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Establishment of a Hybrid Electric Vehicle by combining a gasoline engine with an electric motor

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Abstract: Hybridization of a vehicle is one of the praising step as the substitution of conventional vehicle and also one of the best alternative solution to reduce the amount of automotive emissions. These vehicles over a last decade gain great attention due to eco-friendly nature and lower greenhouse gas emission as compare to conventional vehicles. Due to expensiveness and limited driving range hybrid vehicle is not getting too much appreciation from consumer side. This paper present comprehensive overview of hybrid vehicle and energy storage unit i.e. battery, diffusion of hybrid electric technology in vehicles, advantages, disadvantages and methodology.

1. INTRODUCTION

Today, we are facing the problem of dwindling fuel resources for vehicles. There is no doubt that the emission of carbon dioxide from an automobile exhaust is a concern for the increasing rate of global warming. One of the optimistic solution for such problems is hybridization of the vehicle. .A hybrid vehicle combines any two power (energy) sources. Possible combinations include diesel/electric, gasoline/fly wheel, and fuel cell (FC)/battery. Typically, one energy source is storage, and the other is conversion of a fuel to energy. The combination of two power sources may support two separate propulsion systems. Thus to be a True hybrid, the vehicle must have at least two modes of propulsion. The modern hybrid vehicle is very useful because we have limited source of fossil fuels and have seen the electric vehicle like as the new model of scooter but we are going to implement some new thing and going to make a useful hybrid bike.[1]

2. LITERATURE REVIEW

2.1 In 2004 a vehicle has invented with motor and engine which can be called as a two wheeler hybrid vehicle because it works on both electrical energy by means of motor and on chemical energy by means of internal combustion engine. The primary concern of this invention is to provide a vehicle which can be used in quiet neighborhood quietly and used in sport/power mode as per the situation.

This invention includes a frame and two wheels one in front and another in rear. The engine is mounted on the framewith a transmission system connecting the rear wheel with engine and motor. Also a battery may be rechargeable is mounted on the frame for providing energy to the motor. There are two aspects of invention, according to first aspect the engine includes a manual starter connected therewith which consist of a first clutch arranged between crankshaft and pulley of transmission. The first clutch does not transmit power until a pre-determined value of angular speed of crankshaft is achieved. According to the second aspect, the engine includes a automatic starter connected therewith. In this a second clutch is may be arranged between the automatic starter and motor. It is switched between a active position where it transmit power to automatic starter from the motor and a neutral position in vice-versa.

The transmission includes two pulleys on the crankshaft, one of them is connected to the pulley on the rear wheel and another one is connected to the pulley mounted on the mandrel of the motor by belts. A third pulley mounted on the shaft is connected to the pulley mounted on the first clutch.[2]

2.2 According to author, the invention is related to electrically powered vehicles in which control circuit, drive motor elements and power supply are contained within one or

more vehicle wheels. For this a bicycle is taken and a cylindrical stator frame is fixed on the wheel axle, with a inner surface of stator frame defining a space for housing power supply. A plurality of electro magnet Stator Segments are mounted on and distributed about an outer Surface of the Stator frame. A cylindrical rotor frame is coupled to the axle through bearings. An inner Surface of the rotor frame Support a plurality of permanent magnets distributed about the Surface and Surrounding the Stator Segments to form a radial air gap therebetween. The power Supply may comprise a plurality of Standard battery cells, such as D-cells, which can be replaced easily when necessary with readily available cells. So it can be moved using mechanical work by rotating the pedal and for high torque requirements such as during up hills motor drive can be used. A further advantage of the invention is that additional battery cells may be contained within Storage Space in a Second wheel and coupled, via an electrical cable carried by the vehicle frame, to the motor drive in the first wheel.[3]

2.3 According to inventor in 2009, any hybrid motorbike that has a mechanism for utilizing both muscle power and power supplied by an electric motor, the combination of battery to supply current for electric motor and fuel cell can be used. The invention consist of a two wheel vehicle provided with a fuel cell for producing electricity to drive an electric motor which in result derives one wheel of the two wheel vehicle say bicycle. The fuel cell and battery along with controls for controlling the fuel cell and the electric motor can be placed in a module in the triangular opening formed by the frame of the bicycle between the front wheel and the rider's seat. This allows for easy replacement of the fuel cells and battery. Fuel cells will supply current to the electric motor that drives the drive wheel and to the battery for storing electricity for future supply to the electric motor.[4]

