A Novel Power Train System Of Hybrid Electric Vehicle

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Abstract: This paper discuss about the new gearing system comparing with various sorts of Hybrid vehicle technology. Hybrids use an indoor combustion engine and may be fueled like normal cars but have an electrical motor and battery, and may be partially or wholly powered by electricity. Hybrid cars are often configured to get different objectives, like improved fuel economy, increased power, or additional auxiliary power for electronic devices and power tools. Many technologies like regenerative braking, motor drive, automatic start or shutoff are getting used in hybrid cars to form them nearly as good as conventional vehicles. the normal sorts of gearing in hybrid vehicles are series, Parallel and series-parallel vehicles, of these three categories use a two-wheel-drive system during which the whole drive package — engine, transmission, differential and therefore the driven wheels — are beat the front of the vehicle. It's called front-wheel drive. Front-wheel drive tends to possess a lower towing capacity than rear-wheel, it's worse acceleration than rear-wheel drive, which is why most sporty and race cars use rear-wheel drive and With all the load up front, front-wheel drive can make handling harder . These issues are rectified by novel gearing system.

Keywords: Electric motors, Battery, Regenerative braking, Hybrid engine

I. INTRODUCTION:

The automobiles play a crucial role within the transport system. With a rise in population and living standard, the transport vehicles also as car population is increasing day by day. additionally to the present there's steep increase within the number of two wheelers during the last 20 years . of those are increasing exhaust pollution and particularly in metros as density of these vehicles in metros are very high. the most pollutants contributed by I.C. engines are CO, NOX unburned hydro-carbons (HC) and other particulate emissions. additionally to the present , all fuel burning systems emit CO2 in large quantities and this is often more concerned with the Green House Effect which goes to make a decision the health of earth. Lot of efforts are made to scale back the pollution from petrol and diesel engines and regulations for emission limits also are imposed in USA and during a few cities of India. Hence we will mapped out this problem by replacing IC engine vehicles with Electric vehicles(EV) which have zero emission and really quiet operational . the most critical a part of an EV is that the battery. What the interior combustion engine is to a petroleum car, the battery is to EV. Currently, all EVs use lithium-ion batteries (LIBs). the restrictions of LIBs is higher charging time and shorter discharging period of time , recharging your EV may be a far more significant time investment. While most electric engines take about four hours to succeed in a full charge. On a full charge, most electric models are limited to a variety of 60 to 100 miles, but a little minority of models can go between 200 and 300 miles per charge. hence to recharge the battery the charging stations availability is inconsistent . one among the optimistic solutions for such problems is that the hybridization of the vehicle. HYBRID ELECTRIC VEHICLE may be a combination of a standard combustion engine and an electrical system . It implies that HEV are often driven on I.C. engine also as on electrical power . HEV produces less emission compared to a similar-sized gasoline car because the internal-combustion engine of the HEV are often geared to run at maximum efficiency. the importance of electrical gearing is that it runs with lesser power loss, hence improving the general fuel economy. Hybridization of vehicles can reduce CO2 emission and also the fuel costs.

hybrid electric vehicle widely available in commercial vehicles, military vehicles and passenger cars .The HEV gearing systems are of either series, parallel and combination hybrid and everyone these categories are of front wheel drive.

Front-Wheel Drive advantages

• Since all the equipment is up front, they create more room and leg room within the back.

• Front-wheel drive has less components than the other drive train setup, making the vehicle lighter and improving its mileage that's why most economy-type cars are front-wheel drive.

• There is bigger tactile feedback through the wheel if the wheels are slipping.

• Front-wheel drive may be a simpler system and tends to be less costly to shop for and maintain.

Disadvantages

• Since all the load is found within the front of the vehicle, front-wheel drive cars tend to under steer.

• During sudden acceleration, front-wheel drive vehicles tend to veer to the proper or left due to something called "torque steer."

• Front-wheel drive tends to possess a lower towing capacity than rear-wheel

• Front-wheel drive has worse acceleration than rear-wheel drive, which is why most sporty and race cars use rear-wheel drive.

• With all the load up front, front-wheel drive can make handling harder .

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Hence to overcome these draw backs we changed the planning of gearing system in such how that the IC engine is coupled to front wheel and motor is coupled to Rear-wheel drive where we will run the vehicle in two modes and that we can gain both the drive system benefits as per desired way generally rear wheel drive offers better initial acceleration than front-wheel drive because weight is transferred to the rear of the car upon accelerating, which boosts traction. Rear-wheel drive also permits expert drivers to use various techniques to slip the buttocks around corners, which may be a skill most useful in racing.

II. CLASSIFICATIONS OF HYBRID POWER TRAIN SYSTEM :

Power train in any vehicle refers to the group of components that generate power and deliver it to the paved surface . Hybrid vehicles are often classified into three basic categories of gearing systems which are briefly discussed below.

A. Parallel hybrid

Parallel hybrid systems have both an indoor combustion engine (ICE) and an electrical motor in parallel connected to a mechanical transmission.

