybrid vehicle (100) comprising of a plurality of individual battery cells (170, 171) configured to form one or more stacks (180, 181, 182). The one or more stacks are accommodated in a storage container (150) in an insertable and removable manner. The storage container is freely openable and closable by a seat (111). At least one stack is accommodated in at least one trench (162, 163, 164) formed between an inner and an outer surface of a wall (153, 154, 155) of the storage container. Each stack from the one or more stacks is electrically coupled to a communicative cell management system (183) which is attached and supported on an outer surface of wall of the storage container.



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## STORAGE CONTAINER FOR A VEHICLE

### FIELD OF THE INVENTION

[0001] The present invention relates generally to an automotive vehicle and more particularly, but not exclusively, to an electrical power source for providing power to the vehicle and fulfilling its other electrical load requirements.

### BACKGROUND OF THE INVENTION

[0002] Conventionally a two wheeled automotive vehicle functioning as an electric vehicle or a hybrid vehicle is powered by an electrical power source. Using lead acid type batteries as the electrical power source has many disadvantages. Generally a lead acid battery is heavier, prone to acid spills and has shorter shelf life. It provides lower power and delivers poor performance. It is also harmful to the environment as it contains heavy metals, for example lead and sulphuric acid. Further, lead acid batteries with sufficient capacity and starting performance are subject to packaging constraints as it is difficult to mount them in the limited spaces of a two wheeled vehicle requiring further structural innovation.

[0003] Therefore, a battery container housing a plurality of battery cells is used in the automotive vehicle. The battery container is typically kept air tight and water resistant so as to protect the battery cells from undesirable damage which may result in electrical disturbances or electrical shorts. However, one of the drawbacks of conventional batteries for electric and hybrid vehicles is the inability to gain 'access' to the individual battery cells within the battery container because the battery container is sealed tight. This becomes a problem because the vehicle operator is unable to get the damaged individual battery cell replaced in the service center, and therefore has to discard the entire battery and purchase a new one. This is an expensive and environment unfriendly process.

[0004] Further, such battery container is fraught with mounting and packaging issues. In the context of a scooter type electric or hybrid two wheeled

vehicle, the battery container is supported in the rear frame of the motorcycle. In one case, the battery container is mounted within a storage container supported on the rear frame of the vehicle. The battery container uses up the storage space and severely compromises the utility space available in the vehicle for storing goods  
5 due to its bigger size. For example, in this configuration, the user is unable to store a full face helmet in the storage container. This configuration also limits the consumer's ability to easily access the battery cells within the battery container. Several components are required to be detached by a technician at the service centre to access the battery cells. In another case where the battery container is  
10 mounted on the front frame, the battery size causes problems related to vehicle handling issues and weight balance. U.S. Pat. No. 5,613,569 disclose electric scooter type motorcycle powered by a battery but access to the battery container requires significant disassembly of the vehicle body and access to individual battery cells within the battery is limited.

## 15 SUMMARY OF THE INVENTION

[0005] The present subject matter is directed to overcome all or any of the problems as set forth above and thereby to obviate a lacunae in the prior art. It is therefore an object of present invention to disclose an electrical power source for powering a vehicle facilitating easy accessibility and easily serviceability. It is yet  
20 another object of the present invention to disclose an easily serviceable electrical power source with replaceable components. It is another object of the present invention to provide an electrical power source packaged within a storage container without compromising the storage space and providing easy accessibility and easy disassembly.

25 [0006] To this end, the present invention discloses an electrical power source comprising one or more stacks connected in series and formed from a plurality of individual battery cells arranged together wherein the one or more stacks are supported in at least one trench formed between an inner surface and an outer surface of at least one wall of a storage container in an insertable and  
30 removable manner. The one or more stacks are electrically coupled to a

communicative cell management system. This configuration does not compromise the available storage space within the storage container.

5 [0007] According to a feature of the present invention, each stack from the one or more stacks includes at least two or more cell packs. Further, each cell pack from the two or more cell packs comprises of two or more individual battery cells connected in parallel to each other and supported by at least one cell holder. The two or more cell packs are mechanically lockable to each other through a plurality of couplers provided on both sides of the long axis of the cell holder of each cell pack.

10 [0008] According to another feature of the present invention, each trench is covered, either solely or jointly with another trench, by a closable trench cover having a locking mechanism. This facilitates easy accessibility to individual battery cells. Further, the cell management system is attached and supported on an outer surface of at least one of the walls of the storage container.

15 [0009] The foregoing objectives and summary is provided to introduce a selection of concepts in a simplified form, and is not limiting. To fully appreciate these and other objects of the present subject matter as well as the subject matter itself, all of which will become apparent to those skilled in the art, the ensuing detailed description of the subject matter and the claims should be read in  
20 conjunction with the accompanying drawings.

## **BRIEF DESCRIPTION OF DRAWINGS**

[00010] The above and other features, aspects and advantages of the subject matter will be better understood with regard to the following description, appended claims and accompanying drawings where:

25 FIG. 1 shows a front perspective view of a two wheeled vehicle exemplified in the form of a two wheeled scooter type motorcycle according to the present invention. FIG. 2 shows a side view of the scooter type motorcycle according to the present invention.

FIG. 3 shows a front perspective view of a storage container of the scooter type motorcycle according to the present invention.

FIG. 4 shows a rear perspective view of the storage container of the scooter type motorcycle according to the present invention.

5 FIG. 5(a) and FIG. 5(b) respectively show a cell pack made of plurality of interconnected battery cells, and a stack comprising a plurality of cell packs.

FIG. 6 shows the assembly of the stacks in the storage container according to the present invention.

10 FIG. 7 shows a rear view of the storage container illustrating power transmission by stacks.

FIG. 8 shows a plan view of the arrangement of stacks in the storage container according to the present invention.

FIG. 9(a) and 9(b) respectively show the thermocouples of respective stacks connected to a cell management system.

15 FIG. 10 shows a frame of the vehicle of FIG. 1 showing the positioning of the storage container according to the present invention.

## DETAILED DESCRIPTION OF THE INVENTION

[00011] The present subject matter discloses an electrical power source for a two wheeled electric or a hybrid vehicle comprising a plurality of individual  
20 battery cells electrically coupled together and configured to jointly provide power to fulfill the electrical load requirements of the vehicle. The load requirements include either propelling a traction motor of the vehicle, or powering lighting and signalling devices associated with the vehicle, or both. In an embodiment, the battery cells are configured to form one or more stacks accommodated within a  
25 storage container provided in the vehicle in an insertable and removable manner. In an implementation, each stack is accommodated within a trench formed between an inner surface and an outer surface of a wall of the storage container. In this way, the battery cells are mounted in the vehicle without compromising the storage area and the need for a separate battery container carrying a battery is  
30 eliminated.

