SPOTTING OF IMBRICATIONS COMMUNITIES IN SOCIAL TAGGER SYSTEM

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ABSTRACT

This design helps the driver to increase his focusing on the road. Also reduces the time needed to engage the required reduction ratio, which increases the vehicles' response. This study describes in detail in an understandable way to how to convert the traditional manually gear shifting mechanism to a semi-automated gear shifting mechanism. The development has concluded also the gearbox, which became much smoother and produces less noise. Gear shifting mechanism must be easy to use and workable, these Demands are very important especially for two wheeler motorcycle and four wheeler & small cars used by special needs people. The power transmission is the most important thing in the present mechanically developing area. In case of the automobiles the power transmission is done by the gear box arrangement. Hence for the perfect transmission of power and quick response the optimum gear pair with the perfect gear shifter is most necessary. Also the weight of the system must be maintained within permissible limits. According to the space considerations in the vehicle the system which we have to implement must be compact in nature and safe in operation.

Keyword – *Gear, Electrical motor, IC-engine, Embedded System, Pneumatic gear box, Principal, Pneumatic cylinder, Pulley, Belt, Design, Working*

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1. INTRODUCTION

For some drivers, the gear shifting can cause some confusing at driving specially 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 this situation is to choose the right reduction ratio and engaging it at the right time. This design helps the driver to increase his focusing on the road. Also reduces the time needed to engage the required reduction ratio, which increases the vehicles' response. Gear shifting mechanism must be easy to use and workable, these demands are very important especially for small cars used by special needs people. For some drivers, the gear shifting can cause some confusing at driving specially 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 this situation is to choose the right reduction ratio and engaging it at the right time.

2. PRAPOSED CONSTRUCTION

The construction is below as proposed in earlier edition are

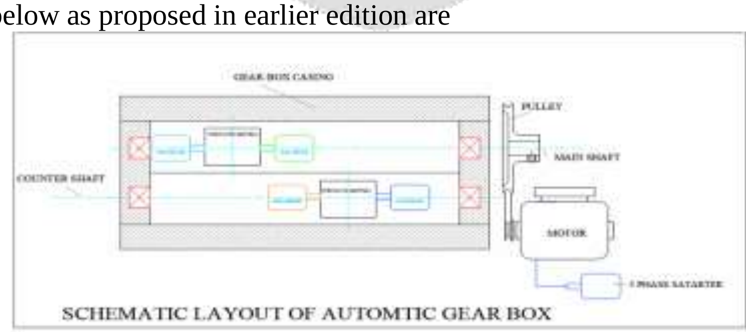


Fig:-1 Schematic layout of gear box

Fig 1. Schematic Layout of Gear Box

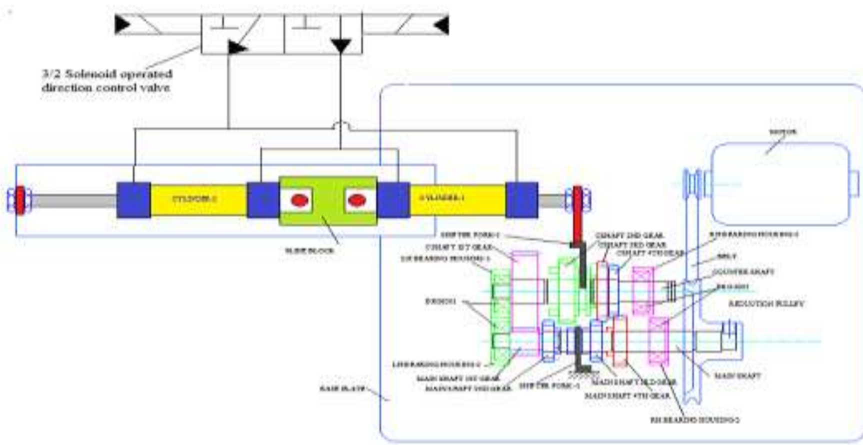


Fig 2 Circuit Diagram

3. PRINCIPAL OF OPERATION

3.1 A.C ELECTRICAL MOTOR (1/16 HP, 230 V)

In both induction and synchronous motors, the AC power supplied to the motor's stator creates a magnetic field that rotates in time with the AC oscillations. Whereas a synchronous motor's rotor turns at the same rate as the stator field, an induction motor's rotor rotates at a slower speed than the stator field. The induction motor stator's magnetic field is therefore changing or rotating relative to the rotor. This induces an opposing current in the induction motor's rotor, in effect the motor's secondary winding, when the latter is short-circuited or closed through an external impedance.

