A

PROJECT REPORT ON

"WATER LEVEL SENSING COOLER WITH REMOTE CONTROL"

SUBMITTED TO

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA BHOPAL (M.P.)
In Partial Fulfillment of the Degree of

BACHELOR OF ENGINEERING
IN
ELECTRICAL ENGINEERING

Under the Guidance of
Prof. ARUN K.S. TOMAR
DEPARTMENT OF ELECTRICAL ENGINEERING

RUSTAMJI INSTITUTE OF TECHNOLOGY, BSF TEKANPUR (M.P)

Submitted by

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CERTIFICATE

This is to certify that **Mr. SAURAV MISHRA (0902EE131054)**, students of Bachelor of Engineering (Electrical Engineering) VI semester has submitted a project synopsis on "**WATER LEVEL SENSING COOLER WITH REMOTE CONTROL"** under the guidance of **PROF. ARUN K.S. TOMAR** in the partial fulfillment of the VI Semester of Bachelor of Engineering (Electrical Engineering) and submitted to the Department of Electrical Engineering of RustamJi Institute of Technology Tekanpur Gwalior(MP) is an authentic record of my own work carried out during a period from
January 2016 to June 2016.

SAURAV MISHRA
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This is to certify that the above statement made by the candidate is correct to the best of my knowledge. I/We wish him success in the future.

Project Coordinator
Prof. ARUN K.S.TOMAR
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CANDIDATE 'S DECLARATION

I hereby certify that the dissertation entitled "**WATER LEVEL SENSING COOLER WITH REMOTE CONTROL**" which is being submitted in the partial fulfillment of the requirement for the award of "**Bachelor of Engineering in Electrical Engineering**" is a record of my own work carried out under the supervision and guidance of "**Prof. ARUN K.S.TOMAR"** Electrical Engineering Department, **Rustam Ji Institute of Technology, BSF Tekanpur Gwalior.**

The Matter presented in the dissertation has not been submitted elsewhere for the award of any Degree /Diploma.

Place: Gwalior (M.P) SAURAV MISHRA

Date:

This is to certify that the above statement made by the candidate is correct to the best of my knowledge and belief.

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ACKNOWLEDGEMENT

I would like to thank the almighty God and my parents for sustaining and guiding me to carry out my project work successfully.

"Task successful...." this phrase makes everyone happy. But the happiness is gold without glitter if the person who supported us to make it a success is not acknowledged. Success will be crowned to people who made it a reality but the people whose constant guidance & encouragement made it a possible will be crowned first on the eve of success.

This acknowledgement transcends the reality of formality when I would like to express my deep gratitude and respect to all those people behind the scene who guided, inspired and helped me for the completion of my project work. I consider myself lucky enough working on such a good project. This project would be an added to my academic profile.

I would like to express my thankfulness to my project guide **Prof. Arun k.s. Tomar** for his constant motivation and valuable help through the project work. I am very thankful to **Dr. Arvind Kumar Jain HOD-Department of Electrical Engineering, RJIT** who has been a source of perpetual inspiration to us. I am grateful to **RJIT, Tekanpur BSF Academy** which has given us bright future.

I expressed my gratitude to my team members, my tech leads for their corporation to complete this project.

SAURAV MISHRA

CONTENTS

Water level sensing cooler with remote control is consist single phase induction motor .so we will discuss about single phase induction motor.

1.INTRODUCTION:-

1.1.GENERAL

An **induction motor** (IM) is a type of asynchronous AC motor where power is supplied to the rotating device by means of electromagnetic induction. The induction motor with a wrapped rotor was invented by Nikola Tesla Nikola Tesla in 1882 in France but the initial patent was issued in 1888 after Tesla had moved to the United States. In his scientific work, Tesla laid the foundations for understanding the way the motor operates. The induction motor with a cage was invented by Mikhail Dolivo-Dobrovolsky about a year later in Europe. Technological development in the field has improved to where a 100 hp (74.6 kW) motor from 1976 takes the same volume as a 7.5 hp (5.5 kW) motor did in 1897. Currently, the most common induction motor is the cage rotor motor.

An electric motor converts electrical power to mechanical power in its rotor (rotating part). There are several ways to supply power to the rotor. In a DC motor this power is supplied to the armature directly from a DC source, while in an induction motor this power is induced in the rotating device. An induction motor is sometimes called a *rotating transformer* because the stator (stationary part) is essentially the primary side of the transformer and the rotor (rotating part) is the secondary side. Induction motors are widely used, especially polyphase induction motors, which are frequently used in industrial drives. Induction motors are now the preferred choice for industrial motors due to their rugged construction, absence of brushes (which are required in most DC motors) and the ability to control the speed of the motor.

