

“Fabrication of Reverse Gear System in Two Wheeler”

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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.

Key words: Fabrication, Reverse Gear System, Two Wheeler

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.

At present, there is no system available to back the vehicle. At times when the front wheel gets into a trench it is very difficult to take the vehicle from parking. Even normal people face much problem to take the vehicle out of the parking at that time. 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 as we do. 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 we have designed a system which will be fit to the vehicle. The paper deals with the design of such a system and the assembly process of the system to the vehicle. The design deals with the conditions of the system operation, and the design of the

system based on easy assembly and easy manufacturing at low cost.

A. Previous Studies on Reverse Gear System

1) Background of Previous Invention

An invention of motorcycle transmission featuring reverse gear were developed by Wittman, Jr. (1985) where this invention of reverse mechanism provides in-unit transmission compared the aftermarket's motorcycle reverse mechanism which manufactured as an independent setup. Basically, a rider are afford to moves backward a two-wheel motorcycles easily by hand although that vehicle do not have reverse gears because most of it are sufficiently light weight. However, there will be a problem for rider to move backward a larger motorcycle where he or she needs to dismount and balance to do that matter especially when moving over a curb. In European countries or United States of America (USA), there are several police units that used three wheel police-type motorcycles in daily for law enforcement and this kind of motorcycle usually comes in two rear wheels with a box mounted there between. In many situations, a police vehicle particularly requires rapid maneuverability but it is impractical especially for the police officer who rides three-wheel motorcycle to dismount and push the vehicle backwardly.

Not just that three wheel motorcycle, even a two wheel police-type motorcycle also faced the same problem in the lack of reverse gear and it could be extremely serious in an emergency situation where the officer would be unsafe to protect himself and enforcing law besides would not be enough time. Although three wheel motorcycles are more stable compared to two wheel motorcycles but it could be harder to move backward due to the increasing of the weight resulted from mounted box and the number of wheels itself. Even the older Harley Davidson three-wheel police motorcycle has provided with a reverse gear mechanism but it was not an in-unit-transmission where the Harley engine drove a chain to a separate transmission which in turn drove a chain powering the rear axle. In order to shifting these Harley's transmission, a cam plate should be employed with forks because it was not a constant mesh transmission.

KVV Enterprises, Inc. of Cincinnati, Ohio, recently had launched a three-wheel police motorcycle which featuring a reverse mechanism. "Trident", the name of that motorcycle however, powered snowmobile starter motor as reverse mechanism by a secondary alternator and battery system where the power system is separated from the regular engine alternator and battery. For the specific operation, a flywheel is set up in the differential while the starter motor is mounted under the tricycles seat engages it for reverse movement after been shifted to neutral. When it is left in gear, the starter switch is turned and this operation is quite similar to the motion of an automobile but it moves slowly in a lurching motion. By then, a reverse gear mounted integrally and associated with motorcycle engine is need in order to ensure these systems can be operated with ordinary motorcycle shifting mechanism in mechanical

compatibility besides providing rapid shifting with full engine power.

B. The Invention of Prior's Motorcycle Transmission Featuring Reverse Gear

The invention of Dittman, Jr. (1985) has provides a constant mesh reverse gear which operates fork system and standard rotary shift drum. This constant mesh reverse gear is located within the engine casing along with motorcycle transmission's 3-5 forward gears. Mounted on a countershaft, the reverse gear engages an idler mounted on its owned separate shaft in engagement with a main shift reverse gear. Besides that, an idler pin placed between a pair of plates mounted on the transmission endplate which these plates also have apertures therein to receive the main shaft and countershaft. As any ordinary motorcycle, this system also operates the shift lever by using toe in order to engage a shift arm which one turn engages a pawl and cam plate assembly for rotating the rotary shift drum. The shift forks are operated by pins riding in cam grooves on the rotary shift drum.