[00012] In an embodiment, the storage container has at least four walls. Each wall excluding one is provided with a trench. The trenches are opened only on one side and permanently closed on the other side. Each trench is covered, either singly or jointly, by a closable trench cover having a locking mechanism.

5 One or more stacks are inserted into each trench and are connected to a communicative cell management system. In the event of a cell damage, the concerned stack is taken out from the trench after opening the closable trench cover thus making the battery cells easily accessible. The battery cells of the stack are uncoupled so as to replace only the damaged battery cell. Thus, the electrical  
10 power source is easily serviceable and cost effective. Further, the arrangement of the battery cells in the storage container also maintains the centre of gravity of the vehicle unlike a heavy battery container as the cells are equally distributed around the storage container.

[00013] In the ensuing description, the present invention is exemplified  
15 with a two wheeled scooter type motorcycle for better illustration. Further “front” and “rear”, and “left” and “right” wherever referred to in the ensuing description refer to front and rear, and left and right directions as seen in a state of being seated on a seat of the scooter type motorcycle. Furthermore, a longitudinal axis refers to a front to rear axis relative to the motorcycle, while a lateral axis refers  
20 generally to a side to side, or left to right axis relative to the motorcycle. Various other features of the electrical power source according to the present subject matter here will be discernible from the following further description thereof, set out hereunder. The detailed explanation of the constitution of parts other than the subject matter which constitutes an essential part has been omitted at suitable  
25 places.

[00014] FIG. 1 shows a front perspective view of a scooter type motorcycle  
100 according to the present invention. Typically such vehicle includes a body frame made up of several tubes welded together which usually supports the body of the said vehicle. The body frame assembly of the scooter type motorcycle is an  
30 elongated structure, which typically extends from a forward end to a rearward end

of the vehicle. It is generally convex in shape, as viewed from a side elevation view. The body frame assembly includes a head pipe (not shown) and a branched down pipe (not shown) that extends downward from the head pipe. The vehicle has a steerable anterior wheel **106** and a driven rear wheel **107** driven by driving force generated by a power source. The body frame of the vehicle is covered with a plurality of vehicle body covers including a front panel **102** and side panels **110** present on both sides of the vehicle longitudinal plane. The vehicle body covers are made of resin or sheet metal to form an external appearance of the vehicle. The front panel **102** is located in an anterior portion of the vehicle and covers the front portion of the frame whereas the side panels **110** are located in the rear portion of the vehicle and cover a rear portion of the frame. A handlebar **119** for steering the motorcycle and a seat **111** for motorcycle occupants is supported at opposing ends of the frame assembly and a generally open area is defined therebetween known as floorboard **108** which functions as a step through space. The anterior portion of the scooter type motorcycle further comprises of a head lamp **101**, a plurality of direction lamps **103** supported on the front panel **102**, a front suspension assembly **105** (commonly a telescopic fork arrangement) operatively positioned between the anterior wheel **106** and the frame assembly. A front fender **104** is provided to prevent undesirable impurities like water, mud etc. from falling on the motorcycle operator and other components of the motorcycle **100**.

[00015] According to an aspect, the power source includes a mechanical power source, or an electrical power source, or a mechanical and an electrical power source co-operatively working to propel the vehicle and fulfilling other electrical load requirements of the vehicle. In an embodiment, the motorcycle **100** comprises of a mechanical power source and an electrical power source. The mechanical and the electrical power source can work either simultaneously or in series or in parallel mode.

[00016] FIG. 2 shows a side view of the scooter type motorcycle according to the present invention. The rear portion of the motorcycle comprises of a fuel

tank **116** disposed above the rear wheel **107** and rearwardly of the seat assembly **111**. It stores fuel supplied to the mechanical power source. The fuel tank **116** is covered substantially from the sides by the side panel **110** and partially from the top by the seat **111**. A storage container **150** having an upwardly facing storage space **151** is provided for storing useful articles below the seat **111**. At least two side tubes **115**, **118** are connected to the down tube of the body frame. The storage container **150** is housed in the space between the side tubes **115**, **118** and is supported on one or more cross tubes provided therein extending laterally from one side tube to the other side tube. The seat **111** is connected to the storage container **150** to be vertically pivotable around a hinge mechanism **112** at a front portion thereof, and is openable and closable vertically to allow access to the storage space **151** for storing useful articles. The seat **111** serves as a lid of the storage container **150**.

[00017] The mechanical power source of the vehicle is a four stroke internal combustion engine **109** mounted to a hub of the rear wheel **107** at one end and to the body frame at the other end through a toggle link mechanism **117** in such a way that the mechanical power source is angularly disposed to the ground. In one of the embodiment, the mechanical power source is mounted on the swing arm. Since the basic construction of the internal combustion engine is known to those versed in the art, the details have been omitted.

[00018] The electrical power source comprises of a plurality of electrically coupled individual battery cells forming one or more stacks. FIG. 3 and FIG. 4 illustrate the storage container in detail. The storage container **150** is configured to accommodate the electrical power source. At least one trench is formed between an inner surface and an outer surface of at least one wall of the storage container. The at least one trench accommodates the one or more stacks in an insertable and removable manner.

[00019] In an implementation, the storage container has a plurality of walls namely a front wall **155** at the front, a rear wall **156** located opposite to the front wall **155**, and at least two side walls, a first side wall **153** and a second side wall

**154** located laterally on each side of the storage container. The arrow shows the front and rear direction of the vehicle along the vehicle longitudinal axis. The side walls are extended along the longitudinal axis to form a front portion **157** and a rear portion **161** of the storage container **150**. The seat **111** is attached to the front portion of the storage container through the hinge mechanism **112**. The front portion **157** is at a lower elevation than the rear portion **161** to accommodate seat assembly and provide better seat orientation.

[00020] The inner surfaces of all walls are connected to each other via a common base to form the storage space **151** below the seat **111**. At least one trench is formed between an inner surface and an outer surface of at least one wall to accommodate one or more stacks. In a preferred embodiment, the storage container **150** is provided with three trenches formed between the inner and outer surfaces of three walls to sufficiently accommodate more number of stacks. Thus, a front trench **162** is formed between the inner and outer surface of the front wall **155**. Likewise, the inner and outer surface of the first side wall **153** includes a first side trench **164** and that of second side wall **154** has a second side trench **163**. The front trench **162**, the first side trench **164** and the second side trench **163** individually accommodate one or more 'stacks' in an insertable and removable manner. The stacks are electrically coupled together to power the motorcycle and also cater to its electrical load requirements like powering signalling lamps, horns, headlamp, tail lamp etc. Each trench is covered from all sides except one through which one or more stacks are inserted into it.