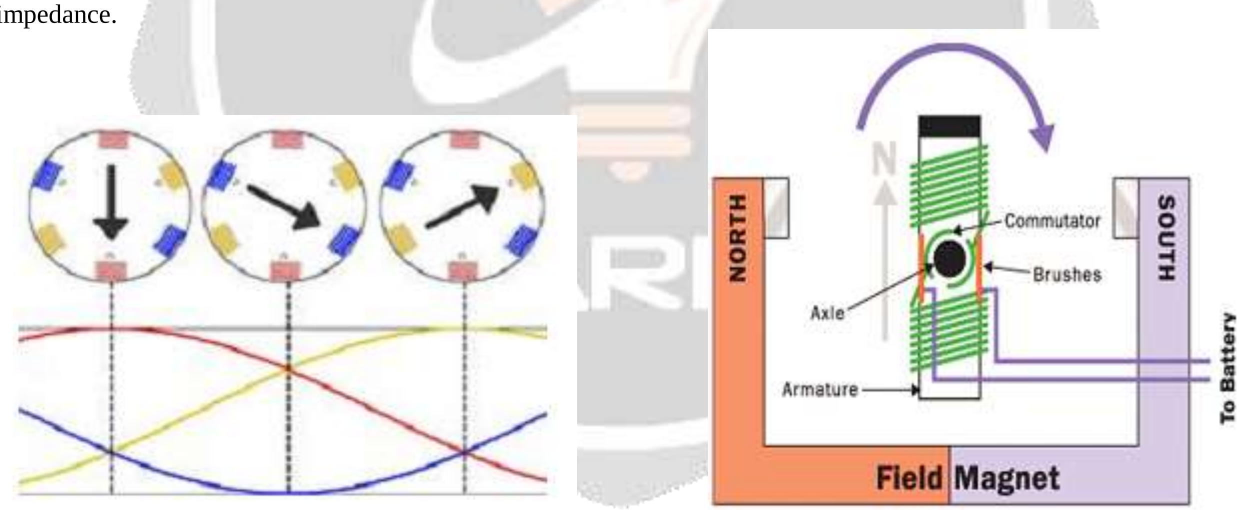


Fig. 3 A.C ELECTRICAL MOTOR

The rotating magnetic flux induces currents in the windings of the rotor; in a manner similar to currents induced in a transformer's secondary winding(s). The currents in the rotor windings in turn create magnetic fields in the rotor that react against the stator field. Due to Lenz's Law, the direction of the magnetic field created will be such as tooppose the change in current through the rotor windings. The cause of induced current in the rotor windings is the rotating stator magnetic field, so to oppose the change in rotor winding currents the rotor will start to rotate in the direction of the rotating stator magnetic field. The rotor accelerates until the magnitude of induced rotor current and torque balances . The applied load. Since rotation at synchronous speed would result in no induced rotor current, an induction motor always operates slower than synchronous speed. The difference, or "slip," between actual and synchronous speed varies from about 0.5 to 5% for standard Design B torque curve induction motors. The induction

machine's essential character is that it is created solely by induction instead of being separately excited as in synchronous or DC machines or being self-magnetized as in permanent magnet motors. For rotor currents to be induced, the speed of the physical rotor must be lower than that of the stator's rotating magnetic field (η_s); otherwise the magnetic field would not bemoving relative to the rotor conductors and no currents would be induced. As the speed of the rotor drops below synchronous speed, the rotation rate of the magnetic field in the rotor increases, inducing more current in the windings and creating more torque. The ratio between the rotation rate of the magnetic field induced in the rotor and the rotation rate of the stator's rotating field is called slip. Under load, the speed drops and the slip increases enough to create sufficient torque to turn the load. For this reason, induction motors are sometimes referred to as asynchronous motors. An induction motor can be used as an induction generator, or it can be unrolled to form a linear induction motor which can directly generate linear motion. Found in applications as diverse as industrial fans, blowers and pumps, machine tools, household appliances, power tools, and disk drives, electric motors can be powered by direct current (DC) sources, such as from batteries, motor vehicles or rectifiers, or by alternating current (AC) sources, such as from the power grid, inverters or generators. Small motors may be found in electric watches. General-purpose motors with highly standardized dimensions and characteristics provide convenient mechanical power for industrial use. The largest of electric motors are used for ship propulsion, pipeline compression and pumped-storage applications with ratings reaching 100 megawatts. Electric motors may be classified by electric power source type, internal construction, application, type of motion output, and so on.
Devices such as magnetic solenoids and loudspeakers that convert electricity into motion but do not generate usable mechanical power are respectively referred to as actuators and transducers. Electric motors are used to produce linear force or torque (rotary).

