

Reverse Gear Mechanism in Two Wheeler for Physically Challenged People

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ABSTRACT

In fast growing modern world many types of vehicles are being innovated. But until now it is a major problem for the physically challenged peoples to move back the vehicles and to “U” turn the vehicles. Even to a small distance they cannot move the vehicles backside. So To eliminate this problem we invent the reverse gear mechanism in two wheeler. The challenged peoples can easily reverse the vehicles without getting down from the vehicle by easily operating hand lever.

The project title is “REVERSE GEAR MECHANISM IN TWO WHEELER FOR PHYSICALLY CHALLENGED PEOPLE”. The main objective of our project is to facilitate ‘comfort ability and safety’ to the challenged peoples. This project requires the motor vehicle, lever, reverse gear box, v-belt, sprocket and other necessary parts. When need to reverse the vehicles they can engage the hand lever for reverse gear, the vehicle moves backwards. This project will be more useful for the challenged peoples in the society.

I.INTRODUCTION

Automobile engineering is the one of the stream of mechanical engineering. It deals with the various types of automobiles, their mechanism of transmission systems and its applications. Automobiles are the different types of vehicles used for transportation of passengers, goods, etc. Basically all the types of vehicles works on the principle of internal combustion processes or sometimes the engines are called as internal combustion engines. Different types of fuels are burnt inside the cylinder at higher temperature to get the transmission motion

in the vehicles. Most of the automobiles are internal combustion engines vehicles only. Therefore, every mechanical and automobile engineer should have the knowledge of automobile engineering its mechanism and its various applications.

Automobile engineering is a branch of engineering which deals with everything about automobiles and practices to propel them. Automobile is a vehicle driven by an internal combustion engine and it is used for transportation of passengers and goods on the ground. Automobile can also be defined as a vehicle which can move by itself.

Engine in Front

Most of the vehicles have engine in the front. Example: most of the cars, buses, trucks in India.

Engine in the Rear Side

Very few vehicles have engine located in the rear. Example: Nano car.

II. PHYSICALLY HANDICAPPED VEHICLE

People who have problem in their physics feel so difficult to move from one place to another. The introduction of some automobile vehicles with three wheels partially fulfills the requirement of handicap for their convenient driving in roadways. But such types of vehicles also need a much range of high effort from challengers to ride in road ways. The main major drawback of such type of automobile vehicles is it can't be able to provide a suitable driving mechanism during turnings and parking. So it may result in more effort with skid. And also such types of vehicles are only suitable for specialized case persons whether they must have problem in only leg or ear.

Those vehicles may also improve the shocking vibration to challengers which result in breakup of backbone of them. So we think that the introduction of **REVERSE GEAR MECHANISM** in two wheelers is the only solution for rectifying all the problems which is in above.

III. NEED AND SCOPE OF PROJECT

NEED OF PROJECT:

- ✓ To eliminate the partiality and complexity nature over the handicap peoples from the society.
- ✓ To improve the tendency and ability of challengers to live with confidence and without considering the illness and disability of them.
- ✓ To get back the hopeful of handicap to show the strength of them to society.

SCOPE OF PROJECT:

- ✓ To provide a better convenient chariot ride feel while driving in roadways to physical challengers.
- ✓ Suitable for the person, who have problem in leg.
- ✓ Suitable for the person, who have problem in ear.

IV. SELECTION OF VEHICLE

Modification in vehicle can be made in following bikes which fulfills the aims of our projects.

TVS 50
TVS ASTRA.,
TVS Super XL

The other forms of bikes like sunny, Kinetic Honda, Honda active, Kinetic 2k, Scotty pep which has a rear engine and mono block aluminum molding can't support the welding modification which are needed by us.

TECHNICAL SPECIFICATION OF TVS 50

Engine

Type	2 stroke single cylinder
Bore x Stroke (mm)	46 x 42
Displacement (cc)	69.9
Max. power	2.61 Kw(3.5 Bhp) @ 5000 rpm
Torque (Nm)	5.0 @3750 rpm

Drive

Clutch	Centrifugal wet type
Primary Drive	Single speed gear box
Secondary Drive	Roller chain drive

Electricals

Ignition System	Fly wheel magneto 12V, 50W Electronic ignition
Head Lamp	12V - 35/35W
Tail Lamp	12V - 5W
Brake Lamp	12V -10W
Speedo Lamp	12V -3.4W
Horn	12V - AC type
Indicator Lamp	12V -5W

