Design And Fabrication Of Antilock Braking System (Pneumatic)

G.Vengadajalapathi[1], P.Balashanmugam[2], R.Suresh[3]
[1, 2, 3] Assistant Professors Dept of Mechanical Engineering
[1, 2, 3] Annamalai University, Chidambaram

Abstract- *Stopping a car in a hurry on slippery and road turnings can be very challenging. Anti lock braking systems (ABS) take a lot of challenge out of this sometimes nerve-wracking event. In fact, on slippery and turning surfaces, even professional drivers can't stop as quickly without ABS as an average driver can with ABS. The main components of an ABS system are, Pneumatic Cylinder, Relay with Driver circuit, Solenoid valve, control unit and DC motor.*

Keywords- Pneumatic power, single acting air cylinder, solenoid valve, air compressor, Antilock braking system

I. INTRODUCTION

A brake is a device for slowing or stopping the motion of a machine or vehicle, or alternatively a device to restrain it from starting to move again. The kinetic energy lost by the moving part is usually translated to heat by friction. Alternatively, in regenerative braking, much of the energy is recovered and stored for later use.

As the standard of living people increased together with the human population it resulted in a drastic increase in the number of moving vehicles on the road. This means that the probability of the number of accidents also increase which resulted in heightened need of safety systems in automobiles. Keeping this fact in mind we have developed a unique way of preventing accidents, by sensing the vehicle which is moving in front measure the distance between the two and if the distance is close enough for a contact, the sensor will immediately send signal to the ECU which actuates the pneumatic cylinder to apply brakes. Thereby preventing a possible accident!

1.1. 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 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.

The compressibility of the air was first investigated by Robot Boyle in 1962 and that found that the product of pressure and volumes of particular quantity of gas.

The usual written as

$$PV = C \quad \text{(or) } P_iV_i = P_2V_2$$

In this equation the pressure is the absolute pressured which for free is about 14.7Psi and is of courage capable of maintaining a column of mercury, nearly 30 inches high in an ordinary barometer. Any gas can be used in pneumatic system but air is the mostly used system now a days.

1.2. Selection of Pneumatics

Mechanization is broadly defined as the replacement of manual effort by mechanical power. Pneumatic is an attractive medium for low Cost mechanization particularly for sequential (or) repetitive operations. Many factories and plants already have a compressed air system, which is capable of providing the power (or) energy requirements and control system (although equally pneumatic control systems may be

economic and can be advantageously applied to other forms of power).

The main advantage of an all pneumatic system are usually Economic and simplicity the latter reducing maintenance to a low level. It can have outstanding advantages in terms of safety.

1.3. 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.

The Advantages of Pneumatics

a) Air used in pneumatic systems can be directly exhausted back
b) In to the surrounding environment and hence the need of special reservoirs and no-leak system designs are eliminated.
c) Pneumatic systems are simple and economical
d) Control of pneumatic systems is easier

Disadvantages Of Pneumatics

a) Pneumatic systems exhibit spongy characteristics due to compressibility of air.
b) Pneumatic pressures are quite low due to compressor design limitations(less that 17.8bar).

1.4. Brake

The modern automobile drum brake was invented in 1902 by Louis Renault, though a less-sophisticated drum brake had been used by maybe a year earlier. In the first drum brakes, the shoes were mechanically operated with levers and rods or cables. From the mid-1930s the shoes were operated with oil pressure in a small wheel cylinder and pistons (as in the picture), though some vehicles continued with purely-mechanical systems for decades. Some designs have two wheel cylinders.

The shoes in drum brakes are subject to wear and the brakes needed to be adjusted regularly until the introduction of self adjusting drum brakes in the 1950s. In the 1960s and 1970s brake drums on the front wheels of cars were gradually replaced with disc brakes and now practically all cars use disc brakes on the front wheels, with many offering disc brakes on all wheels. However, drum brakes are still often used for handbrakes as it has proven very difficult to design a disc brake suitable for holding a car when it is not in use. Moreover, it is very easy to fit a drum handbrake *inside* a disc brake so that one unit serves as both service brake and handbrake.

Early type brake shoes contained asbestos. When working on brake systems of older cars, care must be taken not to inhale any dust present in the brake assembly. The United States Federal Government began to regulate asbestos production, and brake manufacturers had to switch to non-asbestos linings. Owners initially complained of poor braking with the replacements; however, technology eventually advanced to compensate. A majority of daily-driven older vehicles have been fitted with asbestos-free linings. Many other countries also limit the use of asbestos in brakes.

