CHAPTER – 1

INTRODUCTION

This project is to improve the quality of cutting the tender coconut with least efforts and less man power. It reduces the chance of any danger while cutting the tender coconut along with this. The machine is the portable device, and the life span of the machine is good. Only the changing of cutting blades and punching tool has to be required after a certain cutting tender coconut frequently. It required less effort as compare to other cutting process of tender coconuts. The only need is checking the sharpness of blades. The presented report will provide a brief idea in designing new machine to help cut open the top of a fresh green tender coconut easily and quickly . This research work focussing the issues related to manual cutting of tender coconut in commercial purpose. By studying such problem the need of efficient tender coconut cutting machine was developed. If the developed machine is commercialize the problem of use of tender coconut water at hotels and restaurants will get benefited. The purpose of this research is to develop, test, and evaluate the young tender coconut fruit cutting machine. This research work include the description of such a machine which will not only used to cut the tender coconut but also can be used to drink tender coconut water at parks and beaches.

The concept behind this report is to improve efficiency of cutting of tender coconut with less efforts and less man power and to increase the rate while cutting the tender coconut along with this. This machine is the portable device, due to its less weight it can be easily portable. The life of this machine is very long. Only the changing of cutting blades and drill tool have to be required after a certain cutting tender coconut frequently. Other than this the screw jack has a long life. It required less maintenances as compare to other cutting process of tender coconuts. There is only need of checking the sharpness of blades. Tender coconut is one of the important nut crops in Bangladesh.

Its production in Bangladesh is 907255 Metric tons from 12825 acres of land in 2004-2005 (BBS, 2005). It is mostly grown in the southern part of the country. The liquid endosperm inside a young tender coconut is known as tender coconut water. It is fat free and low in calories. Sodium, potassium, phosphorus, chloride and magnesium are the main minerals found in tender coconut water, besides vitamin C and sugars (Magda, 1992; Campos et al., 1996; Nadanasabapathy and Kumar, 1999). Tender coconut water presents anticarcinogenic properties (Sylianco et al., 1992) and can be used as dehydrating solution administrated in oral and intravenous form, the later in case of severe dehydration (Magat and Agustin 1997; Falck et al., 2000). It has a great demand especially during the hot season. It is very effective especially for diarrhoea attacked people and excellent tonic for old and sick [3]. The processed green tender coconut water increased the availability of tender coconut water and the producers sell it at reasonable price. The present investigation was undertaken with a view to preserve green tender coconut water which will be easily transported and increase availability all over the country. Producers cultivate the tender coconut (Cocos nucifera L.) for its kernel of water and soft jelly; both these have health and nutritional benefits which consumers like. The water and kernel are known to build body muscles of thin and emaciated individuals, cure sore throats and relieve stomach ulcers. Consumption of tender coconuts helps diabetic sufferers and those with kidney ailments [3]. The water serves as a refreshing drink or it may be added to cocktails. The dwarf tender coconut plant has economic value and importance. This factsheet will provide producers and potential producers with the essential requirements to cultivate the crop.

Man has always looked for ways to make his work simpler and quicker, this characteristic of him has brought the human race to where it is now. In today’s world almost anything and everything is being automated. Growth in technology over the last few decades has had significant effect in how things work and how people lead their lives

and has witnessed a rapid development in technology. Different types of intelligent machines which facilitate various tasks in industry environment are becoming popular. But harvesting of tender coconuts/plucking of fruits and cutting of unwanted branches of high trees has always been done manually which is difficult and risky job. Safety of the worker and the increased labour charges are the primary concerns of the tender coconut farm owners now. Due to the height and lack of branches, it is very difficult to climb on tender coconut trees. A professional climber with proper training could only be able to climb tender coconut tree. Due to the risk involved nowadays very less people are coming forward to climb on tender coconut trees, and due to the lack of professional climbers, the existing professionals may charge more from the owners, moreover as the educational background of Indian youth is increasing most of the people may hesitate to come into this type of profession. Considering this scenario, a device which will help the user to climb a tender coconut tree easily will be useful for the people who are having tender coconut farms or even residents. These types of devices will encourage more people to come forward into the agricultural sector. There are several industries, which depend on raw tender coconuts, for its processing and manufacturing of various value-added products. The inflorescence sap of tender coconut palms used to produce Neera (sweet toddy or palm nectar), desiccated tender coconut and its powder, packed tender coconut milk, tender coconut cream, tender coconut milk powder, tender coconut water, vinegar, nata-de-coco, etc. are few of them. The growing market for all tender coconut products is waking up even in the American and European countries that have never used tender coconut in their cuisine. Hence, any impact in tender coconut cultivation sector will adversely affect these industries and their markets.

CHAPTER – 2

LITERATURE SURVEY

The aim of this study was to evaluate the effect of MQL using alternative cutting fluids on tool wear. The objectives were; to identify suitable alternative cutting fluids that can be used with the MQL method, and to study the tool wear for different alternatives. Alternative cutting fluids were identified using a literature review. Then a set of simple turning operations using carbide coated tools and AISI D2 steel work-pieces were performed with the MQL method using three identified alternative fluids. Trials were also carried out with dry cutting, conventional flood cooling with emulsion oils and MQL method using emulsion oils. Tool wear in each treatment was measured and graphically analysed to compare the performance of the cooling methods. Tender coconut oil, sun flower oil and waste cooking oil were identified as the alternatives for conventional cutting fluids. Tender coconut oil and sun flower oil performed the best while waste cooking oil was the worst. Further experiments are need with different combinations of cutting tool and work-piece material to generalise the findings(S. W. M. A. I. Senevirathenetа et al).

An image processing with particle swarm optimization (PSO) method is introduced in this report. It will find the best position of the tender coconuts at the tree and pluck it by giving a command to the arm to move toward the tender coconuts and cut its base by turning the grinder on the top of arm. Experiment results show that successful rate of the method to detect tender coconuts at the tree with cluttered background is 80% and then pluck them using the robot arm (Alfin Junaedy; Indra Adji Sulistijono et al).

This study aims to determine the effectiveness of the VCO in experimental cuts. Subjects (rabbits suffering from cut wounds by treating VCO commercial products topically) were divided into four groups (i.e., negative control, positive control treatment with betadine,

treatment with artificial VCO, treatment with commercial VCO. Then the wound diameter was measured on days 0, 3, 7, 15 and 21. On the last day, treated rabbits were anesthetized, and wound tissue was taken for histological examination. The results showed that the VCO treatment had potentially developed into wound care products. The VCO administration group affected the epithelial cell thickness by about 641.5μm lower than other groups, and also have an average number of epithelial cells more than other groups(Nina Andriana; I Nyoman Erich Lister, et al).

In this article, we discuss the design of the Amaran body and harvester. Amarans dexterity in climbing and harvesting tender coconuts can be challenged by height, circumference, and inclination of the tree. Experimental results show that Amaran can successfully climb trees up to 15.2 m tall, circumferences ranging from 0.66 to 0.92 m, and tree trunk inclinations of up to 30°(Rajesh Kannan Meghalingam, et al).

The new proposed design is needed for removal of husk from the tender coconut. In this there are two pneumatic actuators. One is placed at the bottom of structure, it's for Holding the tender coconut and another one is placed on the top of the structure connected with hinge joint for peeling the husk. In hinge joint there are five linkages used for de-husking the tender coconut. These are operated with the help of pneumatic actuators. The actuations are controlled by the 5/2 DC solenoid valve. After the de-husking process the tender coconut shell is taken to the next stage. This part is used for cutting the tender coconut shell. Here one pneumatic actuator is being used. For cutting operation the knife is attached to the pneumatic actuator. When the pneumatic actuator is actuated, the knife comes down with high force, breaking the tender coconut into two(Nagarajan.N1, Sundararajan. P. et al).

This machine is mainly design to cut the tender coconut and to make the hole in tender coconut with the help of various tools like

cutting blade, hole making tool. The important thing about this machine is that it reduces the time of cutting the tender coconut, along with the tender coconut the various fruits can be cut out on these machines. The two operations can be done simultaneously there is no any extra attachment is required for performing the operations. The cost of the developed machine is very less so that it can be used in small restaurants and shops. This will definitely improve the productivity(Prof. S. M. Fulmali1, Prof. A. A. Bhoyar et al).

This project is mainly design to cut and punch the tender coconut by using the compressor. This necessitates the development of a punch-cum-splitter for punching and splitting the tender coconut. The present work focuses on the development of a manually operated tender coconut punch-cum-splitter for extracting tender coconut water and tender coconut meat. In this direction, customer needs statement was translated to the concept; by concept generation. The best concept was selected using push matrix and concept scoring matrix. The selected concept mainly consists of punch operated by a lever and torsion spring mechanism. When the tender coconut has to be punched, the operator places the tender coconut on the top of the holding mechanism in natural rest position and the lever is raised and pressed against the tender coconut to punch a hole. For splitting, the tender coconut is placed in the rest position and the lever is raised & operated to split the tender coconut to extract the meat. The selected concept is further analysed in terms of its functionality and cost(H. Rajanikanth1, Prof. Reddy Naik. Et al).

CHAPTER – 3

EXISTING SYSTEM DESIGN

The purpose of this research is to investigate the effect of main factors on the surface roughness (R a) in Tender coconut wood facing process by Computer Numerical Controlled milling machine and using shell end mill cutting tools. The main factors, namely, cutting speed, feed rate, depth of cut and angle of cut were investigated for optimum surface roughness. Normally, acceptable surface roughness was between 3.0-0.9 μm for this before sanding process. In the experiment, Tender coconut wood of 11-13% humidity was use at 1000-2000 rpm in cutting speed and feed rate at 100-300 mm./min and the result of preliminary trial shown that depth of cut and angle of cut had no effect on surface roughness. It was found from the experiment that the factor affecting surface roughness was feed rate and cutting speed, with tendency for reduction of roughness value at lower feed rate and greater cutting speed. Therefore, in the facing Tender coconut wood it was possible determine a facing condition by means of the equation Ra = 4.72 - 0.000864 Speed + 0.00443 Feed Leading this equation goes to use is in limitation cutting speed 1000-2000 rpm at feed rate 100-300 mm/min. The result from the experiment of mean absolute percentage error (MEPE) of the equation of surface roughness is 4.64% which is less than the margin of error, and is acceptable. As a result, the selection of optimal machining parameters can be greatly benefited to the Tender coconut wood furniture manufacturing industry in terms of productivity improvement.

Harvesting is one of the very crucial stages in crop management. Harvesting the crop at proper time will enhance the quality. In this report we segmented the tender coconut crop bunch from tree image. Different segmentation methods like, Colour based K-Means clustering, Marker controlled watershed, Grow-cut and Maximum Similarity based Region Merging (MSRM) are explored.

Experimentation conducted using a dataset of 200 images for demonstration. Out of these methods the MSRM provides good result

CHAPTER – 4

PROPOSED SYSTEM

4.1 AC Motor:-

A AC motor is any of a class of electrical machines that converts direct current electrical power into mechanical power.

PRINCIPLE OF OPERATION OF A.C. MOTOR

Figure 4.1 show a uniform magnetic field in which a straight conductor carrying no current is placed. The conductor is perpendicular to the direction of the magnetic field. The conductor is shown as carrying a current away from the viewer, but the field due to the N and S poles has been removed.

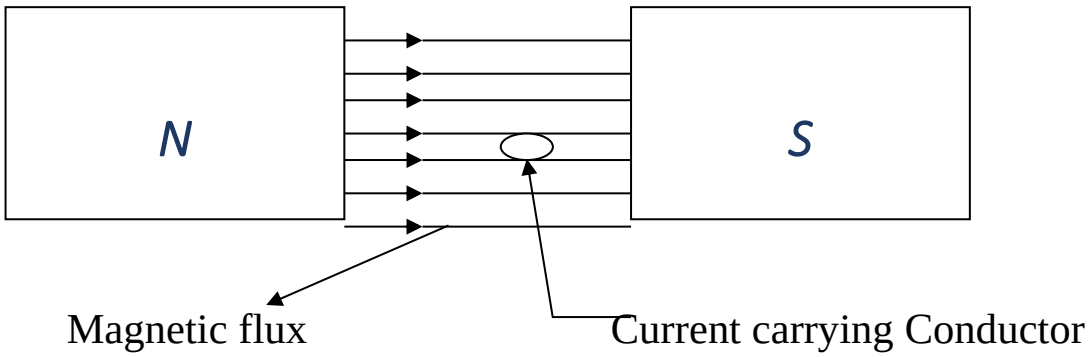


FIG 4.1 Movement of Conductor

There is no movement of the conductor during the above two conditions. The current carrying conductor is placed in the magnetic field. The field due to the current in the conductor supports the main field above the conductor, but opposes the main field below the conductor.

UNIFORM MAGNETIC FIELD

The result is to increase the flux density in to the region directly above the conductor and to reduce the flux density in the region directly below the conductor. It is found that a force acts on the conductor, trying to push the conductor downwards as shown by the arrow.

BEARING

The bearing are pressed smoothly to fit into the shafts because if hammered the bearing may develop cracks . In our project, the 6202 bearing with cap is used. The bearing are pressed smoothly to fit into the shaft because if hammered the bearing may develop cracks. Bearing is made up of steel material and bearing cap is mild steel.

FIG 4.2 BEARING

Ball and bearing are used widely in instruments and machines in order to minimize friction and power loss. While the concept of the ball bearing dates backs at least to Leonardo da Vinci, their design and manufacture has become remarkably sophisticated. this technology was brought to its present state of perfection only after a long period of research and development. The benefits of such specialized research can be obtain when it is possible to use a standardized bearing of the proper size and type. However, such bearing cannot be used in discriminately without a careful study of the loads and operating conditions. In additions, the bearing must be provided with adequate mounting, lubrication and sealing. A Bearing usually consists of four parts :

- Inner ring
- Outer ring
- Balls
- Cage or separator

To increase the contact area and permit larger load to be carried, the ball run in curvilinear grooves in the rings. The radius of the groove is slightly larger than the radius of the ball and a very slight amount of radial play must be provided. The bearing is thus permitted to adjust itself to small amounts of angular misalignment between the assembled shafts and mounting.

PROPERTIES OF BEARING MATERIALS

Bearing materials should have

- Provide hard, wear resistant surface with a tough core.
- Have high compressive strength.
- Have high fatigue strength.
- Be able to bear shocks and vibrations.
- Possess high thermal conductivity to dissipate heat generated due to friction between the bearing and the rotating shaft.
- Possess low coefficient of friction.

SHAFT

Shaft is a rotating member used to transmit power by torsion. An axle is a machine member loaded mainly on the bending and carries rotating parts such as wheels and gears. An axle may be either stationary or rotating. Short shaft and axle are called as spindle. Shafts may be classified as transmission shaft and main shaft. Transmission shafts are used to transmit power from the source of the machine. The main shaft are integrated with machine itself. Here, in our project we are using mild steel for main shaft. In case of our automated punching

machine, both shafts are used namely transmission shaft and main shaft (scotch yoke shaft), the transmission shaft is coupled with motor where as the main shaft is used to carry the scotch yoke. Hence it is otherwise called as scotch yoke shaft.

