DESIGN AND FABRICATION OF FIST CLUTCH

PROJECT REPORT

Submitted by

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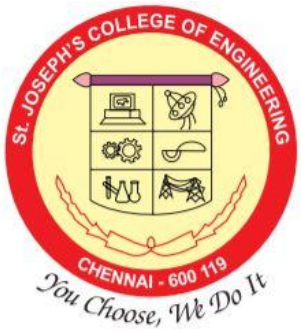
in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

in

MECHANICAL ENGINEERING



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BONAFIDE CERTIFICATE

Certified that this project report **"DESIGN AND FABRICATION OF FIST CLUTH"** is the bonafide work of **"THANGA PRAKASH M** and **VARUN D"** who carried out the project work under my supervision.

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Submitted for End Semester VIVA VOICE Examination held on _____

INTERNAL EXAMINER **EXTERNAL EXAMINER**

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TABLE OF CONTENTS

ABSTRACT

The technology of pneumatics has gained tremendous importance in the field of workplace rationalization and automation from old-fashioned timber works and coal mines to modern machine shops and space robots.

It is therefore important that technicians and engineers should have a good knowledge of pneumatic system, air operated valves and accessories. The air is compressed in an air compressor and from the compressor plant the flow medium is transmitted to the pneumatic cylinder through a well laid pipe line system. To maintain optimum efficiency of pneumatic system, it is of vital importance that pressure drop between generation and consumption of compressed air is kept very low.

The aim is to design and develop a control system based an intelligent electronically controlled automotive braking system is called **"DESIGN AND FABRICATION OF FIST CLUTCH"** This clutch system is consisting of Pneumatic cylinder solenoid Valve and compressor. When we pressing the push button then solenoid valve will give passage to flow of compressed air through it. Then compressed air will directly hit the piston the piston will move forward and push the clutch pedal. This total operation like as a clutch applying while we gear changing.

LIST OF TABLES

LIST OF FIGURES

LITERATURE REVIEW

Zachary Bornemann John LaCamera Leo Torrente

“Development of hand control interface for manual transmission vehicles”

The goal of the MQP was to design and build a minimally invasive hand control interface that can be used by paraplegics or double leg amputees to control manual transmission automobiles. This control interface can also be used by individuals who describe themselves as car enthusiasts and enjoy driving manual transmission vehicles. The primary components of the control interface are mechanical linkages and a steel cable system to actuate the brake and clutch pedals of an automobile. Some products exist that offer control of the gas, brake, and clutch to the user by the means of a hand interface such as the Guidosimplex ‘Duck’ Semi-Automatic Clutch and the Alfred Bekker Manual Hand Clutch, however these products are expensive, invasive, and take away from the full experience of driving a manual transmission of the car. The team conducted analysis of current assistive driving devices, calculated the dynamics of mechanical linkages and steel cables for the brake and clutch systems, and manufactured a prototype control interface. Compared to earlier control interfaces, the team was able to design and build a mechanical

control interface with reduced components that offers a tactile response with a simple installation process.

METHODOLOGY

Methodology is the systematic, Theoretical analysis of the methods applied to a study or to the theoretical analysis of the method and principles associated with branch of study.

1. Studying the present mechanisms.
2. Field Survey
3. To identifying the potential problem.
4. Problem definition.
5. Literature review.
6. Design of Fist clutch.
7. Calculation.
8. Fabrication.

CHAPTER 1 – INTRODUCTION

1.1 CLUTCH

Clutch is used to engage or disengage the engine to the transmission or gear box. When the clutch is in engaged position, the engine power or rotary motion of engine crankshaft is transmitted to gear box and then to wheels. When clutch is disengaged, the engine power does not reach to gear box (and to wheels) although engine is running. Clutch is also used to allow shifting or changing of gears when vehicle is running. For shifting gears, clutch is first disengaged then gear is shifted and then clutch is engaged. Clutch has to be disengaged to stop the vehicle and also at the time of idling.

PRINCIPLE OF CLUTCH

It operates on the principle of friction. When two surfaces are brought in contact and are held against each other due to friction between them, they can be used to transmit power. If one is rotated, then other also rotates. One surface is connected to engine and other to the transmission system of automobile. Thus, clutch is nothing but a combination of two friction surfaces.

Requirements of Clutch

1) Torque Transmission

2) Gradual Engagement

3) Heat Dissipation

4) Dynamic Balancing

5) Vibration Damping

6) Size

7) Inertia

8) Ease of operation

MAIN PARTS OF A CLUTCH

It consists of

(a) A driving member,

(b) A driven member

(c) An operating member.