1.5. Self-Applying Characteristic

Drum brakes have a natural "self-applying" characteristic. The rotation of the drum can drag either or both of the shoes into the friction surface, causing the brakes to bite harder, which increases the force holding them together. This increases the stopping power without any additional effort being expended by the driver, but it does make it harder for the driver to modulate the brakes sensitivity.

Disc brakes exhibit no self-applying effect because the hydraulic pressure acting on the pads is perpendicular to the direction of rotation of the disc. Disc brake systems usually have servo assistance ("Brake Booster") to lessen the driver's pedal effort, but some disc braked cars (notably race cars) do not need to use servos.

1.6. Drum Brake

Drum brakes are typically described as either leading/trailing or twin leading. Rear drum brakes are typically of a leading/trailing design, the shoes being moved by a single double-acting hydraulic cylinder and hinged at the same point. In this design, one of the brake shoes will always experience the self-applying effect, irrespective of whether the vehicle is moving forwards or backwards. This is particularly useful on the rear brakes, where the footbrake must exert enough force to stop the vehicle from travelling backwards and hold it on a slope. Provided the contact area of the brake shoes is large enough, which isn't always the case, the self-applying effect can securely hold a vehicle when the weight is transferred to the rear brakes due of the incline of a slope or the reverse direction of motion.

Front drum brakes may be of either design in practice, but the twin leading design is more effective. This

design uses two actuating cylinders arranged so that both shoes will utilize the self-applying characteristic when the vehicle is moving forwards. The brake shoes pivot at opposite points to each other. This gives the maximum possible braking when moving forwards, but is not so effective when the vehicle is travelling in reverse.

The optimum arrangement of twin leading front brakes with leading/trailing brakes on the rear allows for more braking force to be deployed at the front of the vehicle when it is moving forwards, with less at the rear. This helps to prevent the rear wheels locking up, but still provides adequate braking at the rear when it is needed.

II. DESCRIPTION OF EQUIPMENTS

2.1 Pneumatic Cylinder

All the strange names and terms around pneumatics have evolved through about 100 years of their use in manufacturing. Double acting, four way, quick connect are all terms that were invented to describe (as best as could be) the difference between the parts. Don't let the names discourage you. They're just names. I've used quite colorful terms myself when working with pneumatics, most of which i won't use here...

2.1.1. Air Cylinders

There are only two main kinds of air cylinders: Double acting, and single acting. They come in *all* variations, shapes and sizes. Both kinds are useful for haunt work. Double acting cylinders are useful when you need to push in both directions, and single acting cylinders are useful when only a push in one direction is needed. And, sometimes 'in a pinch', you can adapt a double to act as a single, and a single to act as a double.

Air cylinders are measured by three main values: "pressure rating", the "bore", and "stroke" as shown in table 2.1.

Table2.1.Air cylinders pressure rating, bore and stroke

Pressure	This is the maximum pressure the air cylinder can safely handle.
Bore	The interior diameter of the cylinder.
Stroke	The range of movement of the air cylinder's rod.

There are lots of calculations to accurately figure the power of a cylinder, but most haunt pop-up applications can be handled by air cylinders in the range of 3/4" to 1-1/2" bore, and 3" to 8" stroke.

Power measurements primarily take into account the air pressure (the higher the pressure, the more power); and the bore (the larger the bore - the more power). The power ratings are usually only quoted at maximum pressure. So if a cylinder produces180 pounds of 'push', it will only deliver that at the maximum pressure (usually 250 psi for commercial cylinders). Haunters should work their props to work and much, much lower pressures. A good goal is not to exceed 60-70psi for working props. Going much higher causes more stress on the prop and all parts in the air system, and make your compressor run more often. Even at lower pressures, air cylinders can still move very fast and deliver quite a lot push, so always be very careful around pneumatics!.Double Acting means the air cylinder rod is 'pushed' out, and 'pushed' in

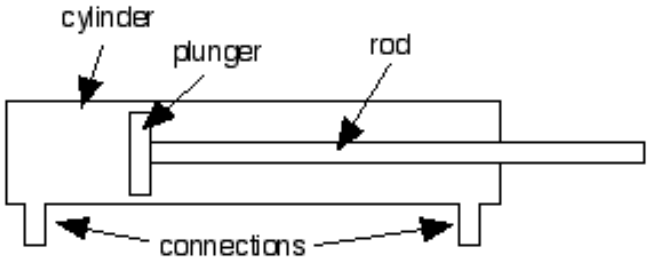

Figure 2.1.A typical double acting air cylinder

Every double acting air cylinder has these basic parts. A cylinder to hold everything together, a 'plunger' that the air pushes against, two connections to get the air in and out, and a rod that goes in and out. That's it. Here's a simple animation to illustrate the motion.