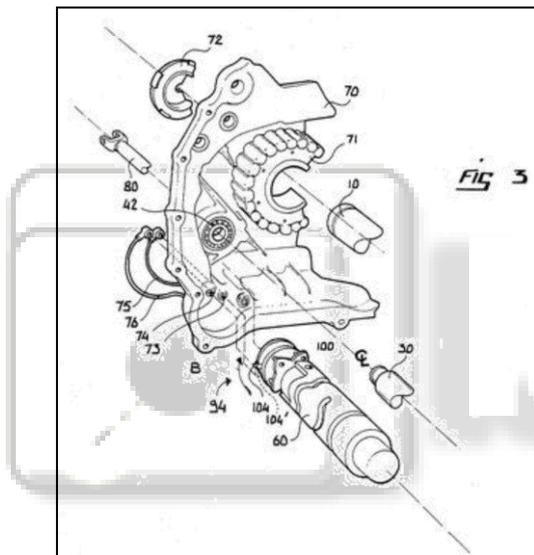


Fig. 1: Rear engine casing showing the contact assembly, movement to signal reverse gear and back-up warning systems.

A brilliant idea that he designs to beware other road user and pedestrians is by producing a reverse signal. In order to structure this design, a contact boss is placed in an indicator plate on the cam plate assembly. Electrical contacts in the rear of the engine casing engaged by the contact boss which positively indicate the engagement of the transmission in reverse gear. In turn, both the rider and pedestrians will be aware about the reversing process and ready to be backed up when these contacts active both of a back-up beeper and back-up light.

II. PRINCIPLE

A. 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 cases persons whether they must have problem in only leg or ear 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.

This project aims to help the handicapped people for their easy convenience for travelling. They are facing many problems related to their transportation. Presently, handicapped people drive two wheelers with extra support wheels and they face difficulty in reversing the vehicle while travelling by using this mechanism. The handicapped people can easily move the vehicle backward at present; there is no system available to back the vehicle. At times when the front wheel gets into a trench it is very difficult to take the vehicle from parking.

Even normal people face much problem to take the vehicle out of the parking at that time. 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 as we do. 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 we have designed a gear box which will be fit to the vehicle. It is fitted to the side of the vehicle and helping in the backing of the vehicle. When the driver wants to move the vehicle backward what he needs is just to move the rod in the newly designed gear box in one direction and when the driver wants the vehicle to move in the forward direction, then the rod is to be moved to the earlier position. The change of direction of the vehicle is just by the movement of the gear rod.

The physically challenged persons are one of the excluded sections of the society and also they face number of problems in their daily life. In order to bring them in the main stream both the central as well as the state governments are introducing many welfare measures and schemes. To avail these welfare measures and the schemes, first of all they must aware about the same. In motor vehicles, the transmission generally is connected to the engine crankshaft via a flywheel and or partly because inter

B. Principle of Motorcycle Gearbox.

Structure of motorcycle gearbox's components. Most of all modern gearboxes operate on the indirect, constant-mesh principle. The word indirect means that power entering a shaft and exits from the other while the power transmitted always passing through one from five or six pairs. By making the only pair in the box while both of whose gears are locked to their respective shafts, selection of a particular pair to carry the drive can be accomplished because constant mesh contains that all gear pairs remained in mesh. Apart from that, one gear is always free spinning (rotating) on the shaft as the pairs not engaged. Shifting, a term referred to an action of changing gear in transmission, cannot be accomplished by forcing precisely formed gear-tooth profiles into and out of mesh. However, the end faces of gears are provided with rings of heavy pegs (hook). Called