[00021] The electrical power source made of stacks is now described in detail with the help of FIG. 5(a) to 8. It is made of one or more stacks housed in trenches and connected in series. Each stack from one or more stacks includes at least two or more cell packs. Each 'cell pack' comprises two or more individual battery cells electrically connected in parallel to each other and supported by at least one cell holder. FIG. 5(a) describes an individual cell pack **177**. In an implementation, each cell pack **177** comprises of at least six individual battery cells (**170**, **171**, **172**, **170a**, **171a**, **172a**) electrically coupled in parallel

configuration and supported by in groove of a cell holder **174**. In an embodiment, the six battery cells are arranged one above another in two layers of three cells each. The two layers of cells have an upper and lower negative plate **173** connected by a connecting wire **178**.

5 [00022] Further, the cell holder **174** is made of an insulating polymer material and assists in keeping the battery cells (**170**, **171**, **172**, **170a**, **171a**, **172a**) intact so as to resist any shock. The cell holder **174** has at least six wire outlets of which two are positive couplers and two negative couplers housed in the sides of the cell holder **174**. The cell holder **174** has a negative coupler **175a** and a positive  
10 coupler **175b** on each side of its long axis. The two or more cell packs **177** are mechanically lockable to each other these couplers provided on both sides of the long axis of the cell holder of each pack to form one stack. **FIG. 5(b)** describes a stack made of multiple cell packs electrically connected to each other. The negative coupler **175a** and the positive coupler **175b** of one cell holder **174** of one  
15 cell pack **177** is connected to a positive coupler **176b** and a negative coupler **176a** of adjacent cell pack. The couplers form a mechanical lock through which the cell packs remain connected to each other.

[00023] In a preferred embodiment, each stack is formed from at least three cell packs and the storage container accommodates at least three stacks. **FIG. 6**  
20 shows the various stacks namely a front stack **182**, a first side stack **181** and a second side stack **180** and their assembly in the storage container according to the present invention. The front stack **182** is laterally inserted in the front trench **162**, the first side stack **181** longitudinally inserted in the first side trench **164** and the second side stack **180** longitudinally inserted in the second side trench **163**. Each  
25 trench is covered, either singly or jointly with other trench, by a closable trench cover having a locking mechanism. In an embodiment, a front trench cover **165** is provided to cover the front trench **162** after the first stack **182** has been inserted and opens laterally. The first side trench **164** and the second side trench **163** are jointly covered through a side trench cover **166** which opens rearwardly. The side

trench cover **166** spans the width of the storage container **150** and covers the first side trench **164** and the second side trench **163**.

[00024] In a preferred embodiment, the first side stack **181** comprises of four cell packs **177**, the second side stack **180** comprises four cell packs and the front stack **182** comprises six cell packs. More number of cell packs in the front stack would enable more power supply and eliminate the need for significant lateral expansion of the storage container **150**.

[00025] The cell packs are connected to each other through couplers housed in the respective cell holder which enables all the cell packs to be connected as a single stack. Moreover, all cell packs in a particular stack are connected in series. All stacks are connected in series and jointly form the electrical power source. In an embodiment, the electrical power source comprises of a total of at least eighty four battery cells in three stacks and fourteen cell packs wherein each individual battery cell has a capacity of 3Ah and 4.2V. The battery cell, however, can also have a higher capacity of around 4Ah or 5Ah depending upon the electrical load requirement. Each individual battery cell is of Lithium-ion type and has a shape from a group consisting of a rectangle, a square, a prism and a cylinder. In an embodiment, the individual battery cells are cylindrical in shape. However, prismatic shaped individual battery cells can also be used. The number of cells forming one cell pack can vary. But in the preferred embodiment, a cell pack contains six battery cells and a total of fourteen cell packs are provided in the vehicle to obtain the required electrical output.

[00026] Each stack from the one or more stacks is electrically connected to a communicative cell management system (CMS) **183** or a battery management system (BMS) as shown in FIG. 6 which controls the battery cells. The CMS **183** is electrically coupled with the stacks comprising plurality of battery cells and monitors the metadata of each of the plurality of battery cells. In an embodiment of the present invention, the CMS **183** is any electronic device that manages each battery cell, such as by monitoring its state, calculating secondary data, reporting the data, protecting the battery cell, controlling its environment, and/or balancing

the charge in each cell. The CMS may monitor various aspects of a pack as a whole and/or each individual battery cell, such as energy input, energy output and temperature etc. The CMS is connected to a central control unit and has CAN communication capabilities.

5 [00027] FIG. 7 shows the rear view of the storage container 150 illustrating power transmission from the stacks to the CMS 183. The electrical output of each stack is provided to the CMS 183 through a plurality of metal plate units (184, 185, 186) having connection terminals. Each metal plate unit comprises of at least two metal plates (one for positive and one for negative terminal) to carry power  
10 from each stack to the CMS 183. The metal plates are enmoulded in the storage container 150 and hence only the ends with connection terminals are visible. A front metal plate unit 184 is provided for front stack 182, a first side metal plate unit 185 is provided for first side stack 181 and a second side metal plate unit 186 is provided for second side stack 180. One end of each metal plate is connected to  
15 the wire output of the respective stack whereas the other end of it is connected to the CMS 183. The output of each stack is carried to the CMS 183 through a connector 179. The connector 179 is connected to the last cell pack of a particular stack and takes the battery output to the CMS through wires. As shown in FIG. 9(b), studs 191a, 191b are provided on both ends of the metal plates. The wires  
20 from the connector 179 are connected to these studs which then supply the power to the CMS through the metal plates. Within the CMS, the stacks are connected in series. The CMS then supplies output to power the vehicle and fulfilling other electrical load requirements of the vehicle. As shown in top view in FIG. 8, the CMS 183 thus receives six inputs through a total of six metal plates, two each  
25 connected to a stack.

[00028] According to a feature, the CMS 183 is attached and supported on an outer surface of the rear wall 156 of the storage container 150. It is located near to the rear portion 161 of the storage container 150. By keeping the CMS near the stacks, the length of the wiring harness is significantly reduced and also leads to

optimum space utilization. The CMS **183** is supported on the studs provided at the ends of metal plates.

[00029] Further, as illustrated in **FIGs. 9(a)** and **9(b)**, each cell pack **177** includes at least one thermocouple **187** and the thermocouples of two or more cell  
5 packs are connected to each other through at least one thermocouple wire **190** further connected to the CMS **183** through a coupler **189**. In a preferred embodiment, for the front stack **182**, six thermocouples are provided for six cell packs. The thermocouple **187** senses the temperature of each cell pack and when in excess, disables the CMS output supply. The respective thermocouple wires  
10 from each stack are merged and the output of all the thermocouples is fed into the CMS through the coupler **189**. Each thermocouple wire **190** is held on the outer surface of the storage container **150** through button straps. For each stack, a button strap is provided (shown by numeral **188a**, **188b**, **188c**) for a wire. The wires are then collated and supported on a common button strap **188d** and  
15 connected to the coupler **189**.