As air is sent into the left connection (pressure is shown in yellow in figure 2.1), it pushes against the plunger and the rod goes out. At the same time, air is released out of the right connection. To reverse the motion, air is sent into the right connection, pushing against the plunger on the other side and the rod is forced back in.

The trick to the double acting cylinder is that you have to let air OUT of the other side! This is an important feature of the double acting cylinder, and an advantage that

gives you great control over the motion of the rod (but, more on that later!).

2.1.2. Single Acting Cylinder

Single Acting means the air cylinder rod is ONLY pushed in a single direction, either out or in. There is only one connection for air, and a little hole in the other end to let air in and out. A spring is used to push the rod in the opposite direction after air pressure is removed.

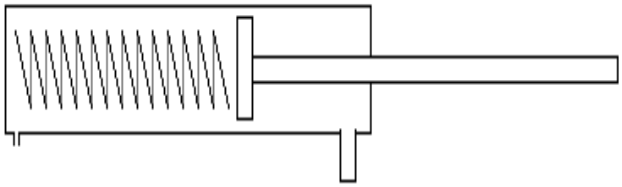

Figure 2.2. Single Acting Air Cylinder

Single Acting Air Cylinder, with the rod normally out without pressure as shown in figure 2.2.

As air is pushed into the connection, the plunger begins to move and compress the spring. Exhaust air exits out the exhaust hole on the other end. When air is released, it exits out the connection, and air is sucked into the exhaust hole as the spring pushes the plunger back to its resting position. Basically, the spring is 'push' needed to return the plunger and rod back to their starting position.

When selecting a cylinder for an application, remember that a double acting cylinder pushes in both directions, while a single acting cylinder only pushes in one direction.

2.1.3. Mounting

There are about as many ways to mount an air cylinder as there are different types of air cylinders. Again, this is because of all the uses. My personal favorite is the clevis mount. Clevis mounts give the greatest amount of movement, flexibility, and ease of mounting over other mounts.

2.2.Solenoid Valves

Here's the most confusing part of dealing with pneumatics - solenoids. Just like air cylinders, they come in all sizes, styles, shapes, sizes, and combinations. There's literally something for everyone when it comes to solenoids.

TIP: Don't worry about what the solenoid looks like, just what it can do.

The whole 'four port ‘,’ five ports, 'two way', 'three way', naming came from the action of the air as it moves through the solenoid. Again, the names aren't as important as what it does. The best combination of flexibility and use for double acting cylinders is what's called a "five port, four way" solenoid (they're also called 'valves') as shown in figure 2.3.

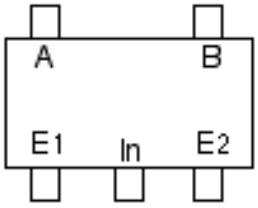

Figure 2.3.Five port, four way solenoid

A five port solenoid has just that - five connections called ports. Usually, they are labeled A, B, E1, E2, and In. There are variations of this too. In most cases, any pair of ports that have a label that has an 'A & B', '1 & 2', 'A1 & A2' - that's the ports that connect to the air cylinder. Exhaust ports almost always have an 'E' in the name. There is almost always a single 'In'. Notice he phrase 'almost always' - that's because there are cases where solenoids have several sets of in's and out's to fill a particular application. Ok, that's the 'five port' part.

The 'four way' term describes the paths that air can take when the solenoid is in operation. Use the drawing to follow this description. When a four way solenoid is 'off' or 'de-energized', air will flow through from the In to the A port (that's one way), and also let out of port B through port E1 (two ways). So air goes in through the In port, and out the A port to push the cylinder, and it lets air out of port B (through E1) as shown in figure 2.4.

