FABRICATION OF COMPRESSED AIR BREAKING SYSTEM

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ABSTRACT

The Brake Systems Of The Rolling Stocks Are Generally Consisted Of Electrical And Mechanical Brake Systems. Because Of Its Inherent Structure Of The Each Brake System,The Electrical Brake System Is Mainly Used At The High Speed Range While The Mechnical Brake System Is Uded At The Relatively Lower Spped Range. It Is Desirable For The Rolling Stocks To Apply The Entire Electical Brake Systems.However, Since The Brake Force From Electric Brake System Is Not Enough To Stop The Rolling Stock Within The Legal Stop Distance. Therefore, The Mechanical Brake System Is Indispensable To Rolling Stocks.InGeneral,The Vast Majonity Of The World Trains Are Equipped With Mechnical Breaking Systems Which Use Compressed Air As The Force To Push Block On Two Wheels Or Pads On To Discs.TheseMechnical Systems Are Known As Air Brake Or Pneumatic Brakes.For Their Brake System,Basically Huge Scale Air Compressor Is Equipped And The Long Pipe Line Is Completive Connected. Since Mass Of These Air Components,It Is Difficult To Be Weight Equipment And The Long Pipe Lne Raises The Maintenance Problem.In Order To Overcome These Problems Of Air Brake System.

KEY WORDS: *Pneumatic Cylinder, battery, Solenoid Valve, 5/2 DCV, Compressor, Flexible hose.*

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1. INTRODUCTION:

Pneumatic Brakes (Also Called **Electro-Mechanical Brakes** Or **Em Brakes**) Slow Or Stop Motion Using Pneumatic Force To Apply Mechanical Resistance (Friction). The Original Name Was "Electro-Mechanical Brakes" But Over The Years The Name Changed To "Pneumatic Brakes", Referring To Their Actuation Method. Since Becoming Popular In The Mid-20th Century Especially In Trains And Trolleys (Trams, Not Shopping Cart), The Variety Of Applications And Brake Designs Has Increased Dramatically, But The Basic Operation Remains The Same.

Both Pneumatic Brakes And Eddy Current Brakes Use Pneumatic Force But Pneumatic Brakes Ultimately Depend On Friction And Eddy Current Brakes Use Magnetic Force Directly.

1.1 Role and responsibilities

My roles and responsibilities include:

- Prepare a requirement document to reach expectations of project and to come up with functionalities which are needed to be implemented.
- Documentation of expected output for various aspects with accepted margin error was also documented.
- To design overall system based on workflow requirements.

- Discussion with the project guide and head of department on ways to improve the design and to optimize performance.
- Choosing suitable components and methods based on the configurations availability and requirements.
- Testing and remedies.
- Recommendations

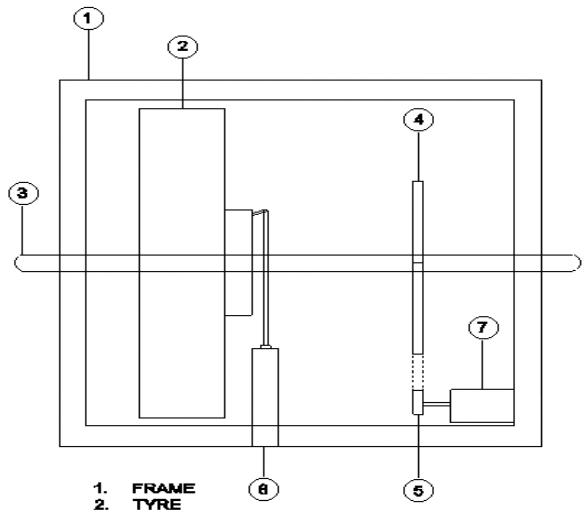
1.2 Personal engineering activity

As a mechanical engineer, before undertaking any task i checked the feasibility of the project. In this project, my role is as team members. This report provides an insight into the design and fabrication of a pneumatic braking system.
I wanted to know more details of the project before commencing; hence, i researched the topic thoroughly by referring to journals and articles online. Additionally, i obtained more information by taking references about the topic.