Most designs combine an outsized electrical generator and a motor into one unit, often located between the combustion engine and therefore the transmission, replacing both the traditional starter and therefore the alternator. The battery are often recharged during regenerative breaking, and through cruising (when the ICE power is above the specified power for propulsion).

More mechanically complex than a series hybrid, the parallel gearing is dual-driven, allowing both the combustion engine and therefore the motor to propel the car. Fig.1 shows that the I.C. engine and motor operate in tandem. Usually the combustion engine operates because the primary means of propulsion and therefore the motor acting as a backup or torque/power booster. the benefits of this are smaller batteries (less weight) and usually more efficient regenerative braking to both slow the car and capture energy while doing so. Another advantage is that it can easily be incorporated into existing vehicle models[1],[2].

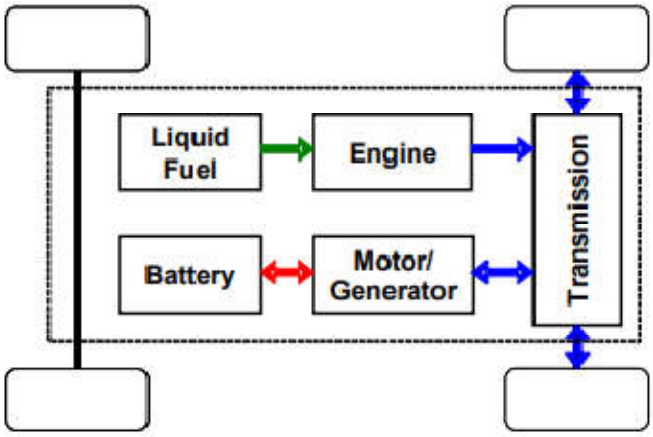

Fig.1. Coupling of parallel HEV

B. Series Hybrid

This is an electrical gearing that an I.C. engine acts as a generator to charge batteries and supply power to the electrical drive motor which may be seen in Fig.2. These vehicles usually have a bigger battery pack and bigger motors with smaller I.C. engines.

Series hybrids are often assisted by ultra capacitors, which may improve the efficiency by minimizing the losses within the battery. They deliver peak energy during acceleration and take regenerative energy during braking.

A complex transmission between motor and wheel isn't needed, as electric motors are efficient over a good speed range. If the motors are attached to the vehicle body, flexible couplings are required.

Some vehicle designs have separate electric motors for every wheel. Motor integration into the wheels has the disadvantage that the unsprung mass increases decreasing the ride performance. Advantages of individual wheel motors include simplified traction control (no conventional mechanical transmission elements like gearbox, transmission shafts, and differential), all wheel drive, and allowing lower floors[1].

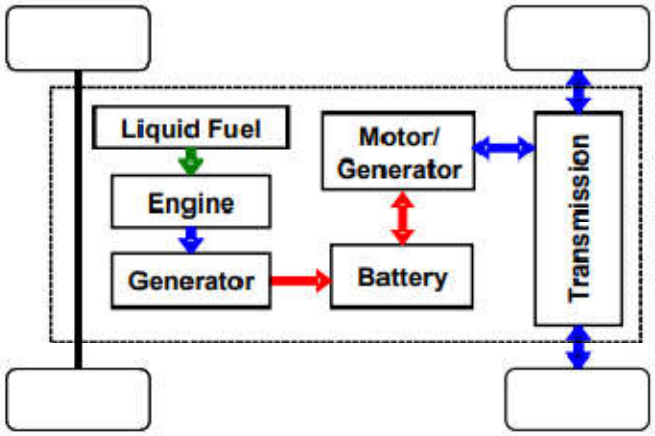

Fig .2 Coupling of series HEV

C. Series-Parallel Hybrid

This drive train may be a combination of the 2 drive train types, allowing the vehicle to work as all-electric (as a series hybrid), as an all combustion vehicle, or as a mixture of the 2 (as a parallel hybrid). this is often the foremost complex and least efficient gearing for many applications.

Combined hybrid systems have features of both series and parallel hybrids. there's a double connection between the engine and therefore the drive axle: mechanical and electrical. This split power path allows interconnecting mechanical and electric power , at some cost in complexity.

Power-split devices are incorporated within the gearing . the facility to the wheels are often either mechanical or electrical or both. this is often also the case in parallel hybrids. But the most principle behind the combined system is that the decoupling of the facility supplied by the engine from the facility demanded by the driving force .

In a conventional vehicle, a bigger engine is employed to supply acceleration from standstill than one needed for steady speed cruising. this is often because a combustion engine's torque is minimal at lower RPMs, because the engine is its own vacuum pump . On the opposite hand, an electrical motor exhibits maximum torque at stall and is compatible to enrich the engine's torque deficiency at low RPMs.