1.2.USES OF SINGLE PHASE INDUCTION MOTOR:-

The single-phase induction machine is the most frequently used motor for refrigerators, washing machines, clocks, drills, compressors, pumps, and so forth. The single-phase motor stator has a laminated iron core with two windings arranged perpendicularly.

One is the main and The other is the auxiliary winding or *starting winding.*

The basic diagram (view A) shows a circle with two leads labeled T1 and T2. Just as in the three phase motor diagram, the motor shows the power supply lines as being identified with the T. For most shore facility applications, this is the case. The single-phase induction motor is much the same in construction as the three-phase motor. Some single-phase induction motors are also called squirrel cage motors because of the rotor's similarity to a circular animal exercise wheel.

1.3.SYMBOLIC REPRESENTATION OF SINGLE PHASE INDUCTION MOTOR:-

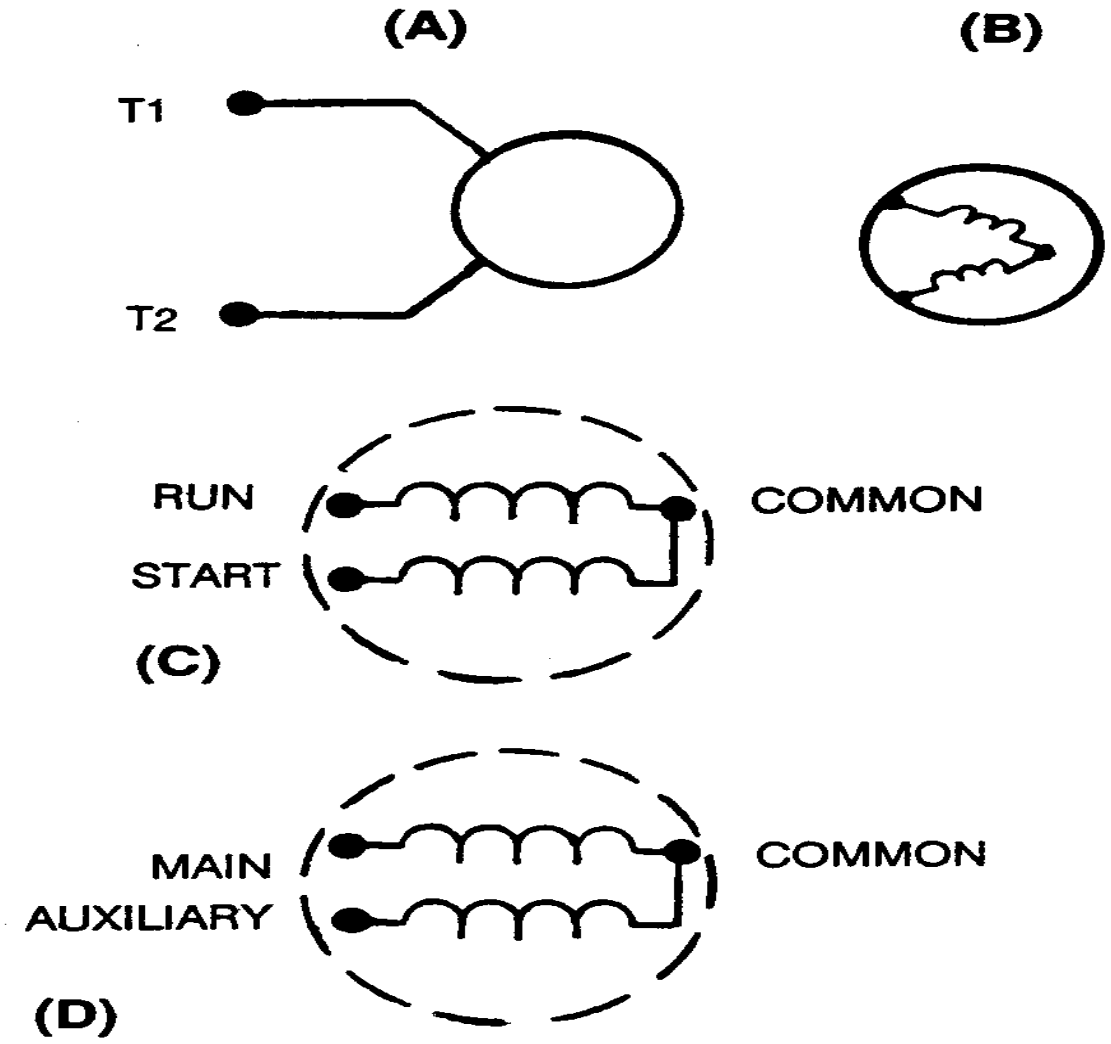
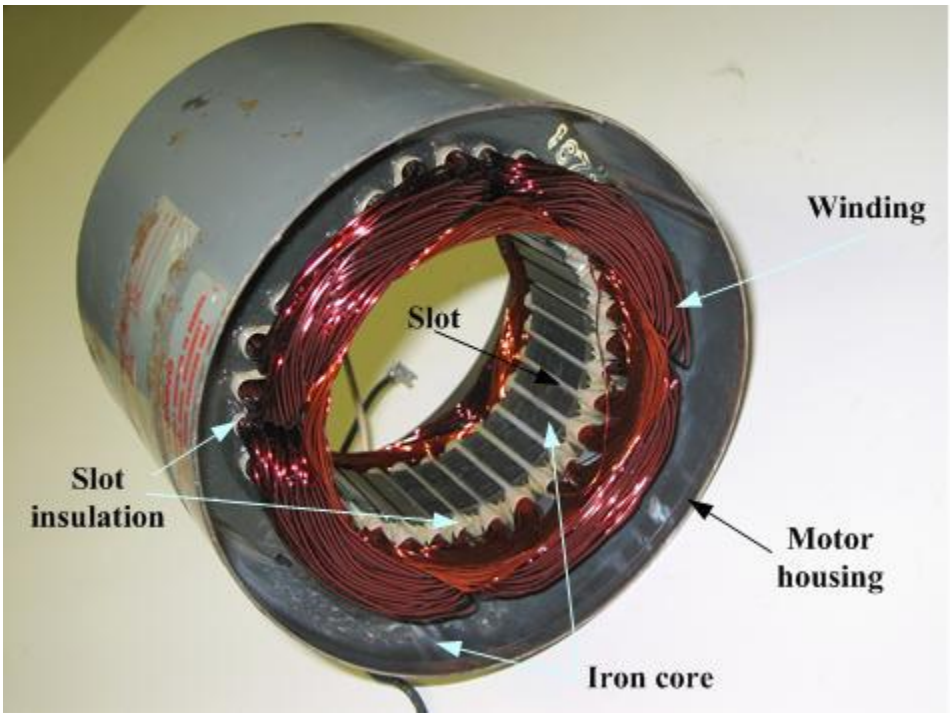


