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Design and Implementation of Pneumatic Gear Shifting Mechanism for two-wheeler

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Abstract
There are disclosed an automatic gear change control apparatus for an automobile and a method of controlling such apparatus. A rotational output of an internal combustion engine is connected to drive wheels of the automobile and a load device. When a gear shifting-up of an automatic transmission is to be affected, the load applied by the load device is increased, or the load is connected to an output rotation shaft of the engine via a selectively- connecting device, thereby reducing the rotational speed of the output rotation shaft of the engine to a required level. In this project, the push button is used to activate/deactivate the solenoid valve. The switch is 'ON' at the time of gear changing; the solenoid valve is activated, so that the compressed goes to the pneumatic cylinder. There are disclosed an automatic gear change control apparatus for an automobile and a method of controlling such apparatus. A rotational output of an internal combustion engine is connected to drive wheels of the automobile and a load device. Then the compressed air passes through the tube, and then pushes the pneumatic cylinder, so that the gear is changed from one speed to another speed with the help of gear box arrangement. There are disclosed an automatic gear change control apparatus an automobile and a method of controlling such apparatus. A rotational output of an internal combustion engine is connected to drive wheels of the automobile and a load device. When a gear shifting-up of an automatic transmission. The load applied by the load device is increased, or the load is connected to an output rotation shaft of the engine via a selectively-connecting device, thereby reducing the rotational speed of the output rotation shaft of the engine to a required level.

Keywords: *Pneumatic Cylinder,DC motor,Gear shifting mechanism,Two wheeler,Pneumatic gear shifting.*

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I. INTRODUCTION

Manual gear shifting or manual transmissions come in two basic types: simple un synchronized systems, where gears are spinning freely. Whereas the other one is the synchronized systems, in which all gears are always in mesh but only one of these meshed pairs of gears is locked to the shaft on which it is mounted at any one time, the others being allowed to rotate freely; thus, greatly reducing the skill required to shift gears. This invention relates to control mechanisms and more particularly to mechanisms for controlling the selection and establishment of various gear relations of automotive vehicle transmission gearing. Our Invention relates to gear shift mechanisms particularly such as are Used on automotive vehicles. It has for one of its principal objects to provide a gear shift mechanism pneumatically operated, through the instrumentality of which the various gears in the mechanism may be made operative. Other objects are to provide a gear shift mechanism which is noiseless in its operation, which greatly relieves all strain on the parts with which it is connected, which has no parts easily broken or apt to get out of order, which may be operated with but slight skill on the part of the driver, which is suitable for all makes of automotive vehicles. And which can be manufactured at a relatively low cost.As a rider when we have control over the gear shifter, typically with the rider's left foot & to operate both the clutch and brake, drivers both hands & foot remains busy. To shift the control of gear, in hand from foot & to provide safety & comfort to driver is the need from the perspective of Ergonomic

1.2 OBJECTIVE

1.Replace the manual gear shifting system with pneumatic gear shifting system.
2.To design Pneumatic Gear Shifting Mechanism for two-wheeler.
3.To design a conceptual 3D model of Pneumatically operated gear changing mechanism.
4.To overcome the drivers tediousness and gear shifting process more comfortable.
5.Analysing the overall assembly to find out Fundamental frequency of the system.

II. PROBLEM DEFINATION

In this revolutionary world of automation and optimization. Two wheelers and four wheeler manufacturers are mainly concerned about the ease of transmission systems to tend the vehicles to comfort. Minimizing the effort of Rider or Driver make the system more reliable and easy to use. Now a days, the two wheeler which we are using has gear shifting lever which might seems like a tedious job for the Long drives. To minimize such tedious process we are using pneumatic cylinders for shifting gears.Manual transmission of gears requires human effort ,accuracy, skills to select the particular gear under the different condition. In city driving condition , it is difficult to shift the gear frequently while negotiating traffic. Shifting effort and shifting frequency are differ with different age of group. It may lead to higher fuel consumption and wear and tear of gear if it is not properly operated, to overcome this difficulties alternative arrangement is used which is pneumatic operated gear shifting mechanism. Now a day, in modern vehicles, gear shifting mechanism is used for power transmission. Working prototype of the push button operated gear shifting mechanism has been tested for its functionality for the entire range of gear shifting. It can be easily incorporated to two wheeler for shifting gears with minimum alternation and the gear position can be displayed