dogs seven or dog clutch. One of a gear will be free-spinning of any given meshing gear pair while the other are splined. A free-spinning must be dogged to the shaft by sliding an adjacent splined gear or dog-ring against it in order to select that pair to transmit power, so that their dog sets engage. Affect from dogging the shaft, the gears that slide could not move out of their teeth to be out of mesh with their mating gear because generally, most of the motion is only 5mm. In this situation, power can be transferred through the gear and shaft properly to the output shaft from clutch shaft because both gears are locked to their individual shaft. Of course only one pair of gear can be allowed to engage in one time; otherwise it could lock the transmission affected from simultaneous double engagement. Shift drum or plate will managed the engagement and disengagement all of gears available in a gearbox with wiggly slots milled into it. Moreover, it drives shift such by engagement of their guide pins into the wiggly slots as rotation of this drum or plate from one detent position to the next by linkage's engagement. Normally, two gears cannot be selected simultaneously because the slots are cut and to hold the transmission in a selected gear, the shift plate or drum is equipped with a decent device. In addition, the detent device usually uses the form of a bumps machined-form onto one end of the shift drum or onto a decent ring a connected to the drum where these components engaged by either pivoted arm or a spring-loaded plunger. Linkage of shift from rotating drum or plate to the other and from one detent is caused by shifting. Met alto-metal in holes of bored rotated by shift drum but to reduce friction of shifting, recent designs always combine rolling bearings. In a situation, selecting neutral in transmission could be harder with engine running as gear lever is dab up and down because the shift drum could jumping between two deep detents and never stopping at the shallow neutral detent between of it if the clutch is dragged such as the plates is been wrapped of lift insufficiently.

C. Transmission of Power through Gear Mechanism (mechanics)

A transmission is a machine that consists of a power source and a power transmission system, which provides controlled application of the power. Often the term transmission refers simply to the gearbox that uses gears and gear trains to provide speed and torque conversions from a rotating power source to another device.

In British English, the term *transmission* refers to the whole drivetrain, including clutch, gearbox, prop shaft (for rear-wheel drive), differential, and final drive shafts. In American English, however, the term refers more specifically to the gearbox alone, and detailed usage differs.

The most common use is in motor vehicles, where the transmission adapts the output of the internal combustion engine to the drive wheels. Such engines need to operate at a relatively high rotational speed, which is inappropriate for starting, stopping, and slower travel. The transmission reduces the higher engine speed to the slower wheel speed, increasing torque in the process. Transmissions are also used on pedal bicycles, fixed machines, and where different rotational speeds and torques are adapted. Often, a transmission has multiple gear ratios (or simply "gears") with the ability to switch between them as speed varies. This

switching may be done manually (by the operator) or automatically. Directional (forward and reverse) control may also be provided. Single-ratio transmissions also exist, which simply change the speed and torque (and sometimes direction) of motor output.

In motor vehicles, the transmission generally is connected to the engine crankshaft via a flywheel and/or clutch and/or fluid coupling, partly because internal combustion engines cannot run below a particular speed. The output of the transmission is transmitted via the driveshaft to one or more differentials, which drives the wheels. While a differential may also provide gear reduction, its primary purpose is to permit the wheels at either end of an axle to rotate at different speeds (essential to avoid wheel slippage on turns) as it changes the direction of rotation.

Conventional gear/belt transmissions are not the only mechanism for speed/torque adaptation. Alternative mechanisms include torque converters and power transformation (e.g. diesel-electric transmission and hydraulic drive system). Hybrid configurations also exist.

Early transmissions included the right-angle drives and other gearing in windmills, horse-powered devices, and steam engines, in support of pumping, milling, and hoisting.

Most modern gearboxes are used to increase torque while reducing the speed of a prime mover output shaft (e.g. a motor crankshaft). This means that the output shaft of a gearbox rotates at a slower rate than the input shaft, and this reduction in speed produces a mechanical advantage, increasing torque. A gearbox can be set up to do the opposite and provide an increase in shaft speed with a reduction of torque. Some of the simplest gearboxes merely change the physical rotational direction of power transmission.

Many typical automobile transmissions include the ability to select one of several gear ratios. In this case, most of the gear ratios (often simply called "gears") are used to slow down the output speed of the engine and increase torque. However, the highest gears may be "overdrive" types that increase the output speed.

D. Continuous Variable Transmission

Mainly the CVT has Primary and Secondary clutches which are connected by belt in which the primary clutch is connected with engine. In scooty, there is CVT arrangement for speed variation. Hence there is no provision of reverse gear in scooty. A figure (2) shows how the variation of speed ratio can be achieved in CVT. At starting when the speed of the engine is minimum, the belt is at minimum diameter in primary clutch and at maximum diameter in secondary clutch so have maximum speed reduction, which is shown in Fig.2 by minimum position.