FIGURE 17-1. Single-Phase Motor Symbols.

2.CONSTRUCTION:-

2.1 DIAGRAM

Construction of Single Phase induction motor are stator and rotor. The single-phase motor stator has a laminated iron core with two windings arranged perpendicularly, One is the main and the other is the auxiliary winding or *starting winding* as showing in the figure 1.



The motor uses a squirrel cage rotor, which has a laminated iron core with slots as shown in figure 2. Aluminum bars are molded on the slots and short-circuited at both ends with a ring.

Despite the fact that the three-phase motor has more phases than the single-phase motor, the singlephase motor is a much more complex machine. Several additional components are necessary to operate the single-phase motor. Single-phase motors have only two power source supply lines connected. The single-phase motor can operate off either the A-B, B-C, C-A, A-N, B-N, or C-N power source phases. The twowire power supply can provide only a single-phase alternating source (Figure 17-5). The individual single-phase current arriving in the stator winding of the

single-phase motor does not have the same “revolving” effect that the three individual phases of the three-phase power supply provides. The magnetic field developed by the single-phase current is created in the stator windings and then is gone. An entire cycle must be completed before current is again available at the single-phase motor stat or. This prevents the development of the revolving field so easily obtained with the threephase power supply. The problem with the single phase motor is its inability to develop a revolving field of its own accord. Without a revolving field, torque cannot be developed, and the rotor will never turn. With only one stator winding, the single-phase motor can only produce an oscillating magnetic field.

A typical motor consists of two parts namely stator and rotor like other type of motors.

1. An outside stationary stator having coils supplied with AC current to produce a rotating magnetic field,
2. An inside rotor attached to the output shaft that is given a torque by the rotating field. Figure. Induction

2.2.Stator Construction

The stator of an induction motor is laminated iron core with slots similar to a stator of a synchronous machine. Coils are placed in the slots to form a three or single phase winding.