1.3 PNEUMATICS:

The word 'pneuma' comes from greek and means breather 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 thenecessary to deal with the question of compressed air supply.

1.4. DESIGN OF AIR COMPRESS BREAKING SYSTEM 2 D:-



2. Pneumatic actuator:

Physical processes proceeding in drives are submitted to the gas laws. The gas laws are a set of laws that describe the relationship between thermodynamic temperature (t), pressure (p) and volume (v) of gases. Three of these laws, boyle's law, charles's law, and gay-lussac's law, may be combined to form the combined gas law

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

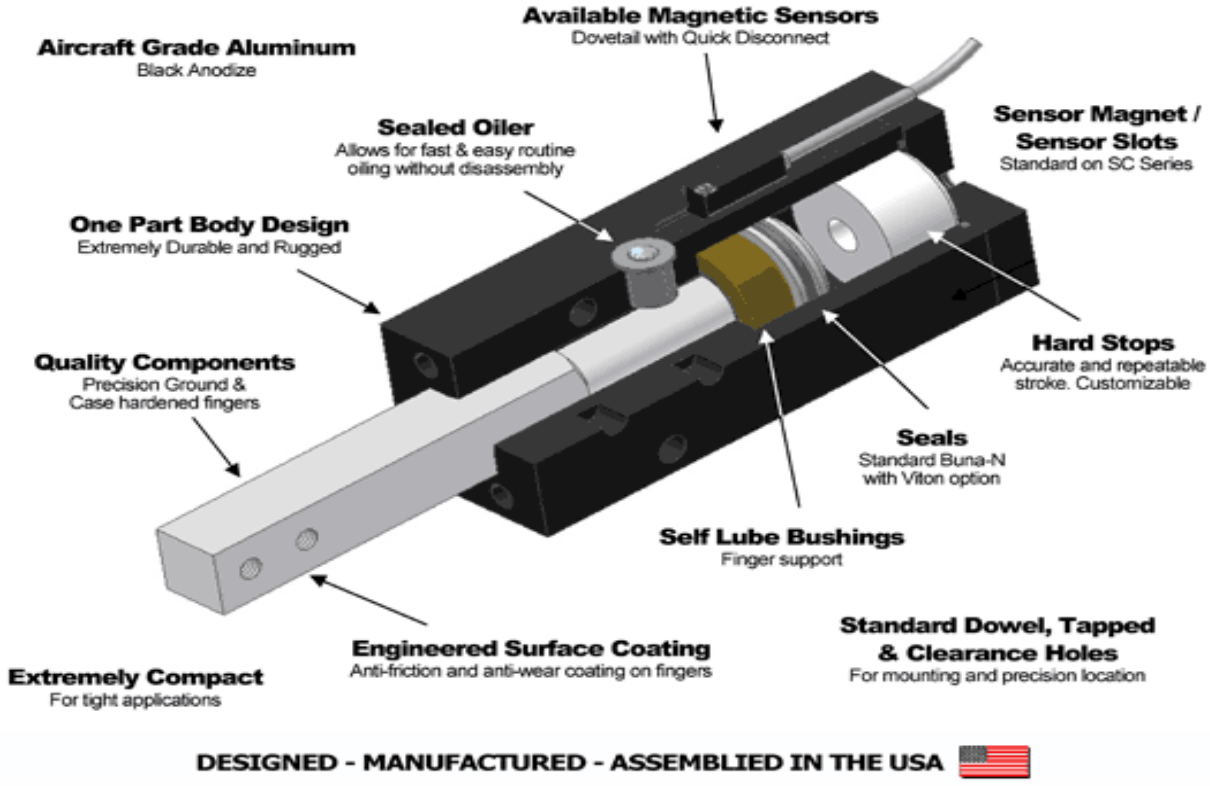
Which with the addition of avogadro's law later gave way to the ideal gas law. Other important gas laws include dalton's law of partial pressures. The kinetic theory of gases, graham's law of effusion and root mean square velocity explains how individual molecules act in a gas and their relation to pressure, volume, and temperature. A gas that obeys these gas laws is known exactly as an ideal gas (or perfect gas). An ideal gas does not exist; however, some gases follow the laws more closely than the others in given standard conditions.
The most important gas law is the ideal gas law, which states that:PV=MRT
Other gas laws, such as vanderwaals equation, seek to correct the ideal gas laws to reflect the behavior of actual gases. Van der waals equation alters the ideal gas law to reflect how actual gases function using a series of calculated values called van der waalsconstan.

