Conceptual Modelling and Fabricating Button Operated Electro-Magnetic Gear Shifting System

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Abstract: A method of controlling a gear change of an automobile, said automobile comprising an internal combustion engine; an automatic transmission connected to an output rotation shaft of said engine so as to transmit the rotational output of said engine to drive wheels of said automobile through any selected one of a plurality of gear ratios; a load device selectively connectable to said output rotation shaft of said engine via selectively-connecting means; and means for generating a gear change control signal for selecting one of said gear ratios of said automatic transmission in accordance with one of operational conditions of said automobile and said engine said method comprising the steps of controlling said selectively-connecting means when said gear change signal-generating means generates the control signal for shifting up the gear. 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 effected, 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 our project, two electromagnetic coils are coupled to the gear rod of the two ends. The two buttons are used to activate the electro-magnetic coil so that the gear will be shifted.

***Index Terms* – Gear Shifting, Button typed, Pneumatic operated, Electro Magnetic Coil.**

I. INTRODUCTION

A method of controlling a gear change of an automobile, said automobile comprising an internal combustion engine; an automatic transmission connected to an output rotation shaft of said engine so as to transmit the rotational output of said engine to drive wheels of said automobile through any selected one of a plurality of gear ratios; a load device selectively connectable to said output rotation shaft of said engine via selectively-connecting means; and means for generating a gear change control signal for selecting one of said gear ratios of said automatic transmission in accordance with one of operational conditions of said automobile and said engine said method comprising the steps of controlling said selectively-connecting means when said gear change signal-generating means generates the control signal for shifting up the gear in said automatic transmission, in such a manner that said selectively-connecting means connects said load device to said output rotation shaft of said engine.

An automatic gear change control apparatus for an automobile, said automobile comprising an internal combustion engine; an automatic transmission connected to an output rotation shaft of said engine so as to transmit the rotational output of said engine to drive wheels of said automobile through any selected one of a plurality of gear ratios; said apparatus comprising a load device for applying a load; means for connecting said load device to said output rotation shaft of said engine and for generating a gear change control signal for selecting one of said gear ratios of said automatic transmission in accordance with one of operational conditions of said automobile and said engine; and load control means for increasing the load of said load device when said gear change signal-generating means generates the control signal for shifting up the gear in said automatic transmission.

II. MATERIALS REQUIRED

2.1 Pneumatic Cylinder

Pneumatic cylinders (sometimes known as air cylinders) are mechanical devices which use the power of compressed gas to produce a force in a reciprocating linear motion Pneumatic cylinders (sometimes known as air cylinders) are mechanical devices which use the power of compressed gas to produce a force in a reciprocating linear motion.

2.2 Compressor:

An air compressor is a device that converts power (usually from an electric motor, a diesel engine or a gasoline engine) into kinetic energy by compressing and pressurizing air, which, on command, can be released in quick bursts. There are numerous methods of air compression, divided into either positive-displacement or negative-displacement.

2.3 Hose Pipes:

A hose is a flexible hollow tube designed to carry fluids from one location to another. Hoses are also sometimes called pipes (the word pipe usually refers to a rigid tube, whereas a hose is usually a flexible one), or more generally tubing. The shape of a hose is usually cylindrical (having a circular cross section). Hose design is based on a combination of application and performance.

Common factors are Size, Pressure Rating, Weight, Length, Straight hose or Coil hose and Chemical Compatibility. Hoses are made from one or a combination of many different materials.

2.4 Adapter

The adapter facilitates the connection of the crimping head to the pneumatic tooling assembly and provides the necessary straight line motion of the movable die when the pneumatic tooling assembly is actuated. The adapter features a switch, two quick pins, and a threaded SDE pin. The switch can be used to manually open and close the dies of the crimping head for insertion and removal of the product. The quick pins secure the outer housing tabs of the crimping head to the adapter, and the threaded SDE pin secures the movable die of the crimping head to the internal spring--loaded die holder and switch of the adapter.