2.3.Types of Single-Phase Induction Motors According to rotor

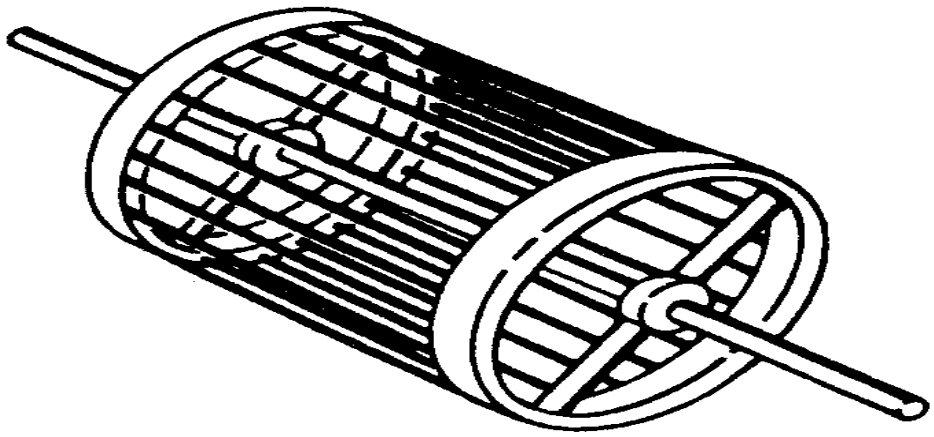
A single phase induction motor has two types of rotor :

(i) a squirrel-cage

(ii) slip ring or wound rotor

Unlike a 3-phase induction motor, a single-phase induction motor is not self starting but requires some starting means. The single-phase stator winding

produces a magnetic field that pulsates in strength in a sinusoidal manner. The field polarity reverses after each half cycle but the field does not rotate. Consequently, the alternating flux cannot produce rotation in a stationary squirrel-cage rotor. However, if the rotor of a single-phase motor is rotated in one direction by some mechanical means, it will continue to run in the direction of rotation. As a matter of fact, the rotor quickly accelerates until it reaches a speed slightly below the synchronous speed. Once the motor is running at this speed, it will continue to rotate even though single-phase current is flowing through the stator winding. This method of starting is generally not convenient for large motors. Nor can it be employed fur a motor located at some inaccessible spot Figure 3hows single-phase induction motor having a squirrel cage rotor and a single phase distributed stator winding. Such a motor inherently docs not develop any starting torque and, therefore, will not start to rotate if the stator winding is connected to single-phase a.c. supply. However, if the rotor is started by auxiliary means, the motor will quickly attain me final speed. This strange behavior of single-phase induction motor can be explained on the basis of double-field revolving theory.



main winding separated into two coils. Each winding is wound in a different direction. The importance of the two different coil winding directions is to emphasize the application of the left-hand rule for coils as expressed in previous

chapters. By winding the wire in a different direction, the polarity of the coil face closest to the rotor can be changed. By using one wire wrapped in two different directions, the polarity of every other coil can be changed .When current flows in the main winding, the magnetic field is established through out the winding.