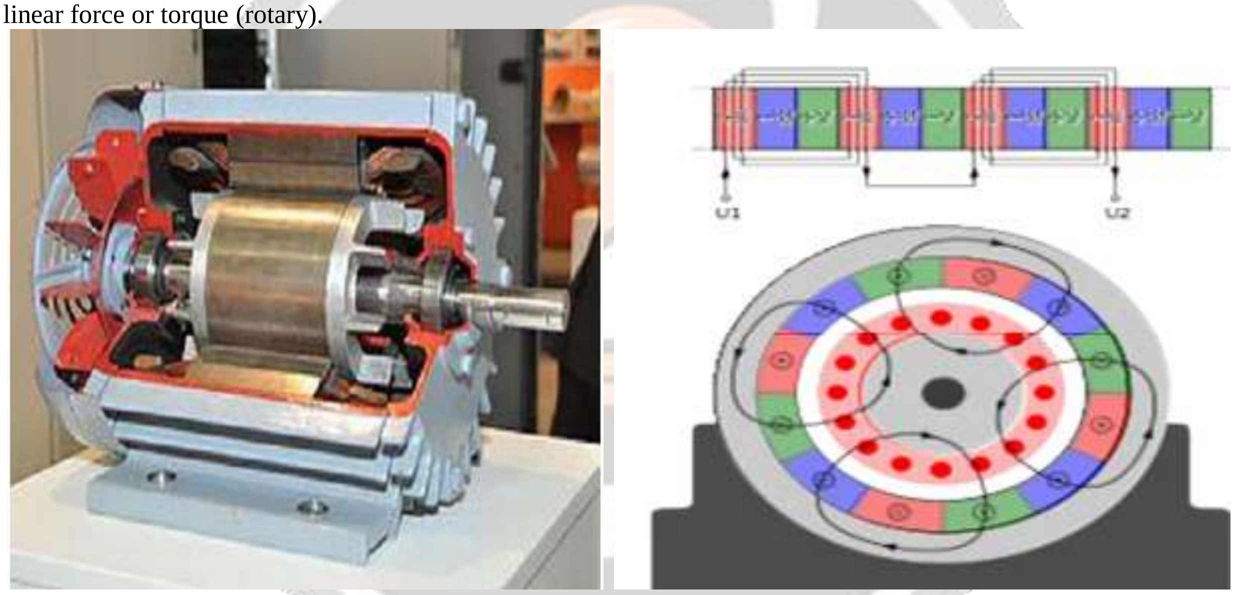


Fig:4 Electrical Motor Working and Construction

3.2 Working and Construction

An electric motor is an electric machine that converts electrical energy into mechanical energy. In normal motoring mode, most electric motors operate through the interaction between an electric motor's magnetic field and winding currents to generate force within the motor. In certain applications, such as in the transportation industry with traction motors, electric motors can operate in both motoring and generating or braking modes to also produce electrical energy from mechanical energy. An ac motor is an electrical motor driven by an alternating current. It commonly consists of two basic part ,an outside stationary stator having coils supplied with alternating current to produce a rotating magnetic field, and an inside rotor attached to the output shaft that is given a torque by the rotating field.The function of the electrical motor is to convert the electrical energy in to mechanical energy & to create magnetism by passing electricity through the coil. It gives the power or motion to the shaft through the v-belt drive. The stator of an induction motor consists of poles carrying supply current to induce a magnetic field that penetrates the rotor. To optimize the distribution of the magnetic field, the windings are distributed in slots around the stator, with the magnetic field having the same number of north and south poles. Induction motors are most commonly run on single-phase or three-phase power, but two-phase motors exist; in theory, induction motors can have any number of phases. Many single-phase motors having two windings can be viewed as two-phase motors, since a capacitor is used to generate a second power phase 90° from the single-phase supply and feeds it to the second motor winding. Single-phase motors require some mechanism to produce a rotating field on startup. Cage induction motor rotor's conductor bars are typically skewed to reduce noise.

