ISSN: 2366-1313

PNEUMATIC GEAR CHANGER FOR HANDICAPPED PEOPLE

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ABSTRACT
In this study, a gear shifting mechanism was designed and applied to make the shifting processfaster and less destructible for the driver. The new device must be reliable, has a small dimensions, low construction and maintenance cost. This paper aims to improve gear shifting processusing devices as amanual four speed gear box, two pneumatic double acting cylinders, Programmable Logic Controller (PLC), anelectrical motor , limit switches, push buttons, bulbs, a table (holder) and power supply. According to suggestedgear_ shifting method the control unit chooses optimum gear shifting ratio for an automobile without operatingit manually (using relays).Using this method leaves to the driver the excitement of choosing the shiftingmoment.

Introduction
At present dueto the extended difficulties in manual operations, the technology has shifted frommanual to automatic; few of them include ABS system, active steering system e.t.c., in order to increasepassenger safety and comfort. Increasing demands on performance, quality and cost are the main challenge fortoday's automotive industry, in an environment where movement, component and every assembly operationmust be immediately and automatically recorded, checked and documented for maximum efficiency. One of theautomatic applications includes pneumatic gear changer. This study describes in detail in an understandable wayto how to convert the traditional manually gear shifting mechanism by using microcontroller (control unit-relays).
A method of controlling a gear change of an automobile, said automobile comprising an internalcombustion engine; an automatic transmission connected to an output rotation shaft of said engine so as totransmit the rotational output of said engine to drive wheels of said automobile through any selected one of aplurality of gear ratios; a load device selectively connectable to said output rotation shaft of said engine viaselectively-connecting means; and means for generating a gear change control signal for selecting one of saidgear ratios of said automatic transmission in accordance with one of operational conditions of said automobileand said engine said method comprising the steps of controlling said selectively-connecting means when saidgear change signal-generating means generates the control signal for shifting up the gear in said automatictransmission, in such a manner that said selectively-connecting means connects said load device to said outputrotationshaftofsaidengine.
For some drivers, the gear shifting can cause some confusing at driving especially at critical situations.A crowded road on a hill or a sudden detour makes a lot of tension on the driver. One of the difficulties in thissituation is to choose right reduction ratio and engaging it at the right time. This design helps the driver toincrease his focusing on the road. Also reduces the time needed to engage the required reduction ratio, whichincreasesthevehicles'response.
1.1PNEUMATICS: The word "pneuma" comes from Greek and means wind. The word pneumatics is the study of air movement and its phenomena is derived from the word "pneuma". Today pneumatics is mainly understood to means the application of air as a working medium in industry especially the driving and controlling of machines and equipment. Pneumatics has for some considerable time between used for carrying out the simplest mechanical tasks in more recent times has played a more important role in the development of pneumatic technology for automation. Pneumatic systems operate on a supply of compressed air which must be made available in sufficient quantity and at a pressure to suit the capacity of the system. When the pneumatic system is being adopted for the first time, however it wills indeed the necessary to deal with the question of compressed air supply. The key part of any facility for supply of compressed air is by means using reciprocating compressor. A compressor is a machine that takes in air, gas at a certain

pressure and delivered the air at a high pressure. Compressor capacity is the actual quantity of air compressed and delivered and the volume expressed is that of that of the air at intake conditions namely at atmosphere pressure and normal ambient temperature.

1.2 PNEUMATIC POWER

Pneumatic systems use pressurized gases to transmit and control power. Pneumatic systems typically use air as the fluid medium because air is safe, low cost and readily available.

ADVANTAGES OF PNEUMATICS:

1. Air used in pneumatic systems can be directly exhausted back in to the surrounding environment and hence the need of special reservoirs and no-leak system designs are eliminated.
2. Pneumatic systems are simple and economical.
3. Control of pneumatic systems is easier.
4. The air could move at speed that can be adjusted from low to high. When using the pneumatic cylinder actuator, the piston speed can reach 3m/s

DISADVANTAGES OF PNEUMATICS:

1. Pneumatic systems exhibit spongy characteristics due to Compressibility of air.
2. Pneumatic pressures are quite low due to compressor design limitations(less that 250 psi).