Driving member has a flywheel which is mounted on the engine crankshaft. A disc is bolted to flywheel which is known as pressure plate or driving disc. The driven member is a disc called clutch plate. This plate can slide freely to and fro on the clutch shaft. The operating member consists of a pedal or lever which can be pressed to disengaged the driving and driven plate.

TYPES OF CLUTCH

Some types of clutches used in vehicles are given below

(a)Friction Clutch :

It may be

(i) single plate clutch,

(ii) multi-plate clutch, or

(iii) Cone clutch.

Multi-plate clutch can be either wet or dry. A wet clutch is operated in an oil batch whereas a dry clutch does not use oil.

(b) Centrifugal clutch.

1.2 Objective of the project

The objective of this project is to fabricate a fist clutch which can be operated by just using a push button .

This system is designed as user friendly to disabled person too. In this project we use the push button to operate the clutch. Push button is attached on the top of the gear lever.

When we press the button, it switches on the solenoid valve which operates the pneumatic cylinder and presses the clutch pedal. Clutch pedal is comprised of return spring that retracts the clutch pedal.

We use the compressor and several pneumatic components for the air supply. As the button is attached to the gear lever, it is easy for disabled person to operate the clutch by a single press.

CHAPTER 2 – COMPONENTS AND MECHANISMS USED

2.1 HAND LEVER SOLENOID VALVE

FIG 2.1

The directional valve is one of the important parts of a pneumatic system. Commonly known as DCV, this valve is used to control the direction of air flow in the pneumatic system. The directional valve does this by changing the position of its internal movable parts.

This valve was selected for speedy operation and to reduce the manual effort and also for the modification of the machine into automatic machine by means of using a solenoid valve. A solenoid is an electrical device that converts electrical energy into straight line motion and force. These are also used to operate a mechanical operation which in turn operates the valve mechanism.

Solenoids may be push type or pull type. The push type solenoid is one in which the plunger is pushed energized electrically.

2.2 PNEUMATIC CYLINDER

FIG 2.2

Pneumatic cylinders can be used to get linear, rotary and oscillatory motion. There are three types of pneumatic actuator:

1. Linear Actuator or Pneumatic cylinders
2. Rotary Actuator or Air motors
3. Limited angle Actuators

Pneumatic cylinders are devices for converting the air pressure into linear mechanical force and motion. The pneumatic cylinders are basically used for single purpose application such as clamping, stamping, transferring, branching, allocating, ejecting, metering, tilting, bending, turning and many other applications.

2.3 HOSE

FIG 2.3

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. Applications mostly use nylon, polyurethane, polyethylene, PVC, or synthetic or natural rubbers, based on the environment and pressure rating needed. In recent years, hoses can also be manufactured from special grades of polyethylene (LDPE and especially LLDPE). Other hose materials include PTFE (Teflon), stainless steel and other metals

HOSE SPECIFICATION:

Max pressure	:	10×10^{5} N/m²
Outer diameter	:	6 mm = 6×10^{-3}m
Inner diameter	:	3.5 mm = 3.5×10^{-3}m

2.4 CLUTCH PEDAL

Clutch Pedal is used to apply the clutch whenever we require but in our project it will be actuated by pneumatic cylinder.

FIG 2.4

Material - mild steel,
Length - 250mm,
Width - 50mm.

2.5 FRAME

A frame is a structural system that supports other components of a physical construction. Frame is used to carry the total setup of arrangement. It would be joined by arc welding to get permanent joint. So frame is very important to our project.

FIG 2.5

Material: Mild Steel
Type: Rectangular

2.6 CONNECTOR:

- Max working pressure : 10 x 10 ^{5} N/m²
- Temperature : 0-100 º C
- Fluid media : Air
- Material : Brass.