2.5 Push Button

A push-button (also spelled pushbutton) or simply button is a simple switch mechanism for controlling some aspect of a machine or a process. Buttons are typically made out of hard material, usually plastic or metal. The surface is usually flat or shaped to accommodate the human finger or hand, so as to be easily depressed or pushed. Buttons are most often biased switches, though even many un-biased buttons (due to their physical nature) require a spring to return to their un-pushed state. Different people use different terms for the "pushing" of the button, such as press, depress, mash, and punch.

III. DESIGN CALCULATIONS

3.1. DESIGN OF BALL BEARING

Bearing No. 6202

Outer Diameter of Bearing (D) =35 mm

Thickness of Bearing (B) =12 mm

Inner Diameter of the Bearing (d) =15 mm

Maximum Speed =14,000 rpm (From design data book)

Mean Diameter (dm) = (D + d) / 2

= (35 + 15) / 2

dm =25 mm

WAHL STRESS FACTOR

Ks =4C – 1 + 0.65

=4C – 4 C

=(4 X 2.3) -1 + 0.65

Ks =1.85

3.2 SPECIFICATION OF FOUR STROKE PETROL ENGINE:

Type	: Four strokes
Cooling System	: Air Cooled
Bore/Stroke	: 50 x 50 mm
Piston Displacement	: 98.2 cc
Compression Ratio	: 6.6: 1
Maximum Torque	: 0.98 kg-m at 5,500RPM

CALCULATION:

Compression ratio =(Swept Volume + Clearance Volume)/ Clearance Volume

Here,

Compression ratio =6.6:1

Vc = 19.64

Assumption:

1. The component gases and the mixture behave like ideal gases.
2. Mixture obeys the Gibbs-Dalton law

Pressure exerted on the walls of the cylinder by air is P_1

$$P_1 = (M_1RT)/V$$

Here,

M_1=m/M= (Mass of the gas or air)/(Molecular Weight)

R =Universal gas constant=8.314 KJ/Kg mole K.

T_1 =303 °K

V_1 =V=253.28 x 10^{-6} m³

Molecular weight of air =Density of air x V mole

Here,

Density of air at 303°K =1.165 kg/m³

V mole =22.4 m³/Kg-mole for all gases.

∴Molecular weight of air =1.165 x 22.4

$\therefore P_1 = \{[(m_1/(1.165 \times 22.4)] \times 8.314 \times 303\}/253.28 \times 10^{-6}$

$P_1 = 381134.1\, m_1$

Let Pressure exerted by the fuel is P_2

$P_2 = (N_2\, R\, T)/V$

Density of petrol = 800 Kg/m^3

$\therefore P_2 = \{[(M_2)/(800 \times 22.4)] \times 8.314 \times 303\}/(253.28 \times 10^{-6}$

$P_2 = 555.02\, m_2$

Therefore Total pressure inside the cylinder

$P_T = P_1 + P_2$

$= 1.01325 \times 100\ KN/m^2$

$\therefore 381134.1\, m_1 + 555.02\, m_2 = 1.01325 \times 100$ ------------------------- (1)

Calculation of air fuel ratio:

Carbon = 86%

Hydrogen = 14%

We know that,

1Kg of carbon requires 8/3 Kg of oxygen for the complete combustion.

1Kg of carbon sulphur requires 1 Kg of Oxigen for its complete combustion.

Therefore,

The total oxygen requires for complete combustion of 1 Kg of fuel

$=[\ (8/3c) + (3H_2) + S]$ Kg

Little of oxygen may already present in the fuel, then the total oxygen required for complete combustion of Kg of fuel

$=\{\ [\ (8/3c) + (8H_2) + S\ ] - O_2\}$ Kg

As air contains 23% by weight of Oxygen for obtain of oxygen amount of air required=100/23 Kg

∴Minimum air required for complete combustion of 1 Kg of fuel

$=(100/23)\ \{\ [\ (8/3c) + H_2 + S] - O_2\}$ Kg

So for petrol 1Kg of fuel requires $=(100/23)\ \{\ [\ (8/3c) \times 0.86 + (8 \times 0.14)\ ]\ \}$

