Battery Powered Single Occupant Mobility Apparatus

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Abstract:
The proposed mobility apparatus is an electrically powered single occupant transporting equipment running on three wheels. This apparatus can be used as a transportation facility in large industries and for internal security purposes in airports and in other public spaces. The apparatus can also be used as a transporting medium in congested city’s as the parking space required for this is very less and can be easily manoeuvred around. The apparatus is environment friendly as the equipment works on electric power which can be recharged. The hub motor installed on the front wheel drives the apparatus. The acceleration is varied by adjusting voltage supply to the hub motor the objectives of this project include tapping a new market segment in compact transportation and Single Occupancy Vehicles (SOVs). For this product is made efficient, attractive in terms aesthetic perspectives, environment friendly and has an economical price range.

Keywords: SOV’s, Mobility Vehicle

I.INTRODUCTION
The ever-growing travel expenses associated with Single Occupancy Vehicles (SOV), in terms of time, money, and emotional stress, created a need for better, easier, and environmental friendly transportation modes. A wide range of responses to such needs have emerged to the market in recent years such as, smaller and energy efficient cars, community bound golf carts and electric cars in the motorized category and Inline skates, bicycles, and scooters considered under the non-motorized category. This project is inspired from SEGWAY Personal Transporter. As claimed by its developer and manufacturer, Segway LLC, Segway HT is a self-balancing, personal transportation device that’s designed to operate in any pedestrian environment. Segway derived from the word “Segue” means to transition smoothly from one state to another”. Segway HT can travel three times faster than the average walker, empowering the pedestrian with speed and a comfortable ride. These products perform best in areas with adequate sidewalks, cut sat intersections, and ramps. Visitors and employees can use them in theme parks, industrial sites, open markets, warehouses and places where motion can be reduced. This product is equipped with three wheels and front motor drive which make it self-balancing and a platform is provided for standing comfortably. This gives a person an ease to ride in busy and congested areas. As this is equipped and powered by rechargeable battery this doesn’t cause pollution. Future modifications of this product include a flexible design and secondary recharging by solar panels. Flexible design can be done by providing a ball and socket joint between platform and steer rod. Another major modification is providing a rail and automatic ramp on the platform so that the physically challenged personnel can mount their wheelchair over the apparatus by themselves.

II. RELAVANCE OF TOPIC
A personal transporter provides smooth driving and it does not consume conventional fossil fuels like petrol or diesel. Personal transporter can be charged using power obtained from solar or from any other means. It can be used inside big industries, in shopping malls, parking garages. Personal transporter can be adjusted in size and can be easily transported and stored. The Personal Transporter can be transported inside the boot space of a vehicle. The personal transporter use very little parking space making it suitable in crowded areas. Provisions for solar panel installation also can be done on the personal transporter. The extended application includes transportation for handicapped people. For this the transporter can be attached to a ramp system and through that the person will be able to get on the vehicle. Accelerator and switch is arranged such that it can be operated by hand.

III. PROPOSED SYSTEM
Personal transporter has a simple working principle. Primary power is driven out from four lead acid batteries. These four batteries are connected in series to provide sufficient power to drive the motor. There is a switch and accelerator connected to the controller. If the switch is in ON position, controller receives the accelerator feed. Accelerator consists of a magnet and Hall Effect sensor assembly. A Hall Effect sensor is a transducer that varies its output voltage in response to a magnetic. Hall Effect sensors are used for proximity switching, positioning, speed detection, and current sensing applications. In its simplest form, the sensor operates as an analog Tran saucer, directly returning a voltage. With a known magnetic field, its distance from the Hall plate can be determined. Using groups of sensors, the relative position of the magnet can be deduced. Frequently, a Hall sensor is combined with threshold detection so that it acts as and is called a switch. As accelerator is applied, the distance between magnet and Hall Effect sensor increases and thus voltage supply to the hub motor will be increased. Similarly, during braking or when pressure on accelerator is released, distance between magnet and Hall Effect sensor will decrease and thus voltage supply to the motor will decrease. The AC current is passed to the hub motor through MOSFETs in order to ensure a 3-phase
supply to the hub motor. The wheel hub motor (also called wheel motor, wheel hub drive, hub motor or in-wheel motor) is an electric motor that is incorporated into the hub of a wheel and drives it directly. Hub motor electromagnetic fields are supplied to the stationary windings of the motor. The outer part of the motor follows, or tries to follow, those fields, turning the attached wheel. Hub motor is connected to front wheel so front wheel drive is occurring in this personal transporter. Hall Effect sensor ensures that hub motor runs at exact power as supplied from accelerator.

Braking is done in two stages in which first stage involves reducing the voltage supplied to the motor and in second stage, drum brake system is involved to make the transporter to complete rest. The accelerator contains a magnet and a Hall Effect sensor assembly. As we release pressure on accelerator, especially when on braking, the distance between magnet and Hall Effect sensor decreases, thus decreasing voltage to the hub motor thereby reduces the speed. To make the vehicle to stop a separate braking system is used. This secondary braking system consists of drum brake and a lever, when lever is pressed it acts on the drum brake and it is applied. A drum brake is a brake that uses friction caused by a set of shoes/pads that press outward against a rotating cylinder-shaped part called a brake drum. The term drum brake means a brake in which shoes press on the inner of the drum. When shoes press on the outside of the drum, it is usually called a clasp brake. Where the drum is pinched between two shoes, similar to a conventional disc it is sometimes called a pinch drum brake, though such brakes are relatively rare. A related type called a band brake uses a flexible belt or "band" wrapping around the outside of a drum. Due to the fact that a drum brake's friction contact area is at the circumference of the brake, a drum brake can provide more braking force than an equal diameter disc brake. The increased friction contact area of drum brake shoes on the drum allows drum brake shoes to last longer than disc brake pads used in a brake system of similar dimensions and braking force. Drum brakes retain heat and are more complex than disc brakes but are often the more economical and powerful brake type to use in rear brake applications due to the low heat generation of rear brakes, a drum brake's self-applying nature, larger friction surface contact area, and long life wear characteristics (% life used/kW of braking power).

IV. CONCLUSION

We have designed and fabricated a single occupant transportation vehicle which is battery powered. Acceleration and braking is done using MOSFETS, Hall Effect Sensors. Power is supplied by four 12V, 6A Lead Acid type batteries. A hub motor is coupled to the front wheel to which energy is supplied from battery. Material and other design specifications have been determined. MS material is used for chassis fabrication to reduce cost of production. We have designed a model in Catia and a prototype was developed using determined specifications. We have tested the prototype for further improvement in the design.

V. REFERENCE