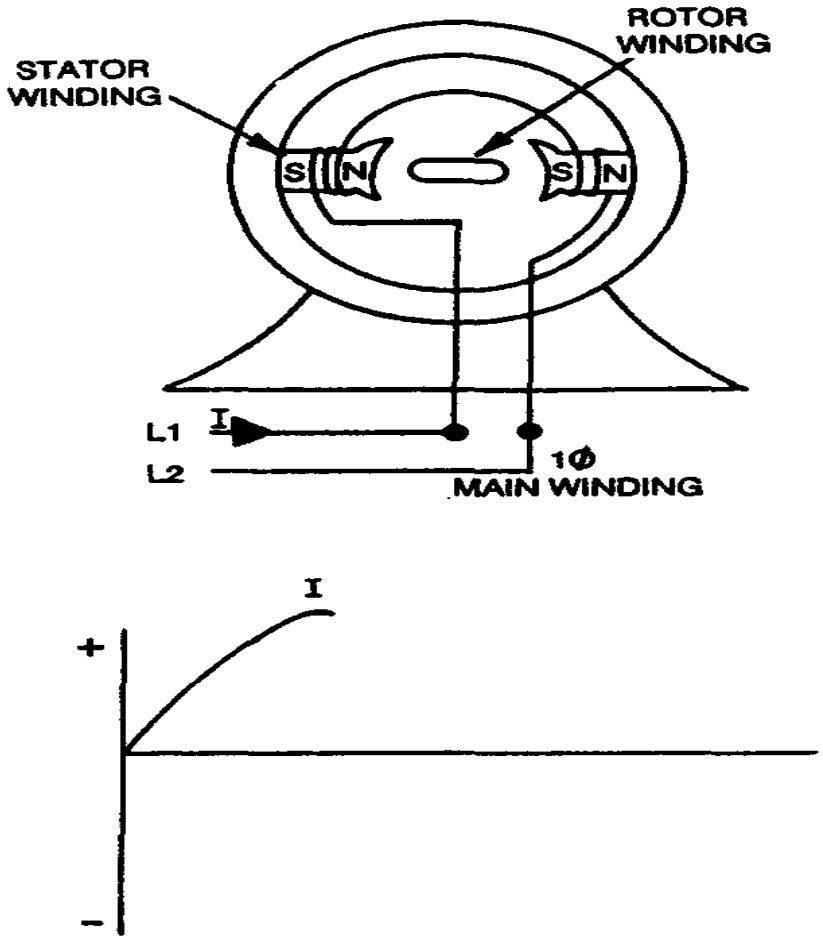
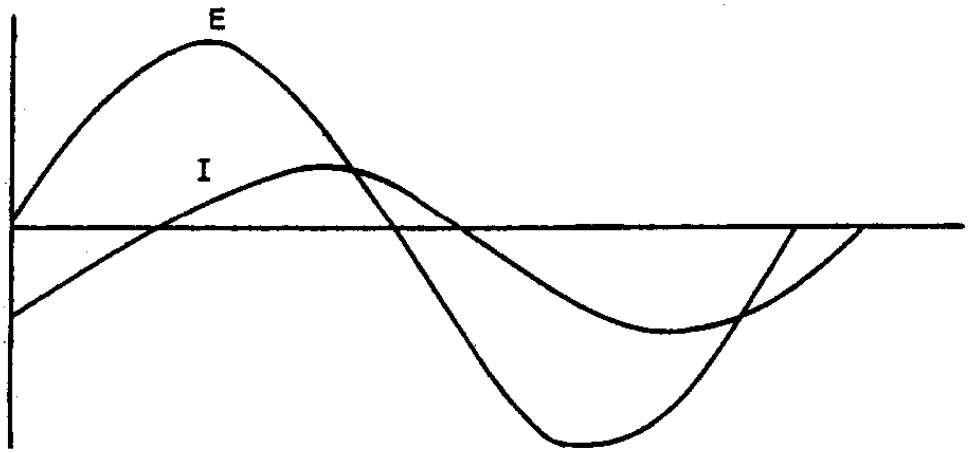


FIGURE 17-6. Current Flow Through Four Main Windings.

Soon the current flow stops and changes direction (Figure 17-7). With this change in current direction comes a change in all the coil polarities.



Single-Phase Voltage and Current Sine Waves.

3.Operating principle:- The single-phase induction motor operation can be described by two methods:

- Double revolving field theory; and
- Cross-field theory.

3.1.Double revolving field theory:-

• A single-phase ac current supplies the main winding that produces a pulsating magnetic field.

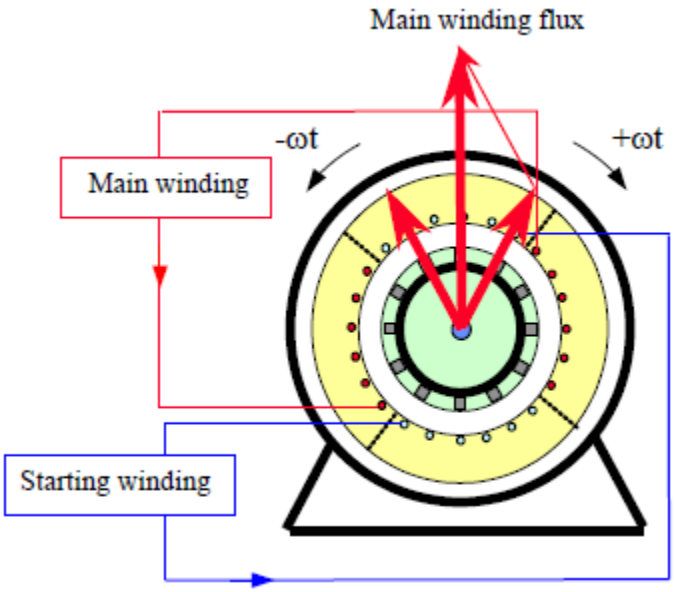
• Mathematically, the pulsating field could be divided into two fields, which are rotating in opposite directions.