In a combined hybrid at lower speeds, this technique operates as a series HEV, while at high speeds, where the series gearing is a smaller amount efficient, the engine takes over. this technique is costlier than a pure parallel system because it needs an additional generator, a mechanical split power grid and more computing power to regulate the twin system[1]

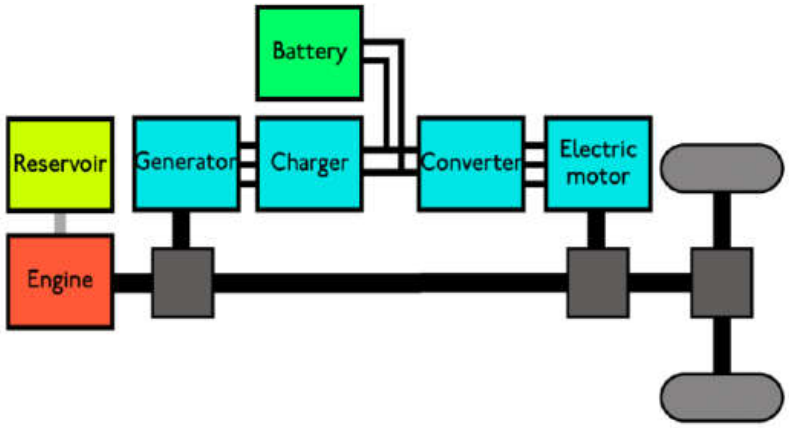

Fig.3 Combined hybrid Electric vehicle

TABLE I: TYPICAL PRODUCTS OF HEV

Year	Company name and model name	Type
2012	Toyota Lexus ES 300h	combination
2013	Chevrolet Volt	Plug-in series
2014	BMW i8 Roadster	Plug-in parallel

2015	Porsche Cayenne S E-Hybrid	Plug-in parallel
2016	Mercedes-Benz c350e	Plug-in parallel
2016	Toyota Prius	combination
2017	Kia Niro	combination
2017	Honda Accord Hybrid	combination
2017	Toyota Prius Prime	Plug-in parallel
2018	Toyota Camry Hybrid LE	combination
2019	Nissan Rogue FWD Hybrid	combination
2020	Kia Optima Hybrid	PHEV

III. COUPLING OF PROPOSED HEV

In this proposed power train HEV system, the engine is coupled to front wheel shaft and the electric motor is coupled to the rear axle shown in fig.4, whenever the vehicle runs with IC engine the vehicle runs through front wheel where back wheels acts as dummy by this we can get the benefits of front wheel drive and to get the benefits of rear wheel drive we can switch over the vehicle mode from IC engine to electrical engine which is coupled to rear wheels now front wheels acts as dummy, in this way we are optimizing the benefits of both front and rear wheel drive and at the same time the battery can be charged by the IC engine via the electric motor when the vehicle is at light load condition which reduces the battery charging time period. The fig 5 shows the practical model of proposed design in which the BLDC motor is coupled to rear axle through chain .

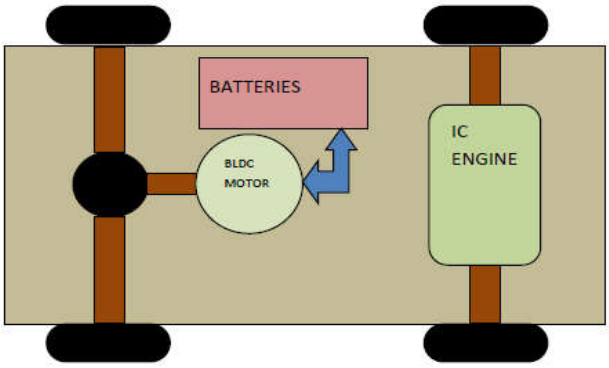

Fig.4 Coupling of proposed HEV

Fig.5 Coupling of motor to rear axle

IV CONCLUSION

Hybrid-electric vehicles (HEVs) have the combine advantages of IC engines and electric motors and may be configured to get different objectives, like improved fuel economy, increased power, or additional auxiliary power for electronic devices and power tools

The transmission of power using front wheels drive and rear wheel drive is straightforward and reliable. One disadvantage is that driving on electrical power isn't an honest option for an extended distance travel. Though this proposed gearing system can become much useful in additional stop and go traffic situations. With the utilization of this gearing system, the general fuel consumption and fuel economy is improved and battery charging time is reduced. Such vehicle would run on fuel but would use its motor to spice up the facility when needed. the prices of HEVs are a touch quite the traditional cars but they more efficient and therefore the exhaust emissions are less.

REFERENCES

[1] Vinay K M, Isaac Raju , "Hybrid Electric Vehicles, International Journal of Engineering Trends and Technology", (IJETT) – Volume 50 Number 2 August 2017
[2] Satti Swami Reddy, Kola Siva Tharun, "Eco Friendly Vehicle, International Journal of Engineering Trends and Technology" (IJETT), 4(4), April 2013, 957-960.
[3] Trajkovic, S., Tunestal, P., and Johansson, B., "Vehicle Driving Cycle Simulation of a Pneumatic Hybrid Bus Based on Experimental Engine Measurements," SAE Technical Paper 2010-01-0825, 2010, doi:10.4271/2010-01-0825.
[4] Husain, "Electric and Hybrid Vehicles-Design Fundamentals", Boca Raton, CRC Press, 2003.
[5] Charters, D., 2008. MIRA Case Study: Hybrid 4WD vehicle (H4V)..