FIG 2.6

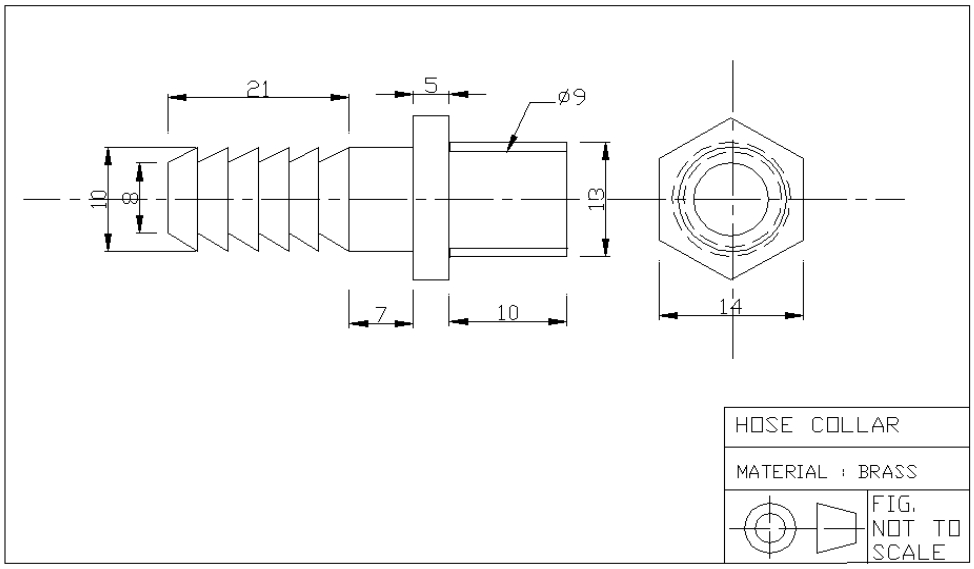

FIG 2.6.1

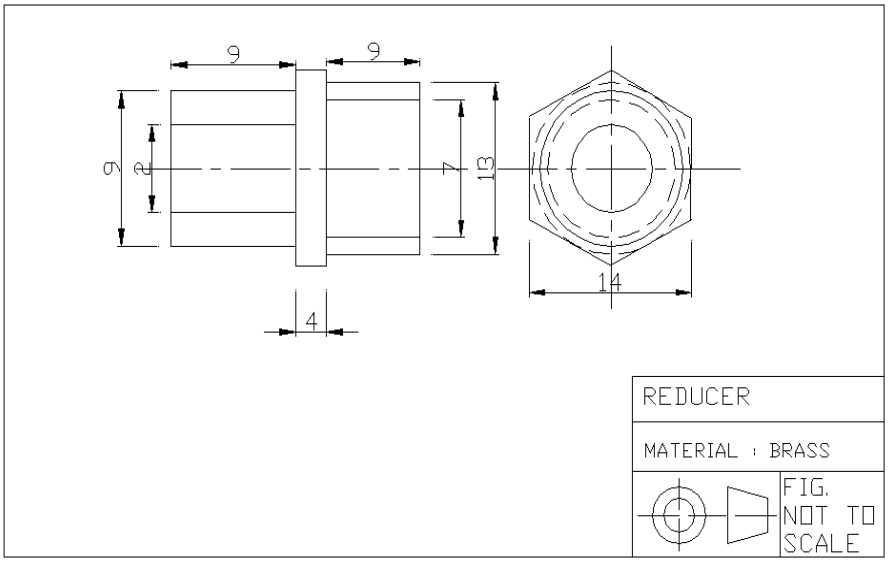

FIG 2.6.2

CHAPTER 3

3.1 PNEUMATIC CYLINDER DESIGN:

Design of Piston rod:

Load due to air Pressure.

Diameter of the Piston (d) = 20 mm

Pressure acting (p) = 6 kgf/cm²

= 6 ×0.981

= 5.886 bar

= 0.5886N/mm^2

Material used for rod =C 45

(Data book page no 1.12)

Yield stress (σ_y)=36 kgf/mm²

=36×98.1

=3531.6 bar

= 353.16N/mm^2

Factor of safety =2(data book page.no 8.19)

Force acting on the rod (F) = Pressure x Area

= p x (Πd² / 4)

= 0.5886 x {(Π x 20²) / 4 }

F = 739.6 N

Design Stress(σ_y) = σy / F0 S

= 353.16 / 2

= 176.5N/mm^2

∴d = √4F/π [σy]

= √ (4×739.6)/ π[176.5]

∴ Minimum diameter of rod required for the load = 2.3 mm

We assume diameter of the rod = 7.5 mm

Length of piston rod:

Approach stroke = 160 mm

Length of threads = 2 x 20

=40mm

Extra length due to front cover = 12 mm

Extra length of accommodate head = 20 mmTotal length of the piston rod = 160 + 20 +12 +20

= 212 mm

By standardizing, length of the piston rod = 210 mm.

CHAPTER 4

CONSTRUCTION & WORKING PRINCIPLE

4.1 CONSTRUCTION

FIG 4.1

Our proposed model "**FIST CLUTCH FOR PHYSICALLY CHALLENGED HUMANS**" need so many raw materials which are mentioned in above chapter.For that materials first of all we purchased the raw materials based upon requirement and for that we've planned to how to buy. After bought we cut raw materials in required dimensions in precise manner by using hand wheel cutting machine. After that we've gone for some rough turning and finishing by using lathe and grinding machines. After that for assembly purpose we went for welding for permanent joint wherever we require and joined

with rivets wherever we require rigidly fixed joints. After that we've connected the solenoid valve and pneumatic cylinder with polyurethane tubes for the flow of compressed air to actuate the clutch pedal and brake.