• The interaction between the fields and the current induced in the rotor bars generates opposing torque.

A single-phase ac voltage supplies the main winding that produces a magnetic field change with time around one access so that this field call as pulsating . The currents which generated due to this field in rotor in right side reverse to lift side , the total torque equal zero. as shown in figure 4.

An AC current is applied in the stator armature which generates a flux in the stator magnetic circuit. This flux induces an emf in the conducting bars of rotor as they are "cut" by the flux while the magnet is being moved ($E = BVL$ (Faraday's Law)) . A current flows in the rotor

circuit due to the induced emf, which in term produces a force, ($F = BI$L) can be changed to the torque as the output.



• The pulsating filed is divided a forward and reverse rotating field.

• Motor is started in the direction of forward rotating

field this generates small (5%) positive slip.

• Reverse rotating field generates a larger (1.95%)

negative slip.

• The three-phase induction motor starting torque inversely depends on the slip.

• This implies that a small positive slip (0.01–0.03) generates larger torque than a larger negative slip (1.95–1.99).

• This torque difference drives the motor continues to rotate in a forward direction without any external torque.

• Each of the rotating fields induces a voltage in the rotor, which drives current and produces torque.

• An equivalent circuit, similar to the equivalent circuit of a three phase motor, can represent each field.

• The parameters of the two circuits are the same with the exception of the slip.

3.2.Starting torque:- The single-phase motor starting torque is zero because of the pulsating single-phase magnetic flux.

• The starting of the motor requires the generation of a rotating magnetic flux similar to the rotating flux in
a three-phase motor.
• Two perpendicular coils that have currents 90° out of- phase can generate the necessary rotating
magnetic fields which start the motor.
• Therefore, single-phase motors are built with two
perpendicular windings• The phase shift is achieved by
connecting
– a resistance,
– an inductance, or
– a capacitance in series with the starting winding.
• Most frequently used is a capacitor to generate the starting torque.
When the motor reaches the operating speed, a centrifugal switch turns off the starting winding.
• The centrifugal switch is necessary because most motors use a cheap electrolytic capacitor that can only carry ac current for a short period.
• A properly selected capacitor produces around 90° phase shift and large starting torque.
A less effective but more economical method using shaded pole motors
• The motor has two salient poles excited by ac current.
• Each pole includes a small portion that has a short circuited winding. This part of the pole is called the shaded pole.
• The main winding produces a pulsating flux that links with the squirrel cage rotor.
• This flux induces a voltage in the shorted winding. • The induced voltage produces a current in the shorted winding.
• This current generates a flux that opposes the main flux in the shaded pole (the part of the pole that carries the shorted winding).
• The result is that the flux in the unshaded and shaded parts of the pole will be unequal.
• Both the amplitude and the phase angle will be different.
In addition to the run or main winding, all induction single-phase motors are equipped with an auxiliary or start winding in the stator. The auxiliary or start winding overlaps the main or run

winding. This provides the revolving field necessary to turn the rotor. The terms are used in sets. The frost group is the run and start set. The second group is the main

and auxiliary winding set. Each group has a common terminal connection. Run and Start Winding Set. The term “run winding” is used to designate a winding that receives current all the time the motor is in operation.It is theoutermost winding, located next to the motor housing. The term “run” is used only when the other winding is a start winding. A start winding is in parallel with the run winding. The start winding receives current only during the initial starting period. Then it becomes disconnected from the power source. The start winding is the set of coils located nearest to then rotor. Main and Auxiliary Winding Set. The term “main winding” is used to designate a winding that receives current all the time the motor is operating. The main winding is located next to the motor housing. The term “main” is used only when the other winding is an auxiliary winding. An auxiliary winding receives current all the time the motor is operating. It is always in parallel with the main winding. The auxiliary coils are located closest to the rotor. By creating a winding with better insulating properties and a motor housing with better heat dissipation qualities, the auxiliary winding can remain in the circuit as long as the main winding. This then increases the motor’s running load capabilities Common Connection. The auxiliary or start winding is connected to the main or run winding through a connection called the common. The

auxiliary or start winding is in parallel with the main or run windingBoth the windings in

the motor use the same single-phase power source. The common connection between the set of windings is necessary to complete the parallel circuit. Without the use of a three-phase alternating current, an artificial phase displacement must be established. If the stator could only develop another current, slightly out of phase from the original current,

a revolving field could be assimilated. This is the problem encountered by single-phase induction motors. It is also the area of greatest component failure and maintenance requirements, In fact, the specific names for induction motors represent the means which the revolving field is developed from a single-phase power source.