PROBLEM IDENTIFICATION

Automation is nowadays carried out in because less skilled labor, more time lag to complete process and also to increase the accuracy, faster production of machines.so companies prefer automation but it leads the moderate people to buy it difficult for their regular use. Most of the researches in automobile is being automated so it made the manual transmission to make it as automated one it will be easier for transmission. We used some simple components to make it simple and affordable.

3. COMPONENTS USED

S.NO	COMPONENTS	QUANTITY
1	DOUBLE ACTING CYLINDERS	2
2	5/2 WAY SOLENOID OPERATED AC VALVE	2
3	VALVE CONNECTORS	5
4	HOUSING UNIT	1
5	GEAR LEVER	1
6	COMPRESSOR	1
7	GEAR ARRANGEMENT	1

COMPONENTS DESCRIPTION

In this pneumatic gear changer for four wheelers we use some electronics as well as with mechanical components. The components we used here are

- Double Acting Cylinder
- 5/2 Way solenoid operated AC valve
- Air compressors
- Gear Lever
- Pneumatic fittings
- Bulk head union
- Flexible hoses

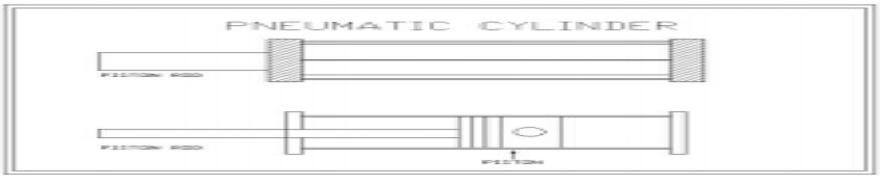
DOUBLE ACTING CYLINDER

It consists of a piston inside a cylindrical housing called a barrel. Attached to one end of the piston is a rod which the rod end has one port. This rod end port is used for entrance of air and extends outside one end of the cylinder. At another end is a port for exit of air. Double acting cylinder can be extended and retracted pneumatically. The smallest bore size of a double acting cylinder is 1 1/8 inch. The piston, which is made of ductile Iron, contains ucup packing to

seal against leakage between the piston andbarrel. The ports are located in the end caps, which are secured to the barrel by bolts and nuts.

SPOOL VALVE

The spool is rod in 5/2 values, so that 5/2 valve is called “Spool Valve”. It used to change the path of flow of air.



DIRECTION CONTROL VALVES

A direction control valve is used to change the directionf airflow as and when required by the system for reversingthe machine tool devices. A direction control valve may be classified, according to the construction of the internalmoving parts, as

1. Rotary spool Type.
2. Sliding Spool Type.
3. Solenoid operated valve.

SOLENOID OPERATED VALVES

Solenoid valves are electromechanical devices likerelays and contractors. A solenoid valve is used to obtainmechanical movement in machinery by utilizing fluid or airpressure. The fluid or air pressure is applied to the cylinder piston through a valve operated by a cylindrical electricalcoil. The electrical coil along with its frame and plunger isknown as the solenoid and the assembly of solenoid andmechanical valve is known as solenoid valve. The solenoid valve is thus another important electromechanical deviceused in control of machines.

Solenoid valves are of twotypes,

1. Single solenoid spring return operating valve,(5/2)
2. Double solenoid operating valve

AIR COMPRESSOR

An air compressor is a device that converts power(using an electric motor, diesel or gasoline engine, etc.) intopotential energy stored in pressurized air (i.e., compressedair). By one of several methods, an air compressor forcesmore and more air into a storage tank, increasing thepressure. When tank pressure reaches its upper limit the aircompressor shuts off. The compressed air, then, is held inthe tank until called into use. The energy contained in thecompressed air can be used for a variety of applications,utilizing the kinetic energy of the air as it is released and thetank depressurizes. When tank pressure reaches its owerlimit, the air compressor turns on again and re-pressurizesthe tank.

COMPRESSOR MAY BE CLASSIFIED INTWO GENERAL TYPES.