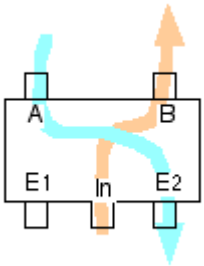

Figure 2.4..Four way solenoid

And when the solenoid is 'on', (energized), air pressure from the In port flows to the B port (the third way),

and exhaust air is let out of port A through port E2 (the fourth way).

An important characteristic of the 5 port, 4way solenoid is called "orifice" size. This is the size of the internal air paths through the solenoid. Its usually quoted is diameter. An orifice of at least 1/8" is recommended, with a size of 1/4" preferred. The orifice size directly affects the solenoids air flow. The more air it can move, the faster an air cylinder can move.

2.2.1. Fittings

There are two very useful fittings: Push-in (or Push-on), and quick-connect. The quick-connect are the standard fittings seen mostly at a gas station. They are extremely useful to 'quickly' connect and disconnect air to props. The Push-in connectors are very useful to connect solenoids to air cylinders. Both of these connector types are highly recommended.

2.2.2. Regulators and filters

Most air systems include air regulators, particle filters, water filters, and manual valves to deliver 'good' air to the solenoids and air cylinders.

The most important of these is the air regulator. This unit sets the overall pressure for your air system. A good starting pressure to run a few popups is 60 psi or less. If you're supporting a large air system with lots of popups and long air lines, 70-80 psi is not excessive. However, pressures beyond 80 psi will begin to 'stress' the entire system, and show itself in small leaks around fittings, wear and tear of popup mechanisms, and long running times for the compressor.
You may also consider having several regulators in your air system. This gives you the option of optimizing just the right amount of air to each place. For example, a jumper popup may only need 30psi to work. Running it on your 60 psi system will eventually wear it out. Placing a regulator just before the jumper's solenoid lets you reduce air pressure and just give the jumper what it needs to run.

Particle and water filters are useful items to use to keep your air lines free from debris and moisture. Debris will clog air lines, solenoids and cause erratic or intermittent operation. Moisture in the air line will cause rust to form.
There are also lubricators that add a small amount of oil to the air to keep the mechanics working smoothly.

2.2.3. Pressure Control Valve

The main function of the pressure control valve is to limit (or)

Control the pressure required in a pneumatic circuit.

Depending upon the method of controlling they are classified as

1. Pressure relief valve
2. Pressure reducing valve

2.3. Air Compressor

Compressor is the air producing machine. They collect the airs from the atmosphere are in the running of machine are engine. Air compressors are utilized to raise the pressure of a volume of air as shown in figure 2.5. Air compressors are available in many configurations and will operate over a very wide range of flow rates and pressures. Compressed air was expelled by primitive man to give glowing embers sufficient oxygen to allow them to flare up into a fire. During the compression process, the temperature increases as the pressure increases. This is known as polytypic compression. The amount of compression power also increases as the temperature increases. Compressors are staged thereby reducing the temperature rise and improving the compression efficiency. The temperature of the air leaving each stage is cooled prior to entering the next stage. This cooling process is called intercooling. Volumetric efficiency also increases with multi-stage compression since the pressure ratio over the first stage will be decreased.

Selection of the air compressor is only the first step in designing an efficient and reliable compressed air system. The air exiting the compressor is saturated with moisture and will have compressor lubricants (lubricated compressors only). Other chemicals that may have been drawn into the compressor intake may also be present. This contamination is harmful to many processes, pneumatic tools, instruments and equipment. Air purification equipment, filters, air dryers, breathing air purifiers, monitoring equipment, used alone or in combination will remove these contaminants. Selection and purchase of the compressor and necessary purification equipment can be easily done on the Compressed air site. Our application engineers are ready to answer all of your questions and to assist you in placing your order. And it work in the process of rotating the fan and the piston movement with the help of current supply.