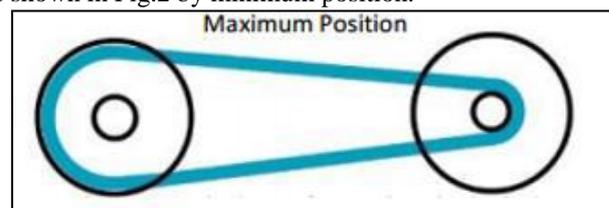


Fig. 1: Maximum Position

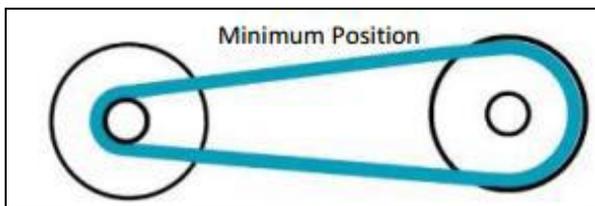


Fig. 2: Transmission Position

Now when the speed of engine increased due to throttling the belt shifts in clutches such that have contact at maximum diameter in primary clutch and minimum diameter in secondary clutch so have minimum speed reduction, which is shown in Fig.1 by maximum position

E. 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.

F. 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.

G. Gear Ratio

In all gear speeds but one, the power flow from the main drive gear (input) to the cluster gear and then from the cluster gear to the main shaft (output). The power passes through two gear sets. The exception is a 1:1 ratio, where the power flows directly from the main drive gear to the main shaft. All the forward gears are normal in constant mesh so they always rotate at their design speed relative to the engine speed. The gears of the cluster gear rotate as an assembly. The output gears usually are mounted to the main shaft so they float or rotate freely. These gears are called speed gears; they completed the ratio for each gear speed when they become coupled to the main shaft. The main shaft includes synchronizer assemblies for each pair gear speed and can lock the individual speed gears to the main shaft. This is done for each shift (Birch T. And Rockwood C. (2007). When choosing the lowest and higher gear ratio, the most important factor to consider is not just the available engine power but also the weight of the vehicle and any load it is expected to propel. Another major consideration when selecting gear ratios is deciding upon the steepest gradient the vehicle is expected to climb and the maximum level road speed the vehicle is expected to reach in top gear with a small surplus of about 0.2% grade ability (Heister H. (2004)

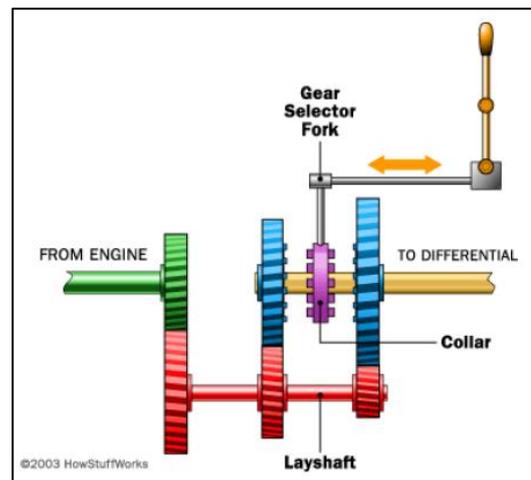


Fig. 3: Simple gear system in transmission

Source: Brain M. (2007).

The method includes selecting gear ratios for a specific application includes calculating a low gear ratio, and a high gear ratio based upon vehicle parameters and performance requirements. The total ratio spread is determined by dividing the low gear ratio by the high gear ratio. Using the total ratio spread, a geometric sequence is created at last I also included the research DESIGN AND DEVELOPMENT OF TRANSMISSION FOR TWO-SEATED URBAN CAR done by "MAARUF BIN MUHAMAD"

