

POWER OPERATED PORTABLE HUMAN TRANSPORTER (POPORT HT)

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Abstract:

The basic requirement and reason behind the introduction of POPORT HT is minimizing human effort and eventually the time consumption for covering short distances and also the portability of the vehicle. User can fold it and carry it as a trolley whenever needed and can be used as a vehicle by unfolding it. The development of the vehicle has been done keeping in mind the basic requirements and also in a budget friendly manner.

Keywords — Power Operated Portable Human Transporter (POPORT HT)

I. INTRODUCTION

The idea behind development of the transporter was basically inspired by the flaws detected in earlier developed high-tech vehicles like Segway [1], Electric skateboards [2], Self-balancing vehicle (hover board) [3], Single Wheeled vehicle [4], Side movement propelled scooter device having expanded foot platform [5], Lean-to-Turn Wheeled Device [6] etc. The major disadvantages present in these vehicles are the instability and poor ergonomics. The mass of the user gets distributed between two points which adds to the instability. The instability of these devices has been taken care of by introducing a number of sensors which unintentionally boosts the cost and eventually making these vehicles difficult to afford. Also they charge a large amount of time to get use to and the safety of the user is compromised due to its aesthetics.

The POPORT HT unlike these vehicles takes care of the above mentioned flaws in a cost effective manner.

II. DEVELOPMENT OF POPORT HT

A. Frame

The geometry of the frame is triangular and cross section is circular. The reason for a triangular geometry is the rigidity that the arrangement provides. The front two points serve as a housing for the axle bearings whereas the rear point houses the steering on a pivoted point.

The frame also mounts the engine and a platform for the user to stand on. It has got a pair of sliding pivot racks which holds the front section of the vehicle.

B. The front section

The front section of the transporter serves not just one but multiple purposes. It serves as a guard for the user during collisions. The brakes and the decompressor valve are mounted on its handle. Another economical purpose comes into play when the vehicle is being folded, the front member acts as a handle similar to a handle in a suitcase. When the vehicle is in the motion various dynamic forces act on the body and the user, the front member then provides a firm grip to the user.

C. The steering

The POPORT HT comes with a dedicated rear steering system which manoeuvres the vehicle. It has two hinge joints which helps the steering

column to fold about the two points adding to its portability.

D. The Axle

It is provided with a live axle which houses the disc for braking purpose and a pulley which propels the vehicle. The axle itself is mounted on two bearings.

III. METHODOLOGY

A. Frame Assembly

1)Materials:

The material used the frame is mild steel. The cross-section of the members is circular with wall thickness 1mm and outer diameter 1inch. The reason behind selection of mild steel was its availability and low cost also, it is easier to bend and light weight because of its structure.

2)Method Adopted for assembly:

Basically, the members of the frame were joined using gas and TIG welding. Gas welding was used keeping in mind the wall thickness of the material and at points which were not prone to sudden impacts.

On the other hand, TIG welding like gas welding was incorporated keeping in mind the wall thickness but unlike gas welding it was used to join parts which were prone to sudden impacts to provide rigidity.

B. Front section and Steering column

1)Materials:

The material incorporated for the front section and steering is stainless steel with circular cross-section of 1inch diameter. The reason behind using stainless steel is its physical properties i.e., lustre and strength. Using this would impart required strength and desirable appearance. Since, stainless steel is stronger than mild steel and at the same time costlier therefore it is used where necessary.

2)Method Adopted for assembly:

The procedure appointed for joining elements of the front section and steering is MIG welding as it has good productivity.

C. Wheel Assembly

The wheels provided in the vehicle are made up of different materials. The front wheels which are two in number are made up of PU (Poly urethane) high density foam whereas the rear wheel is made up of rubber.

D. Pulley

The pulley which is used to propel the vehicle is aluminium casted. Aluminium because of its light weight would not impart extra weight to the vehicle. The belt which is used to drive the pulley is made up of industrial rubber and together they form a V-belt drive.

E. Axle

The material used for axle is extruded mild steel and the shaft is provided with key ways of 6mm dimensions.

F. Brakes

The brakes used are wire operated disc brakes where the disc is made up of heat-treated stainless steel so that it would easily dissipate the heat and can also bear fluctuating loads.