Suspension

Front	Oil - filled telescopic spring assisted shocks
Rear	Adjustable hydraulic spring arm shocks

Dimensions & Weights

Wheelbase (mm)	1222
Dry Unladed Weight (kg)	75
Gross Vehicle Weight (kg)	205
Fuel Tank Capacity	4liter(incl.1liter. serve)
Tyre Size (Front & Rear)	2.5 x 16

Brake Drum

Front (mm)	80 dia
Rear (mm)	110 dia

V. DESCRIPTION OF PARTS

- Gear box assembly
- Pulley
- V-belt
- Sprocket
- Wheel assembly
- Clutch
- Rope

Gear box

The set of gear enclosed in a metal box is called gear box. This set of gear is used for transmission. This gearbox is provided between the clutch and sprocket shaft. In this project the gear box contains the gear and pinion which is keyed to the corresponding shaft. Both gear and pinion material is steel. The speed reduction ratio of the gear and pinion is 6.



Here we use the helical type gears because of Helical gears offer a refinement over spur gears. The leading edges of the teeth are not parallel to the axis of rotation, but are set at an angle. Since the gear is curved, this angling causes the tooth shape to be a segment of a helix. Helical gears can be meshed in *parallel* or *crossed* orientations. The former refers to when the shafts are parallel to each other; this is the most common orientation. In the latter, the shafts are non-parallel, and in this configuration the gears are sometimes known as "skew gears".



The above figure indicates the placing of the gear box. The lever is used to reverse the vehicle which is attached to the gear box

Pulley

A **pulley** is a wheel on an axle that is designed to support movement and change of direction of a cable or belt along its circumference. Pulleys are used in a variety of ways to lift loads, apply forces, and to transmit power. It is also called a **sheave** or **drums** and may have a groove between two flanges around its circumference.

V-Belt drive

When the distance between the shafts is less, then V-belts are preferred. It consists of central layer of fabric and moulded in rubber. This assembly is enclosed in an elastic wearing cover. The belt will have contact at the two sides of the groove in the pulley. Two or more v belts can be joined side-by-side in an arrangement called a multi-V, running on matching multi-groove sheaves. This is known as a multiple-V-belt drive.

V-belts may be homogeneously rubber or polymer. The fibers may be of textile materials such as cotton, polyamide (such as Nylon) or polyester or, for greatest strength.

Belt friction

Belt drives depend on friction to operate, but excessive friction wastes energy and rapidly wears the belt. Factors that affect belt friction include belt tension, contact angle, and the materials used to make the belt and pulleys.

Belt tension

Power transmission is a function of belt tension. However, also increasing with tension is stress (load) on the belt and bearings. The ideal belt is that of the lowest tension that does not slip in high loads. Belt tensions should also be adjusted to belt type, size, speed, and pulley diameters. Belt tension is determined by measuring the force to deflect the belt a given distance per inch of pulley. Timing belts need only adequate tension to keep the belt in contact with the pulley.

Belt wear

Fatigue, more so than abrasion, is the culprit for most belt problems. This wear is caused by stress from rolling around the pulleys. High belt tension; excessive slippage; adverse environmental conditions; and belt overloads caused by shock, vibration, or belt slapping all contribute to belt fatigue.

Belt vibration

Vibration signatures are widely used for studying belt drive malfunctions. Some of the common malfunctions or faults include the effects of belt tension, speed and misalignment conditions. The effect of sheave Eccentricity on vibration signatures of the belt drive is quite significant. Although, vibration magnitude is not necessarily increased by this it will create strong amplitude modulation.

Belt dressing

Belt dressings are typically liquids that are poured, brushed, dripped, or sprayed onto the belt surface and allowed to spread around; they are meant to recondition the belt's driving surfaces and increase friction between the belt and the pulleys..

Advantages of V-belt over Flat belt

Advantages:

- Compact and give high velocity ratio.
- Provides shock absorption between driver and driven shafts.
- Positive and reliable drive.

Disadvantages:

- Initial cost is more as the fabrication of pulleys with V-grooves are complicated.
- Improper belt tensioning and mismatching of belt results in reduction in service life.

Chain drive (Sprocket)

Roller chain or **bush roller chain** is the type of chain drive most commonly used for transmission of mechanical motorcycles, and bicycles. It consists of a series of short cylindrical rollers held together by side links. It is driven by a toothed wheel called a sprocket. It is a simple, reliable, and efficient means of power transmission.

