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DESIGN AND FABRICATION JOYSTICK MICROCAR FOR PHYSICALLY HANDCAPED PEOPLE

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ABSTRACT

The main aim of the present project is to design, simulate and to analyze a joystick for physically handicapped persons who doesn't have both legs to drive a car consisting of sequential manual gear box.

The joystick is designed with a mechanism such that the handicapped person can easily operate the main operations of the car such as clutch, gears, break, accelerator and steering with only two hands by avoiding the necessity of leg operations. In addition, horn, headlights and indicator switches are provided on the top portion of the joystick without giving exception for them.

The joystick is designed on the mechanism of two degrees of freedom ,in which a link rotates in two direction with reference to a pinned/hinged joint. The height of the joystick is selected in a manner to generate enough moment to apply force on the hydraulic master cylinder to operate the brakes.

Here in the system, the joystick is operated with left hand and the right hand is completely allocated for the operation of steering with the help of a knob provided on the steering.

For the operation of clutch pneumatic system is adopted in which the clutch pedal is pressed by a slave cylinder activated by compressed air. Solenoid valves are used to control the passage of air whose switches are provided on the joystick.

Even though there are many companies which modifies the vehicle to be operated by handicapped persons, the vehicle requires automatic gear transmission system and much installation cost. Here in the present project the system is designed with much simpler mechanism at much lower cost.

Further modifications of the system and scope of the work has been mentioned at the end of the project work. The main disadvantages with in the mechanism are also mentioned which requires designer and operator concentration and the future work.

Simulation has been done by using Sketchup / SketchyPhysics and the analysis of each component has been done by using PRO E MECHANICA, AUTOFEM LITE.

I.INTRODUCTION

1.1 NEED OF A CAR FOR PHYSICALLY HANDICAPPED PEOPLE

Though there are lot of vehicles modified to meet the needs of handicapped people ,they are not so efficient in satisfying the other requirements which can done by the conventional vehicles.

Wheel chairs, Tri cycles, and scooters are easy to manufacture or for modification to carry the disabled people but they are not meant to be for long journeys and cannot fulfill a family requirements. Though cars have been modified to meet their needs, the cars themselves have some difficulties in their operation and involves high installation cost.

So to make the operation of controllers easy and to meet a family requirements in the long journeys , we have decided to fabricate a car which satisfies the above aspects.

1.2 KEY FEATURES

1. The present mechanism to make the operation of controllers so easy needs 2. low installation cost to be incorporated.

3. It doesn't needs any too much electrical equipment.

4. The mechanism has been designed so it can be built with the available mechanical linkages and no other additional equipments.

5. Since it can be driven by a physically handicapped person, it can also be driven by a normal being very easily.

6. Since the volumetric efficiency of the engine has been increased by increasing the size of the bore diameter and piston diameter, the engine will deliver high power by consuming the same quantity of the fuel as in the previous stage.

7. It can run continuously up to 300 km without stalling the engine as it is provided with oil cooling.

II.LITERATURE REVIEW

The first wheelchair was invented for King Phillip II of Spain. A drawing of the King dated 1595 shows him in a chair with wheels, armrests and footrests. However, he needed assistance to propel it and the chair resembled more a modern baby's highchair than a wheelchair of today. In 1665 one of the first self-propelled vehicles was invented by Stephan Farfler. But it looked more like a present day hand-bike than a wheelchair as it was propelled by hand cranks attached to the front wheel. The modern wheelchair began to take shape in the late 19^{th} century to early 20^{th} century with the advent of push rims for self-propulsion and slings for seat and backrests. The 20^{th} century saw a rapid development in wheelchairs, from the first motorized wheelchair, to the first folding wheelchair, to lightweight and sports wheelchairs.The mechanism that has been designed for the present purpose is inspired from the aviation technology and "steer by wire" mechanism. Steer by wire mechanism is a part of "Drive by wire" mechanism which is the latest technology adopted in designing the concept cars, future cars to improve the comfort ability and precision control in the vehicles.

Steer by wire mechanism which is inspired from the aviation technology consists of a joystick by which steering operation can be performed .The joystick movement directs the vehicle to move in the concerned direction in which the joystick is moved. Different operations can be performed by the same joystick on which different knobs (buttons) and lever are provided for different uses.To make the front wheels steered by the joystick, it is provided with an electrical motor connected to the pinion of the rack and pinion assembly. By directing the rotation of the motor by the joystick control over the steering can be achieved.

III.DESIGNING AND INSTALLATION OF THE JOYSTICK

As we have discussed earlier, the present invention that is going to be incorporated in the micro car, to make operation of the controls so easier needs no additionally designed equipment and consists of simple mechanical linkages. The joystick is shown below (sketch up model).

The lever will perform the clutch operation. The linear motion of the joystick is intended for the shifting of the gears, right hand movement will activate the brake operation and the left hand movement will activate the acceleration of the vehicle.