[00030] As the stacks of battery cells provide power, they generate heat inside the respective trenches. Therefore, efficient heat dissipation is required to maintain a normal operating temperature within the trenches. In an embodiment, enmoulded fins **159** and air openings **160** are provided on the outer surface of the  
20 first side wall **153**, front wall **155** and the second side wall **154** to enable heat dissipation. The fins can be horizontal or vertical to the vehicle longitudinal plane. They increase the surface area for heat dissipation from the cells. When the vehicle is moving, the atmospheric air hits the fins and dissipates the heat generated in the side trenches. Further, the air entering through air openings **160**  
25 can traverse the length of the side trenches and can escape out from the perforations provided in the side trench cover **166**. Thus, air openings **160** improve the air circulation through the battery cells. They can be smaller or bigger in diameter depending upon the heat dissipation required. The perforations and the air openings may be directed downwards or may be sealed for water entry. In  
30 another embodiment, the outer casing of the stacks is made of heat conductive

metal to increase the rate of heat dissipation. This metal casing may be fastened to the storage container outer surface.

[00031] Each of the front trench **162**, the first side trench **164** and the second side trench **163** are integrally formed with the storage container **150**. In an embodiment, to enable more power, more number of cell packs can be provided in the trenches. To enable this, the width of the storage container is increased for accommodating the respective bigger side trenches and length to be increased to accommodate front trenches. According to an aspect, the space between the side tubes **115**, **118** may be increased to house a bigger and wider storage container resulting in the increase in the width of the vehicle. Further, in the scooter type motorcycle, space is a not a constraint unlike motorcycle and hence front trench **162** can be easily accommodated by slightly increasing the length of the storage container **150**.

[00032] From the foregoing description, it will be appreciated that the present invention offers many advantages including those described above. Diagnostic facility can be integrated to monitor the performance of each pack via CMS. A malfunction indicator may be provided to the user for each pack and in case of failure, all stacks need not be replaced. The current construction of electrical power source helps gain easy access to the battery cells without significant disassembly of the vehicle. The stacks are easily insertable into the trenches and the trench covers are closed after that. In case of a damage, to remove the damaged cell pack, the user needs to take the vehicle to the service station. The mechanic would take out the storage container **150** from the vehicle after opening the seat **111** without removing the side panel **110**. Thereafter, a particular stack is removable from a particular trench of the storage container and each cell pack can be separated or serviced by pulling it out from the connectors. Each cell pack and hence stack is thus serviceable in the present electrical power source. Thus, when individual battery cells get damaged or malfunction, the consumer has the advantage to get the concerned sole damaged pack replaced at the service center with a minimal amount of disassembly. This feature of the

present invention is advantageous as it increases the usability of the vehicle, reduces cost to the vehicle consumer and simplifies its maintenance. Further, the storage container space is utilized for providing power to the vehicle and no special battery mounting space is required. The battery cells within the storage container act as the complete battery and do not compromise the storage space already available in the storage container, for example, to put a full face helmet **201** as shown in **FIG. 10**. Furthermore, the arrangement of battery cells in the storage container also maintains the center of gravity of the vehicle as the cells are equally distributed on both sides of storage container.

10 **[00033]** The present invention is thus described. It is to be noted that the present subject matter is not dependent on the type of vehicle and therefore is equally workable with any vehicle capable of accommodating the storage container including a scooter type gasoline powered motorcycle, a scooter type electric motorcycle and a scooter type hybrid motorcycle with required  
15 modifications. For example, if the vehicle is a gasoline powered scooter type motorcycle, the present electrical power source can still fulfil the electrical load requirements like signalling lamps, head lamp, tail lamp, powering the starter motor for electric start etc. In this scenario, the small capability battery cells can be used. The use of the expression “at least” or “at least one” suggests the use of  
20 one or more elements or ingredients or quantities, as the use may be in the embodiment of the disclosure to achieve one or more of the desired objects or results. The numerical values mentioned for the various physical parameters, dimensions or quantities are only approximations and it is envisaged that the values higher/lower than the numerical values assigned to the parameters,  
25 dimensions or quantities fall within the scope of the disclosure, unless there is a statement in the specification specific to the contrary. It will also be obvious that the present invention may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the present invention, and all such modifications as would be obvious to one skilled in the art are intended to be  
30 included within the scope of the present invention.

We claim:

1. A storage container (150) for a vehicle accommodating an electrical power source comprising a front wall (155), a first side wall (153), a second side wall (154),

5                    wherein a front trench (162) is formed between an inner and outer surface of the front wall (155), a first side trench (164) is formed between an inner and an outer surface of the first side wall (153), a second side trench (163) is formed between an inner and an outer surface of the second side wall (154), and

10                   wherein, at least one or more stacks (180, 181, 182) connected in series and formed from a plurality of individual battery cells electrically coupled together to define the electrical power source are accommodated in each of the front trench (162), first side trench (164) and the second side trench (163) respectively in an insertable and removable manner, and

15                   wherein further, each stack from the one or more stacks (180, 181, 182) is electrically coupled to a communicative cell management system (183).

2. The storage container as claimed in claim 1, wherein the cell management system (183) is attached and supported on an outer surface of a rear wall (156) of the storage container.

20

3. The storage container as claimed in claim 1, wherein each stack from the one or more stacks (180, 181, 182) includes at least two or more cell packs, and wherein each cell pack (177) from the two or more cell packs comprises of two or more individual battery cells (170, 171) connected in parallel to each other and supported by at least one cell holder (174).

25

4. The storage container as claimed in claim 3, wherein the two or more cell packs are mechanically lockable to each other through a plurality of couplers (175a, 175b, 176a, 176b) provided on both sides of the long axis of the cell holder (174) of each cell pack (177).

- 5           5. The storage container as claimed in claim 1, wherein the electrical output of each stack from the one or more stacks (180, 181, 182) is provided to the cell management system through a plurality of metal plate units (184, 185, 186) enmoulded in the storage container (150) and having connection terminals.
- 10           6. The storage container as claimed in claim 3, wherein each cell pack includes at least one thermocouple (187) and the thermocouples of the two or more cell packs in each stack are connected to each other through at least one thermocouple wire (190) further connected to the cell management system through a coupler (189).
- 15           7. The storage container as claimed in claim 6, wherein the at least one thermocouple wire (190) is supported on the outer surface of the storage container through one or more button straps (188a, 188b, 188c).
8. The storage container as claimed in claim 1, wherein each of the front trench (162), the first side trench (164) and the second side trench (163) are integrally formed with the storage container and are covered, either singly or jointly, by a closable trench cover (165, 166) having a locking mechanism.
- 20           9. The storage container as claimed in claim 1, wherein the outer surface of the first side wall (153), the second side wall (154) and the front wall (155) of the storage container is provided with a plurality of fins (159) and air openings (160).
- 25           10. The storage container as claimed in claim 1, wherein each individual battery cell is of lithium ion type and has a shape from a group consisting of a rectangle, a square, a prism and a cylinder.