4. GEAR BOX CONFIGURATION

A motorcycle transmission is a transmission created specifically for motorcycle applications. They may also be found in use on other light vehicles such as motor tricycles and quad bikes, off-road buggies, movers and other utility vehicles, microcars, and even some superlight sports cars. Most manual transmission two-wheelers use a sequential gearbox. Most modern motorcycles (except scooters) change gears (of which they increasingly have five or six) by foot lever. On a typical motorcycle either first or second gear can be directly selected from neutral, but higher gears may only be accessed in order – it is not possible to shift from second gear to fourth gear without shifting through third gear. A five-speed of this configuration would be known as "one down, four up" because of the placement of the gears with relation to neutral. Neutral is to be found "half a click" away from first and second gears, so shifting directly between the two gears can be made in a single movement. Automatic transmissions are less common on motorcycles than manual, and are mostly found only on scooters and some custom cruisers and exotic sports bikes. Types include continuously variable transmission, semi-automatic transmission and dual clutch transmission.

Fig:5 Gear box and Parts of gear box

In earlier times (pre-WWII), hand-operated gear changes were common, with a lever provided to the side of the fuel tank (above the rider's leg). British and many other motorcycles after WWII used a lever on the right (with brake on the left), but today gear changing is standardized on a foot-operated lever to the left. In many modern designs, the engine sits in front of the gearbox. From a sprocket on one side of the crankshaft, a chain or sprocket directly mounted to the clutch will drive the clutch, which can often be found behind a large circular cover on one side of the gearbox. The clutch is connected to the gearbox input shaft. For motorcycles with chain drive, the gearbox output shaft is typically connected to the sprocket which drives the final drive chain. Most manual motorcycle gearboxes have "constant mesh" gears which are always mated but may rotate freely on a shaft until locked by a toothed sliding collar or "dog clutch". Since the gears are always rotating and can only be accessed sequentially, synchromesh is not generally needed. To save space, both shafts may contain a mixture of fixed and free-spinning gears, with some gears built into the sliding parts. Most manual transmissions are called "constant mesh" which simply means all of the gears in the box are constantly in contact with each other. When you shift gears you aren't actually moving any gears. You're moving a plate or a cylinder that locks into the side of a gear engaging the output shaft with that gear.

Fig: 6 Actual transmissions in motorcycle and shift pattern

If you're shifting properly, matching engine/transmission speeds and shift quickly those dogs can slip right into the slots no muss no fuss. If, however, you are a little lazy with a shift and take too long or don't put much pressure on the shift lever those dogs will just skitter over the top of the slots causing what many riders misinterpret as grinding 'gears'.

There are two common problems that develop with motorcycle transmissions.

1. Each time the dogs are allowed to grind the rider is wearing just a little bit off of them. Those 'pegs' get shorter and shorter (or the holes become more elongated) until the transmission will no longer stay in a particular gear or it pops out of a gear. This is 'most' common between 1st and 2nd gear for some reason.
2. The rider forces the transmission to shift too quickly and/or puts too much pressure on the shift lever. When this happens the dogs might be pressed hard against the gear in the solid space between slots. Look at the top animation again and notice the green shift fork. That fork can be bent and, as you can see from the animation if the fork is bent backward (to the right in this picture) it probably isn't going to completely engage the dogs. Result, the transmission will pop out of gear. If the dogs just barely release you'll not only be back in neutral but could hear a lot of grinding with the dogs rubbing against the slots.

4.1 GEAR STICK and SHIFT PATTERN

A gear stick is the device is used to change gear; in a manual transmission vehicle this will normally be done whilst depressing the clutch pedal with the left foot to disengage the engine from the drive train and wheels. Automatic transmission vehicles, robotized manuals, and those with continuously variable transmission gearboxes, do not require a clutch pedal. The shift pattern refers to the layout of the gears. In a typical manual transmission two wheel vehicle, first gear is located to the down side of the neutral position. Again press the pedal down side then obtain second, third and fourth gear respectively. In many motor cycles first gear is located to the upper side of the neutral position. Similarly second, third and fourth gear is obtained down side of the neutral position.