The design is achieved by plugging the clutch, gear and accelerator cables to the plungers(holders) that are arranged at the end of the rods on which the joystick will move freely in four directions. Since the breaks are the hydraulic brakes the plunger of the tandem master cylinder is directly attached to the another end of the rod on which the joystick will rotate. Hence by activating the all controls, the need of operation of the controllers can be achieved with a simple design and low installation cost. As showed in the earlier pictures similar to the mechanism that has followed by the handicappedpeople.com, we also arranged a small knob on the steering wheel to make the steering operation so simple by making it to be operated even with one hand.

The apparatus consists of :

a. An indicator switch,
b. Joystick consisting of mechanical linkages,
c. Brake Master cylinder
d. Brake pipes, gear cables, electrical wires
e. Pneumatic clutch

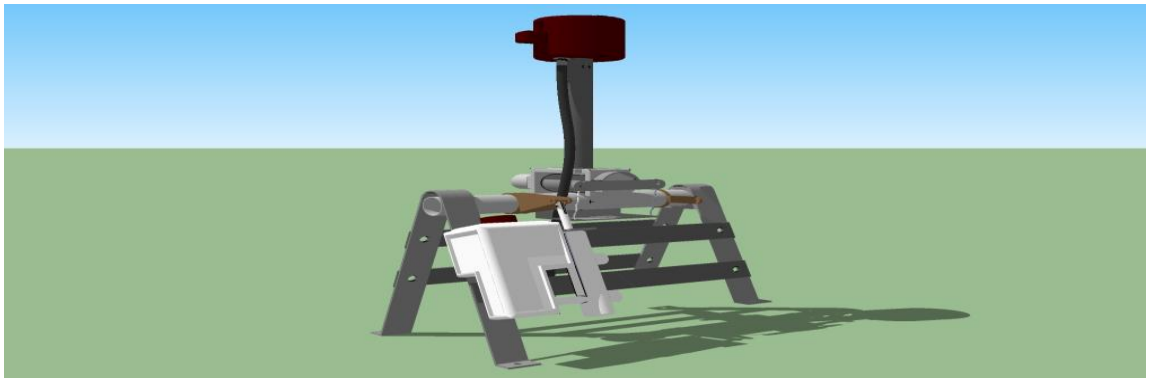

Fig 11.1Joystick

3.1 OPERATION/ WORKING OF JOYSTICK:

The sketch up model of the joystick shown above. The joystick consists of simple mechanical linkages and an electrical indicator switch.

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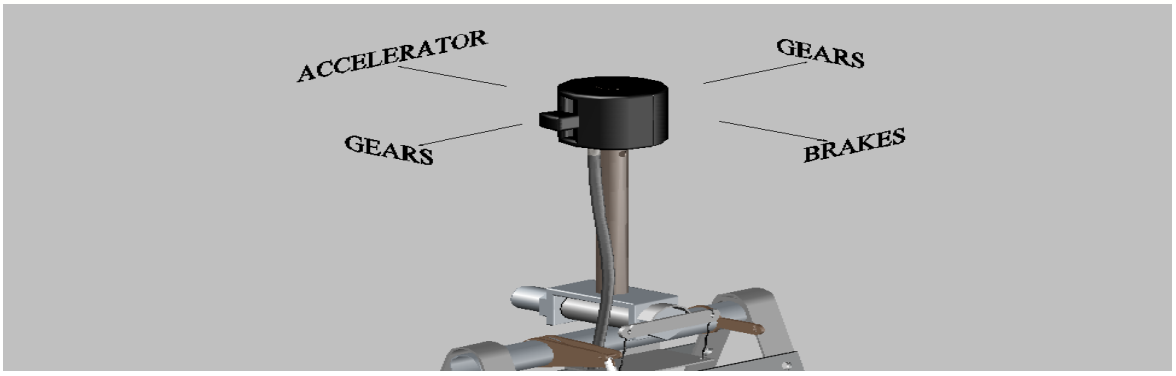

Fig 11.2 Names of the operations

3.2 ENGAGING GEARS:

A gear wire plunger is arranged to hold and push the two gear wires. Whenever we engage the clutch and move the vertical rod in forward and backward direction the gears will engage and disengage.