The "bushing less" roller chain is similar in operation though not in construction; instead of separate bushings or sleeves holding the inner plates together, the plate has a tube stamped into it protruding from the hole which serves the same purpose. This has the advantage of removing one step in assembly of the chain.

The roller chain design reduces friction compared to simpler designs, resulting in higher efficiency and less wear. The original power transmission chain varieties lacked rollers and bushings, with both the inner and outer plates held by pins which directly contacted the sprocket teeth; however this configuration exhibited extremely rapid wear of both the sprocket teeth, and the plates where they pivoted on the pins.

There is even very low friction, as long as the chain is sufficiently lubricated. Continuous, clean, lubrication of roller chains is of primary importance for efficient operation as well as correct tensioning.

Chains operating at high speeds comparable to those on motorcycles should be used in conjunction with an oil bath.

Clutch

The clutch in a manual-shift motorcycle transmission is typically an arrangement of plates stacked in alternating fashion, one geared on the inside to the engine and the next geared on the outside to the transmission input shaft. Whether wet (rotating in engine oil) or dry, the plates are squeezed together by a spring, causing friction build up between the plates until they rotate as a single unit, driving the transmission directly

As the throttle is opened and engine speed rises, counterweights attached to movable inner friction surfaces (connected to the engine shaft) within the clutch assembly are thrown gradually further outwards, until they start to make contact with the inside of the outer housing (connected to the gearbox shaft) and transmit an increasing amount of engine power.

Wheel assembly (Supporting wheels)

As a construction, the wheels consist of hubs, discs or spokes, rim, tire and tube. The vehicles cannot move without wheels. The wheels support the whole weight of the vehicle and protect the vehicle from the roads shocks where as the rear wheels move the vehicle, the front wheel steer it. All the wheels must resist the braking stresses and withstand the side thrust.

Function of wheel assembly

- ✓ Able to grip the road surfaces.
- ✓ Flexible to absorb the road shocks.
- ✓ Perfectly balance dynamically.
- ✓ Strong enough to withstand the weight of the whole vehicle.

Tyre assembly:

The assembly of the tyers and tubes with air is a cushion element. The tyer is the outer cover of the assembly. This assembly mounted over the wheel rim. The air inside the tubes carries the entire load and provides the cushion.

The tyre are used for following purposes

- ✓ To support vehicle load.
- ✓ To provide cushion against shocks.
- ✓ To transmit driving and braking forces to the roads.
- ✓ To provide cornering power for smooth steering.

Suspension System

Suspension system of an automobile separates the wheel and axle assembly of the automobile from its body. Main function of the suspension system is to isolate the body of the vehicle from shocks and vibrations generated due to irregularities on the surface of roads. Shock absorbers are provided in the vehicles for this purpose. It is in the form of spring and damper. The suspension system is provided both on front end and rear end of the vehicle.



VI. DESIGN CALCULATION

Pulley calculation

Speed of engine pulley $n_e = 1500$ rpm
Diameter of engine pulley $d_{ep} = 55$ mm