4.2 PRESSURE REGULATER

Many techniques have been developed for the measurement of pressure and vacuum. Instruments used to measure pressure are called pressure gauges or vacuum gauges. A manometer is an instrument that uses a column of liquid to measure pressure, although the term is often used nowadays to mean any pressure measuring instrument. A vacuum gauge is used to measure the pressure in a vacuum—which is further divided into two subcategories, high and low vacuum (and sometimes ultra-high vacuum). The applicable pressure range of many of the techniques used to measure vacuums has an overlap. Hence, by combining several different types of gauge, it is possible to measure system pressure continuously from 10mbar down to 10^{-11} mbar.

4.3 SOLENOID OPERATED DIRECTION CONTROL VALVE:

Directional control valves are one of the most fundamental parts in hydraulic machinery as well and pneumatic machinery. They allow fluid flow into different paths from one or more sources. They usually consist of a spool inside a cylinder which is mechanically or electrically controlled. The movement of the spool restricts or permits the flow, thus it controls the fluid flow.

Fig: 7 Solenoid operated direction control valve

They are widely used in the hydraulics industry. These valves make use of electromechanical solenoids for sliding of the spool. Because simple application of electrical power provides control, these valves are used extensively. However, electrical solenoids cannot generate large forces unless supplied with large amounts of electrical power. Heat generation poses a threat to extended use of these valves when energized over time. Many have a limited duty cycle. This makes their direct acting use commonly limited to low actuating forces. Often a low power solenoid valve is used to operate a small hydraulic valve (called the pilot) that starts a flow of fluid that drives a larger hydraulic valve that requires more force. A bi-stable pneumatic valve is typically a pilot valve that is a 3 ported 2 position detented valve. The valve retains its position during loss of power, hence the bi-stable name. Bi-stability can be accomplished with a mechanical detent and 2 opposing solenoids or a "magna-latch" magnetic latch with a polarity sensitive coil. Positive opens and negative closes or vice -versa. The coil is held in position magnetically when actuated. A directional control valve with three ways, three ports, and two positions.

4.4 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. Like hydraulic cylinders, something forces a piston to move in the desired direction. The piston is a disc or cylinder, and the piston rod transfers the force it develops to the object to be moved. Engineers sometimes prefer to use pneumatics because they are quieter, cleaner, and do not require large amounts of space for fluid storage. Because the operating fluid is a gas, leakage from a pneumatic cylinder will not drip out and contaminate the surroundings, making pneumatics more desirable where cleanliness is a requirement.

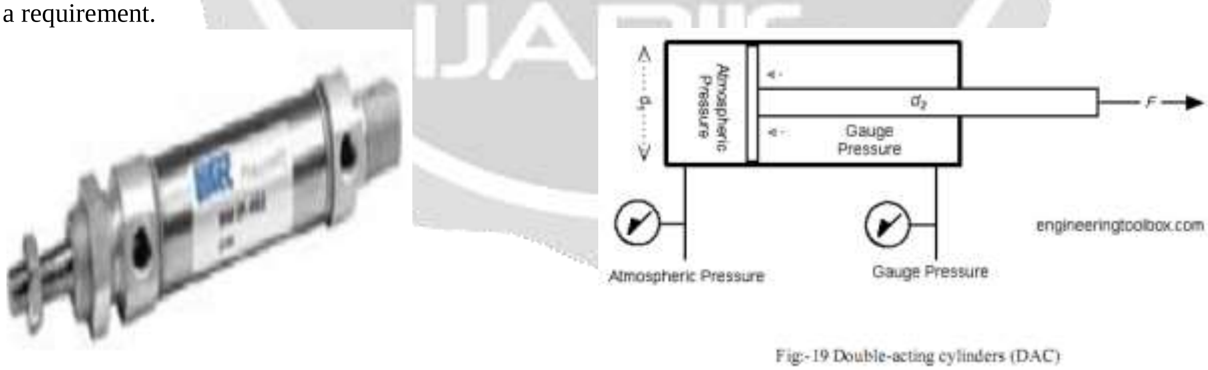


Fig:8 Double-acting cylinders

4.5 Double-acting cylinders

Double-acting cylinders (DAC) use the force of air to move in both extends and retract strokes. They have two ports to allow air in, one for outstroke and one for in stroke. Stroke length for this design is not limited; however, the piston rod is more vulnerable to buckling and bending. Additional calculations should be performed as well.