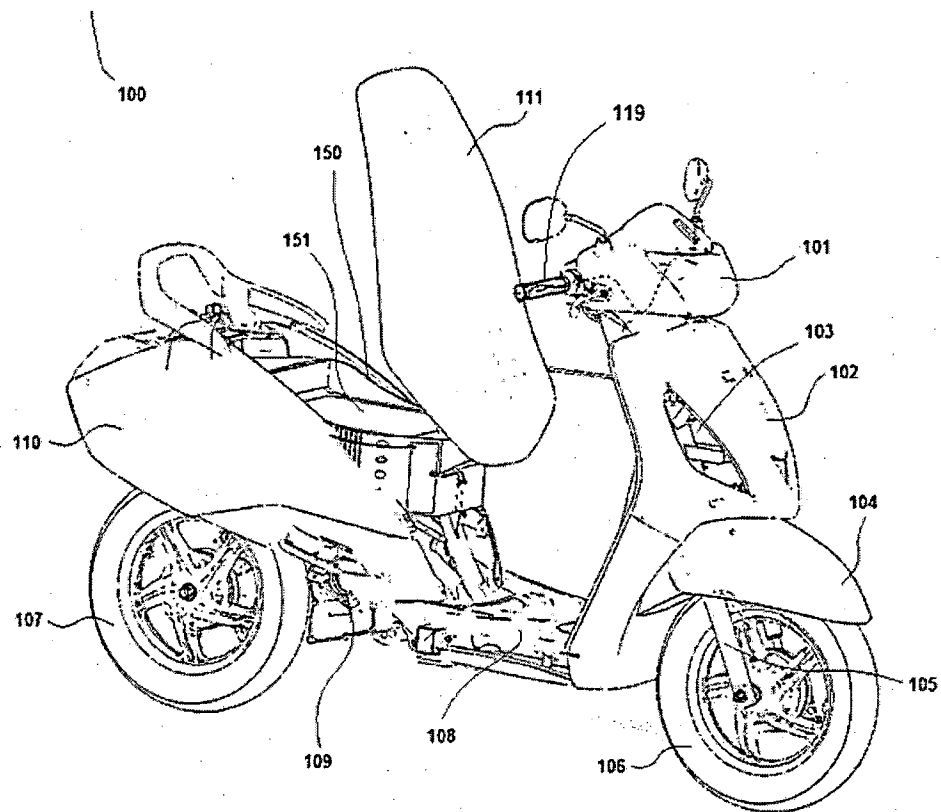


FIG. 1

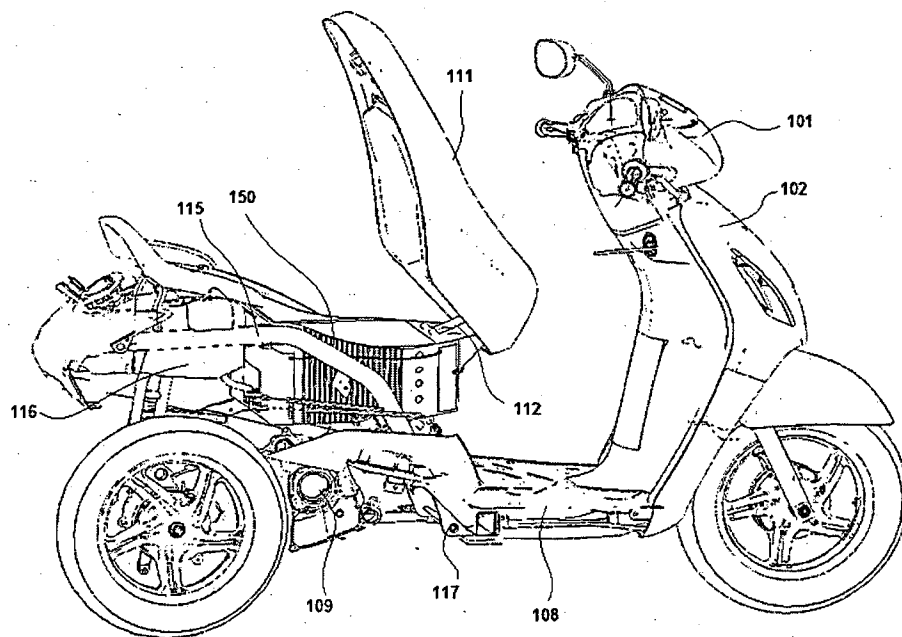


FIG. 2

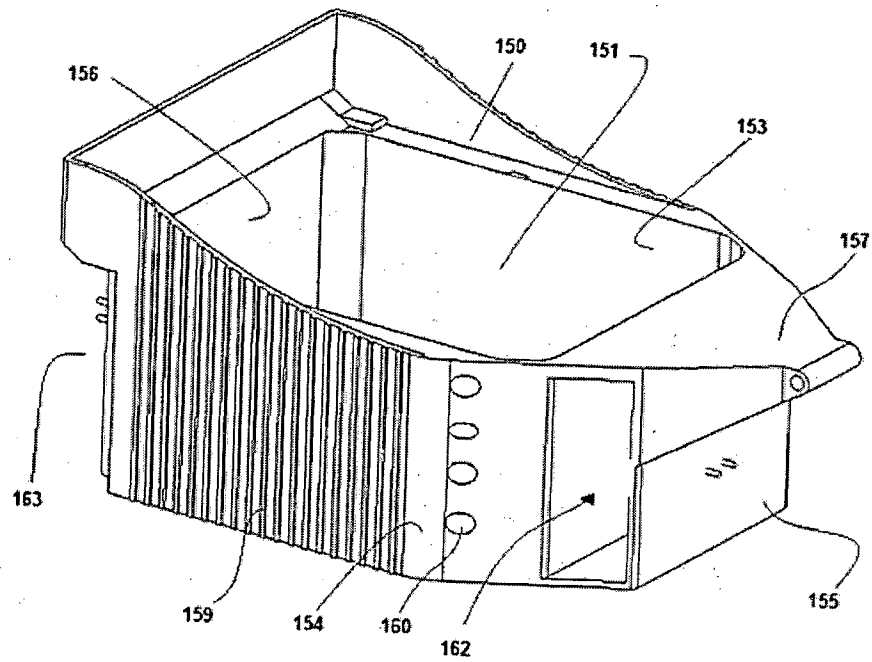