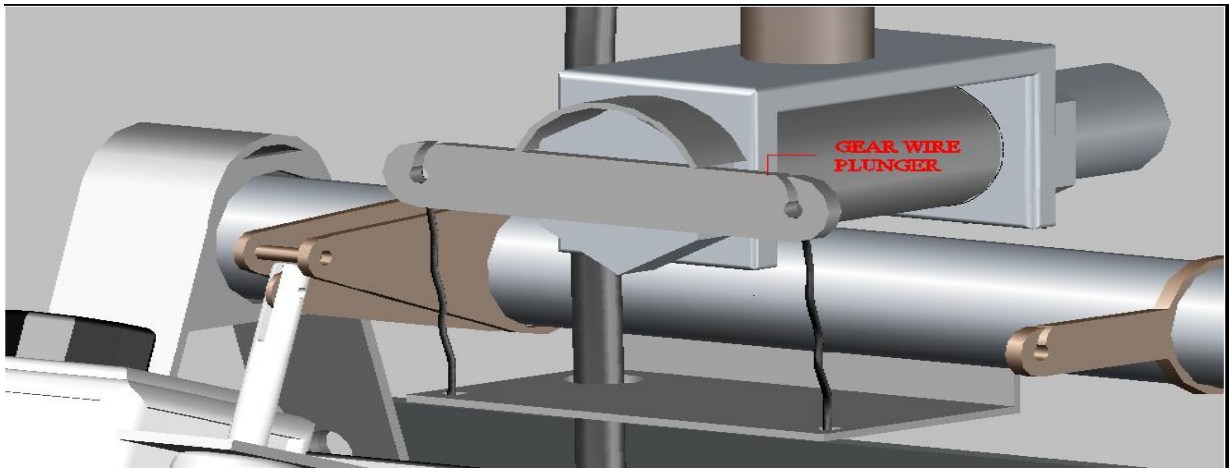

Fig 11.3 Engaging gears

3.3 ENGAGING BRAKES:

The operation of brakes can be done by rotating the rod/lever in clockwise direction. A pressing lever of 3.5cm is attached to the main shaft that is resting on the two stands. The end of that lever is connected to the plunger of master cylinder in such a manner that the lever can freely rotate on the shaft and whenever load is applied on the lever it presses the plunger of the **master cylinder** that is connected to the other end of the lever. Other two levers of same size are arranged on the both sides of the freely rotating lever in order to apply the load on the freely rotating lever.

IV.BRAKE IN ENGAGED POSITION

Whenever the plunger is pressed the fluid in master cylinder will be compressed and after flowing through the brake pipes it reaches the wheel cylinder of the brake drum and pushes the brake liners forward to stop the rotation of the tyres. Thus the engaging of the braking can be achieved by the joystick.

4.1 ACCELERATING

At the end of the horizontal shaft another lever with a hole is arranged to pull the accelerator wire to accelerate the vehicle. It is permanently fixed on the shaft Accelerating can be achieved by rotating the joystick in anti clock wise direction.

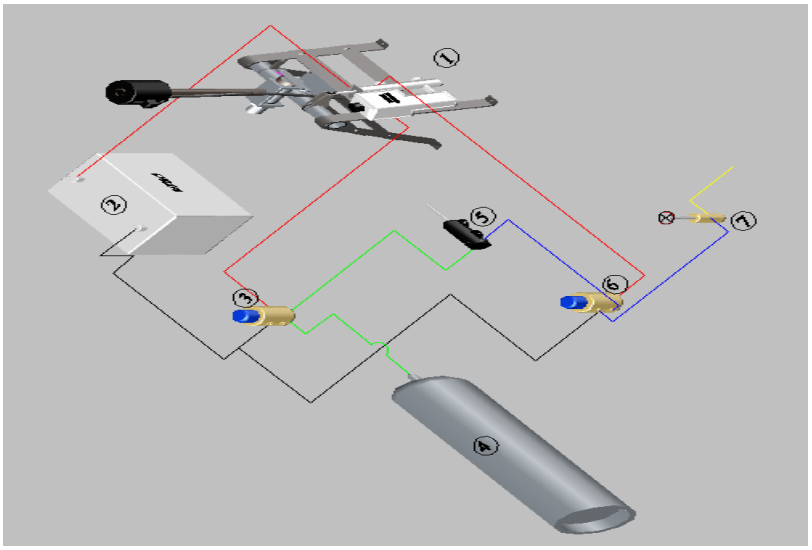

Fig 11.14 Joystick and clutch circuit

_____ Copper pipe _____ Electric wire

_____ Copper pipe _____ Electric wire

_____ Copper pipe

V.FUTURE WORK

Safety concerns have slowed the adoption of joystick and drive by wire technology. The future work would mean mechanically-controlled systems would be controlled electronically. Power demands placed on a vehicle by electric motors and other power hungry systems can be extensive. The existing 12-volt vehicle architecture is not expected to be able to cope with the power demands that will be placed on it in the future and the switch to a 42-volt architecture is expected. This is expected to result in a greater use of electric motors.

Mechanical systems can and do fail, but regulatory authorities still see them as being more reliable than electronic systems. Drive-by-wire systems are also more expensive than mechanical controls due to the fact that they are significantly more complex.

However, the future could lead to a number of interesting developments. The removal of mechanical controls could allow automakers to design vehicles that are radically different from the cars and trucks that are on the road today. Concept cars like the Hy-Wire have even allowed the seating configuration to be moved around, since there are no mechanical controls that dictate the position of the driver.

A driverless car technology could also be integrated , which would allow vehicles to be operated remotely or by a computer.

Systems such as braking and suspension are likely candidates for control using electric motors or hybrid mechanical/electrical systems, also incorporating electric motors.

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