4.6 PULLEY AND BELTS

A pulley is a wheel with a groove that allows a rope, belt or chain to ride securely on it. A pulley is a circular lever, with the wheel rotating freely on the axle. A fixed pulley is fastened to one spot, and does not move around. It provides no gain in force, distance or speed, but it changes the direction of the force. A fixed pulley acts as a first class lever. Pulleys can change the direction of the effort force, or change the amount of effort force needed to move the load.

A belt is a loop of flexible material used to mechanically link two or more rotating shafts, most often parallel. Belts may be used as a source of motion, to transmit power efficiently, or to track relative movement. Belts are looped over pulleys. In a two pulley system, the belt can either drive the pulleys normally in one direction (the same if on parallel shafts), or the belt may be crossed, so that the direction of the driven shaft is reversed (the opposite direction to the driver if on parallel shafts). As a source of motion, a conveyor belt is one application where the belt is adapted to continuously carry a load between two points.

5. DESIGN

In our attempt to design a PNEUMATIC GEAR BOX we have adopted a very careful designing method. The total design work has been divided into two parts mainly;

System design v/s Mechanical design

System design mainly concerns with the various physical constraints and ergonomics, space requirements, arrangement of various components on the main frame of machine no of controls position of these controls ease of maintenance scope of further improvement; height of m/c from ground etc. In Mechanical design the components are categories in two parts.

Design parts v/sParts to be purchased.

For design parts detail design is done and dimensions thus obtained are compared to next highest dimension which are readily available in market this simplifies the assembly as well as post production servicing work. The various tolerances on work pieces are specified in the manufacturing drawings. The process charts are prepared & passed on to the manufacturing stage. The parts are to be purchased directly are specified & selected from standard catalogues.

5.1 MECHANICAL DESIGN

5.1.1 MOTOR SELECTION

Selecting a motor of the following specifications Single phase AC motor Induction motor
Power = 1/16 HP
Speed= 3200 rpm
Amp = 7.5
Volts= 220V
The power from motor is transmitted from the motor shaft to input shaft of gear box via open belt drive using the motor pulley, reduction pulley and belt.

5.1.2 SELECTION OF BELT DRIVE

Selection an open belt drive using V- belt;
Reduction ratio = 1
Planning a 1 stage reduction;
A) Motor pulley (□ D1) = inner = 6 mm
= outer = 60 mm
B) Main shaft pulley (□ D2) = inner = 15mm
= outer = 205 mm

INPUT DATA

Input power = 1/16 hp
Input speed = 3200 rpm
Center distance = 540 mm
Max belt speed = 4.78 m/sec
Coefficient of friction = 0.25
Between belt and pulley
Allowable tensile stress =48 N/mm^2
FORCE ACTING ON SHIFTING LEVER
Taking an actual operating reading in working condition

5.1.3 READING TABLE

RPM				
	MAIN SHAFT	COUNTE SHAFT	PRESSURE (kgf/cm^2)	TIME TAKEN BY EACH STROKE
NUTRAL GEAR	824 RPM	238 RPM	$P0=0$ (kgf/cm^2)	T0=0.0 sec
FIRST GEAR	824 RPM	207 RPM	$P1=4$ (kgf/cm^2)	T1= 3 sec
SECOND GEAR	824 RPM	251 RPM	$P2=4$ (kgf/cm^2)	T2= 2sec
THIRD GEAR	824 RPM	440 RPM	$P3=4$ (kgf/cm^2)	T3= 1sec
FORTH GEAR	824 RPM	701 RPM	$P4=4$ (kgf/cm^2)	T4= 0.5sec

MAXIMUM TIME TAKEN FOR 1 TO 4 GEAR (T)=

$T= T1+T2+T3+T4$

$= 3+2+1+0.5$

$= 6.5$ sec

$= 0.10$ minute

5.1.4 CYLINDER THRUST

1)For double acting cylinder in forward stroke

$F = \pi/4*D^2*P$

$= (3.14/4)*(0.016^2)*(4*10^5)$

$= 80.384$ N

2)For double acting cylinder in return stroke

$F = \pi/4*(D^2-d^2)*P$

$= (3.14/4)*(0.016^2-0.006^2)*(4*10^5)$

$= 69.08$ N

6. AIR CONSUMMATION

The air consummation data for a cylinder is required to estimate the compressor capacity. The calculations include air consummation during forward as well as return stroke.