=14.84 Kg of air

∴Air fuel ratio $=m_1/m_2 = 14.84/1$

$\therefore m_1 = 14.84\, m^2$

Substitute (2) in (1)

$1.01325 \times 100 = 3.81134\,(14.84\, m_2) + 555.02\, m_2$

$\therefore m_2 = 1.791 \times 10^{-5}$ Kg/Cycle

Mass of fuel flow per cycle $=1.791 \times 10^{-5}$ Kg cycle

Therefore,

Mass flow rate of the fuel for 2500 RPM

$[(1.791 \times 10^{-5})/3600] \times (2500/2) \times 60$

$= 3.731 \times 10^{-4}$ Kg/sec

Calculation of calorific value:

By Delong's formula,

Higher Calorific Value $= 33800\, C + 144000\, H_2 + 9270\, S$

$= (33800 \times 0.86) + (144000 \times 0.14) + 0$

HCV = 49228 KJ/Kg

Lower Calorific Value $=HCV - (9H_2 \times 2442)$

$=49228 - [(9 \times 0.14) \times 2442]$

=46151.08 KJ/Kg

LCV =46.151 MJ/Kg

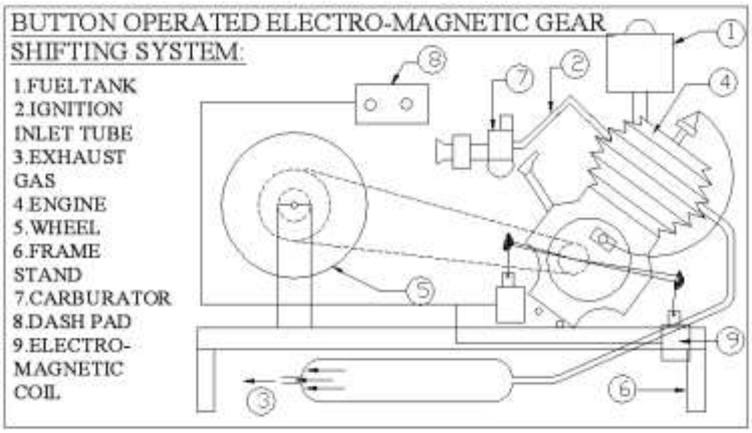

Fig.1. 2D Design of gear shifting mechanism

IV. CONSTRUCTION AND WORKING PRINCIPLE

The main objective of this concept is used to apply the gear by using automation system in automobile vehicles. This is the new innovative model mainly used for the vehicles to control the vehicle. Here we are concentrating to design the automatic gear changing mechanism in two wheeler vehicles by using the mechanical devices. This is very useful for the gear changing mechanism in automobile vehicles. By using this we can easily control the vehicle and improve the performance of the vehicle also we can avoid the wear and tear of the gear

A method of controlling a gear change of an automobile, said automobile comprising an internal combustion engine and means for generating a gear change control signal for selecting one of said gear ratios of said automatic transmission in accordance with one of operational conditions of said automobile and said engine said method comprising the steps of controlling said selectively-connecting means when said gear change signal-generating means generates the control signal for shifting up the gear in said automatic transmission, in such a manner that said selectively-connecting means connects said load device to said output rotation shaft of said engine. The two electro-magnetic coils are fixed to the gear shaft of the two ends. One is used to shift the gear in upward direction. Another one is used to shift the gear in downward direction. These two coil is operated depends upon the activation of the push button.

V. CONCLUSION

This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work. We feel that the project work is a good solution to bridge the gates between institution and industries. The Button Operated Electro-Magnetic Gear Shifting System is working with satisfactory conditions. We are able to understand the difficulties in maintaining the tolerances and also quality. We have done to our ability and skill making maximum use of available facilities. Thus we have developed a “Button Operated Electro-Magnetic Gear Shifting System” which helps to know how to achieve low cost automation. The application of electro-magnetic coil produces smooth operation. By using more techniques, they can be modified and developed according to the applications.

Fig.2.a. Button operated system setup

Fig.2.b. Vehicle with Button operated gear shifting

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