1. Positive displacement compressor
2. Turbo compressor Positive displacement

compressors are most frequently employed forCompressed air plant and have proved highly successful and supply air for pneumatic controlapplication. The types of positive compressor

1. Reciprocating type compressor
2. Rotary type compressor

II. **WorkingPrinciple:** In this construction there are two pneumatic cylinders consisting of pistons on either side of thevehiclepedalforengagingthegear.Thecylindersareoperatedwiththehelpofapressurizedaircomingfromcompressoranditis controlledbyacontrolunit(microcontroller).Thismicrocontroller(chip)ispre-programmed for working of the system. The role of two pneumatic cylinders is one for increasing the gear speedand for decreasing the gear speed. For the forward motion one cylinder is actuated & for the reverse motionsecond cylinderisactuated.

III. **Constructiondetails:** The two solenoid valves are connected to a compressor with the help of hoses of Ø6mm from whichpressurized air is extracted. The solenoid valves are followed by two pneumatic cylinders with the help of airhoses. The cylinders are followed by a clutch pedal. Next to the clutch pedal gear box and a motor arrangementis present. The construction also includes a proximity sensor which senses the speed of the wheel. The precisesignals are sent to the solenoid valves by the control unit through the relays. Therefore the input is speed of thewheel sensed by a sensor and the output is shifting of gear accordingly. The power to the control unit issupplied from the 12V battery. On the other hand the shifting of gear can be monitored on an LCD. It alsoconsists of DC motor, ATMEGA Development board, speed regulator (accelerator), transformer etc.Thefollowing fig. explains briefly about the construction of the pneumatic gear changer incorporated in inductionmotors:

Working Procedure:

The compressor sends the pressurized air to the solenoid valves through the hoses of 6mm diameter where as the solenoid valve acts as temporary storage of air and acts as passage. The air from the solenoid valves passes to the pneumatic cylinders which act as working medium for actuating cylinders. When air enter into the cylinders the pistons starts reciprocating that is extraction and retraction. The retraction is done manually by operating switches on the solenoid valves by closing the air inlet. On the other hand the relays send the precise signals to the solenoid valves. The input for these relays is the speed of the wheel or vehicle which is sensed by sensor proximate to the wheel. The shifting of gear is done by altering the speeds by rotating the rotor in the speed regulating board i.e., accelerator in case of automobile. The following analysis shows the procedure for shifting of gears.

The gear shifting operation is start when lever is turned in the control valve. When the hand lever is turned, the 5/2 way directional controlled solenoid valve supplies pressurized air to the air cylinder in the pneumatic cylinder unit. The piston rod pushes the yoke in the gear changer .thus gear drive changes to next speed. The cylinder in 'A-(MINUS) position the middle gear connects the bottom shaft gears and in A+ position the middle gear connects the top shaft gears. Then the gear shifting operation is performed in ease so the devise works perfectly using the principle followed. In this construction there are two pneumatic cylinders consisting of pistons on either side of the vehicle pedal for engaging the gear. The cylinders are operated with the help of a pressurized air coming from compressor and it is controlled by a control unit (micro controller). This microcontroller (chip) is pre-programmed for working of the system. The role of two pneumatic cylinders is one for increasing the gear speed and for decreasing the gear speed. For the forward motion one cylinder is actuated & for the reverse motion second cylinder is actuated.

V. Conclusion:

The project presented has involved the development and implementation of automatic transmissions forbikes. The motivation of this work is to implement this idea in clutch featured bikes with a suitable clutchcontrol. The automatic transmission can be also used in 5 and 6 speed versions by altering few changes in theprogram.Thereforefrom theabove calculations it is evident that theforces exertedby the cylinders areoptimum to move the shifting levers (pedals).According to the achieved results, the suggested mechanism isrealizable and workable. Using the simplest PLC and required hardware enables to convert the old traditionalgear shifting mechanism to semi automatic one. The application of this mechanism leads to make the driving process easier, reduces the risk of destabilizing the car, thelap/stagetime, andthechanceof missshifting.

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