III. METHODOLOGY

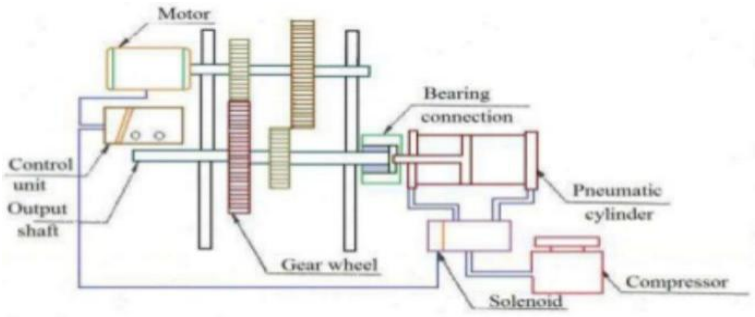

Figure 1: Block diagram of pneumatic gear shifting mechanism

IV. DESIGN AND CALCUTATION

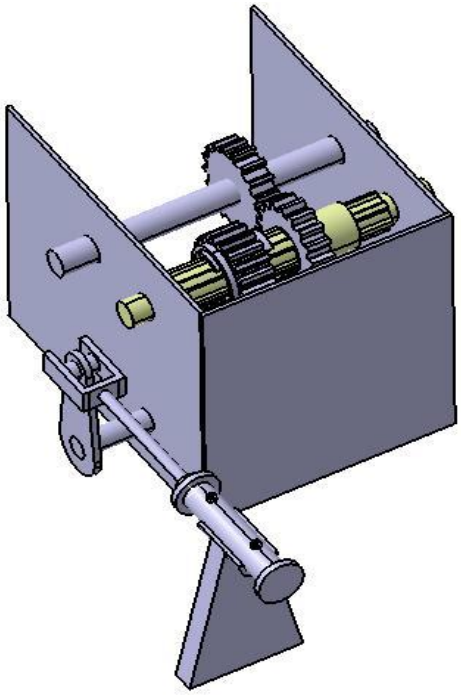

Figure2. Cad Model

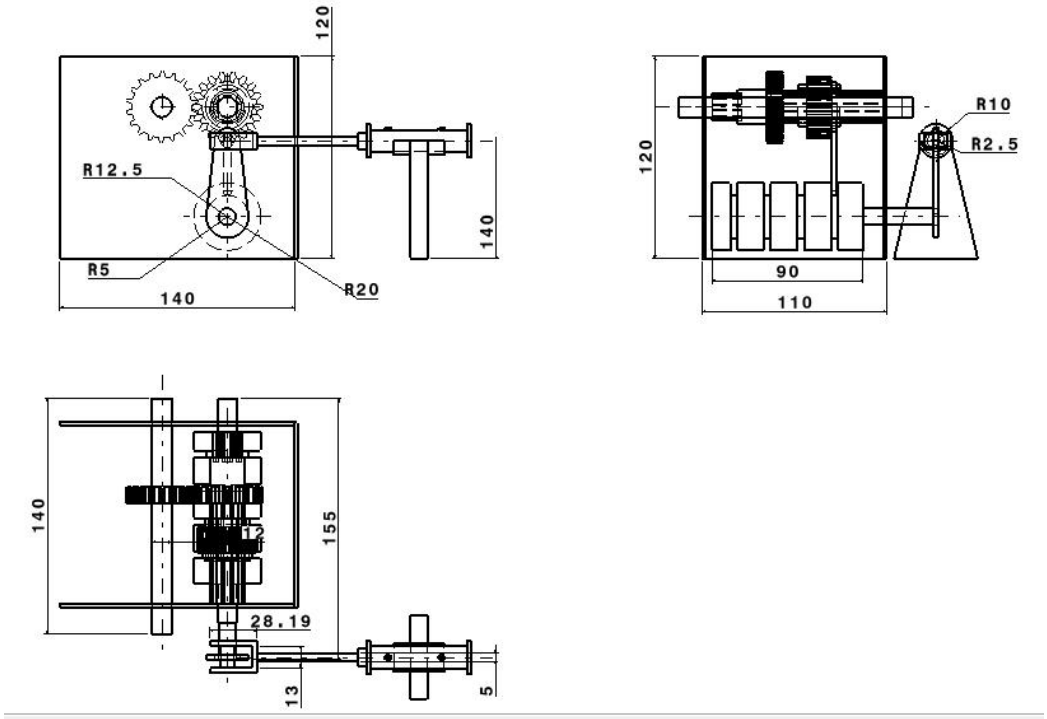

Figure3.Drafting of Model

1.4 CALCULATION

1. Shaft calculations:

We select M.S material for shaft,ϱ = 7860 kg/ m3 L = 0.183 m (we consider this length for given value of oil tank) Mt = torsional moment (torque) acting on the shaft i.e., torque supplied to shaft from motor

Mt = 41.3692 Nm

G = Modulus of rigidity (N/ m2) for M.S.material

G = 79300 N/ m2 = 79300 * 106 N/ m2

For line shaft Θ = 30 per meter length[Design data book, table no. 9.8, V.B.Bhandari] Now we know that,

Θ = (584 * Mt * l)/ (G * d4)

d4 = (584 * 41.3692 * 0.183)/ 79300 * 106 *30 ,d4 = 18.06 * 10-3

Hence d = 12.06 mm From Design data book, table no. 9.3, V.B.Bhandari we select std. Dimension of shaft. d=20 mm & designation of shaft as ISRO 20

2.Pneumatic Cylinder-

Given data:

Selecting Cylinder:25 mm diameter and 100 mm stroke. Our input given pressure is 0.4 bar. Diameter of piston rod is 8 mm.

Solution-

1) Area of piston = π/4*25^2 490.873 mm^2

2) Volume of air exhaust = stroke *area of piston =100*π/4*25^2 = 49087.385 mm^3

3) As pressure = F/A ,Outstroke force (F) = pressure *Area ofcylinder = 0.4bar *490.873m^3 = 196.349 N

4)Piston rod area A1 = π/4*d^2 π/4*8^2 = 50.20 mm^2

Effective area = piston area- piston rod area = 490.873 -50.20 = 440.673 mm^2

In-stroke force = P*A = 0.4*440.673 = 176.2692 N

As we have calculated the force required, the force required for shifting the gear= Total force/ 2 ,Force required to shift the gear = 176.27/2 = 88.135N

That means 8.98Kg of force is applied to shift the gear.

3.Motor selection:

Consider weight of the consumable = 5kg (approximately) So, the force applied is equal to = 5x9.81 newton. F= 49.05 N Hence, the torque required = 49.05 x 850 mm = 41.3692 N-m