Speed of gear $n_g = 800$ rpm

We know that

Pulley speed ratio

$$\frac{n_e}{n_g} = \frac{d_{gp}}{d_{ep}}$$

$$\frac{1500}{800} = \frac{d_{gp}}{55}$$

Diameter of gear pulley $d_{gp} = 112$ mm

Calculation of input speed of sprocket

Input speed of gearbox $n_g = 800$ rpm

Speed reduction ratio of gearbox = 6

$$\frac{n_g}{n_p} = 6$$

$$\frac{800}{n_p} = 6$$

Speed of sprocket or speed of pinion $n_p = 133.34 \approx 135$ rpm

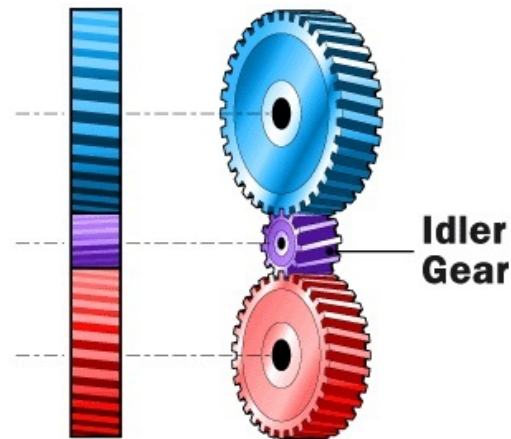
Sprocket calculation

Based on the speed of sprocket select the diameter and number teeth on sprocket

Diameter of sprocket $d_s = 55$ mm

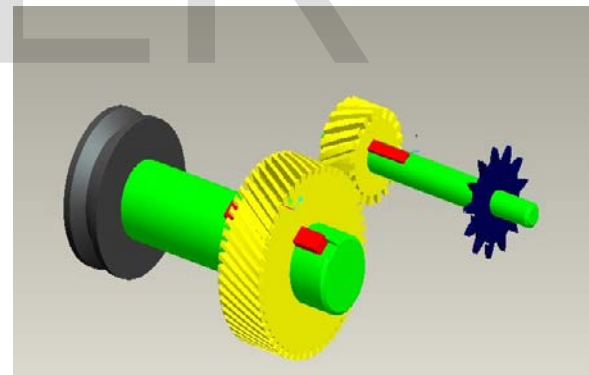
No of teeth on sprocket $n_s = 13$ nos

VII. WORKING PRINCIPLE



The principle applied to this project is a gear transmitting is power in opposite direction. When an intermediate gear is introduced between these two gears the intermediate gear will change the direction of rotation of the final gear or drive.

VIII. CONSTRUCTION AND WORKING PRINCIPLE



Working diagram of this project

It is mainly consists of gear box assembly, v-belt & v-pulley and sprocket. In the gear box it has a gear (helical) and pinion (helical) which is keyed to the corresponding shaft and outside of the gear box the v-pulley is attached to the gear shaft. Then the sprocket is attached to the pinion shaft and also it is engaged to the chain drive.

When the clutch is pressed the main drive is disengaged and it engaged to the gear box pulley by means of v belt drive. Then power is transmitted from the engine to the gear box pulley. Then the gear

SL.NO	NAME OF PARTS	PRICE
1	GEAR BOX ASSEMBLY	500
2	PULLEY	350
3	V BELT	700
4	SPROCKET	220
5	ROPE	400
6	WHEEL & TYRES	600
7	MUTGAURD	100
8	WELDIN CHARGES	100
9	PAINTING	120
10	TRANSPORT	200
11	MISCELLANEOUS	500
TOTAL		3790

box gets powered and it reduces the speed of the sprocket by means of helical gear and helical pinion. Reversing of the vehicle is obtained because of an intermediate gear is introduced between these two gears the intermediate gear will change the direction of rotation of the final gear or drive. Then sprocket rotates reverse direction and also the chain drive rotates reverse by means of a sprocket is engaged with the chain drive. Then finally reverse of the vehicle is obtained.

ADVANTAGES

- It improves the safety.
- It is more comfortable to the physically disabled person.
- It gives more confident to handicapped people to drive the vehicle.
- Easy to U turn the vehicle.
- Easy to reverse the vehicle.

IX. APPLICATION

1. It is used to eliminate the partiality and complexity nature over the handicap peoples from the society.
2. It is used to improve the tendency and ability of challengers to live with confidence and without considering the illness and disability of them.
3. It is used to get back the hopeful of handicap to show the strength of them to society.

4. It is provide a better convenient chariot ride feel while driving in roadways to physical challengers.

X. COST ESTIMATION

XI. BILL OF MATERIAL

SL. NO	NAME OF PARTS	MATERIAL	QTY. NO
1.	GEAR	STEEL	1
2.	PINION	STEEL	1
3.	PULLEY	CAST IRON	2
4.	V-BELT	RUBBER	1
5.	SPROCKET	MILD STEEL	1
6.	WHEEL	STEEL	2
7.	ROPE	NYLON	1
8.	MOTOR VEHICILE		1
9.	MUTGUARD	TIN	2

XII. CONCLUSION

A disability is a condition or function judged to be significantly impaired differentiation of an individual from the group. Current issues and debates surrounding disability include social rights and citizenship of them.

In the developed countries the debate has moved beyond a concern about the perceived cost of maintaining the dependent people and to find effective ways of ensuring the people to contribute in all spheres of life activities. Measuring the developments which are happened in automobile technology is incredibly difficult. So through this project work, we interlink these two things and try to solve the problem as more as efficient with our knowledge. We hope that the launching of our vehicle in our Indian road ways would give a pleasurable development to physical challengers which may result in unity.

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