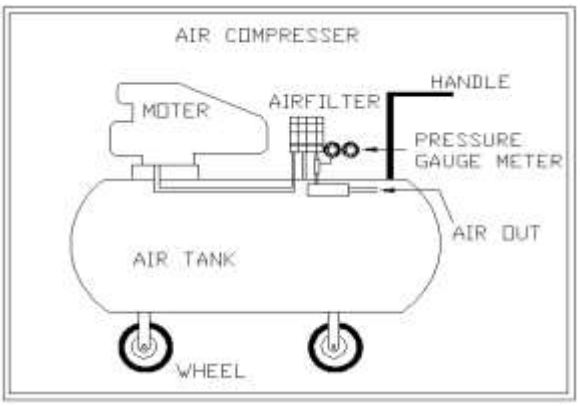

Figure 2.5..Air compressor

2.4. Wheel

A wheel is a circular device that is capable of rotating on its axis, facilitating movement or transportation or performing labour in machines. A wheel together with an axle overcomes friction by facilitating motion by rolling. In order for wheels to rotate a moment needs to be applied to the wheel about its axis, either by way of gravity or by application of another external force. Common examples are found in transport applications. More generally the term is also used for other circular objects that rotate or turn, such as a Ship's wheel and flywheel. The wheel most likely originated in ancient as shown in figure 2.6.

The wheel is a device that enables efficient movement of an object across a surface where there is a force pressing the object to the surface. Common examples are a cart drawn by a horse, and the rollers on an aircraft flap mechanism.

The wheel is not a machine, and should not be confused with the wheel and axle, one of the simple machines. A driven wheel is a special case, that is a wheel and axle. Wheels are used in conjunction with axles, either the wheel turns on the axle or the axle turns in the object body. The mechanics are the same in either case. The normal force at the sliding interface is the same. The sliding distance is reduced for a given distance of travel. The coefficient of friction at the interface is usually lower.

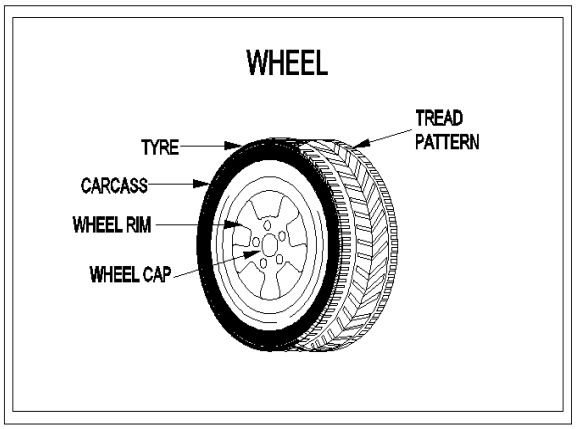

Figure 2.6.Wheel

2.5. Brake

The brakes are one of the most important control components of vehicle as shown in figure 2.7. They are required to stop the vehicle within the smallest possible distance and this is done by converting the kinetic energy of the vehicle into the heat energy which is dissipated into the atmosphere. The brake must be strong enough to stop the vehicle within a minimum distance in an emergency. But this should also be consistent with safety. The driver must have proper control over the vehicle during emergency braking and the vehicle must not skid. The brakes must have good effectiveness should not decrease with constant prolonged application while descending be very efficient.

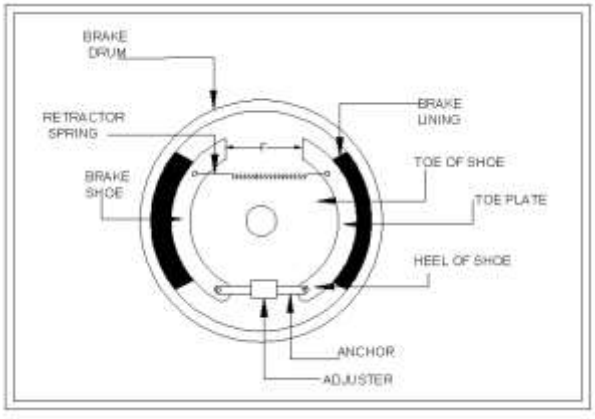

Figure 2.7.Brake

2.5.1. Electric Brakes

This type of brakes, through not very popular, as service brakes, has been commonly used on trailers. One such example is Warner electric brake.

The current from the battery is utilized to energize an electromagnet within the brake drum, which in turn actuates

the mechanism to expand the brake shoes. When current stops, the cam brake shoes are returned to the release position by retractor springs. The severity of braking is controlled by means of a rheostat, which is operated by the driver through the foot pedal.

As an alternative to the foot-operated rheostat, hydraulic pressure has also been used to apply electric brakes. As pedal is pressed more, hydraulic pressure actuates the rheostat to increase the current to the electromagnet. Still another method uses an inertia weight to uncover a light. As the brakes are applied for the main vehicle, it slows down due to which the weight or pendulum in the trailer brake control device moves forward, exposing a light-sensitive diode to more of the light beam. This increases the current to the electromagnet in the trailer brake, there by applying these brakes.