Introduction this chapter will deal with the overview of the state knowledge about motorcycle's reverse gear. There are several stages in developing reverse gear system that must be understood include its chronology order and related to theoretical studies because the main method in this research is by using conceptual of reverse engineering. As Modenas Kris 110cc's transmission would be the vehicle used for my research. An understanding to its specification of transmission or gearbox also must be explored before making the development of reverse gear mechanism and several improvements. Project overview and research background sections before has discuss about the significance this reverse gear to the user but not stated in details. There will be a section to discuss the major problem and user, Previous Studies, which require a better reverse mechanism system that appropriate with their uses compared to the other reverse mechanism in the market. Apart from that, reverse engineering is the main method used in this research because the Kris 110cc's transmission already exists nowadays but not providing a reverse mechanism. A clearly understanding of reverse engineering also must be discussed in this chapter from the beginning of development of reverse mechanism to get almost the same of original transmission components. Another development and innovation of this research is to design this built-in-reverse transmission in split unit or pre construction transmission. There are several criteria and causes that force in-unit transmission to be converted and built into split unit transmission.

III. BLOCK DIAGRAM

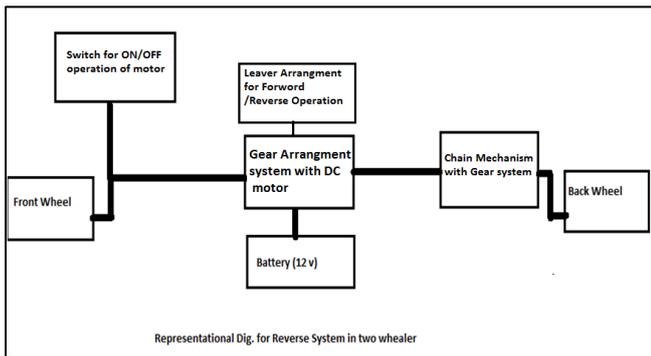


Fig. 2: Block Diagram of Reverse Gear System in two wheeler

A. Experimental Dig.:

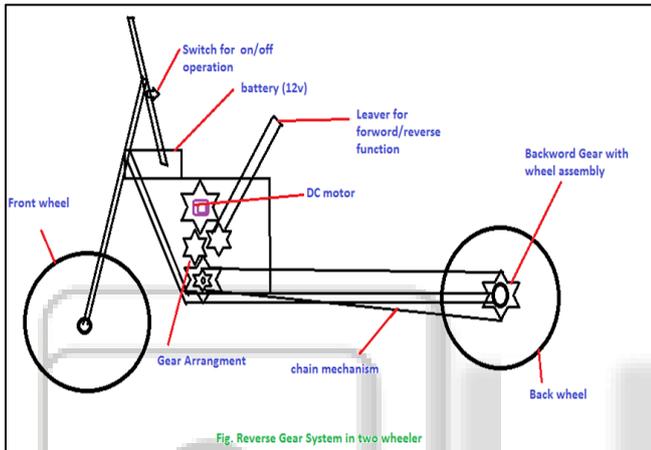


Fig. 3: Experimental Diagram of Reverse gear system

B. Description of Parts:

- Central Shaft High Torque DC Motor (100 RPM) – use as Engine here in prototype model.
- DC Motor assembly with Gear - work for Rotation of whole system.
- Two Big Gear and two small Gear – for Gear Arrangement
- Two Gear Assembly with chain – for driving the back wheel
- Lever system – for controlling the Forward / Reverse Operation
- Switch – for on/off operation of DC motor
- Battery (12v) – for power supply to motor.



C. Working Principle

- Reverse gear system is based on gear and its perfect assembly.
- As upper gear (1) is connected to lower small gear (2) and then to main drive gear (3) with chain arrangement, its transfer the power from one gear to another gear with forward force. It drive the whole system in forward direction.
- The whole function is based on drive the force on gear mechanism.
- As upper gear is connected to small gear (3) and to another small gear(2) and then to main drive gear (3) with chain arrangement. It drive the whole system in Reverse direction.
- In this way the main function of reverse gear system is perform on gear assembly
- Which will helpful for physically handicapped person.

D. Application:

- It is used to eliminate the partiality and complexity nature over the handicap peoples from the society.
- It is used to improve the tendency and ability of challengers to live with confidence and without considering the illness and disability of them.
- It is used to get back the hopeful of handicap to show the strength of them to society.
- It is provide a better convenient chariot ride feel while driving in roadways to physical challengers.

E. 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.

IV. CONCLUSION

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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