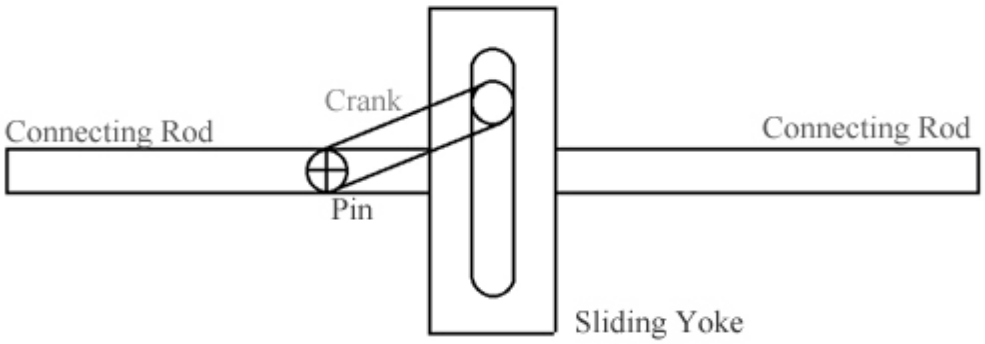
4.2 Scotch Yoke Mechanism:-

The Scotch Yoke Mechanism also known as slotted link mechanism is a reciprocating motion mechanism converting the linear motion of a slider into a rotational motion or vice versa. The piston or other reciprocating part is directly coupled to a sliding yoke with a slot that engages a pin on the rotating parts. The location of the piston versus time in a sine wave of constant amplitude, and constant frequency given a constant rotational speed. The scotch yoke is a mechanism for converting the rotational motion of crank in linear motion of slider. The reciprocating part is directly coupled to sliding

DESCRIPTION OF MECHANISM

The Scotch yoke (also known as slotted link mechanism) is a reciprocating motion mechanism, converting the linear motion of a slider into rotational motion, or vice versa. The piston or other reciprocating part is directly coupled to a sliding yoke with a slot that engages a pin on the rotating part. The location of the piston versus time is a sine wave of constant amplitude, and constant frequency given a constant rotational speed. It is one of reciprocating motion mechanism, it should be convert an rotary motion into sliding of linear motion. When the Piston or reciprocating part to directly coupled together for the sliding of yoke including a slot. That engages a pin at reciprocating part. When the internal combustion engine to convert rotary motion into linear motion by means of crankshaft rotation. Where the Piston and connecting rod should be connected together. The Scotch Yoke Mechanism to be consider for more efficient because of the rotational motion to spent more time at high point of it rotate than Piston part. A scotch yoke is a projecting part of

a rotating wheel or shaft that strikes a lever at one or more points on its circular path. The scotch yoke can be a simple tooth, as is used to deliver pulses of power to a steam hammer, for example, or an eccentric disc or other shape that produces a smooth reciprocating (back and forth) motion in the follower which is a lever making contact with the scotch yoke.



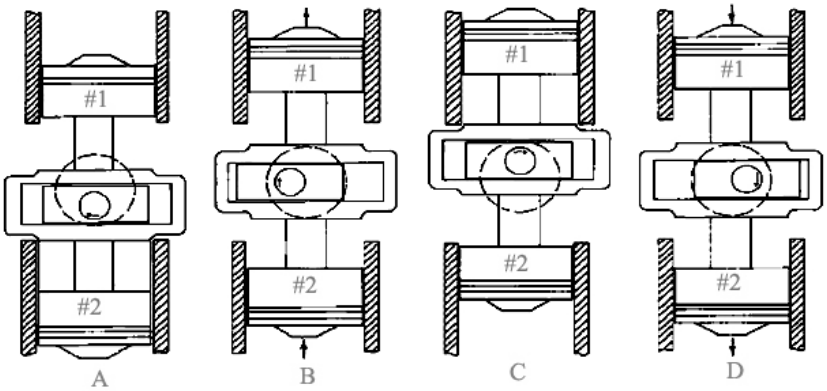
Scotch yoke Mechanism

FIG 4.3 SCOTCH YOKE MECHANISM

This setup is most commonly used in control valve actuators in high-pressure oil and gas pipelines. Although not a common metalworking machine nowadays, crude shapers can use Scotch yokes. Almost all those use a Whitworth linkage, which gives a slow speed forward cutting stroke and a faster return. It has been used in various internal combustion engines, such as the Bourke engine, Sy Tech engine, and many hot air engines and steam engines. The term scotch yoke continues to be used when the slot in the yoke is shorter than the diameter of the circle made by the crank pin. For example, the side rods of a locomotive may have scotch yokes to permit vertical motion of intermediate driving axles. What is essentially a Scotch yoke, is used in the Tide-Predicting Machine No. 2 to generate a sinusoidal motion.

Working principle of Scotch Yoke Mechanism.

It is a simple mechanism, the rotary motion of pin convert into linear motion. First, the power supplied to be connected in AC motor, when the shaft to start in rotation moment, now the crank rotate the pin slider inside of yoke part and also move in forward direction. When the Crank will be rotate in clockwise direction and yoke will be getting displacement moment at forward. The maximum displacement of yoke depends upon the length of Crank. The crank is completed the clockwise Revolution at the same time the Yoke sliding completely moved in forward. When this position take more time to start return stork. After spent time, the crank will be rotate in continuously it to be come back in initial position of rotation. Sothe Yoke move in backward direction and come back for initial position. Therefore the crank has full Revolution to be completed, At the same time the Yoke will be complete the forward and backward movement of Sliding. By means of the full revolution of Crank, the Yoke will be sliding through equal of double length of Crank. The Yoke displacement can be controlled by varying of crank length.



Example of Scotch Yoke Mechanism

FIG 4.4(A) EXAMPLE OF SCOTCH YOKE MECHANISM

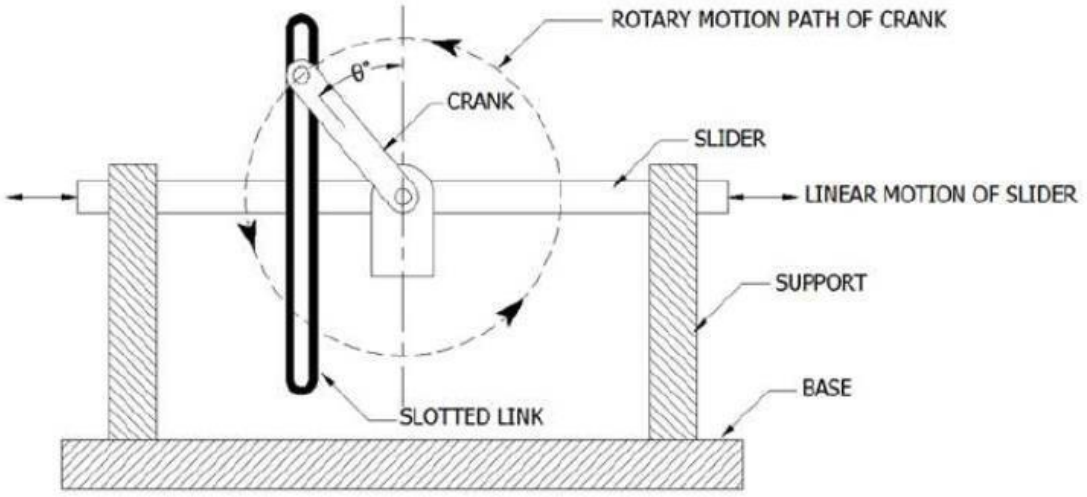


FIG 4.5(B)Example Of Scotch yoke Mechanism diagram

At Position A

- It indicates with beginning position of pin and initial position of connecting rod (#1 and #2)

At position B

- Now the disc rotate together, the slot with reciprocate motion and position will be changed, when the connecting rod (#1) travel upward direction and also connecting rod (#2) at upward direction.

At position C

- The Disc rotates further both connecting rod #1 & #2 to get an Extreme upper position.

At position D

- The disc rotate continuously, the position of C of connecting rod #1 and #2 Start to come back with downward for its initial position.

DESIGN CLCULATION:

SCOTCH YOKE MECHANISM

The analysis of a Scotch yoke mechanism shows that its input torque is highly variable. The input torque may be reduced by optimal redistribution of moving masses.7–11 or by using non-circular gears.12 One of the more efficient methods used to solve the problem of input torque balancing is creating a cam spring mechanism, in which the spring is used to absorb the energy from the system when the torque is low, and release energy to the system when the required torque is high. It allows reducing the fluctuation of the periodic torque in the high-speed mechanical systems.13–21 The input torque balancing technique proposed in this report is achieved by adding linear springs.

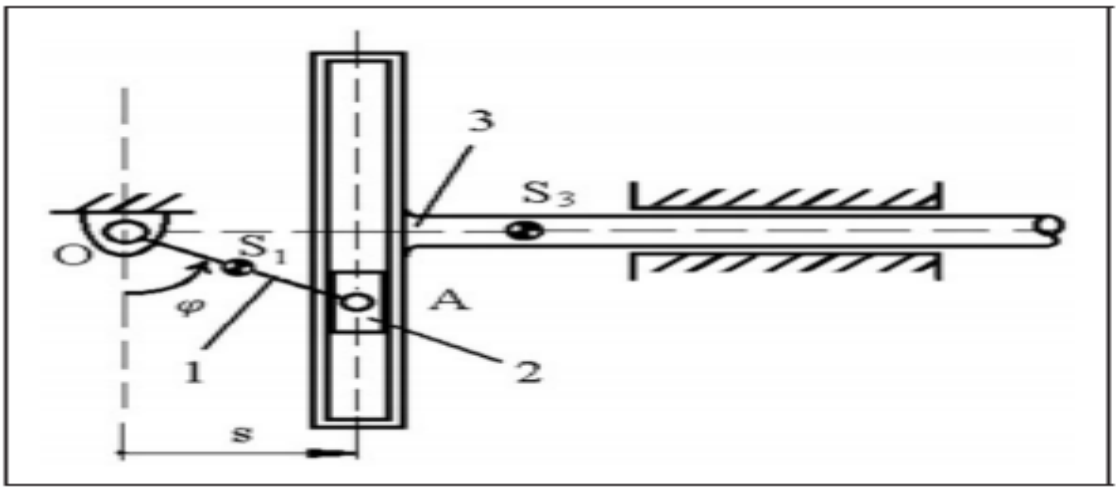


FIG 4.6 DESIGN OF SCOTCH YOKE MECHANISM

Input torque of a Scotch yoke mechanism The Scotch yoke mechanism is a reciprocating motion mechanism, converting the linear motion of a slider into rotational motion of a crank or vice versa (Figure

1). In the present study, it has been considered that the gravitational forces are perpendicular to the motion plane. As is mentioned by Berkof,7 the input torque of a single degree of freedom mechanism due to inertial effects can be found from equation

$$M_{IN} = \frac{1}{\dot{\varphi}} \frac{dT}{dt} \qquad (1)$$

where T is the total kinetic energy of the mechanism and ’_ is the input angular velocity. The relationship between the rotation of link 1 and the translation of link 3 can be written as

$$s = l_{OA} \sin \varphi \qquad (2)$$

where ’ is the rotating angle of link 1; lOA is the length of link 1, i.e. the distance between the joints O and A; s is the translational displacement of slier 3. The slider velocity can be found by differentiating equation (2)

$$\dot{s} = l_{OA} \dot{\varphi} \cos \varphi \qquad (3)$$

Considering that the input angular velocity is constant and differentiating equation (3), the slider acceleration can be written as

$$\ddot{s} = -l_{OA} (\dot{\varphi})^2 \sin \varphi \qquad (4)$$

The kinetic energy of the mechanism can be written as

$$T = 0.5(\dot{\varphi})^2 \left(I_{S1} + m_1 r_{S1}^2 + m_2 l_{OA}^2 + m_3 l_{OA}^2 \cos^2 \varphi\right) \qquad (5)$$

4.3 PUNCHING PART

The pneumatic cylinder converts the pressure energy of a compressed air medium into mechanical energy in the form of linear or rotary mo Power supply tion.

When selecting a pneumatic cylinder, you must pay attention to:

- how far the piston extends when activated, known as "stroke"

- surface area of the piston face, known as "bore size"
- action type
- pressure rating, such as "5 PSI"
- type of connection to each port, such as "1/4" NPT"
- must be rated for compressed *air* use
- mounting method
- A "double-acting" cylinder has two ports for compressed air.
- Note that a double-acting cylinder requires a more complex solenoid valve. When you want to return the piston to its resting position, you must not only apply pressure to the second port, but also open up the first port so that the gas in it can be expelled.
- A double-acting cylinder consumes more air than the equivalent single-acting cylinder, because you need air to push the cylinder in each direction.

DETAILS FOR 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 mean 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 will indeed be 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 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 the air at intake conditions namely at atmosphere pressure and normal ambient temperature. The compressibility of the air was first investigated by Robert Boyle in 1962 and that found that the product of pressure and volume of a particular quantity of gas.

The usual written as

$$PV = C \quad \text{(or)} \quad P_1V_1 = P2V2$$

In this equation the pressure is the absolute pressured which for free is about 14.7 Psi 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.

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 the 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 also have outstanding advantages in terms of safety.

PRODUCTION OF COMPRESSED AIR

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 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 the air at intake conditions namely at atmosphere pressure and normal ambient temperature. Clean condition of the suction air is one of the factors, which decides the life of a compressor. Warm and moist suction air will result in increased precipitation of condense from the compressed air. 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

1. Reciprocating type compressor
2. Rotary type compressor

Turbo compressors are employed where large capacity of air required at low discharge pressures. They cannot attain pressure necessary for pneumatic control application unless built in multistage designs and are seldom encountered in pneumatic service.

RECIPROCATING COMPRESSORS

Built for either stationary (or) portable service the reciprocating compressor is by far the most common type. Reciprocating compressors lap be had is sizes from the smallest capacities to deliver more than 500 m^3/min. In single stage compressor, the air pressure may be of 6 bar machines discharge of pressure is up to 15 bars. Discharge

pressure in the range of 250 bars can be obtained with high pressure reciprocating compressors that of three & four stages. Single stage and 1200 stage models are particularly suitable for pneumatic applications , with preference going to the two stage design as soon as the discharge pressure exceeds 6 bar , because it in capable of matching the performance of single stage machine at lower costs per driving powers in the range.

DESIGN OF CYLINDER

The pneumatic machine consists of the following components to full fill the requirements of complete operation of the machine.