2.4 According to inventor in 2008, to mount a hybrid type drive unit on a motor cycle a hybrid two-wheeled vehicle is provided, comprising an engine and a crank shaft extending in a direction generally transverse to a longitudinal axis of the motorcycle and a generator configured to generate electric power upon rotation of crankshaft. The vehicle also comprises of an electric motor driven by power generated by generator. The motor is configured to rotate a drive wheel via a reduction device and a drive-wheel transmission device, and a power distributing device configured to distribute a crank shaft drive force to generator and the reduction device. The generator, the motor, and the power distributing device are arranged on an axis that is backward spaced from the crank shaft and generally parallel to the crank shaft. [5]

2.5 In 1997 author gives the mechanism for the wheel drivevehicle. In this mechanism the vehicle has an electrical motor with a rotor and stator and pedal drive. Electrical motor is the first drive source and pedal drive is second drive source. The stator of the electrical motor is placed on the axle of the pedal crank. The second drive source or pedal drive coupled with the stator mechanically. The Stator of first drive is driven through the second drive source. Finally the rotor of the electromotor has a speed, corresponding total of first and second drive source.[6]

2.6 In 1996, author gives the patent for a two wheeler vehicle. The vehicle has an electric motor with solar penal and rechargeable batteries. The electric motor and pedal coupled with rear wheel of the vehicle. The Vehicle also includes a forwardly open air ducts which have a wind driven generator. The back portion of the vehicle a space for a solar penal and rechargeable batteries. The solar panel collect sun light energy for the charging of batteries**.**[7]

2.7 john at el (2010) explored two aspects for market for plug in electric vehicles: (1) PHEV performance goals and (2) the abilities of present and near-term battery chemistries to meet the resulting technological requirements. They summarized evidence stating that battery technologies do not meet the requirements that flow from three sets of influential PHEV goals due to inherent trade-offs among power, energy, longevity, cost, and safety.However, they also shown that part of this battery problem is that those influential goals are overly ambitious compared to goals derived from consumers' PHEV designs. They elicited PHEV designs from potential early buyers among U.S. new car buyers; most of those who are interested in a PHEV are interested in less technologically advanced PHEVs than assumed by experts. Using respondents' PHEV designs, they derived the peak power density and energy density requirements and shown that current battery chemistries can meet them.[8]

2.8 Ismail et al (2010) presented a design procedure for an internal combustion engine hybrid electric propulsion system. The choice of suitable components is the key issue in the design procedure of a hybrid electric vehicle. Different selections and different sizing choices highly influence the overall performance expected from the vehicle. Maximum cruise speed, acceleration performance, gradability and energy recovery are defined as the key parameters of the design procedure. Finally, a case study was also presented to demonstrate the propulsion system design procedure of a parallel hybrid electric vehicle.[9]

2.9 Jeremy and Ahmad (2011) took a first step toward an assessment by estimating the impact of battery second use on the initial cost of PHEV/EV batteries to automotive consumers and exploring the potential for grid-based energy storage applications to serve as a market for used PHEV/EV batteries.It was found that although battery second use is not expected to significantly affect today's PHEV/EV prices, it has the potential to become a common component of future automotive battery life cycles and potentially to transform markets in need of cost-effective energy storage. Based on these findings, the authors advise further investigation focused on forecasting long-term battery degradation and analyzing second-use applications in more detail.[10]

2.10 Some authors in 2009 presented state-of-the-art permanent magnet brushless DC (PMBLDC) motor drives with an emphasis on sensor-less control of these motors. The PMBLDCM drives are suitable for many applications; however, the choice of the motor (i.e. rotor configuration), control scheme (such ICs with cost effective solutions will be developed in the near future, sensor-less or with sensors) and controller topology depends on the accuracy, cost, complexity and reliability of the system. ASICs are one step in the direction of low cost controllers and many more such ICs with cost effective solutions will be developed in the near future.A customer can select a PMBLDCM drive with their desired features,however, there is a

tradeoff between the number of parameters (e.g. sensor-less or with sensors, accuracy, complexity, reliability and cost of controller). It is hoped that this investigation on PMBLDCM drives will be a useful reference for users and manufacturers.[11]