3. Pneumatic control component:

- Compressor
- Pneumatic cylinders
- Solenoid valve
- Flow control valve
- Hoses
- Connector5
- Control unit
- Frame

PNEUMATIC CYLINDER
An air cylinder is an operative device in which the state input energy of compressed air i.e. pneumatic power is converted in to mechanical output power, by reducing the pressure of the air to that of the atmosphere.

➢ **Fir**



The basic, rod-style industrial cylinder consists of a tube sealed by end caps. A rod attached to an internal piston extends through a sealed opening in one of the ends. The cylinder mounts to a machine and the piston rod acts upon the load.

4.2 Double acting cylinders:

A double acting cylinder is employed in control systems with the full pneumatic cushioning and it is essential when the cylinder itself is required to retard heavy loads. This can only be done at the end positions of the piston stock. In all intermediate positions a separate externally mounted cushioning device must be provided with the damping feature. The normal escape of air is out off by a cushioning piston before the end of the stock is required. As a result the sit in the cushioning chamber is again compressed since it cannot escape but slowly according to the setting made on reverses. The air freely enters the cylinder and the piston stokes in the other direction at full force and velocity.

Fig 4.2: Double Acting Cylinder

4.3 Compressor

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 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 may be classified in two general types.

1. Positive displacement compressor.
2. Turbo compressor.

Positive displacement compressors are most frequently employed for compressed air plant and have proved highly successful and supply air for pneumatic control application.

The types of positive compressor are:

1. Reciprocating type compressor
2. Rotary type compressor.

Fig 4.3: Compressor

4.4. Flexible Hose

The flexible hoses connect the solenoid valve and the cylinder block. Hoses are made of in layer of elastomer (or) synthetic rubber and braided fabric which takes up the higher pressure. If the hose is subjected to rubbing, it should be enclosed in a protective sleeve.

Fig 4.4: Flexible hoses

5. Working

The compressed air from the compressor at the pressure of 8 to 12bar is passed through a pipe connected to the solenoid valve with one input. The solenoid valve isactuated with control timing unit. The solenoid valve has two outputs and one input. The airentering into the input goes out through the two outputs when the timing control unit is actuated. Dueto the high air pressure at the bottom of the piston, the air pressure below the piston is more than thepressure above the piston. This moves the piston rod upwards which further moves up the effort arm,pivoted by control unit. This force acting is passed on to punch which also moves downwards. Thepunch is guided by a punch guide which is fixed such that the punch is clearly guided to the die. Thematerials are in between the punch and die. So as the punch descends down, the material is shearedto the required profile of the punch and the blank is moved downwards through the die clearance.

6.Merits

- It reduces the manual work.
- Quick in operation.
- Accuracy is more.
- Low cost machine.
- Consumption of electric power is less when compare with manual machines.
- Low cost automation, man power for performing operations are reduced.

Demerits

- Workpiece changing for every operation is manual .
- Noise in operation .
- Constant pressure maintenance is required for thought operation .
- Connections are may be leak .
- Pressure drop occur in the pipelines .

7. CONCLUSION:

Pneumatic Brakes Have Been Used As Supplementary Retardation Equipment In Addition To The Regular Friction Brakes On Heavy Vehicles. An Pneumatic Brake Would Be Very Advantageous, As It Has Great Braking Efficiency And Has The Potential To Regain Energy Lost In Braking. When Used In A Large Vehicle, These Regenerative Brakes Could Generate Large Quantities Of Electricity To Be Re-Used By The Vehicle, Instead Of Being Lost As Heat. Furthermore, These Pneumatic Brakes Would Reduce Break Wear, A Common Problem With Many Cars.

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