1. Flow control present in the compressor
2. Connectors
3. Hoses
4. Pneumatic cylinder

1. Flow control present in the compressor

Technical Data

Port size : 0.635×10^{-2} m

Pressure : $0\text{-}8 \times 10^{5}$ N/m²

Media : Air

Quantity : 1

2. Connectors

Technical data

Max working pressure: 10×10^{5} N/m²

Temperature : 0-100 ° C

Fluid media : Air

Material : Brass

3. Hoses

Technical date

Max pressure : $10 \times 10^{5}\ N/m^2$

Outer diameter : $6\ mm = 6 \times 10^{-3} m$

Inner diameter : $3.5\ mm = 3.5 \times 10^{-3} m$

4. Pneumatic cylinders

Force to be exerted is 40N

Force = Pressure×area

Pressure in the cylinder = 0.4 x105 N/m2

Area of the piston, (πd2)/4 = Force/pressure

= 40/ 40000

= 0.001m2

Bore diameter = 0.0356m = 35.6 mm

From pneumatic products catalogue, we have selected 40mm bore diameter cylinder.

For forward stroke

For 40mm bore diameter

Corresponding rod diameter = 16mm

Area of the piston = (πd2)/4

= (πx402)/4

= 1256.8mm2

Force (modified) to be exerted = pressure ×area

= 0.4 x105 x1256.8

= 50N

For return stroke

On the return stroke, when the pressure is applied to the reverse direction, the force on the piston due to the pressure is = P × (A-a)

Where,

P = Pressure in the cylinder (N/m2)

A = Area of the piston (m2)

a = Cross sectional area of the piston rod(m2)

Therefore

Area of the piston (A-a) = {(π× d2)/4}-{(π× d12)/4}

= {(π× 402)/4}-{π (×162)/4}

= 1256.6-201

= 1055mm2

Force to be converted

On the reverse direction = pressure×area

= 0.4× 105×1055

= 42.2 N

For working pressure of 0.4×105 N/m2

Extending force = 50.3 N

Retracting force = 42.2 N

ELECTRONICS METHODOLOGY

- The young tender coconut is hold in position on the top face of screw jack. The drill tool is fixed on the top of the frame.
- Next the screw jack is lifted up with the help of handle. It will move the jack in upward direction. the threads are strong enough to lift the tender coconut even after tool restrict the motion.
- Due to the lifting force of screw jack the hole will get drilled in the young tender coconut and water will be ready to use.
- After this if we change the dill with blade and repeat the same procedure we will get cut that young tender coconut in to two halves.
- The procedure is simple enough that we can commercialize the process.

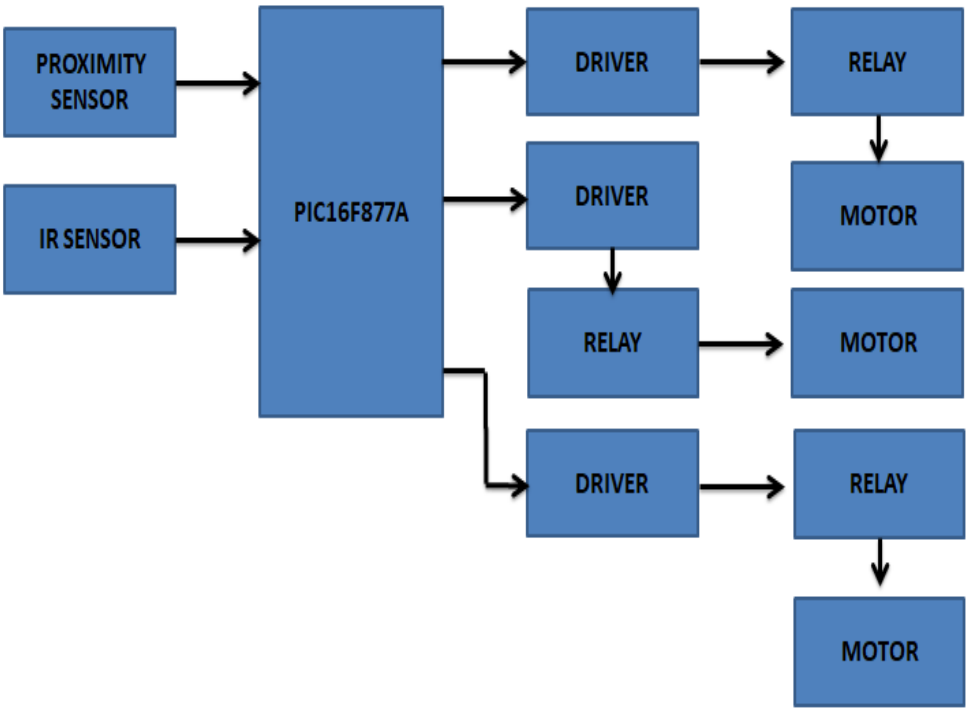


FIG 4.7 BLOCK DIAGRAM

WORKING PRINCIPLE

When the work piece is inserted in the cutting machine, the work piece is placed the limited surface of the machine's main handle. The main function of this cutting machine is to cut the husk of the tender coconutby using motor power. This is an era of automation where it is broadly defined as replacement of manual effort by mechanical power in all degrees of automation. The operation remains an essential part of the system although with changing demands on physical input as the degree of mechanization is increased. Degrees of automation are of two types, viz. • Full automation. • Semi automation. In semi automation a combination of manual effort and mechanical power is required whereas in full automation human participation is very negligible. 10inch cutting tool is fixed to perform this operation. Scotch yoke mechanism is used to feed this cutting machine. A AC motor with 1440 rpm is used here to operate the scotch yoke mechanism. After cutting we attached a pneumatic punching system to put a hole in the tender tender coconut. A double acting cylinder and a 230v solenoid valve is used to perform this operation.

CHAPTER – 5

HARDWARE DESCRIPTION

5.1 POWER SUPPLY

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others. Power supplies for electronic devices can be broadly divided into linear and switching power supplies. The linear supply is a relatively simple design that becomes increasingly bulky and heavy for high current devices; voltage regulation in a linear supply can result in low efficiency. A switched-mode supply of the same rating as a linear supply will be smaller, is usually more efficient, but will be more complex.

Linear Power supply:

An AC powered linear power supply usually uses a transformer to convert the voltage from the wall outlet (mains) to a different, usually a lower voltage. If it is used to produce DC, a rectifier is used. A capacitor is used to smooth the pulsating current from the rectifier. Some small periodic deviations from smooth direct current will remain, which is known as ripple. These pulsations occur at a frequency related to the AC power frequency (for example, a multiple of 50 or 60 Hz).The voltage produced by an unregulated power supply will vary depending on the load and on variations in the AC supply voltage. For critical electronics applications a linear regulator will be used to stabilize and adjust the voltage. This regulator will also greatly reduce the ripple and noise in the output direct current. Linear regulators often provide current limiting, protecting the power supply and attached circuit from over current. Adjustable linear power supplies are common laboratory and service shop test equipment, allowing the output voltage to be set

over a wide range. For example, a bench power supply used by circuit designers may be adjustable up to 30 volts and up to 5 amperes output. Some can be driven by an external signal, for example, for applications requiring a pulsed output.

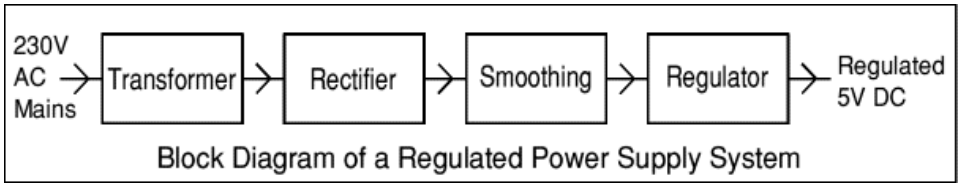


FIG 5.1 BLOCK DIAGRAM OF RPS

5.2 Transformer:

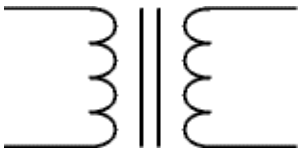


FIG 5.2 TRANSFORMER SYMBOL

Transformers convert AC electricity from one voltage to another with little loss of power. Transformers work only with AC and this is one of the reasons why mains electricity i Rectifier s AC. Step-up transformers increase voltage, step-down transformers reduce voltage. Most power supplies use a step-down transformer to reduce the dangerously high mains voltage (230V in UK) to a safer low voltage. The input coil is called the primary and the output coil is called the secondary. There is no electrical connection between the two coils; instead they are linked by an alternating magnetic field created in the soft-iron core of the transformer. The two lines in the middle of the circuit symbol represent the core. Transformers waste very little power so the power out is (almost) equal to the power in. Note that as voltage is stepped down current is stepped up. The ratio of the number of turns on each coil, called the turn's ratio, determines the ratio of the voltages. A step-down transformer has a large number of turns on its primary (input) coil which is connected to the high voltage mains supply, and a small number of turns on its secondary (output) coil to give a low output voltage.

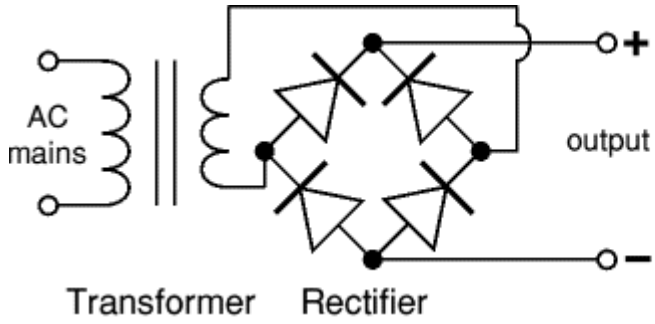
Turns ratio=Vp/Vs=Nn/Ns and Power out=Power in

Vs*Is=Vp * Ip

The low voltage AC output is suitable for lamps, heaters and special AC motors. It is not suitable for electronic circuits unless they include a rectifier and a smoothing capacitor.

5.3 Rectifier

There are several ways of connecting diodes to make a rectifier to convert AC to DC. The bridge rectifier is the most important and it produces full-wave varying DC. A full-wave rectifier can also be made from just two diodes if a centre-tap transformer is used, but this method is rarely used now that diodes are cheaper. A single diode can be used as a rectifier but it only uses the positive (+) parts of the AC wave to produce half-wave varying DC.



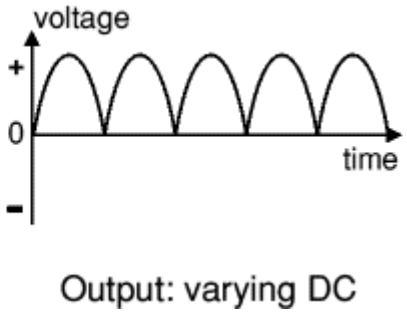


FIG 5.3 RECTIFIER **FIG5.4RECTIFIER OUTPUT**

The varying DC output is suitable for lamps, heaters and standard motors. It is not suitable for electronic circuits unless they include a smoothing capacitor.

Bridge rectifier:

A bridge rectifier can be made using four individual diodes, but it is also available in special packages containing the four diodes

required. It is called a full-wave rectifier because it uses the entire AC wave (both positive and negative sections). 1.4V is used up in the bridge rectifier because each diode uses 0.7V when conducting and there are always two diodes conducting, as shown in the diagram below. Bridge rectifiers are rated by the maximum current they can pass and the maximum reverse voltage they can withstand (this must be at least three times the supply RMS voltage so the rectifier can withstand the peak voltages). Please see the Diodes page for more details, including pictures of ridge rectifiers.

Alternate pairs of diodes conduct, changing over the connections so the alternating directions of AC are converted to the one direction of DC.

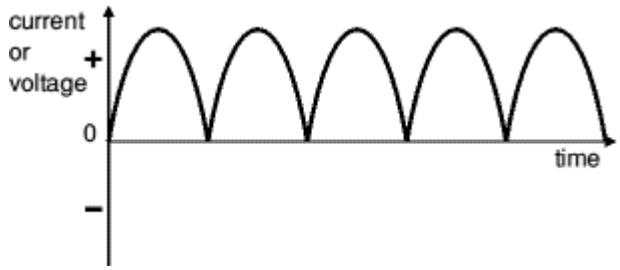
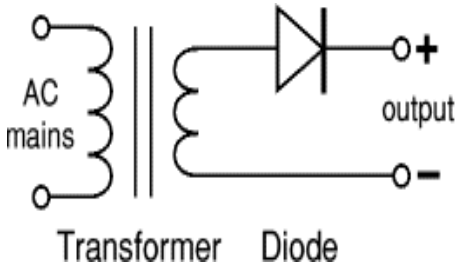


FIG 5.5 OUTPUT WAVEFORM

Single diode rectifier:

A single diode can be used as a rectifier but this produces half-wave varying DC which has gaps when the AC is negative. It is hard to smooth this sufficiently well to supply electronic circuits unless they require a very small current so the smoothing capacitor does not significantly discharge during the gaps. Please see the Diodes page for some examples of rectifier diodes.



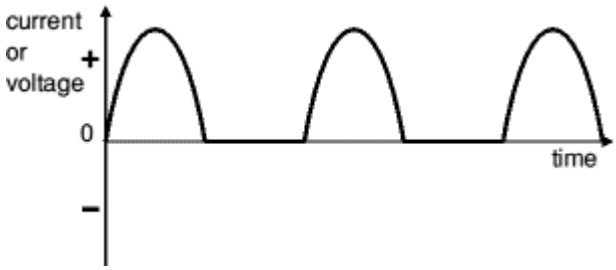


FIG 5.6SINGLE DIODE RECTIFIER FIG 5.7 Output: halfwave varying DC

Smoothing:

Smoothing is performed by a large value electrolytic capacitor connected across the DC supply to act as a reservoir, supplying current to the output when the varying DC voltage from the rectifier is falling. The diagram shows the unsmoothed varying DC (dotted line) and the smoothed DC (solid line). The capacitor charges quickly near the peak of the varying DC, and then discharges as it supplies current to the output.

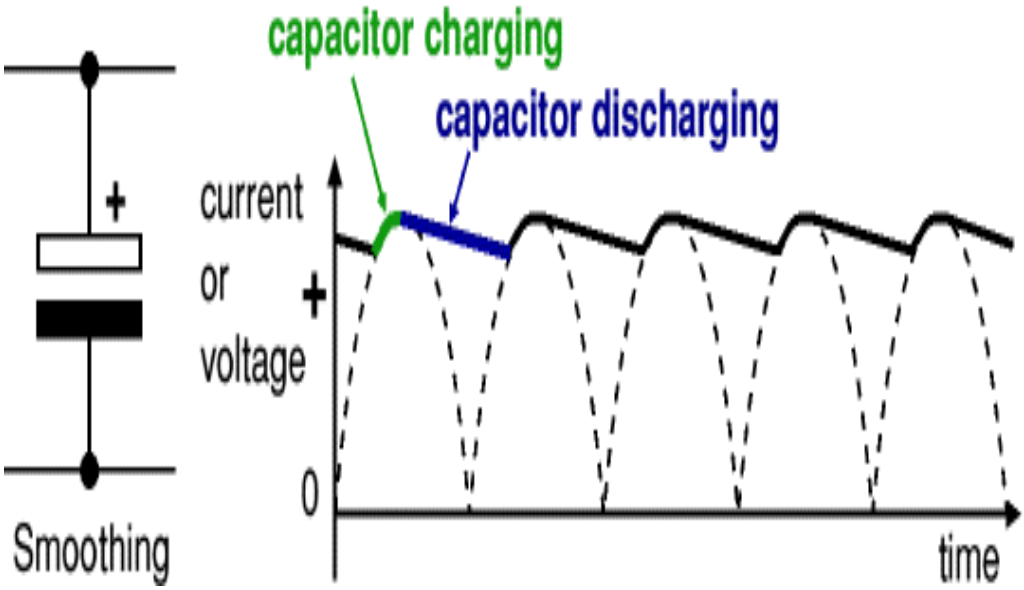


FIG 5.8 SMOOTHING CURVE

Note that smoothing significantly increases the average DC voltage to almost the peak value (1.4 × RMS value). For example 6V RMS AC is rectified to full wave DC of about 4.6V RMS (1.4V is lost in the bridge rectifier), with smoothing this increases to almost the peak value giving 1.4 × 4.6 = 6.4V smooth DC. Smoothing is not perfect due to the capacitor voltage falling a little as it discharges, giving a small ripple voltage. For many circuits a ripple which is 10% of the supply voltage is satisfactory and the equation below gives the required value for the smoothing capacitor. A larger capacitor will give fewer ripples. The capacitor value must be doubled when smoothing half-wave DC.