FIG. 3

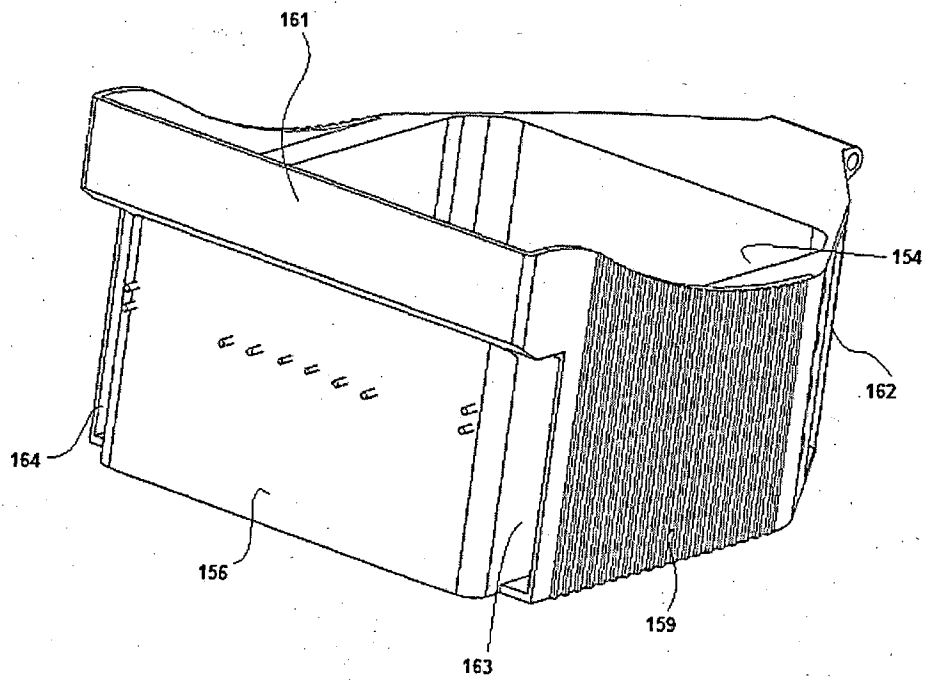


FIG. 4

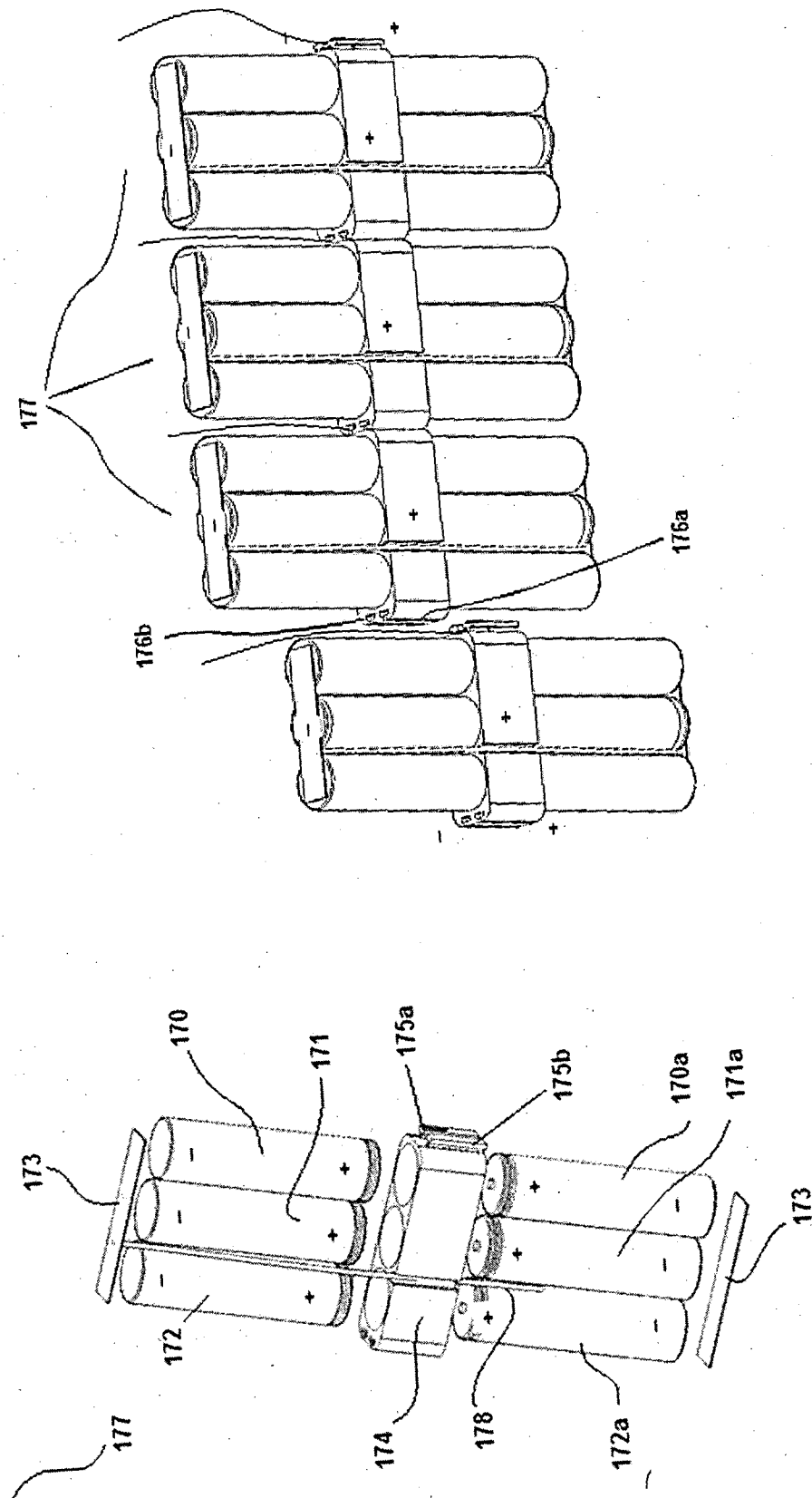


FIG. 5(a)