The free air consummation for forward stroke is calculated as follows

Free air consummation = piston area * (operating pressure + 1.013) * stroke

$= (\pi/4*D^2*(P+1.013)*L)/1000$ liter

$= ((3.14/4)*(0.016^2)*(4+1.013)*25*10^2)/1000$

$= 0.0025185312$ liter

The free air consummation for return stroke is calculated as follows

Free air consummation = piston area * (operating pressure + 1.013) * stroke

$= (\pi/4*(D^2-d^2)*(P+1.013)*L)/1000$ liter

$= ((3.14/4)*(0.016^2-0.006^2)*(4.0+1.013)*25*10^2)/1000$

$= 0.0021643$ liter

Total free air consummation = 0.0025185312 + 0.0021643

= 0.0046828312 liter

Number of stroke per minute required from this cylinder to perform certain work will give us free compressed air consummation per minute for this cylinder.

Free air consummation = free air consummation per cycle * stroke per minute

= 0.0046828312* 34

= 0.15921626 liter per minute.

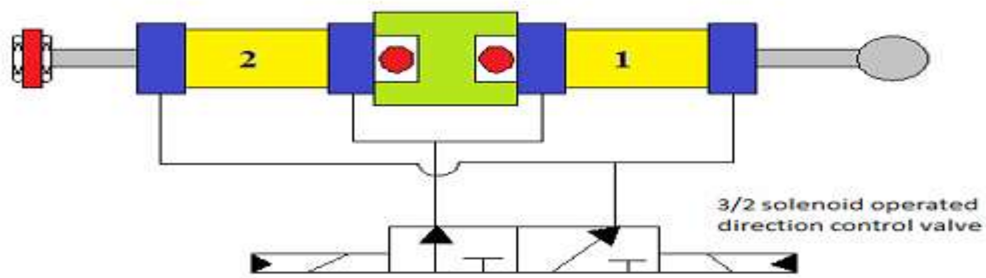
For two cylinder free air consummation = 2 * 0.15921626

= 0.31843252 liter per minute

7. WORKING

The pneumatic circuit is as shown the motor is started to drive the main shaft by means of belt and pulley arrangement, initially the gear box is in neutral i.e., the output shaft does not rotate. When the 3/2 way direction control valve is operated the cylinder operates the piston to move in the downward direction thereby bringing the 1st gear into engagement, and thus the output shaft starts to rotate thereby transmitting power from the input (motor/engine) to the output (chain drive). The flow control valve in the circuit governs the pressure which is of the order of 1 to 4 bars; hence the governed pressure causes the gradual push provided to the piston rod which brings about gradual engagement of the gears. When the 3/2 way direction control valve is operated the cylinder operates towards upward as the piston rod is locked for movement upward , hence first the fork shifter moves towards upward bringing on the neutral position and then slides farther to bring the 2stgear into engagement .

Note:-Similarly the circuit works for the 3rdand 4thgear.



GEAR POSITION	REQUIERD POSITION OF CYLINDER
N	1F,2R
I	1R,2R
II	1F,2F

Fig:9 solenoid operated cylinders

8. ADVANTAGES

1. Semi-automated gear shifting mechanism.
2. Gear shifting mechanism is easy to use and workable, these demands are very impor especially for small cars used by special needs people.
3. Gearbox becomes much smoother and produces less noise.
4. Gear shifting less confusing.
5. Easy to choose the right reduction ratio and engaging it at the right time.
6. This design helps the driver to increase his focusing on the road.
7. It reduces the time needed to engage the required reduction ratio, which increases the vehicles' response.
8. It used for special need people.
9. It is also educational model
10. It is used for testing purpose in automobile industries, e.g. TATA, Ashok Layland.

9. CONCLUSION

While doing this project, we have drawn the following conclusions.

1. This design is very useful for special needs people.
2. This can improve the performance of the vehicle much larger than the regular gear shifting process.
3. This design helps the driver to increase his focusing on the road.
4. Also reduces the time needed to engage the required reduction ratio, which increases the vehicle's response.

Fig:10 Experimental Setup

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