Smoothing Capacitor for 10% ripple, C=5*10/vs.*f

C = smoothing capacitance in farads (F)

Io = output current from the supply in amps (A)

Vs = supply voltage in volts (V), this is the peak value of the unsmoothed DC

f = frequency of the AC supply in hertz (Hz), 50Hz in the UK.

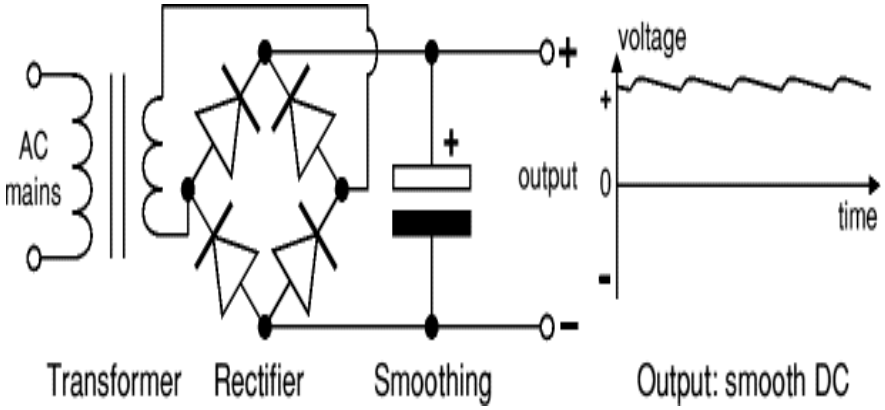


FIG 5.9 RECTIFIER SMOOTHING OUTPUT

The smooth DC output has a small ripple. It is suitable for most electronic circuits.

5.4 Regulator:

Voltage regulator ICs are available with fixed (typically 5, 12 and 15V) or variable output voltages. They are also rated by the maximum current they can pass. Negative voltage regulators are available, mainly

for use in dual supplies. Most regulators include some automatic protection from excessive current ('overload protection') and overheating ('thermal protection'). The LM78XX series of three terminal regulators is available with several fixed output voltages making them useful in a wide range of applications. One of these is local on card regulation, eliminating the distribution problems associated with single point regulation. The voltages available allow these regulators to be used in logic systems, instrumentation, HiFi, and other solid state electronic equipment. Although designed primarily as fixed voltage regulators these devices can be used with external components to obtain adjustable voltages and current. Many of the fixed voltage regulator ICs has 3 leads and look like power transistors, such as the 7805 +5V 1A regulator shown on the right. They include a hole for attaching a heat sink if necessary.

1. Positive regulator
    1. input pin
    2. ground pin
    3. output pin

It regulates the positive voltage

2. Negative regulator
    1. ground pin
    2. input pin
    3. output pin

It regulate the negative voltage

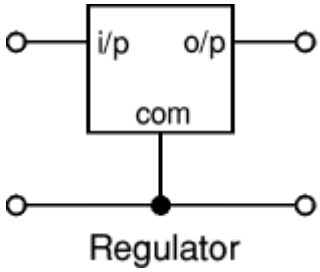


FIG 5.10 REGULATOR

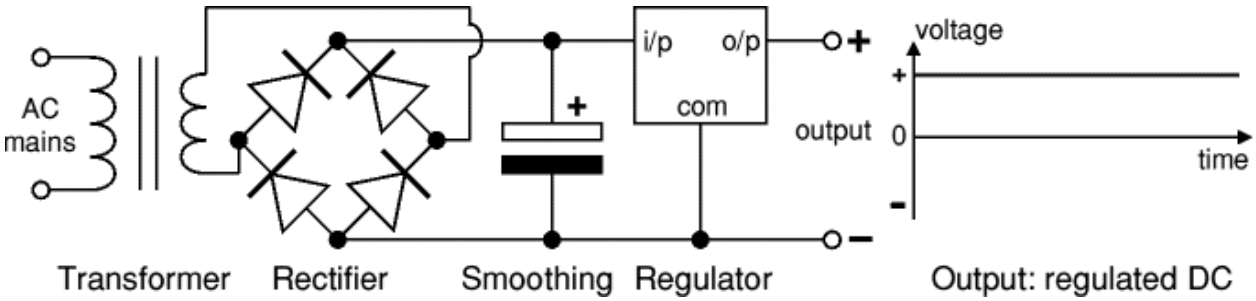


FIG 5.11 REGULATED OUTPUT

The regulated DC output is very smooth with no ripple. It is suitable for all electronic circuits.

5.5 Proximity sensor

A proximity sensor detects an object when the object approaches within the detection boundary of the sensor. Proximity sensors are used in various facets of manufacturing for detecting the approach of metal objects. Various types of proximity sensors are used for detecting the presence or absence of an object.

OPERATING PRINCIPLES FOR INDUCTIVE PROXIMITY SENSORS

Inductive proximity sensors are used for non-contact detection of metallic objects. Their operating principle is based on a coil and oscillator that creates an electromagnetic field in the close surroundings of the sensing surface. The design of a proximity sensor can be based on a number of principles of operation, some examples include: variable reluctance, eddy current loss, saturated core, and Hall Effect. Depending on the principle of operation, each type of sensor will have different performance levels for sensing different types of objects. Common types of non-contact proximity sensors include inductive proximity sensors, capacitive proximity sensors, ultrasonic proximity sensors, and photoelectric sensors. Hall-effect sensors detect a change in a polarity of a magnetic field. Variable reluctance sensors typically include a U-type core and coils wound around the core legs. Inductive

proximity sensors have a lossy resonant circuit (oscillator) at the input side whose loss resistance can be changed by the proximity of an electrically conductive medium. An electrical capacitance proximity sensor converts a variation in electrostatic capacitance between a detecting electrode and a ground electrode caused by approaching the nearby object into a variation in an oscillation frequency, transforms or linearizes the oscillation frequency into a direct current voltage, and compares the direct current voltage with a predetermined threshold value to detect the nearby object. Ultrasonic sensing systems provide a much more efficient and effective method of longer range detection. These sensors require the use of a transducer to produce ultrasonic signals. Eddy-current proximity sensors are well known and operate on the principle that the impedance of an ac-excited electrical coil is subject to change as the coil is brought in close proximity to a metallic object. Proximity sensors often are employed in manufacturing industries in which the sensors are exposed to harsh environmental conditions. Inductive proximity sensors are used in automation engineering to define operating states in automating plants, production systems and process engineering plants. Magnetic proximity detectors are commonly used on ski lifts and tramways for detecting a de-rope condition of the steel cable used as a haul line or haul rope. Proximity sensors are widely used in the automotive industry to automate the control of power accessories. For instance, proximity sensors are often used in power window controllers to detect the presence of obstructions in the window frame when the window pane is being directed to the closed position.

FIG 5.12 PROXIMITY SENSOR

5.6 IR SENSOR

Infrared radiation (IR) is electromagnetic radiation with a wavelength between 0.7 and 300 micro meters, which equates to a frequency range between approximately 1 and 430 THz. Its wavelength is longer (and the frequency lower) than that of visible light, but the wavelength is shorter (and the frequency higher) than that of terahertz radiation microwaves. Bright sunlight provides an irradiance of about 1 kilowatt per square meter at sea level. Of this energy, 527 watts is infrared light, 445 watts is visible light, and 32 watts is ultraviolet light. Infrared imaging is used extensively for military and civilian purposes. Military applications include target acquisition, surveillance, night vision, homing and tracking. Non-military uses include thermal efficiency analysis, remote temperature sensing, short-ranged wireless communication, spectroscopy, and weather forecasting. Infrared astronomy uses sensor-equipped telescopes to penetrate dusty regions of space, such as molecular clouds; detect cool objects such as planets, and to view highly red-shifted objects from the early days of the universe.

Circuit Design

Two different designs are proposed, each one of them is more suitable for different applications. The main difference between the 2 designs is the way infra-red (IR) light is sent on the object. The receiver part of the circuit is exactly the same in both designs. Note: Both the sender and the receiver are constructed on the same board. They are separated in the schematics for simplification.

Design 1: Low range, Always ON

As the name implies, the sensor is always ON, meaning that the IR led is constantly emitting light. This design of the circuit is suitable for counting objects, or counting revolutions of a rotating object, that may be of the order of 15,000 rpm or much more. However this design is more power consuming and is not optimized for high ranges. in this design, range can be from 1 to 10 cm, depending on the ambient light conditions. As you can see the schematic is divided into two parts the sender and the receiver.

1. The sender is composed of an IR LED (D2) in series with a 470 Ohm resistor, yielding a forward current of 7.5 mA.
2. The receiver part is more complicated, the 2 resistors R5 and R6 form a voltage divider which provides 2.5V at the anode of the IR LED (here, this led will be used as a sensor). When IR light falls on the LED (D1), the voltage drop increases, the cathode's voltage of D1 may go as low as 1.4V or more, depending on the light intensity. This voltage drop can be detected using an Op-Amp (operational Amplifier LM358). You will have to adjust the variable resistor (POT.) R8 so the voltage at the positive input of the Op-Amp (pin No. 5) would be somewhere near 1.6 Volt. if you understand the functioning of Op-Amps, you will notice that the output will go High when the volt at the cathode of D1 drops under 1.6. So the output will be High when IR light is detected, which is the purpose of the receiver.

In case you're not familiar with op-amps, here is shortly and in a very simplified manner, what you need to know to understand how this sensor functions: The op-amp has 2 input, the +ve input,

and the -ve input. If the +ve input's voltage is higher than the -ve input's voltage, the output goes High (5v, given the supply voltage in the schematic), otherwise, if the +ve input's voltage is lower than the -ve input's voltage, then the output of the Op-Amp goes to Low (0V). It doesn't matter how big is the difference between the +ve and -ve inputs, even a 0.0001 volts difference will be detected, and the output will swing to 0v or 5v according to which input has a higher voltage.

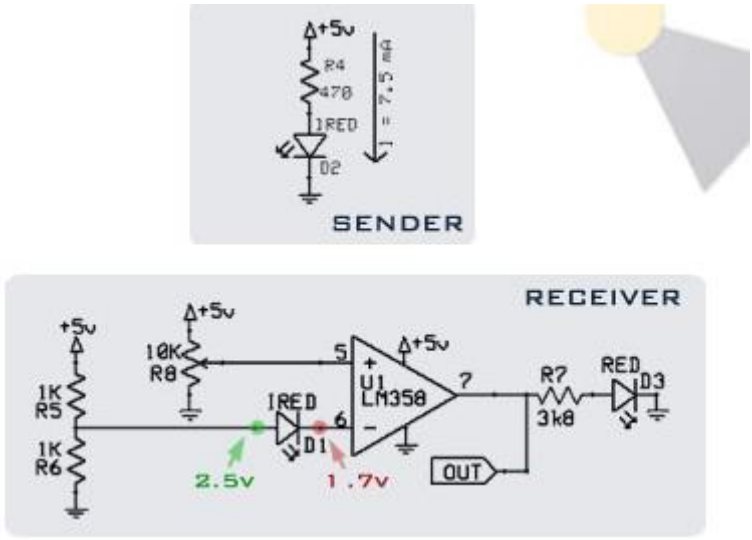


FIG 5.13 CIRCUIT DESIGN OF IR CIRCUIT

Design 2: High range, Pulsed IR

In this design, which is oriented to obstacle detection in robots, our primary target is to reach high ranges, from 25 to 35 cm, depending on ambient light conditions. The range of the sensor is extended by increasing the current flowing in the led. This is a delicate task, as we need to send pulses of IR instead of constant IR emission. The duty cycle of the pulses turning the LED ON and OFF have to be calculated with precision, so that the average current flowing into the LED never exceeds the LED's maximum DC current (or 10mA as a standard safe value).The duty cycle is the ratio between the ON duration of the pulse

and the total period. A low duty cycle will enable us to inject in the LED high instantaneous currents while shutting it OFF for enough time to cool down from the previous cycle.