So, we have to select a motor having considerably similar torque as calculated.

V. FUTURE SCOPE

According to the achieved results, the suggested mechanism is realizable and workable. Using the simplest pneumatic system and required hardware enables to convert the old traditional gear shifting mechanism to semi-automatic. The application of this mechanism leads to make the driving process easier, reduces the risk of destabilizing the bike, the lap/stage time, and the chance of miss shifting

VI. CONCLUSION

Present work involves the development and implementation of semi-automatic transmission for two-wheeler with gears. The application of this mechanism leads to simple and effective method for shifting gear. This mechanism makes the driving process easier and more comfortable. The driver can concentrate more on driving than the shifting of gear. This avoids the accidents. Present system reduces the strain to the driver while shifting the gears.The system is reliable and cost effective when it is produced in large scale.The project presented has involved the development and implementation of pneumatic gear transmissions for bikes. The motivation of this work is to implement this idea in clutch featured bikes with a suitable clutch control. Therefore from the above calculations it is evident that the forces exerted by the cylinders are optimum to move the shifting levers (pedals).According to the achieved results, the suggested mechanism is realizable and workable. Using the simplest pneumatic system and required hardware enables to convert the old traditional gear shifting mechanism to semi-automatic. The application of this mechanism leads to make the driving process easier, reduces the risk of destabilizing the bike, the lap/stage time,and the chance of miss shifting.

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