4. ADVANTAGES AND DISADVANTAGES & APPLICATIONS

4.1 ADVANTAGES

- Environmental friendly – One of the best advantages is the hybrid bikes are environmental friendly,and less fuel consumption. The twin power source give the bsdt performance of the Hybrid bike.
- Financial Benefit – The hybrid case twin power sources gives the less fuel consumption and also conserves the energy in the form of electricity.
- Less dependence of fossil fuel - A Hybrid bike is requires less fuel to run which means that less emissions and less dependence on fossil fuels. It also helps to reduce the price of gasoline in fuel market.
- Built From Light Materials: Hybrid vehicles frame or body and components made up of lighter materials which means less energy is required to run which also saves much energy.[12]

4.2 DISADVANTAGES

- Low Power- Hybrid Bikes are the twin powered engine. The IC engine which is primary source of power and electric motor is low power source. The combined power of both sources is less than that of powered engine. So therefore it is suited for city driving and not for speed and acceleration on Highway.
- Can be Expensive: The biggest drawback of having a hybrid vehicle is that its initial cost is quiet high than that of a conventional vehicle.
- Poorer Handling: A hybrid vehicle possess a gasoline powered engine, a light electric engine and a pack of powerful batteries. This adds weight and eats up the extra space in the vehicle. Extra weight results in fuel inefficiency and manufacturers cut down weight which has resulted in motor and battery downsizing and less support in the suspension and body.
- Higher Maintenance Costs: The presence of dual engine, continuous improvement in technology, and higher maintenance cost can make it difficult for mechanics to repair the vehicle. It is also difficult to find a mechanic with such an expertise.[13]

4.3 APPLICATION

- **4.3.1** Can be used widely in future due to insufficiency of fossil fuel or may be due to high cost of fossil fuels.
- **4.3.2** Very useful in saving consumption of fuel while travelling in city or village areas.
- **4.3.3** While travelling in villages or cities, it is preferred for its quiet operation while running on battery and can be used in power mode when required.
- **4.3.4** Hybrid vehicle emits less number of pollutants and hence harm the environment comparatively less than that of a conventional gasoline powered vehicle.[14]

REFERENCES

[1]. NPTEL. 2013 Feb 08. Co-ordinated by IIT Guwahati [https://nptel.ac.in/courses/108103009/]

[2]. Chien-Chang Ho, inventor; Chien-Chang Ho, assignee. 2004 Jun 22. Vehicle with motor and engine. United states patent US 6,752,229 B2.

[3]. Alexander V. Pyntikov, Mark A. Benson, inventors; Wavecrest Laboratories,LLC, assignee. 2004 Oct 12. Electrically powered vehicles having motor and power supply contained within wheels. United states patent US 6,802,385B2.

[4]. Hans Peter Naegeli, inventor.2009 Oct 29. Hybrid motorbike powered by muscle power and an electric motor with the current generated by a fuel cell. United states patent application publication US 2009/0266636 A1.

[5]. Tatsuyuki Masuda, Toshinori Fukudome, Shinji Sasamoto, inventors; Yamaha Hatsudoki Kabushiki Kaisha, assignee. 2008 Oct 07. Hybrid motorcycle. United states patent US 7,431,112B2.

[6]. Michael kutter, inventor; Michael Kutter original Assignee 1996 June 6, Hybrid driven mechanism for a vehicle, United States patent US6,286,616B1.

[7]. Glenn C. Streiff, inventor; Streiff, Glenn C original assignee 1994 Nov 11, Solar powered two vehicle with energy intensifying solar collector. United States patent US5,489,002.

[8]. Shodhganga.[http://shodhganga.inflibnet.ac.in/bitstream /10603/25066/7/07_chaptcombustion]

[9]. Shodhganga.[http://shodhganga.inflibnet.ac.in/bitstream /10603/25066/7/07_chapter%202.pdf]

[10]. Shodhganga.[http://shodhganga.inflibnet.ac.in/bitstream /10603/25066/7/07_chapter%202.pdf]

[11]. Shodhganga.[http://shodhganga.inflibnet.ac.in/bitstream /10603/25066/7/07_chapter%202.pdf]

[12]. LinkedIn. 2016 May 24. Ashraf Makhtar, advantages and disadvantages of hybrid cars. [https://www.linkedin.com/pulse/advantages-disadvantages-hybrid-cars-ashraf-makhtar].

[13]. LinkedIn. 2016 May 24. Ashraf Makhtar, advantages and disadvantages of hybrid cars. [https://www.linkedin.com/pulse/advantages-disadvantages-hybrid-cars-ashraf-makhtar]

[14]. Shodhganga, [http://shodhganga.inflibnet.ac.in/bitstream/10603/45694/7/07_chapter%201.pdf]