Graph-1:

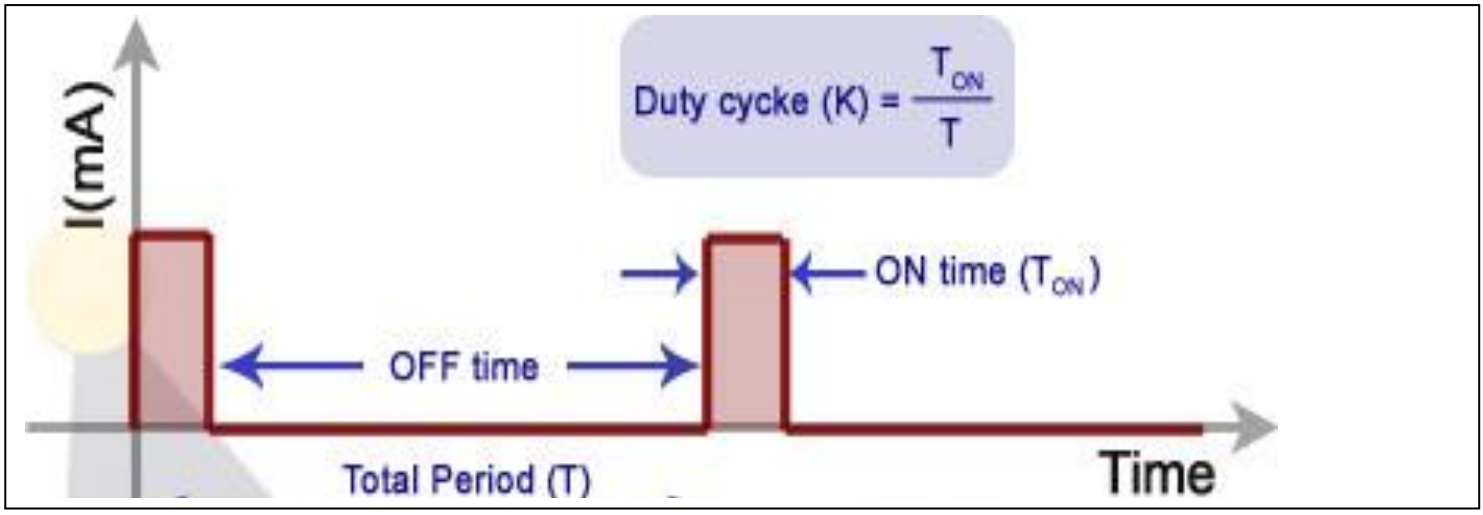


FIG 5.14 GRAPHICAL OUTPUT-1

Graph-2:

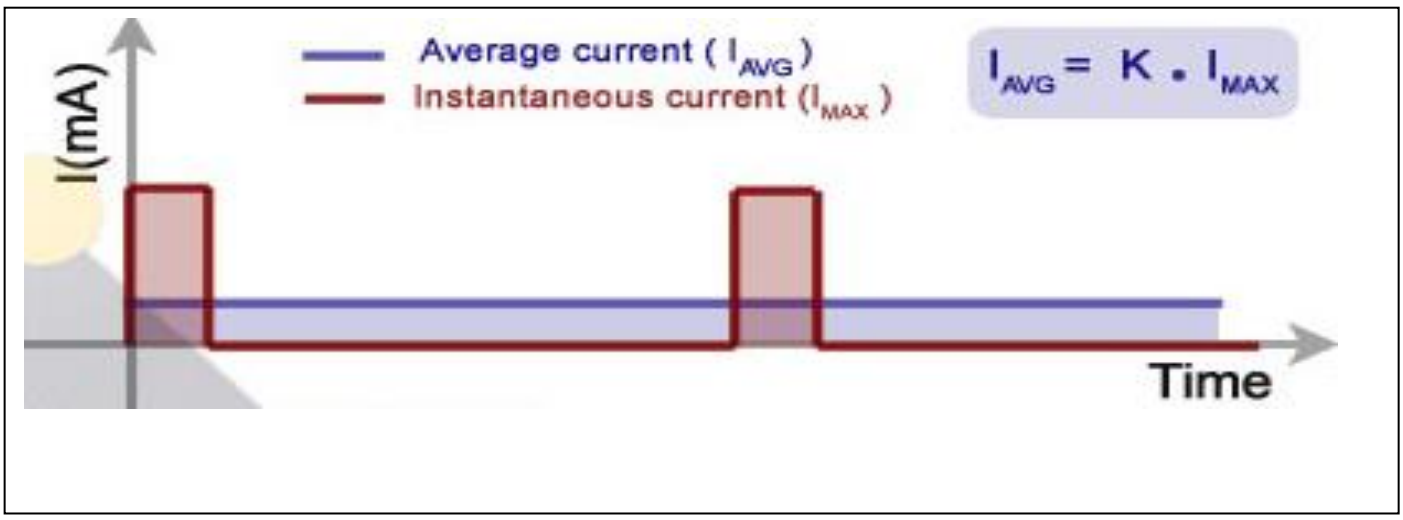


FIG 5.15 GRAPHICAL OUTPUT-2

Those 2 graphs show the meaning of the duty cycle, and the mathematical relations between the ON time, the Total period, and the average current. In the second graph, the average current in blue is exaggerated to be visible, but real calculations would yield a much smaller average current.

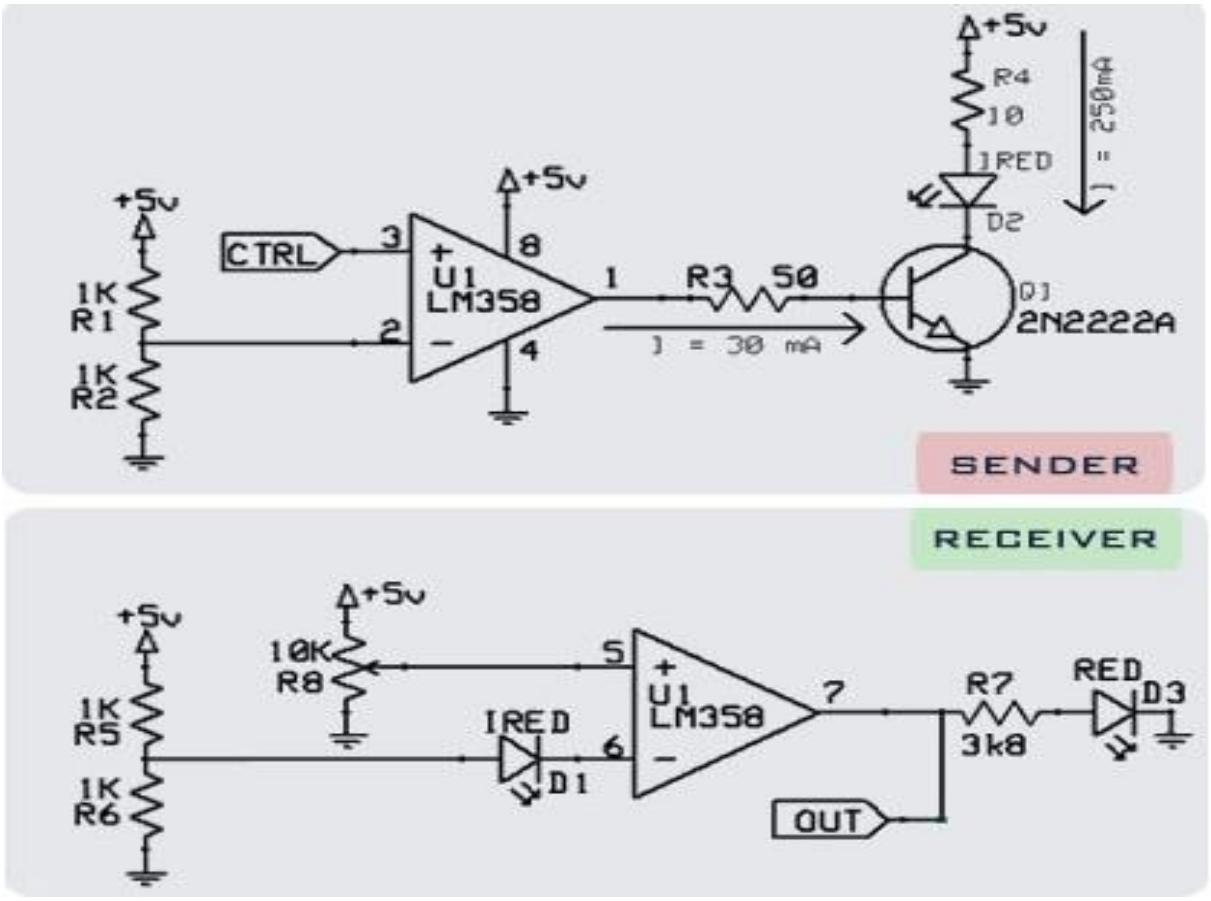


FIG 5.16 CIRCUIT DESIGN-2

The first Op-amp will provide voltage buffer, to enable any kind of device to control the sensor, also, it will provide the 30mA base current required to drive the base of the transistor. The calculation of the base resistor R3 depends on the type of transistor you use, thus on how much current you need on the base to drive the required collector current.

- The receiver part of this schematic functions in the exact same way as in the first design, refer to the first, 'ALLWAYS ON' design for a detailed description.

5.7 PIC MICROCONTROLLER:

PIC is a family of Harvard architecture microcontrollers made by Microchip Technology, derived from the PIC1640. Originally developed by General Instrument's Microelectronics Division. The name PIC initially referred to "Programmable Interface Controller".

PICs are popular with both industrial developers and hobbyists alike due to their low cost, wide availability, large user base, extensive collection of application notes, availability of low cost or free development tools, and serial programming (and re-programming with flash memory) capability. Microchip announced on February 2008 the shipment of its six billionth PIC processor. Microcontroller is a general purpose device, which integrates a number of the components of a microprocessor system on to single chip. It has inbuilt CPU, memory and peripherals to make it as a mini computer. A microcontroller combines on to the same microchip:

- CPU core
- Memory (both ROM and RAM)
- Some parallel digital input/output

Microcontrollers will combine other devices such as:

- A timer module to allow the microcontroller to perform tasks for certain time periods.
- A serial I/O port to allow data to flow between the controller and other devices such as a PIC or another microcontroller.
- An ADC to allow the microcontroller to accept analogue input data for processing.

Microcontrollers are:

- Smaller in size
- Consumes less power
- Inexpensive

Microcontroller is a standalone unit, which can perform functions on its own without any requirements for additional hardware like I/O ports and external memory. The heart of the microcontroller is the CPU

core. In the past, this has traditionally been based on an 8 bit microprocessor unit. For example, Motorola uses a basic 6800 microprocessor core their 6805/6808 microcontroller devices. In the recent years, microcontrollers have been developed around specifically designed CPU cores, for example the microchip PIC range of microcontrollers.

Introduction to PIC:

The microcontroller that has been used for this project is from PIC series. PIC microcontroller is the first RISC based microcontroller fabricated in CMOS (complementary metal oxide semiconductor) that uses separate bus for instruction and data allowing simultaneous access of program and data memory. The main advantage of CMOS and RISC combination is low power consumption resulting in a very small chip size with a small pin count. The main advantage of CMOS is that has immunity to noise than other fabrication techniques.

PIC 16877A:

Various microcontrollers offer different kinds of memories. EEPROM, EPROM, FLASH etc. are some of the memories of which FLASH is the most recently developed. Technology that is used in PIC 16877 is flash technology, so that data is retained even when the power is switched off. Easy programming and erasing are other features of PIC 16F877. PIC16F877A microcontroller is used in the project. The following are some of the important features of the controller.

Core features:

- High performance RISC CPU
- Only 35 single word instructions to learn
- All single cycle instructions except for program branches which are two cycle

- Operating speed: DC- 20MHz clock input DC- 200 ns instruction cycle
- Up to 8K x 14 words of FLASH Program Memory,

  Up to 368 x 8 bytes of Data Memory (RAM)

  Up to 256 x 8 bytes of EEPROM data memory
- Pin out compatible to the PIC 16c73/74/76/77
- Interrupt capability (up to 14 external/internal)
- Eight level deep hardware stack
- Direct, indirect and relative dressing modes
- Power –On Reset
- Power – Up Timer (PWRT) and Oscillator Start – Up Timer (OST)
- Watchdog Timer (WDT) with its own on-chip RC oscillator for reliable operation
- Programmable code operation
- Power saving SLEEP mode
- Selectable oscillator options
- Low-power, high speed CMOS EPROM/EEPROM technology
- Fully static design
- In-circuit Serial Programming (ISCP) via two pins
- Only single 5V source needed for programming capability
- In-circuit Debugging via two pins
- Processor read/write access to program memory

- Wide operating voltage range: 2.5v - 5.5v
- High sink source current: 25mA
- Commercial and industrial temperature ranges
- Low-power consumption:

  <2mA typical at 5V, 4MHz

  20mA typical at 3V, 32 kHz

  <1mA typical standby current

Peripheral features:

- Timer0: 8bit timer/counter with 8-bitprescaler
- Timer1: 16-bit timer/counter with pre-scaler, can be incremented during sleep via external clock/crystal
- Timer2: 8-bit timer/counter with 8-bit period register, pre-scaler and post-scaler
- 10-bit multichannel Analog-to-Digital converter
- Synchronous Serial Port (SSP) with SPI (Master mode) and 12C (Master/ Slave)
- Universal Synchronous Asynchronous Receiver Transmitter (USART/SCI) with 9-bit address detection
- Brown – out detection circuitry for Brown out Reset (BOR)

Pin Description:

PIC16F877A consists of 40 pins enclosed in 5 ports. Each port holds 8 pins which are bidirectional input/output pins. Pin diagram of PIC 16F877 is represented in Fig.

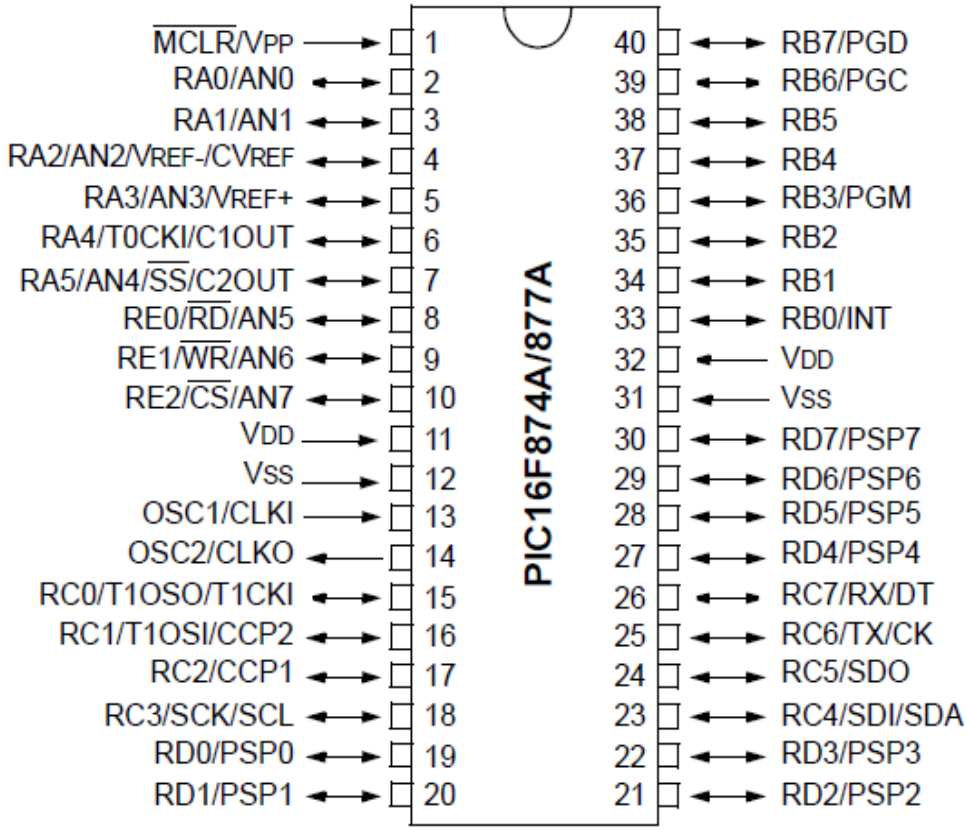


FIG 5.17 PIN DIAGRAM OF PIC 16F877

PIN 1: MCLR

The first pin is the master clear pin of this IC. It resets the microcontroller and is active low, meaning that it should constantly be given a voltage of 5V and if 0 V are given then the controller is reset. Resetting the controller will bring it back to the first line of the program that has been burned into the IC.

