

An Electric Vehicle with adjustable Power and Range obtained by varying the number and position of modules of replaceable battery packs

ABSTRACT

An electric vehicle (EV) runs by a motor powered by the stored energy in the battery pack of the vehicle. In this set-up of an Electric vehicle, the power and driving range can be varied changing the number of battery packs used and by varying the position of these battery packs in a series or parallel fashion.

BACKGROUND OF THE INVENTION

Field of the invention

The present invention relates to Electric Vehicles with replaceable battery packs.

Description of prior art

Electrification of transport is set on the premise of a revolution on the horizon; a wide spread transformation of the world economy and ways of life. This new industrial revolution holds an important promise: securing the world against the dangers of global warming. It had been developing amid the political, economic and technological environment an equivalent of the perfect storm. The movers of this revolution have directed focus to a major contributor to this problem: The way energy is produced and used in the transportation sector. It is well known that localized and inefficient generation of energy by explosion of fossil fuels in today's ICE engine automobiles is a major contributor to the problem of global warming and our dependence on foreign oil.

The power storage device in an EV is one of the most important areas of research. Most of the research done so far had been focused on improvement and reduction in the cost of

the storage devices and re-charging time of storage devices. Not enough focus and attention is devoted to the option of battery pack swap to increase the range of an EV. Recently there were some developments in that area with Tesla Motors talking about easy replacement of battery packs in their Model S.

Because of the direction of research and business in the EV industry, the vehicles are mostly seen as short range vehicles because the miles that the EV can go on one charge are significantly lower than a gasoline car can go on a full tank of gasoline before it needs refueling. This has led to the development in NEV (Neighborhood Electric Vehicles). However the recent developments in this area with Tesla Motors' Model S, which can go over 200 miles (under certain defined experimental conditions) the EV market is seeing some movement in long range vehicles.

In spite of the developments the cost of the storage device in an EV makes the vehicle cost-prohibitive. The cost increases with the size of the storage device (a lithium ion battery pack in case of Model S and most EVs) and also adds to the weight of the vehicle. It is very difficult to manufacture an EV with comparable (to gasoline cars) power and driving range within the limit of the cost of a gasoline car because of the limitations of the energy storage device. Tesla Motors announced that it manufactured the Model S with option of easy replacement of the battery pack with fully charged one to enhance driving range.

SUMMARY OF THE INVENTION

It is the object of the present invention to provide an Electric Vehicle with the option of converting the vehicle into either a short distance EV or a long distance EV. The EV

owner make their choice in a battery replacement station on their driving range and based on that input modules of battery packs are replaced to an optimum requirement. If battery modules are added in series connection, the voltage the battery system can provide the motor of the EV will be higher and if battery modules are added in parallel connection the driving range will increase. With increase in module in series connection the power the EV can provide at a given current will be higher. This also leads to increase in torque (or 0-60 pick up of the EV). With increased modules in parallel connection the EV can draw current for a longer time. Other advantages also arise if the invention is adopted. For example if the driver is on a shorter distance drive he will be carrying a lower wait battery system on his EV which will lead to more effective power delivered by the EV. If he is on a city drive with lower speed limits he can operate at a lower power and expend less amp-hour/mile from the battery system. This leads to lower battery life and lower spending on electricity.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The Electric Vehicle design provides option for replacement of the battery modules. Multiple battery modules may be connected in either series or parallel connection settings in the predetermined space in the EV. Addition of each battery module in series connection will at least increase some voltage the battery system can provide the motor. Addition of a battery module in parallel connection settings will at least increase some driving range of the EV.

While the invention has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by those skilled in the art that

various changes in form and details may be made therein without departing from the spirit and scope of the invention.