# Design & Fabrication of Reverse Gear Mechanism for Handicapped Person Vehicle

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**ABSTRACT**

 Mobility of physically disabled persons is a concerning social issue nowadays. In case of the handicapped people, who drive two wheelers with extra support wheels face much problem to take the vehicle out of the parking by pushing the vehicle with legs. In order to take the vehicle out of the parking, they need to seek others help or they should push it out of the parking. As a help to them, this research paper aims at designing and fabrication a reverse gear mechanism, which will be fitting to the vehicle with little modifications of the existing mechanism.

## INTRODUCTION

Nowadays, the intensity of traffic on Indian roads is increasing at high pace. As in this date there are many options for transportation available for physically challenged persons like, Motorized wheel chair, Hand powered tri-cycle, Scooters, etc. The problem associated with motorized wheel chair is that it way too costly and is not suitable for commuting. Hand powered tri-cycle requires heavy human effort. So, disable people, now days prefer two wheelers as better mode of transportation. Since it is comfortable and cost efficient. The major problem associated with the two wheelers that are available in India is that they don't have provision for reversing the scooter which is very much necessary for a disable person. Transport disability keep out current physically challenged people from all form of transport like public, private and personal transportation. In order to overcome this drawback, we've designed and fabricated a vehicle with reverse mode.

## Material Selection and Fabrication

## GEAR RATIO

The gear ratio of a gear train, also known as its speed ratio, is the ratio of the angular velocity of the input gear to the angular velocity of the output gear. The gear ratio can be calculated as directly from the numbers of teeth on the gears in the gear train. The torque ratio of the gear train, also known as its mechanical advantage, is determined by the gear ratio. The speed ratio and mechanical advantage are defined so they yield the same number in an ideal linkage.



**Fig 1. Gear Box**

## GENERAL CALCULATION

Gear ratio can be calculated by the following formula = Number of teeth in driven gear /Number of teeth in driver gear

Input gear GA= 68 teeth
Output gear GB = 32teeth.
Compound idler gear
G11= 22 teeth
G12= 18 teeth

### For Forward direction,

The gear ratio =driven/driver
$= TA / T12$
$= 68 / 18$
$= 3.77$
Gear ratio $= T11 / TB$
$= 22 / 32$
$= 0.687$
Overall gear ratio $=3.77 \times 0.687$
$= 2.58$
For every 1 revolution of an input gear, the output gear turn 2.58 revolution.

### For Reverse direction,

Input gear (GA) is meshed with the output gear (GB)
Gear ratio $= TA / TB$
$= 68 /32 = 2.12$
For every one revolutions of the input gear, the output gear turns 2.12 revolutions.



**Fig 2. Position of Gears in Casing**

| Sr no | Components | Material |
|---|---|---|
| 1 | Power transmission shaft | SAE 1040(H.T) |
| 2 | Spur Gears | SAE 1045(H.T) |
| 3 | Casing of gear box | ALUMINIUM |

## GEAR DESIGN

| Gear | Module | No. of Teeth | Pitch Diameter | Face width | Material |
|---|---|---|---|---|---|
| GEAR A | 2mm | 68 | 136mm | 20mm | SAE 1045(H.T) |
| GEAR B | 2mm | 32 | 64mm | 20mm | SAE 1045(H.T) |
| GEAR $1_1$ | 2mm | 22 | 40mm | 20mm | SAE 1045(H.T) |
| GEAR $1_2$ | 2mm | 18 | 38mm | 20mm | SAE 1045(H.T) |

## DESIGN OF GEAR BOX

**Concept:**

The engine drives provides the power to the gear box and the gear gives out the power to the rear wheel in two direction .when output in clockwise direction the vehicle move forward and when the output is in counter clockwise direction vehicle moves backward. Thus reversing of the vehicle can be achieved.

The following calculations are to be performing for the designing and fabrication of the reverse gear mechanism.

(1) Design of gear box.
- Input Gear.
- Intermediate Gear.
- Output Gear.
- Gear ratio calculation.
(2) Design of Shaft.
- Input Shaft.
- Intermediate Shaft.
- Output Shaft.

(3)Design and selection of bearing.

(4)Design of frame.

(5)Selection of Suspension system.

## IDENTIFICATION OF COMPONENTS

- Moped vehicle.
- Two wheels with tyre.
- Axel shaft.
- Suspension system.
- Modified gear box
- Frame.
- Hand lever for shifting gear.

Also it will provide a lot of comfort and safety while driving. So, implementing our project will surely provide mobility to all disabled people without any help from others.

## ADVANTAGES

- It requires simple maintenance cares.
- Repairing is easy. Replacement of parts is easy.
- Checking and cleaning are easy.

## APPLICATIONS

- This mechanism installed in any moped vehicle.
- This mechanism is less in weight & size.
- Easy to use for handicapped person.



**Fig 3. Assembly of Gear Box**

## CONCLUSION

Thus, the design and fabrication of vehicle with gearbox is tested for various static and dynamic conditions. The reverse gear mechanism is achieved by adding only about 2% of the original weight balance is maintained. The

inclusion of our project in moped vehicles will not reduce the speed of the vehicle; hence the performance of the vehicle is not affected. Since no complex structure is used in our design, it can be easily by physically challenged peoples. The designed vehicle will prove to be of great importance for the handicapped persons and aid them in driving on the heavy traffic intensity roads. Also it will provide a lot of comfort and safety while driving. So, implementing our project will surely provide mobility to all disabled people without any help from others. Our project has a great scope in future as it will assist in parking and also travelling in traffic roads.

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