4.2 WORKING PRINCIPLE

FIG 4.2

The hand lever activate the solenoid valve when the optimum distance value is crossed. If the solenoid valve is activated, the compressed air passes to the Single Acting Pneumatic Cylinder. The compressed air activates the pneumatic cylinder and moves the piston rod. If the piston moves forward, then clutch arrangement activated.

4.3 COST ESTIMATION

Sl. No.	PARTS	Qty.	Material cost
1	Shaft	1	300
2	Bearing with bearing cap	1	1000
3	Pneumatic Cylinder	1	1000
4	Solenoid Valve	1	1500
5	Hoses and Connections	1	200
6	Clutch pedal	1	500
7	Spring	1	100
8	Frame	1	400
9	Total		5000

TABLE 4.1

LABOUR COST:

LATHE, DRILLING, WELDING, GRINDING, POWER HACKSAW, GAS CUTTING:

Cost = 2000/-

OVERHEAD CHARGES

The overhead charges are arrived by “Manufacturing cost”

Manufacturing Cost =Material Cost + Labour cost

= 5000 + 2000

= 7000

Overhead Charges = 14.5% of the manufacturing cost

= 1000

TOTAL COST

Total cost = Material Cost + Labour cost + Overhead Charges

= 5000+ 2000+ 1000

= ₹8000

Total cost for this project = Rs.8000

CHAPTER 5:2D LAYOUT

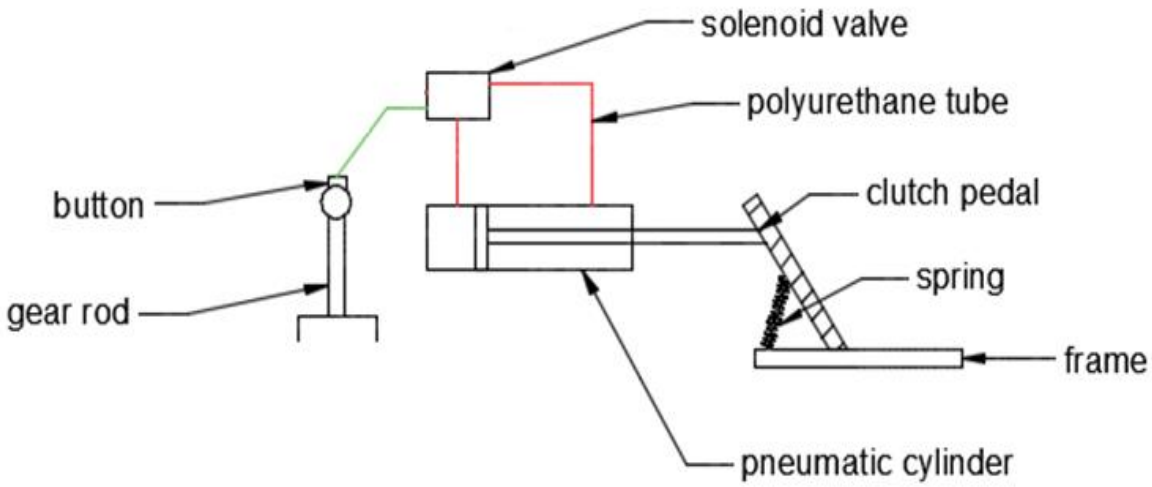

FIG 5.1

TOP VIEW

FIG 5.2

SIDE VIEW RIGHT

FIG 5.3

SIDE VIEW LEFT

FIG 5.4

CHAPTER 6: ADVANTAGES AND APPLICATIONS

ADVANTAGES

- ✓ It requires simple maintenance cares
- ✓ The safety system for automobile.
- ✓ Checking and cleaning are easy, because of the main parts are screwed.
- ✓ Easy to Handle.
- ✓ Repairing is easy.
- ✓ Replacement of parts is easy.
- ✓ Used by disabled persons.

APPLICATIONS

It is very much useful for Car Owners & Auto-garages.

Thus it can be useful for the following types of vehicles;

1) MARUTI

2) AMBASSADOR

3) FIAT

4) MAHINDRA

5) TATA

CONCLUSION

The project presented has involved the development and implementation of pneumatic clutch based on the distance of vehicles in order to avoid the accidents. The motivation of this work is to implement this idea in clutch featured cars with a suitable clutch control. Therefore from the above calculations it is evident that the forces exerted by the cylinders are optimum to apply or push clutch pedal. 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 applying mechanism to semi-automatic. The application of this mechanism leads to make the driving process easier, reduces the risk of destabilizing the car, the lap/stage time, and the chance of miss applying.

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