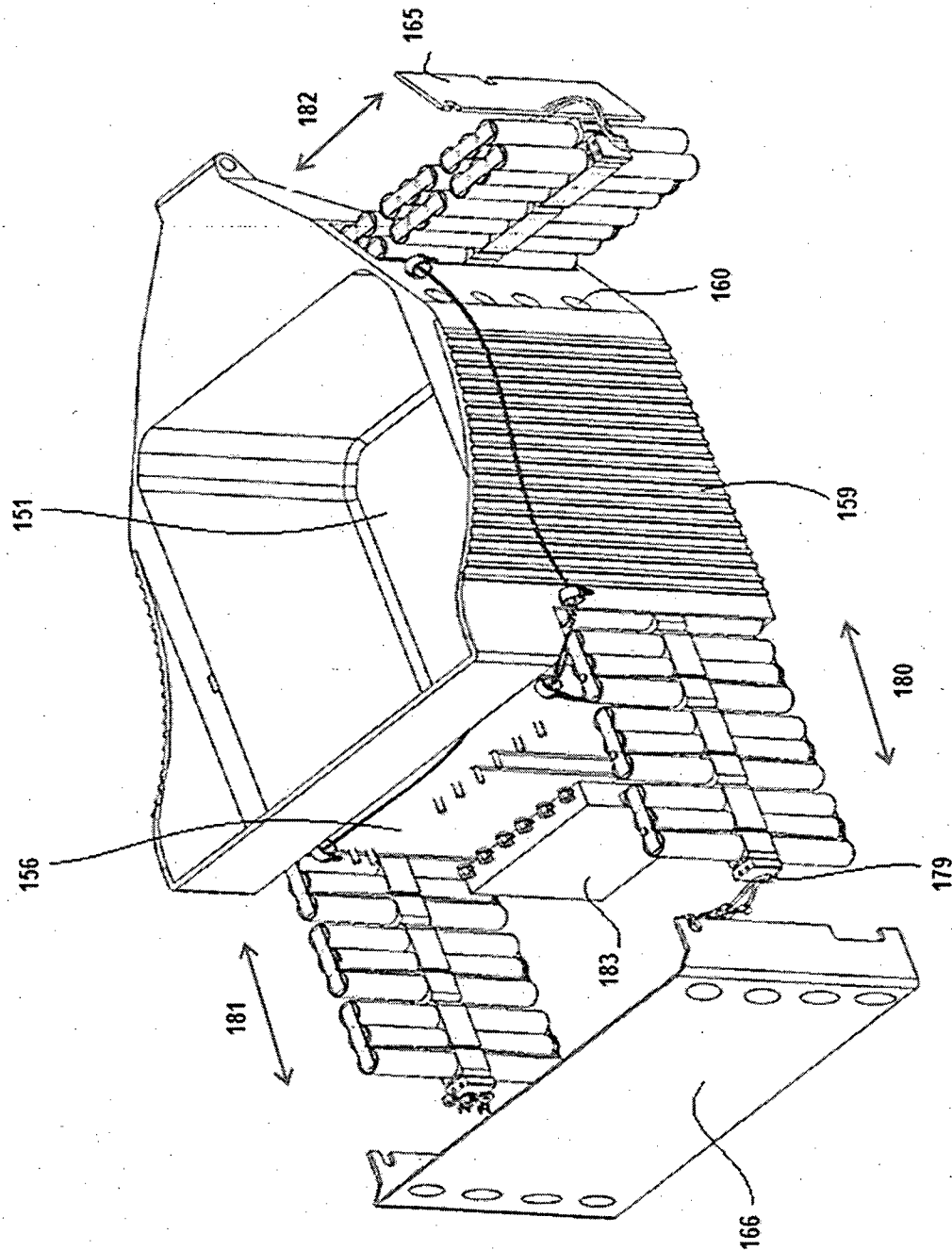


FIG. 6

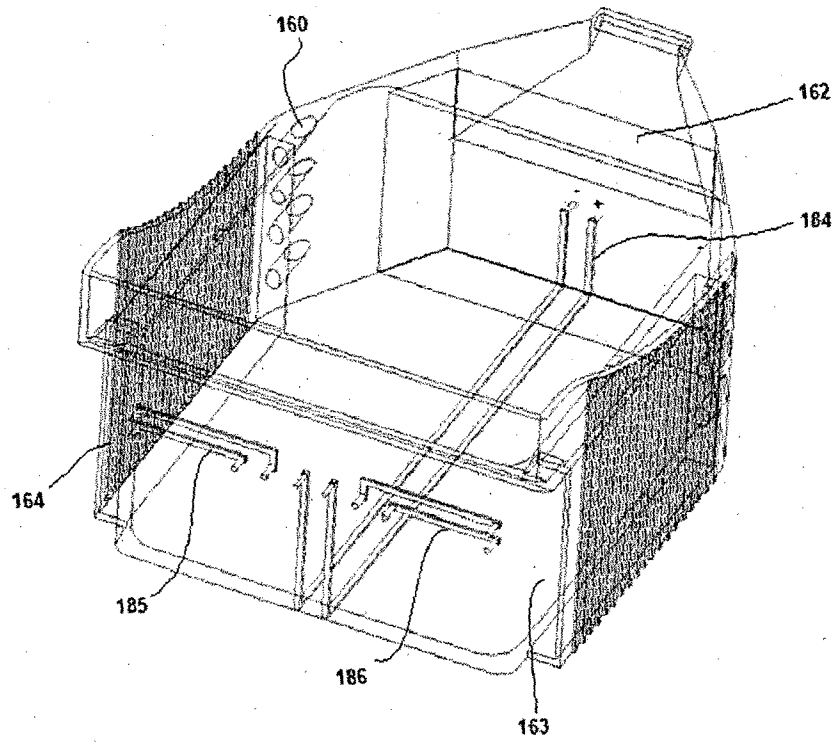


FIG. 7

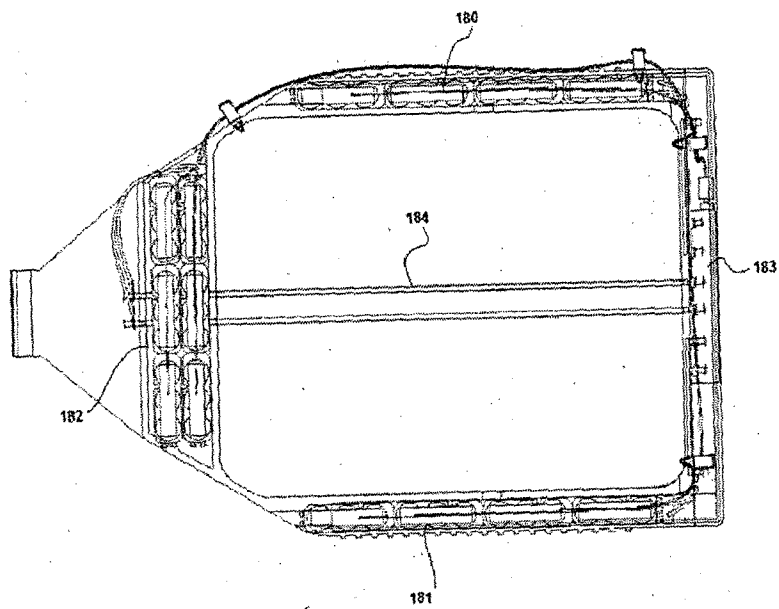


FIG. 8

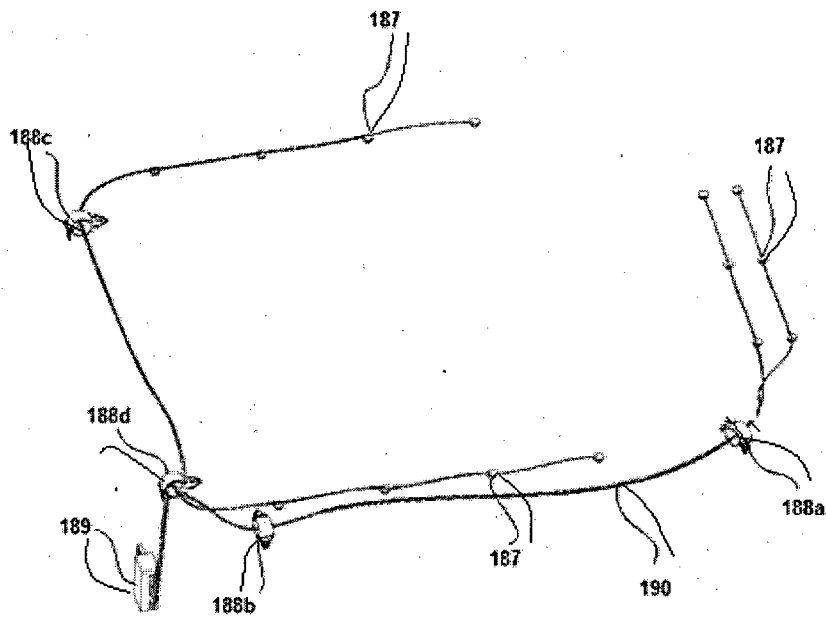


FIG. 9(a)

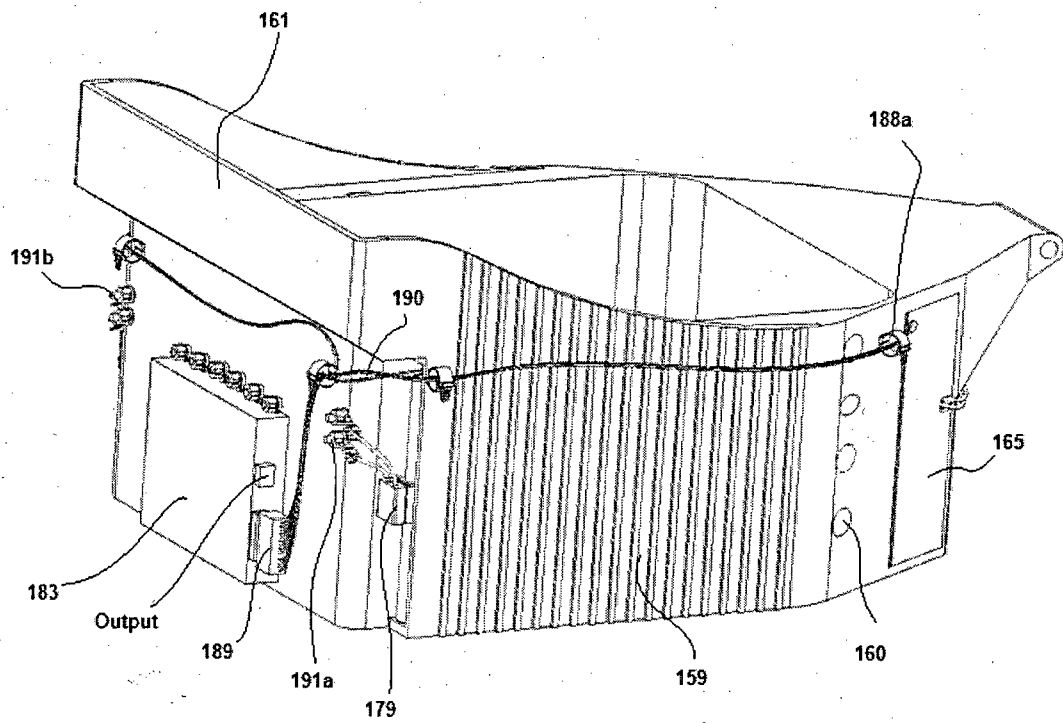


FIG. 9(b)

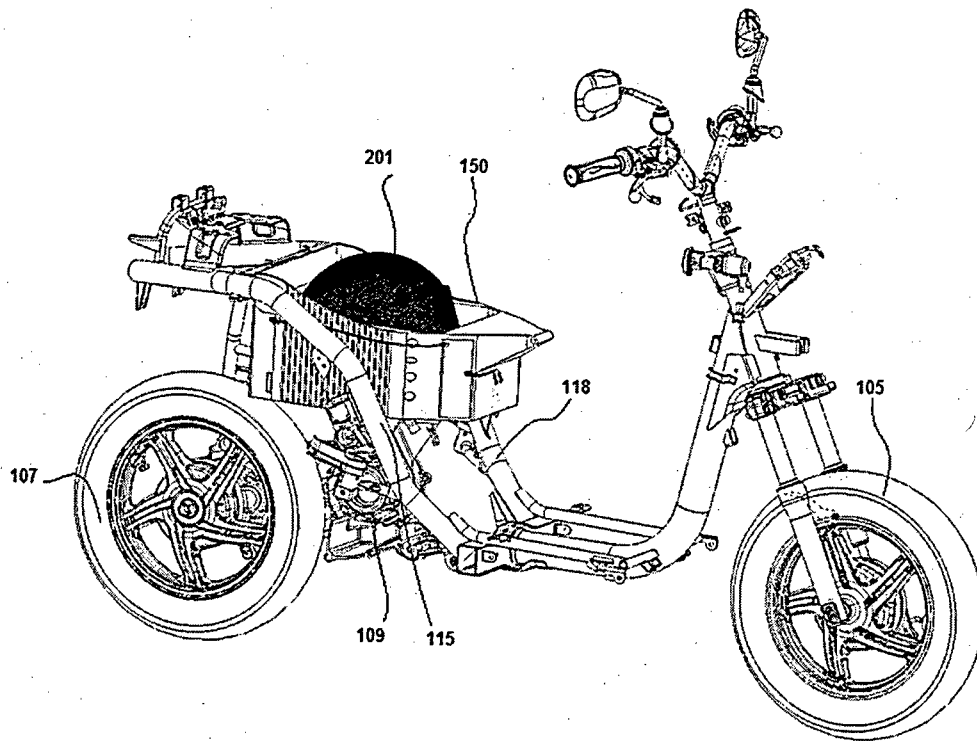


FIG. 10

## INTERNATIONAL SEARCH REPORT

International application No

PCT/IN2014/000784

A. CLASSIFICATION OF SUBJECT MATTER  
 INV. B62K19/46 B60K1/04 B60L11/18 H01M2/10  
 ADD.

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)

B62K B60K B60L H01M B62M

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

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

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	JP H11 129960 A (HONDA MOTOR CO LTD) 18 May 1999 (1999-05-18) figures 1-3	1-10
X	JP H11 34957 A (TEC CORP) 9 February 1999 (1999-02-09) figures 9-11	1-10
	- / - -	



Further documents are listed in the continuation of Box C.



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"&" document member of the same patent family

Date of the actual completion of the international search

21 April 2015

Date of mailing of the international search report

04/05/2015

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## INTERNATIONAL SEARCH REPORT

International application No

PCT/IN2014/000784

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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