

Development and Implementation of Reverse Drive Mechanism in Bikes



Engineering

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ABSTRACT

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 without altering the existing gear box. The paper deals with the design of such a gear box and the assembly process of the gear box to the vehicle. The design deals with the conditions of the gear box operation, and the design of the gear box based on easy assembly and easy manufacturing at low cost.

1. INTRODUCTION

In motor vehicles, the transmission generally is connected to the engine crankshaft via a flywheel and or partly because inter combustion engines cannot run below a particular speed. Transmission may be Directional i.e. Forward and Reverse control may be provided. Reverse gear mechanism is used to transmit the power in reverse direction. The reverse gear was used in locomotive engine in order to stop the Train. The later it was used in three wheelers (Auto) and it became a prominent feature of four wheelers. Recently the reverse gear mechanisms implemented in two wheelers also for various applications. To design reverse gear mechanism in a two wheeler Engine. To fabricate the designed gear mechanism. The main Moto of our project is to fit the reverse gear mechanism in differently abled person's vehicles because they find it difficult to move the vehicle backward without the help of others. A simple but rugged sliding-mesh or unsynchronized/non-synchronous system, where straight-cut spur gear sets spin freely, and must be synchronized by the operator matching engine revs to road speed, to avoid noisy and damaging clashing of the gears. The now common constant-mesh gearboxes, which can include non-synchronized, or synchronized/synchromesh systems, where typically diagonal cut helical (or sometimes either straight-cut, or double-helical) gear sets are constantly "meshed" together, and a dog clutch is used for changing gears. On synchromesh boxes, friction cones or "synchro-rings" are used in addition to the dog clutch to closely match the rotational speeds of the two sides of the (de-

clutched) transmission before making a full mechanical engagement. Manual transmissions can include both synchronized and unsynchronized gearing. For example, reverse gear is usually unsynchronized, as the drive is only expected to engage it when the vehicle is at a standstill.

2. Material Selection and Fabrication[4]:

S.NO	COMPONENT	MATERIAL
1	GEAR	CAST IRON
2	BEARING	52100 CHROME STEEL
3	CHAIN DRIVE	45MN STEEL
4	SPROCKET	A3 STEEL

Table 1. Materials

3. 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 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.

GEAR RATIO CALCULATION

Gear ratio can be calculated by the following formula

$$\text{Gear Ratio} = \frac{\text{Number of teeth in driven gear}}{\text{Number of teeth in driver gear}}$$

Number of teeth in driver gear

FORWARD DIRECTION

Input gear (G_A) is directly meshed with the output gear (G_B)

Input gear G_A has 27 teeth

Output gear G_B has 23 teeth.

Gear ratio for input & output gears,

The gear ratio = driven/driver

$$= 27/23$$

$$= 1.17391$$

$$\approx 1.2 \text{ or } 1.2:1$$

For every 1 revolution of a input gear, the output gear turn 1.2 revolution.

REVERSE DIRECTION

Input gear (G_A) is meshed with one idler gear (G_I) and then idler gear is meshed with the output gear (G_B)

Input gear G_A has 27 teeth

Output gear G_B has 23 teeth.

Since we are using compound Idler gear

G_{I1} has 13 teeth

G_{I2} has 19 teeth

The Gear ratio for G_A and G_{I1} ,

Gear ratio = $27/13$

$$= 2.07 \text{ or } 2.07:1$$

The gear ratio between G_{I2} and G_B is,

gear ratio = $19/23$

$$= 0.826 \text{ or } 0.826:1$$

Hence the overall gear ratio is,

Overall gear ratio = 2.07×0.826

$$\approx 1.7 \text{ or } 1.17:1$$

For every one revolutions of the input gear, the output gear turns 1.7 revolution

4. CONSTRUCTION AND WORKING

The reverse gear on the manual transmission system typically uses an Idler gear. Idler gear is an intermediate gear which does not drive a shaft to perform any work. Sometimes, a single idler gear is used to reverse the direction, in which case it may be referred to as a reverse idler. In our system we are going to use the compound idler gear. The input gear is connected with the crank shaft. And output gear is connected with the flywheel. During forward gear the input gear is directly meshed with the output gear. If the input gear rotates in clockwise direction, the output gear will rotate in anticlockwise direction. So the vehicle moves in the forward direction. During reverse gear the idler gear is meshed in between the input and output gear. Idler gear here using is a compound gear, so smaller gear in compound gear is meshed with input gear and larger gear is meshed with output gear. When the input gear rotates in clockwise direction the idler gear rotates in anticlockwise direction. Also the output gear meshed with idler gear rotates in clockwise direction. So the vehicle moves in reverse direction.

S.NO	MATERIAL	QUANTITY	COST
1	SPUR GEAR	2	1000
2	COMPOUND GEAR (SPUR GEAR)	1	900
3	CHAIN, SPROCKET SET	1	1000
4	BEARING	5	200
5	GEAR SHIFTING LEVER	1	300
6	WELDING, GRINDING		1000
7	MACHINING		1000
8	BIKE	1	12000
9	SIDEWHEELS	2	1600
	TOTAL		20000

Table 2. Costing

5. ADVANTAGES

It requires simple maintenance cares. Low cost to coating a catalytic converter. Checking and cleaning are easy, because of the main parts are easy to Handle. Low cost automation Project. Repairing is easy. Replacement of parts is easy.

6. APPLICATION

It can be used in differently abled peoples vehicle. Also this mechanism is less in weight and size, it can be installed in any bikes.

7. CONCLUSION

Our project "reverse gear in bike" has been completed successfully and tested is done on various 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 bikes will not reduce the speed of the vehicle, hence the performance of the vehicle is not affected. Since no complex structure are used in our design, it can be easily by physically challenged peoples. Our project has a great scope in future as it will assist in parking and also travelling in traffic roads.

REFERENCE

R.S. KHURMI - "DESIGN OF MACHINE ELEMENTS" 14TH revised edition || PSG COLLEGE OF ENGINEERING "DESIGN DATA BOOK" |