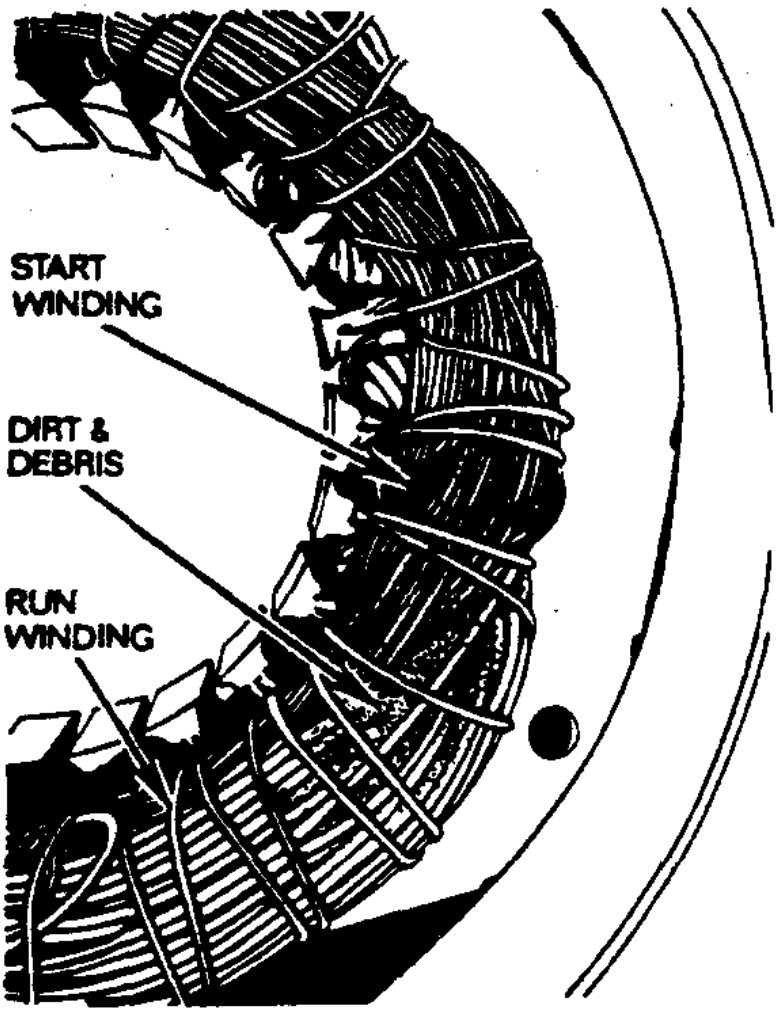


FIGURE 17-8. Two Overlapping Stator Windings in the Single-Phase Motor.

3.3.SPLIT-PHASE (RESISTANCE-START)

MOTORS:-

The run and start stator windings are connected in parallel. If you apply current to both windings and establish a magnetic field simultaneously, the rotor could do nothing more than oscillate. Unless two or more slightly out of phase currents arrive in different windings, torque cannot be achieved. Every time current changed directions, the magnetic polarities of the stator coils would switch as well. The induced rotor EMF and its resulting magnetic field would also switch. No torque can be produced. Something must be done so that a given magnetic field in one winding can happen at a slightly different time than in the other winding, thus producing a pulling or pushing effect on the established magnetic polarity in the rotor. The would create motion.

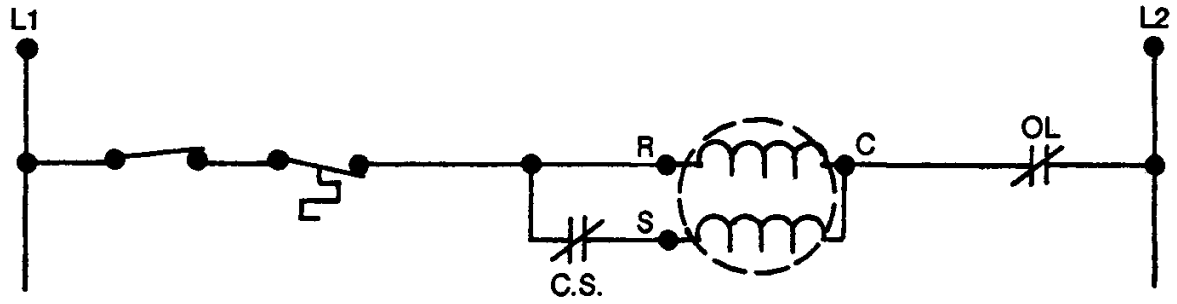


FIGURE 17-10. Simple Line Diagram Of the Single-Phase Motor.