A brake is a device for slowing or stopping the motion of a machine or vehicle, or alternatively a device to restrain it from starting to move again. The kinetic energy lost by the moving part is usually translated to heat by friction. Alternatively, in regenerative braking, much of the energy is recovered and stored for later use.

Note that kinetic energy increases with the square of the velocity ($E = 1/2 \cdot m \cdot v^2$ relationship). This means that if the speed of a vehicle doubles, it has four times as much energy. The brakes must therefore dissipate four times as much energy to stop it and consequently the braking distance is four times as long.

Brakes of some description are fitted to most wheeled vehicles, including automobiles of all kinds, trucks, trains, motorcycles, and bicycles. Baggage carts and shopping carts may have them for use on a moving ramp.

Some aeroplanes are fitted with wheel brakes on the undercarriage. Some aircraft also feature air brakes designed to slow them down in flight. Notable examples include gliders and some WWII-era fighter aircraft. These allow the aircraft to maintain a safe speed in a steep descent. The Saab B 17 dive bomber used the deployed undercarriage as an air brake.
Deceleration and avoiding acceleration when going downhill can also be achieved by using a low gear; see engine braking.
Friction brakes on cars store the heat in the rotating part (drum brake or disc brake) during the brake application and release it to the air gradually.

2.6. Motor

In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. As you are well aware of from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion as shown in figure 2.8.

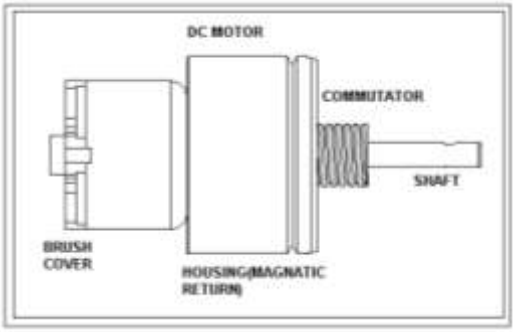

Figure 2.8.Motor

Let's start by looking at a simple 2-pole DC electric motor (here red represents a magnet or winding with a "North" polarization, while green represents a magnet or winding with a "South" polarization).

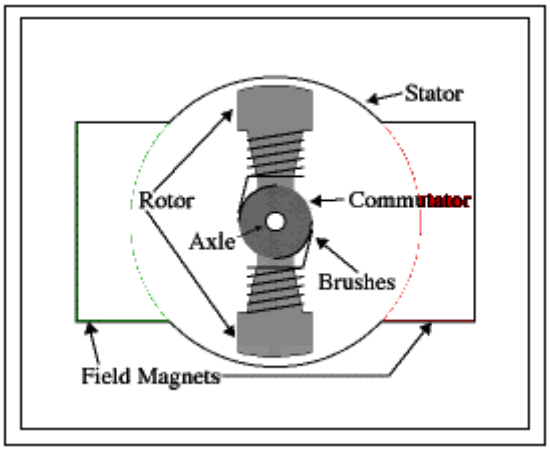

Figure 2.9.Principle operation of motor

Every DC motor has six basic parts -- axle, rotor (armature), stator, commutator, field magnet(s), and brushes. In most common DC motors, the external magnetic field is produced by high-strength permanent magnets. The stator is the stationary part of the motor -- this includes the motor casing, as well as two or more permanent magnet pole pieces. The rotor (together with the axle and attached commutator)

rotates with respect to the stator. The rotor consists of windings (generally on a core), the windings being electrically connected to the commutator. The above diagram shows a common motor layout -- with the rotor inside the stator (field) magnets as shown in figure 2.9.

The geometry of the brushes, commutator contacts, and rotor windings are such that when power is applied, the polarities of the energized winding and the stator magnet(s) are misaligned, and the rotor will rotate until it is almost aligned with the stator's field magnets. As the rotor reaches alignment, the brushes move to the next commutator contacts, and energize the next winding. Given our example two-pole motor, the rotation reverses the direction of current through the rotor winding, leading to a "flip" of the rotor's magnetic field, driving it to continue rotating.