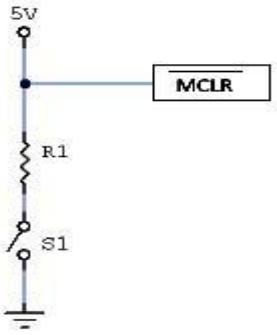


FIG 5.18.PIN-1 CIRCUIT DIAGRAM

A push button and a resistor is connected to the pin. The pin is already being supplied by constant 5V. When we want to reset the IC we just have to push the button which will bring the MCLR pin to 0 potential thereby resetting the controller.

PIN 2: RA0/AN0

PORTA consists of 6 pins, from pin 2 to pin 7, all of these are bidirectional input/output pins. Pin 2 is the first pin of this port. This pin can also be used as an analog pin AN0. It is built in analog to digital converter.

PIN 3: RA1/AN1

This can be the analog input 1.

PIN 4: RA2/AN2/V-ref-

It can also act as the analog input2. Or negative analog reference voltage can be given to it.

PIN 5: RA3/AN3/V-ref+

It can act as the analog input 3. Or can act as the analog positive reference voltage.

PIN 6: RA0/T0CKI

To timer0 this pin can act as the clock input pin, the type of output is open drain.

PIN 7: RA5/SS/AN4

This can be the analog input 4. There is synchronous serial port in the controller also and this pin can be used as the slave select for that port.

PIN 8: RE0/RD/AN5

PORTE starts from pin 8 to pin 10 and this is also a bidirectional input output port. It can be the analog input 5 or for parallel slave port it can act as a 'read control' pin which will be active low.

PIN 9: RE1/WR/AN6

It can be the analog input 6. And for the parallel slave port it can act as the 'write control' which will be active low.

PIN 10: RE2/CS/A7

It can be the analog input 7, or for the parallel slave port it can act as the 'control select' which will also be active low just like read and write control pins.

PIN 11 and 32: VDD

These two pins are the positive supply for the input/output and logic pins. Both of them should be connected to 5V.

PIN 12 and 31: VSS

These pins are the ground reference for input/output and logic pins. They should be connected to 0 potential.

PIN 13: OSC1/CLKIN

This is the oscillator input or the external clock input pin.

PIN 14: OSC2/CLKOUT

This is the oscillator output pin. A crystal resonator is connected between pin 13 and 14 to provide external clock to the microcontroller. ¼ of the frequency of OSC1 is outputted by OSC2 in case of RC mode. This indicates the instruction cycle rate.

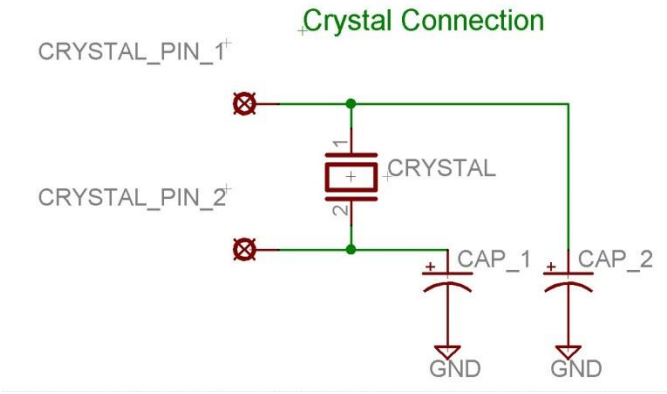


FIG 5.19 PIN-14 CIRCUIT DIAGRAM

PIN 15: RC0/T1OCO/T1CKI

PORTC consists of 8 pins. It is also a bidirectional input output port. Of them, pin 15 is the first. It can be the clock input of timer 1 or the oscillator output of timer 2.

PIN 16: RC1/T1OSI/CCP2

It can be the oscillator input of timer 1 or the capture 2 input/compare 2 output/ PWM 2 output.

PIN 17: RC2/CCP1

It can be the capture 1 input/ compare 1 output/ PWM 1 output.

PIN 18: RC3/SCK/SCL

It can be the output for SPI or I2C modes and can be the input/output for synchronous serial clock.

PIN 23: RC4/SDI/SDA

It can be the SPI data in pin. Or in I2C mode it can be data input/output pin.

PIN 24: RC5/SDO

It can be the data out of SPI in the SPI mode.

PIN 25: RC6/TX/CK

It can be the synchronous clock or USART Asynchronous transmit pin.

PIN 26: RC7/RX/DT

It can be the synchronous data pin or the USART receive pin.

PIN 19,20,21,22,27,28,29,30:

All of these pins belong to PORTD which is again a bidirectional input and output port. When the microprocessor bus is to be interfaced, it can act as the parallel slave port.

PIN 33-40: PORT B

All these pins belong to PORTB. Out of which RB0 can be used as the external interrupt pin and RB6 and RB7 can be used as in-circuit debugger pins.

Architecture of PIC 16F877:

The basic building block of PIC 16F877A is based on Harvard architecture. The memory of a PIC 16F877A is divided into 3 sections. They are:

- Program memory
- Data Memory
- Data EEPROM

Program memory

The PIC 16F877A devices have a 13-bit program counter capable of addressing an 8K word x 14 bit program memory space. The PIC16F877A devices have 8K words x 14 bits of flash program memory.

Data memory

The data memory is partitioned into multiple banks which contain the General Purpose Registers and the Special Function Registers. Bits RP1 and RP0 are the bank select bits. The lower locations of each bank are reserved for the Special Function Registers. Above the Special Function Registers are General Purpose Registers, implemented as static RAM. All implemented banks contain Special Function Registers.

Data EEPROM

The data EEPROM and flash program memory is readable and writing during normal operation. This memory is not directly mapped in the register file space. Instead, it is indirectly addressed through the special function registers. The EEPROM data memory allows single-byte reads and writes. The flash memory allows single-word reads and four-word block writes.

Registers:

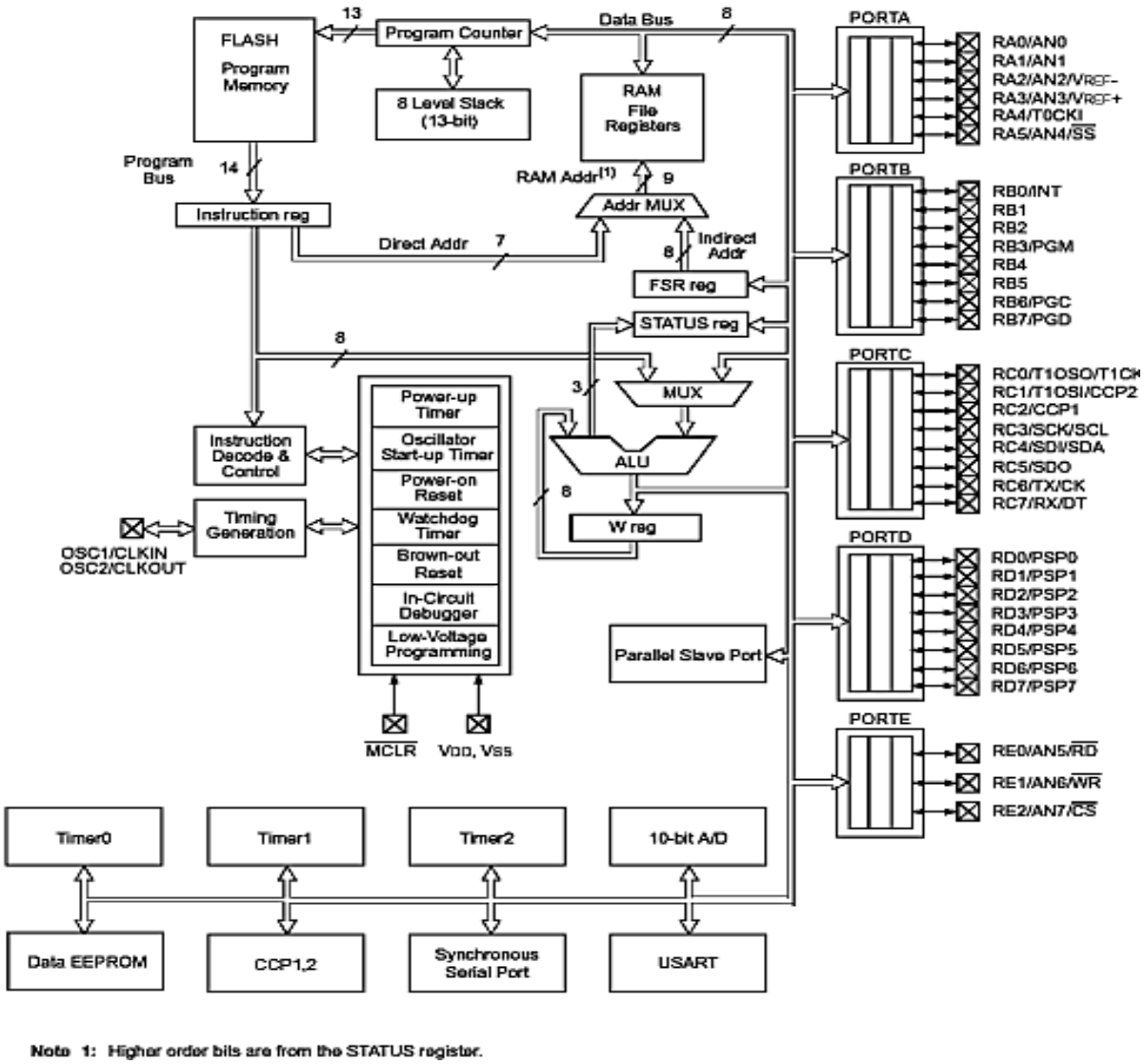
The module has four registers for operation. These are:

- Control Register
- Status Register
- Serial Receive/Transmit Buffer Register
- Shift Register

CR and SR are the control and status registers used in operation. The CS register is readable and writable. The lower six bits of the SR are read only. The upper two bits of SR are read/write. SSPSR is the shift register used for shifting data in or out. SSPBUF is the buffer register to which data bytes are written to or read form. In receive operations: SSPSR and SSPBUF together create a double-buffered receiver. During transmission, the SSPBUF is not double-buffered.

The PIC16F877A incorporates timer modules for the purpose of producing software interrupts. These interrupts are part and parcel of microcontroller programming. There are three timers available. They are:

- Timer0 module
- Timer1 module
- Timer2 module



Note 1: Higher order bits are from the STATUS register.

FIG 5.20 ARCHITECTURE OFPIC 16F877

Master Synchronous Serial Port (MSSP) Module:

The Master Synchronous Serial Port (MSSP) module is a serial interface, useful for communicating with other peripheral or microcontroller devices. These peripheral devices may be serial EEPROMs, shift registers, display drivers, A/D converters, etc. The MSSP module can operate in one of two modes:

- Serial Peripheral Interface (SPI)
- Inter- Integrated Circuit (I2C)
- Full Master mode
- Slave mode (with general address call)

The I2C interface supports the following modes in hardware:

- Master mode
- Multi-Master mode
- Slave mode

Control Registers:

The MSSP module has three associated registers. These include a status register (SSPSTAT) and two control registers (SSPCON and SSPCON2). The use of these registers and their individual configuration bits differ significantly, depending on whether the MSSP module is operated in SPI or I2C mode.

Analog to Converter Module:

The Analog-to-Digital Converter module has five inputs for the 28-pi devices and eight for the 40/44 pin devices. The conversion of an Analog input signal results in a corresponding 10-bit digital number. The A/D module has high and low voltage reference input that is software selectable to some combination of VDD, VSS, RA2 or RA3. The A/D converter has a unique feature of being able to operate while the device is in sleep mode. To operate in sleep mode, the A/D clock must be derived from the A/D internal RC oscillator.

Core architecture

The PIC architecture is characterized by the following features:

- Separate code and data spaces (Harvard architecture) for devices other than PIC32, which has a Von Neumann architecture.
- A small number of fixed length instructions
- Most instructions are single cycle execution (2 clock cycles), with one delay cycle on branches and skips
- One accumulator (W0), the use of which (as source operand) is implied (i.e. is not encoded in the opcode)
- All RAM locations function as registers as both source and/or destination of math and other functions.
- A hardware stack for storing return addresses
- A fairly small amount of addressable data space (typically 256 bytes), extended through banking
- Data space mapped CPU, port, and peripheral registers
- The program counter is also mapped into the data space and writable (this is used to implement indirect jumps).

There is no distinction between memory space and register space because the RAM serves the job of both memory and registers, and the RAM is usually just referred to as the register file or simply as the registers.

Data space (RAM)

PICs have a set of registers that function as general purpose RAM. Special purpose control registers for on-chip hardware resources are also mapped into the data space. The addressability of memory varies depending on device series, and all PIC devices have some banking mechanism to extend addressing to additional memory. Later series of devices feature move instructions which can cover the whole addressable space, independent of the selected bank. In earlier devices,

any register move had to be achieved via the accumulator. To implement indirect addressing, a "file select register" (FSR) and "indirect register" (INDF) are used. A register number is written to the FSR, after which reads from or writes to INDF will actually be to or from the register pointed to by FSR. Later devices extended this concept with post- and pre- increment/decrement for greater efficiency in accessing sequentially stored data. This also allows FSR to be treated almost like a stack pointer (SP).External data memory is not directly addressable except in some high pin count PIC18 devices.

Code space

The code space is generally implemented as ROM, EPROM or flash ROM. In general, external code memory is not directly addressable due to the lack of an external memory interface. The exceptions are PIC17 and select high pin count PIC18 devices.

Word size

The word size of PICs can be a source of confusion. All PICs handle (and address) data in 8-bit chunks, so they should be called 8-bit microcontrollers. However, the unit of addressability of the code space is not generally the same as the data space. For example, PICs in the baseline and mid-range families have program memory addressable in the same word size as the instruction width, i.e. 12 or 14 bits respectively. In contrast, in the PIC18 series, the program memory is addressed in 8-bit increments (bytes), which differs from the instruction width of 16 bits. In order to be clear, the program memory capacity is usually stated in number of (single word) instructions, rather than in bytes.

Stacks

PICs have a hardware call stack, which is used to save return addresses. The hardware stack is not software accessible on earlier devices, but this changed with the 18 series devices. Hardware support for a general purpose parameter stack was lacking in early series, but this greatly improved in the 18 series, making the 18 series architecture more friendly to high level language compilers.

Instruction set

A PIC's instructions vary from about 35 instructions for the low-end PICs to over 80 instructions for the high-end PICs. The instruction set includes instructions to perform a variety of operations on registers directly, the accumulator and a literal constant or the accumulator and a register, as well as for conditional execution, and program branching. Some operations, such as bit setting and testing, can be performed on any numbered register, but bi-operand arithmetic operations always involve W (the accumulator) ; writing the result back to either W or the other operand register. To load a constant, it is necessary to load it into W before it can be moved into another register. On the older cores, all register moves needed to pass through W, but this changed on the "high end" cores.PIC cores have skip instructions which are used for conditional execution and branching. The skip instructions are: 'skip if bit set', and, 'skip if bit not set'. Because cores before PIC18 had only unconditional branch instructions, conditional jumps are implemented by a conditional skip (with the opposite condition) followed by an unconditional branch. Skips are also of utility for conditional execution of any immediate single following instruction. The PIC architecture has no (or very major) hardware support for automatically saving processor state when servicing interrupts. The 18 series improved this situation by implementing shadow registers which save several important registers during an interrupt.