IV.DESIGN

The design chosen for the vehicle assembly is so chosen that the user has to apply a minimum effort while handling and making use of it the front section of the vehicle is designed that when folded and carried away like a trolley the rear wheel does not strike the body of the user. The housing for the bearing are provided with slots so that the tension in belt can be accordingly. The bearings with the shaft are mounted in housing which allow the bearing to in the plane of the shaft when sudden jerks are encountered. This is done so in order to increase the life of the bearings.

The hinges in the coulomb are spring loaded in such a way that they remain in a fixed position as placed by the user and not move under their own weight.

The platform on the frame is provided with a thick layer of foam which serves 2 purposes (i)to damp the high frequency low vibrations developed due to road irregularities & (ii)when the user takes position to ride it, the foam gets compressed and the resulting depression under the feet of the driver provides better grip to the driver.

The discs used in the brakes are provided with a number of small holes so that the heat generated in the disc can be dissipated easily also, when the metal expands on heating it may fill up for the holes.

Speaking of placing the engine, it has been placed centrally so that the total center of mass may be balanced.

V. APPLICATIONS

The POPORT HT finds its use in a variety of ways and for users of various age groups. Children below the age of 12 must use the device only under adult supervision. As far as the people above the age of 12 are concerned they can make use of it in a diverse manner. School goers staying not much far away from the schools can make use of it instead of a bicycle which may cost them a lot of effort. College goers can make use of the vehicle in a similar way. In addition, they can even use it inside the college premises to move from one location to another. The device could also mean a fortune for many households to fulfill their requirements easily for which they usually have to walk. Even in big industries where movement from one place to another is required, using this device could save a lot of their time which eventually could increase the productivity of the industry making use of it.

VI. CONCLUSION

In a nutshell after going through this vehicle the user will realize that the POPORT HT is a distinguished vehicle not just look wise but also feature wise. The features which distinguishes the model from the veteran vehicles are that the weight of the user is distributed between three points making it stable and easy to use. Secondly, the vehicle is made portable by designing a foldable mechanism for it to be carried when needed. The safety of the user has been ensured by introducing a dedicated breaking system and a rigid element to safeguard the user during miss happenings. Finally, a comparatively high ground clearance has been provided keeping in mind the uneven terrain.

VII. FUTURE WORK

In the upcoming future, the device will have a lot more to offer than what it does in the present. The POPORT HT will be the best and upgraded version

of itself which will ensure a bright future of the device. The device will be made more compact and lighter than what it is now. Stronger and light weighted metals like molybdenum, chrome vanadium and carbon fiber will be incorporated which will serve the purpose they are used for in a remarkable manner. Engine used presently is a 2-stroke and comes with a centrifugal clutch based transmission but later a 4-stroke engine with a continuous variable transmission (CVT) will be appointed in addition, the harmful emissions emerging out will also be controlled.

Ergonomics and aesthetics will be improved in order to make it more user-friendly.

Pneumatic wheels instead of solid wheels will be used which will offer less vibrations while riding.

Dedicated seating arrangements will also be provided which will add to the comfort of the user so that s/he can have the pleasure of riding the POPORT HT.



Fig.1 Example of an image user riding POPORT HT



2. John Ulmen, Sanjay Dastoor, Boosted Boards, "Personal Transport Vehicle," United States Patent US20130081891A1, Apr. 4, 2013.
3. Shane Chen, "Two-wheel self-balancing vehicle with independently movable foot placement sections," United States Patent US8738278B2, Feb. 2, 2012.
4. Shane Chen, "Single-wheeled vehicle," United States Patent USD673081 S1, Dec. 25, 2012.
5. Shane Chen, "Side movement propelled scooter device having expanded foot platform," United States Patents US20070170666A1, Jan. 21, 2006.
6. Shane Chen, "Lean-to-Turn Wheeled Device," United States Patent US20100044981A1, Aug. 20, 2008.

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Fig. 2 POPORT HT in compact form

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REFERENCES

1. Prof. Shakil Tadavi, Rahul, Sharma, Mayank Sharma, Kshitij and Vikrant Sinha, "Segway- The Human Transporter," IJSRD, Vol.3, Issue 02, 2015 ISSN (online): 2321-0613