In real life, though, DC motors will always have more than two poles (three is a very common number). In particular, this avoids "dead spots" in the commutator. You can imagine how with our example two-pole motor, if the rotor is exactly at the middle of its rotation (perfectly aligned with the field magnets), it will get "stuck" there. Meanwhile, with a two-pole motor, there is a moment where the commutator shorts out the power supply as shown in figure 2.10. This would be bad for the power supply, waste energy, and damage motor components as well. Yet another disadvantage of such a simple motor is that it would exhibit a high amount of torque "ripple" (the amount of torque it could produce is cyclic with the position of the rotor).

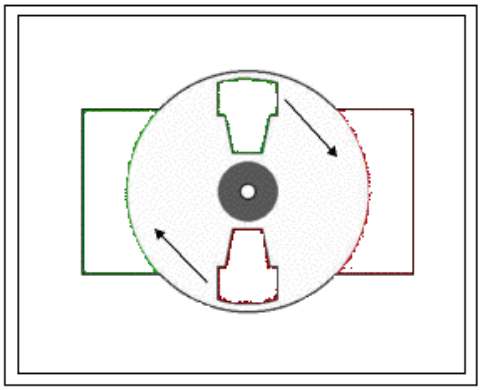

Figure 2.10.DC motor-two pole

So since most small DC motors are of a three-pole design, let's tinker with the workings of one via an interactive animation (JavaScript required) as shown in figure 2.11.

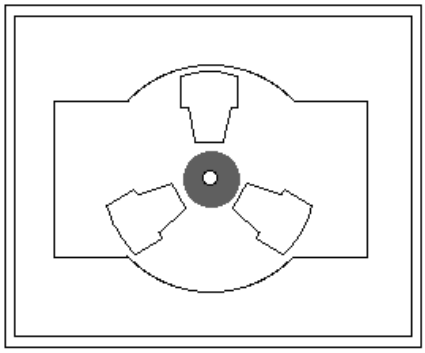

Figure 2.11..DC motor three pole

A few things from this -- namely, one pole is fully energized at a time (but two others are "partially" energized). As each brush transitions from one commutator contact to the next, one coil's field will rapidly collapse, as the next coil's field will rapidly charge up (this occurs within a few microsecond) as shown in figure 2.12.We'll see more about the effects of this later, but in the meantime you can see that this is a direct result of the coil windings' series wiring:

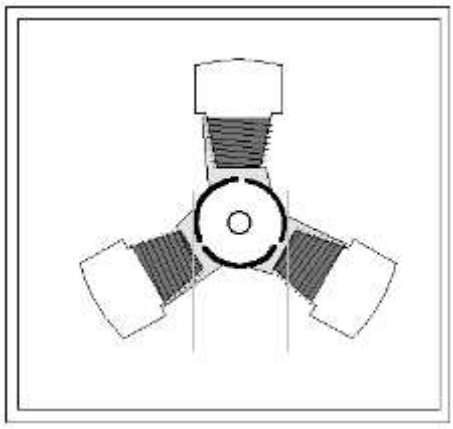

Figure 2.12. One pole is fully energized at a time (but two others are "partially" energized)

There's probably no better way to see how an average DC motor is put together, than by just opening one up. Unfortunately this is tedious work, as well as requiring the destruction of a perfectly good motor.

The guts of a disassembled Mabuchi FF-030-PN motor (the same model that Solarbotics sells) are available for (on 10 lines / cm graph paper). This is a basic 3-pole DC motor, with 2 brushes and three commutator contacts.

The use of an iron core armature (as in the Mabuchi, above) is quite common, and has a number of advantages. First off, the iron core provides a strong, rigid support for the windings -- a particularly important consideration for high-torque motors. The core also conducts heat away from the

rotor windings, allowing the motor to be driven harder than might otherwise be the case. Iron core construction is also relatively inexpensive compared with other construction types. But iron core construction also has several disadvantages. The iron armature has a relatively high inertia which limits motor acceleration. This construction also results in high winding inductances which limit brush and commutator life.

In small motors, an alternative design is often used which features a 'coreless' armature winding. This design depends upon the coil wire itself for structural integrity. As a result, the armature is hollow, and the permanent magnet can be mounted **inside** the rotor coil. Coreless DC motors have much lower armature inductance than iron-core motors of comparable size, extending brush and commutator life.