In general, PIC instructions fall into 5 classes:

1. Operation on W with 8-bit immediate ("literal") operand. E.g. movlw (move literal to W), andlw (AND literal with W). One instruction peculiar to the PIC is retlw, load immediate into W and return, which is used with computed branches to produce lookup tables.
2. Operation with W and indexed register. The result can be written to either the W register (e.g. addwf reg,w). or the selected register (e.g. addwf reg,f).
3. Bit operations. These take a register number and a bit number, and perform one of 4 actions: set or clear a bit, and test and skip on set/clear. The latter are used to perform conditional branches. The usual ALU status flags are available in a numbered register so operations such as "branch on carry clear" are possible.
4. Control transfers. Other than the skip instructions previously mentioned, there are only two: goto and call.
5. A few miscellaneous zero-operand instructions, such as return from subroutine, and sleep to enter low-power mode.

Performance

The architectural decisions are directed at the maximization of speed-to-cost ratio. The PIC architecture was among the first scalar CPU designs, and is still among the simplest and cheapest. The Harvard architecture—in which instructions and data come from separate sources—simplifies timing and microcircuit design greatly, and this benefits clock speed, price, and power consumption. The PIC instruction set is suited to implementation of fast lookup tables in the program space. Such lookups take one instruction and two instruction cycles. Many functions can be modelled in this way. Optimization is facilitated by the relatively large program space of the PIC (e.g. 4096 x 14-bit words on the 16F690) and by the design of the instruction set, which allows for embedded constants. For example, a branch

instruction's target may be indexed by W, and execute a "RETLW" which does as it is named - return with literal in W. Execution time can be accurately estimated by multiplying the number of instructions by two cycles; this simplifies design of real-time code. Similarly, interrupt latency is constant at three instruction cycles. External interrupts have to be synchronized with the four clock instruction cycle, otherwise there can be a one instruction cycle jitter. Internal interrupts are already synchronized. The constant interrupt latency allows PICs to achieve interrupt driven low jitter timing sequences. An example of this is a video sync pulse generator.

Relay Driver:

A relay is an electro-magnetic switch which is useful if you want to use a low voltage circuit to switch on and off a light bulb (or anything else) connected to the 220v mains supply.

The diagram below shows a typical relay (with “normally-open” contacts).

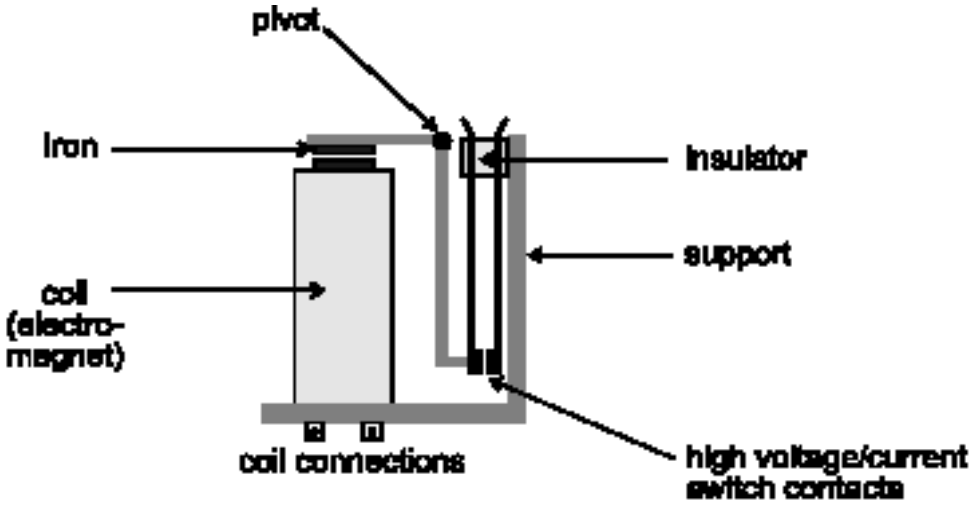


FIG 5.21 RELAY DRIVER

The current needed to operate the relay coil is more than can be supplied by most chips (op. amps etc), so a transistor is usually needed.

Driver using IC ULN 2003:

The ULN2003 is a monolithic high voltage and high current Darlington transistor arrays. It consists of seven NPN Darlington pairs that feature high-voltage outputs with common-cathode clamp diode for switching inductive loads. The collector-current rating of a single Darlington pair is 500mA. The Darlington pairs may be paralleled for higher current capability. Applications include relay drivers, hammer drivers, lamp drivers, display drivers (LED gas discharge), line drivers, and logic buffers. The ULN2003 has a 2.7kW series base resistor for each Darlington pair for operation directly with TTL or 5V CMOS devices. Ideally suited for interfacing between low-level logic circuitry and multiple peripheral power loads, the Series ULN20xxA/L high-voltage, high-current Darlington arrays feature continuous load current ratings to 500 mA for each of the seven drivers. At an appropriate duty cycle depending on ambient temperature and number of drivers turned ON simultaneously, typical power loads totalling over 230 W (350 mA x 7,95 V) can be controlled. Typical loads include relays, solenoids, stepping motors, magnetic print hammers, multiplexed LED and incandescent displays, and heaters. All devices feature open-collector outputs with integral clamp diodes. The ULN2003A/L and ULN2023A/L have series input resistors selected for operation directly with 5 V TTL or CMOS. These devices will handle numerous interface needs particularly those beyond the capabilities of standard logic buffers. The ULN2004A/L and ULN2024A/L have series input resistors for operation directly from 6 to 15 V CMOS or PMOS logic outputs. The ULN2003A/L and ULN2004A/L are the standard Darlington arrays. The outputs are capable of sinking 500 mA and will withstand at least 50 V in the OFF state. Outputs may be paralleled for higher load current capability. The ULN2023A/L and ULN2024A/L will withstand 95 V in the OFF state. These Darlington arrays are furnished in 16-pin dual in-line plastic packages (suffix “A”) and 16-lead surface-mountable SOICs (suffix “L”). All devices are pinned with

outputs opposite inputs to facilitate ease of circuit board layout. All devices are rated for operation over the temperature range of -20°C to +85°C. Most (see matrix, next page) are also available for operation to -40°C; to order, change the prefix from “ULN” to “ULQ”. Two methods of controlling the ULN2003 are shown on the diagram. Method "A" is preferable and resistor R1 should be sized to pass about 1 milliamp. Method "B" is OK but requires an extra diode to compensate for the voltage drop across the opto-isolator transistor when it is conducting. If this diode was not used the transistor in the ULN2003 would not be able to turn off fully. Resistor R2 would also be sized to pass about 1 milliamp and the voltage drop across the drivers’ internal resistor will have to be taken into account. As the peripheral drivers in the ULN2003 require only a small control current opto-isolators with non-Darlington transistor outputs such as the 4N35 can be used. There are other devices that are similar to the ULN2003, such as the ULN2803, which has eight drivers in an eighteen pin package. Other devices have higher or lower ratings and/or lack the protection diodes built into the ULN2003 package. One advantage of Solid-State relays is that it has no moving parts and are therefore very fast. This can be very helpful for loads that are switched often as relay noise and wear is eliminated. Two disadvantages of this type of relay are that three terminals are required for the output side of the higher current version and a voltage drop across the output transistor. In most uses the voltage drop will not affect the circuit load. Opto-isolators also are available in other output configurations and number of units per package. Consult a supplier’s parts catalogue for details. Don't hesitate to experiment with these devices you might find an inexpensive solution to a complicated relay problem.

FEATURES:

- TTL, DTL, PMOS, or CMOS-Compatible Inputs
- Output Current to 500 mA
- Output Voltage to 95 V

- Transient-Protected Outputs
- Dual In-Line Plastic Package or Small-Outline IC Package
- 500mA rated collector current (Single output)
- High-voltage outputs: 50V
- Inputs compatible with various types of logic.
- Relay driver application

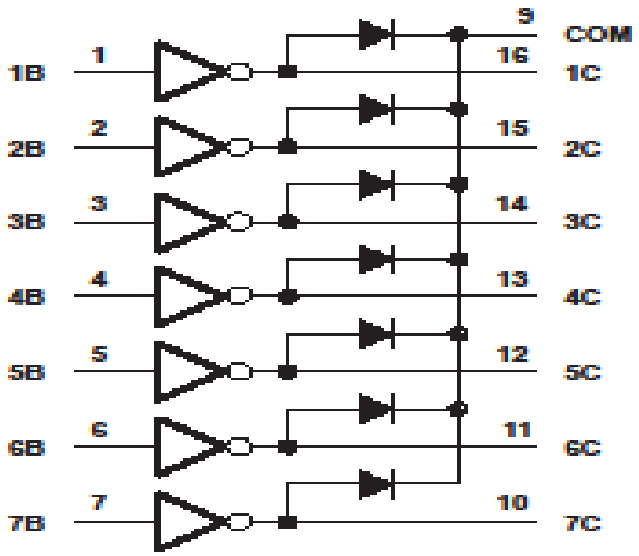


FIG 5.22 LOGIC DIAGRAM

Specification:

Collector-emitter voltage . . . . . 50 V

Input voltage, VI . . . . . 30 V

Peak collector current . . . . . 500 mA

Output clamp current, IOK . . . . . 500 mA

Total emitter-terminal current . . . . . −2.5 A

Operating free-air temperature range, TA, ULN200xA . −20°C to 70°C

5.8 RELAYS

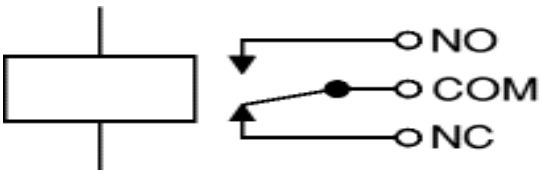


FIG 5.23 RELAY

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and most have double throw (changeover) switch contacts as shown in the diagram. Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits, the link is magnetic and mechanical. The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Most ICs (chips) cannot provide this current and a transistor is usually used to amplify the small IC current to the larger value required for the relay coil. The maximum output current for the popular 555 timer IC is 200mA so these devices can supply relay coils directly without amplification. Relays are usually SPDT or DPDT but they can have many more sets of switch contacts, for example relays with 4 sets of changeover contacts are readily available. The coil will be obvious and it may be connected either way round. Relay coils produce brief high voltage 'spikes' when they are switched off and this can destroy transistors and ICs in the circuit. To prevent damage you must connect a protection diode across the relay coil. The relay's switch connections are usually labelled COM, NC and NO:

- COM = Common, always connect to this, it is the moving part of the switch.
- NC = Normally Closed, COM is connected to this when the relay coil is off.
- NO = Normally Open, COM is connected to this when the relay coil is on.
- Connect to COM and NO if you want the switched circuit to be on when the relay coil is on.
- Connect to COM and NC if you want the switched circuit to be on when the relay coil is off.

Choosing a relay

You need to consider several features when choosing a relay:

1. Physical size and pin arrangement

   If you are choosing a relay for an existing PCB you will need to ensure that its dimensions and pin arrangement are suitable. You should find this information in the supplier's catalogue.

2. Coil voltage

   The relay's coil voltage rating and resistance must suit the circuit powering the relay coil. Many relays have a coil rated for a 12V supply but 5V and 24V relays are also readily available. Some relays operate perfectly well with a supply voltage which is a little lower than their rated value.
3. Coil resistance

   The circuit must be able to supply the current required by the relay coil. You can use Ohm's law to calculate the current:

$$\text{Relay coil current} = \frac{\text{Supply voltage}}{\text{coil resistance}}$$

For example: A 12V supply relay with a coil resistance of 400 Ohm passes a current of 30mA. This is OK for a 555 timer IC (maximum output current 200mA), but it is too much for most ICs and they will require a transistor to amplify the current.

4. Switch ratings(voltage and current)

   The relay's switch contacts must be suitable for the circuit they are to control. You will need to check the voltage and current ratings. Note that the voltage rating is usually higher for AC, for example: "5A at 24V DC or 125V AC".

5. Switch contact arrangement(SPDT,DPDT etc)

   Most relays are SPDT or DPDT which are often described as "single pole changeover" (SPCO) or "double pole changeover" (DPCO).

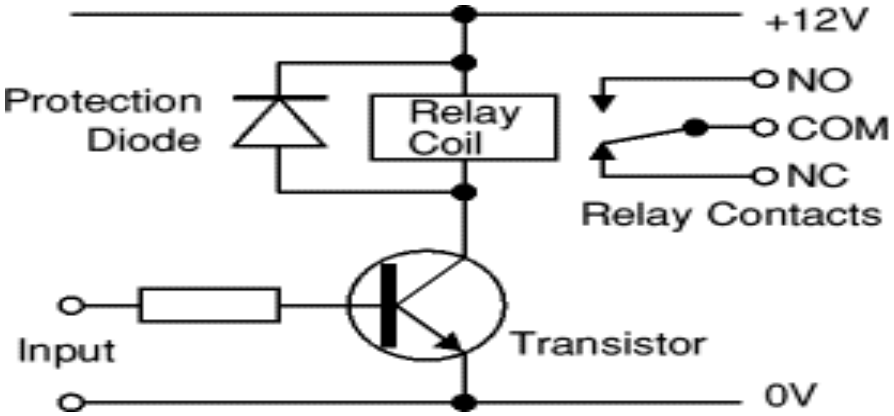


FIG 5.24 PROTECTION DIODES FOR RELAYS

Transistors and ICs must be protected from the brief high voltage produced when a relay coil is switched off. The diagram shows how a

signal diode (eg 1N4148) is connected 'backwards' across the relay coil to provide this protection.

Current flowing through a relay coil creates a magnetic field which collapses suddenly when the current is switched off. The sudden collapse of the magnetic field induces a brief high voltage across the relay coil which is very likely to damage transistors and ICs. The protection diode allows the induced voltage to drive a brief current through the coil (and diode) so the magnetic field dies away quickly rather than instantly. This prevents the induced voltage becoming high enough to cause damage to transistors and ICs.

Relays and transistors compared

Like relays, transistors can be used as an electrically operated switch. For switching small DC currents (< 1A) at low voltage they are usually a better choice than a relay. However, transistors cannot switch AC (such as mains electricity) and in simple circuits they are not usually a good choice for switching large currents (> 5A). In these cases a relay will be needed, but note that a low power transistor may still be needed to switch the current for the relay's coil! The main advantages and disadvantages of relays are listed below:

Advantages of relays:

- Relays can switch AC and DC, transistors can only switch DC.
- Relays can switch higher voltages than standard transistors.
- Relays are often a better choice for switching large currents (> 5A).
- Relays can switch many contacts at once.

Disadvantages of relays:

- Relays are bulkier than transistors for switching small currents.

- Relays cannot switch rapidly (except reed relays), transistors can switch many times per second.
- Relays use more power due to the current flowing through their coil.
- Relays require more current than many ICs can provide, so a low power transistor may be needed to switch the current for the relay's coil.