III. DESIGN OF EQUIPMENT AND DRAWING

3.1 Machine Components

The pneumatic anti lock braking system consists of the following components to full fill the requirements of complete operation of the machine.

1. Double acting pneumatic cylinder
2. Solenoid vale
3. Air compressor
4. Brake lever
5. DC motor
6. Wheel

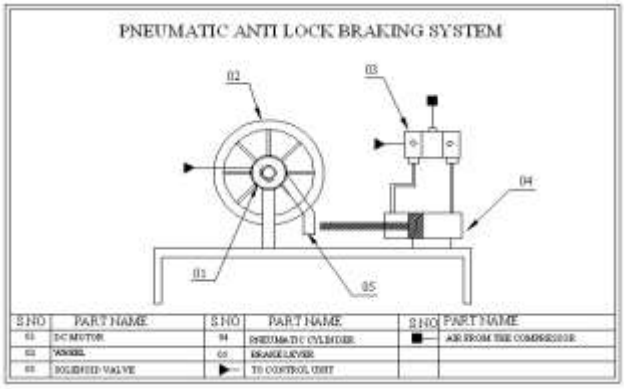

Figure 3.1.Pneumatic Antilock braking system

3.2. Working Principle

In this project pneumatic cylinder is employed for applying the brake. A button is placed whenever brake is to be applied the button is pressed and that actuates the pneumatic cylinder. A wheel is coupled to a motor and placed on the base frame as shown in figure 3.1. When the motor is switched on the wheel rotates. For applying brake a pedal is provided with the wheel. The pneumatic cylinder actuates faster to and fro to press the brake pedal thus braking is carried out efficiently. Solenoid valve supplies the air to the pneumatic cylinder from the air compressor. When the brake is applied in a regular time interval the braking will be efficient also the vehicle can be controlled also in the turning. Thus anti lock braking system provides safer drive even on slippery surfaces and turning roads.

IV. ADVANTAGES AND DISADVANTAGE

4.1. Advantages

- The reaction time is fast
- Can avoid accidents
- Efficient braking provided even on slippery surfaces

4.2. Disadvantage

Needs separate compressor for the operation.
It is applicable in all automobiles for efficient braking.

V. APPLICATIONS

5.1. Applications

Applicable in all four wheeler vehicles

VI. LIST OF MATERIALS

6.1. Factors determining the Choice of Materials

6.1.1Properties:

The material selected must possess the necessary properties for the proposed application. The various requirements to be satisfied Can be weight, surface finish, rigidity, ability to withstand environmental attack from chemicals, service life, reliability etc.

The following four types of principle properties of materials decisively affect their selection

- Physical
- Mechanical
- From manufacturing point of view
- Chemical

The various physical properties concerned are melting point, thermal

Conductivity, specific heat, coefficient of thermal expansion, specific gravity, electrical conductivity, magnetic purposes etc.

The various Mechanical properties Concerned are strength in tensile,

Compressive shear, bending, torsional and buckling load, fatigue resistance, impact resistance, eleastic limit, endurance limit, and modulus of elasticity, hardness, wear resistance and sliding properties.

The various properties concerned from the manufacturing point of view are,

- Cast ability
- Weld ability
- Forge ability
- Surface properties
- Shrinkage
- Deep drawing etc.

6.2. Manufacturing case

Sometimes the demand for lowest possible manufacturing cost or surface qualities obtainable by the application of suitable coating substances may demand the use of special materials.

6.3. Quality Required

This generally affects the manufacturing process and ultimately the material. For example, it would never be desirable to go casting of a less number of components which can be fabricated much more economically by welding or hand forging the steel.

6.4. Availability of Material

Some materials may be scarce or in short supply, it then becomes obligatory for the designer to use some other material which though may not be a perfect substitute for the material designed. The delivery of materials and the delivery date of product should also be kept in mind.

6.5. Space consideration

Sometimes high strength materials have to be selected because the forces involved are high and space limitations are there.

6.6. Cost

As in any other problem, in selection of material the cost of material plays an important part and should not be ignored. Sometimes factors like scrap utilization, appearance, and non-maintenance of the designed part are involved in the selection of proper materials.

VII. CONCLUSION

The project carried out by us will make an impressing mark in the field of automobile. It is very usefully for drivers to drive the vehicle without tension.

This project has also reduced the cost involved in safety arrangement on four wheeler vehicles. The project has been designed to perform the required task taking minimum time

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