CHAPTER – 6

SOFTWARE DESCRIPTION

6.1 MPLAB IDE SOFTWARE

MPLAB is a proprietary freeware integrated development environment for the development of embedded applications on PIC and ds PIC microcontrollers, and is developed by Microchip Technology. MPLAB X is the latest edition of MPLAB, and is developed on the NetBeans platform. MPLAB and MPLAB X support project management, code editing, debugging and programming of Microchip 8-bit, 16-bit and 32-bit PIC microcontrollers. MPLAB is designed to work with MPLAB-certified devices such as the MPLAB ICD 3 and MPLAB REAL ICE, for programming and debugging PIC microcontrollers using a personal computer. PICK it programmers are also supported by MPLAB.

MPLAB 8.X is the last version of the legacy MPLAB IDE technology, custom built by Microchip Technology in Microsoft Visual C++. MPLAB supports project management, editing, debugging and programming of Microchip 8-bit, 16-bit and 32-bit PIC microcontrollers. MPLAB only works on Microsoft Windows. MPLAB is still available from Microchip's archives, but is not recommended for new projects.

MPLAB supports the following compilers:

- MPLAB MPASM Assembler
- MPLAB ASM30 Assembler
- MPLAB C Compiler for PIC18
- MPLAB C Compiler for PIC24 and ds PIC DSCs
- MPLAB C Compiler for PIC32
- HI-TECH C

MPLAB X is the latest version of the MPLAB IDE built by Microchip Technology, and is based on the open-source NetBeans platform. MPLAB X supports editing, debugging and programming of Microchip 8-bit, 16-bit and 32-bit PIC microcontrollers.

MPLAB X is the first version of the IDE to include cross-platform support for Mac OS X and Linux operating systems, in addition to Microsoft Windows.

MPLAB X supports the following compilers:

- MPLAB XC8 — C compiler for 8-bit PIC devices
- MPLAB XC16 — C compiler for 16-bit PIC devices
- MPLAB XC32 — C/C++ compiler for 32-bit PIC devices
- HI-TECH C — C compiler for 8-bit PIC devices
- SDCC — open-source C compiler

HI-TECH C compiler for PIC10/12/16 MCUs (PRO)

This compiler has been discontinued and is no longer supported. This compiler has been replaced by the MPLAB® XC8 PRO(SW006021-2).HI-TECH C Compiler for PIC10/12/16 MCUs - PRO fully implements the optimizations of Omniscient Code Generation™ - a whole-program compilation technology - to provide denser code and better performance on PIC MCUs. This ANSI C compiler integrates into Microchips MPLAB(R) IDE and is compatible with Microchip debuggers and emulators.

6.2 PROGRAM FOR AUTOMATIC CUTTING AND PUNCHING

```
#include<pic.h>

//_CONFIG( HS & WDTDIS & BOREN & LVPDIS );

__CONFIG(0X3f72);

static bit rs@((unsigned )&PORTD*8+1);

static bit rw@((unsigned )&PORTD*8+2);

static bit en@((unsigned )&PORTD*8+3);

static bit CMOTOR@((unsigned )&PORTC*8+0);

static bit RMOTOR@((unsigned )&PORTC*8+1);

static bit VALUE@((unsigned )&PORTC*8+2);

static bit IRSENSOR@((unsigned )&PORTB*8+1);

static bit PSENSOR@((unsigned )&PORTB*8+0);

bank1 unsigned char gpsdata[50];

unsigned char l,n,o,i,j,k,m,VAL1,ser=0x37,st=0x01,data_cap=0x00,VAL33=0,val11=0;

unsigned int adc_value,val1,val2=0,val3=0,val4,val5=0,b,c,e,f,g,h,gsm_count;

unsigned char s1,H1,H2,H3,T1,T2,T3,COUNT;

unsigned char VALA=0,VALB=0,VAL1=1,VAL3,VAL4,VAL5,VAL6,VAL7,VAL8=0;

unsigned int CNT,HB, VAL2=350;
```

```
void delay(unsigned int y)//delay prg
{
while(y--);
}
//*****************************************************************
*********************
//   GPS AND GSM  INIT
void lcd_command(unsigned char com)
{
unsigned char temp;
PORTD=com&0xf0;
rs=0;
en=1;
delay(10);
en=0;
temp=com<<4;
PORTD=temp&0xf0;
rs=0;
en=1;
delay(10);
en=0;
}
```

```
//*****************************************************************
*********************
void lcd_init()
{
lcd_command(0x02);
lcd_command(0x2c);
lcd_command(0x06);
lcd_command(0x0c);
lcd_command(0x01);
lcd_command(0x80);
}
//*****************************************************************
*********************
void lcd_data(unsigned char data)
{
unsigned char val1;
PORTD=data&0xf0;
en=1;
rs=1;
delay(10);
en=0;
val1=data<<4;
PORTD=val1&0xf0;
```

```
en=1;
rs=1;
delay(10);
en=0;
}
//*****************************************************************
*********************
void lcd_display(const unsigned char*word,unsigned int n)
{
unsigned char l;
for(l=0;l<n;l++)
{
lcd_data(word[l]);
}
//*****************************************************************
*********************
//*****************************************************************
*********************
//IOT
//*********************************
//  main
//*****************************************************************
*********************
void main()
```

```
{
ADCON1=0X82;
ADCON0=0x00;
TRISB=0xFF;
TRISC=0x80;
TRISD=0x00;
TRISE=0x00;
PORTC=0x80;
PORTD=0x00;
PORTE=0x00;
PORTB=0x00;
CMOTOR=1;RMOTOR=1;VALUE=1;
rw=0;
lcd_init();
delay(100);
delay(50000);delay(50000);
delay(50000);
delay(100);
lcd_command(0x80);
delay(100);
lcd_display("welcome",7);
delay(100);delay(100);
```

```
while(1)
{
if(IRSENSOR==0)
{
while(IRSENSOR==0)
{
delay(50000);delay(50000);
CMOTOR=0;delay(50000);delay(50000);
RMOTOR=0;delay(50000);
delay(50000);CMOTOR=1;delay(5000);
RMOTOR=1;delay(50000);delay(50000);delay(50000);
delay(50000);delay(50000);delay(50000);delay(50000);delay(50000);
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delay(50000);delay(50000);delay(50000);delay(50000);
delay(50000);delay(50000);delay(50000);delay(50000);
delay(50000);delay(50000);delay(50000);delay(50000);delay(50000);
delay(50000);
```

```
delay(50000);delay(50000);delay(50000);delay(50000);delay(50000);
delay(50000);delay(50000);delay(50000);

//RMOTOR=0;delay(17000);

/*while(PSENSOR==1)

{

}*/

//RMOTOR=1;delay(50000);

RMOTOR=0;delay(1000);

while(PSENSOR==1)

{

}

RMOTOR=1;delay(50000);delay(50000);

VALUE=0;delay(50000);delay(50000);VALUE=1;

while(IRSENSOR==0)

{

}

}

CMOTOR=1;RMOTOR=1;VALUE=1;delay(50000);delay(50000);

}

CMOTOR=1;RMOTOR=1;VALUE=1;

} }
```

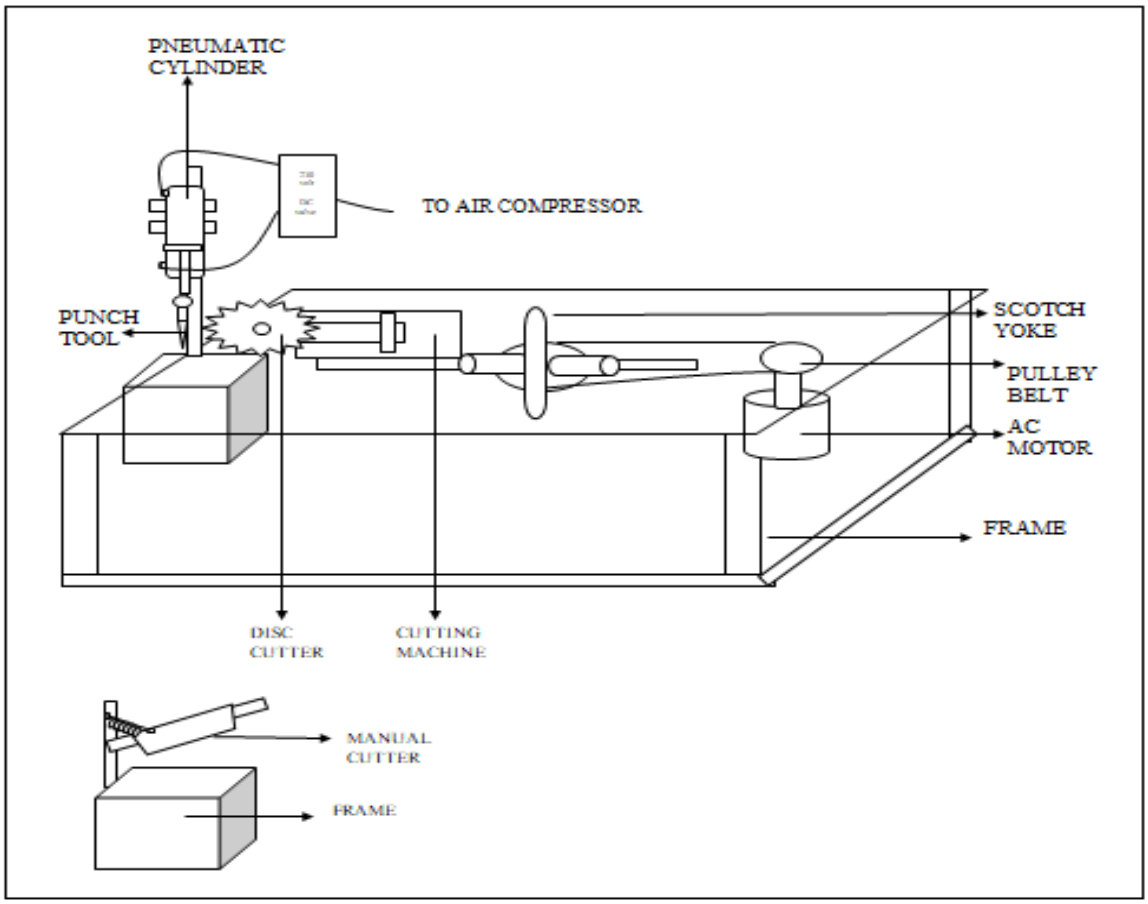
-

CHAPTER-7

RESULTS AND CONCLUSIONS

This machine is mainly design to cut the tender coconut and to make the hole in tender coconut with the help of various tools like cutting blade, hole making tool. The important thing about this machine is that it reduces the time of cutting the tender coconut, along with the tender coconut the various fruits can be cut out on these machines. The two operations can be done simultaneously there is no any extra attachment is required for performing the operations. The cost of the developed machine is very less so that it can be used in small restaurants and shops. This will definitely improve the productivity of tender coconut in all parts of the country and various new applications can be generated in future.

FIG 7.1 ASSEMBLY DIAGRAM



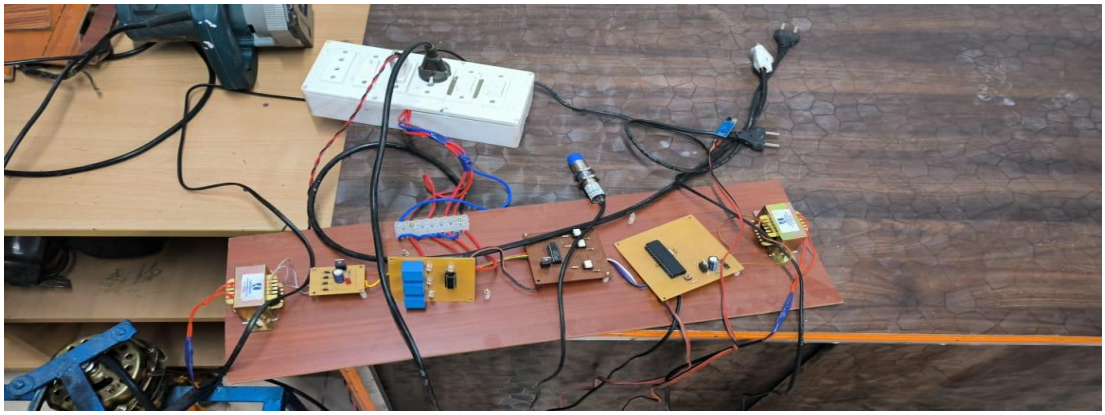


FIG 7.2PROTOTYPE IMPLEMENTATION

FIG 7.3 MECHANICAL IMPLEMENTATION

ADVANTAGES

There are various application of this machine which make it multipurpose, these application includes [2]

1. For cutting an tender coconut with an less efforts.

2. For the cutting or making the hole in an tender coconut.

3. It requires less time than any other tender coconut cutting tool.

4. There is no any human hazard occurred while cutting the tender coconut or it reduces the chances of any human hazard.

5. It reduces time to cut the tender coconut.

6. It improved the quality cutting of the tender coconut.

7. Number of tender coconuts can be cuts and hole out with this machine at time.

8. Less space is required due to its compact size.

- We can obtain the Depth of cut.
- The speed of the operation is high. So, the cutting is done quickly.
- The planning of work is easy.
- We can obtain high amount of productivity.
- Cheaper in cost.
-

APPLICATIONS

- That mechanism commonly used in control valve, activator including high pressure of oil and Gas pipeline.
- It also used to help of making double hack jaw.
- Reciprocating pump (the rotational motion converted into reciprocating motion, it require Piston movement).
- It is used in beam engine when the rotational motion converted into linear sliding motion.

- By using this mechanism to make toys and more.

  - We can directly used in public service.
  - It can applicable in all kinds of hotels and restaurants

It is very much suited for semi automated works

CHAPTER-8

FUTURE ENHANCEMENT

This task is tedious and risky for seller cum worker also it requires a lot of human effort and energy when it was done in manually. Tender coconut does not come with parameters like manufacturing date, expiry date, batch number, MRP etc. They are not uniform in their size, volume content, and taste. Because it is straight from the Tender coconut tree and each one is different. The quality and quantity of the tender coconut water not exactly detected and predicted by the seller using conventional method To overcome the above major issues, the main objective of the research proposal is to mechanism of the tender coconut using image processing and artificial intelligence (AI). The key objectives of the proposed research proposal specifically as follows,

- To determine the amount of water in tender tender coconut.
- To determine the thickness of white kernel inside a tender tender coconut.
- To cut the top portion of tender coconut until the water level.
- The top of the endocarp and split of tender coconutin to halve and it is validated through Mat lab simulating environment.
- To develop IOT module to detect the quality of the water and operated mechanism of punch cum slicing using image modalities with AI for tender tender coconut.
- To evaluate the performance analyses of proposed mechanism over the traditional method
- To keep environment eco-friendly.
- To grade tender coconutfor industrial purpose.

CHAPTER-9

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