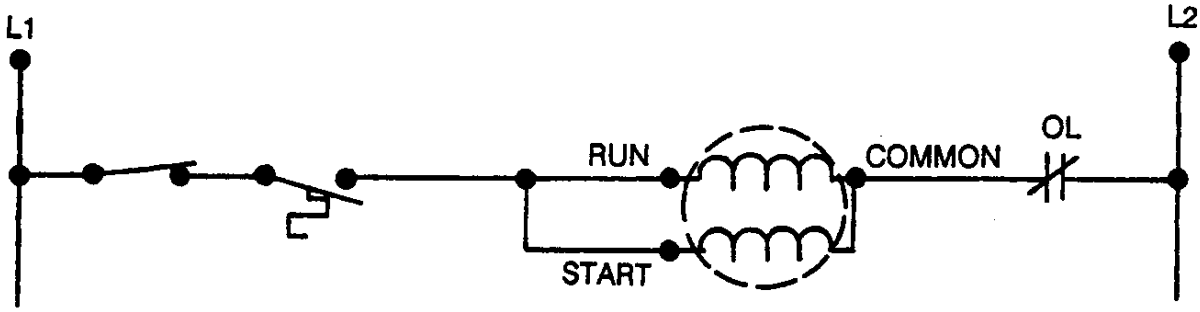


Figure illustrates the run winding and the start winding as separate coils of wire. In view C, the two coils are connected at a common terminal. This is how the two windings are placed in the circuit in parallel. Figure shows how the start and run windings are in parallel with the same voltage source available to each. Current

entering a node must divide between the two windings. Magnetism is a property of current. Forcing current to arrive at one winding before it arrives at the other winding would create the phase difference necessary to create a torque.

The split-phase motor takes advantage of an increased resistance in the start winding. This is done by merely making the start winding wire a smaller diameter. Contrary to popular beliefs, the higher resistance in the start winding lets the current develop a magnetic field in the start winding before the run winding. More current goes into the run winding because there is less resistance in the wire. The greater current in the run winding generates a greater CEMF than can be developed in the start winding. This forces the run current to lag voltage by about 50 degrees. The smaller current entering the start winding generates less CEMF. Power supply EMF quickly overcomes the start winding CEMF. Start winding current lags voltage by about 20 degrees. This puts the magnetic field in the start winding ahead of the run winding by about 30 degrees. In Figure, the start winding current precedes the current arriving in the run winding. The magnetic field develops in the start winding first. A moment later, the start winding current starts to diminish, and its magnetic field decreases. As this happens, the current and the magnetic field in the run winding is increasing. The induced rotor EMF, resulting current flow, and magnetic polarity remain the same. The magnetic polarities of the rotor winding were first developed under the start winding. Now the increasing magnetic pull of the run winding, which is displaced physically, attracts the rotor. This is the phase displacement necessary for torque. The direction of rotation will always be from the start winding to the adjacent run winding of the same polarity. At about 75 percent of the rotor rated speed, the centrifugal switch disconnects the start winding from the power supply. Once motion is established, the motor will continue to run efficiently on the run winding alone . **Centrifugal Switch** Many single-phase motors are not designed to operate continuously on both windings. At

about 75 percent of the rated rotor speed, the centrifugal switch opens its contacts. It only takes a few moments for the motor to obtain this speed. An audible click can be heard when the centrifugal switch opens or closes. The centrifugal switch operates on the same principle as the diesel governor flyballs. Weights attached to the outside periphery of the switch rotate with the rotor shaft (Figures 17-17 and 17-18). As the rotor shaft speed increases, centrifugal force moves the weights outward. This action physically opens a set of contacts in series with the start winding.

3.4.CAPACITOR-START MOTORS:-

Capacitor-start motors are the most widely used single-phase motors in the marine engineering field. They are found on small refrigeration units and portable pumps. They come in a variety of sizes up to 7.5 horsepower. The capacitor-start motor is derived from the basic design of the split-phase motor. The splitphase motor had a current displacement, between the start and run winding, of 30 degrees with wire resistance alone. To increase this angle and increase motor torque, a capacitor can be added. The product of capacitance can be used to increase the current angles, or in other words, to increase the time between current arrival in the start and currentarrival in the run windings. In capacitance, current leads voltage. The capacitor, unlike a resistor, does not consume power but stores it so it can be returned to the circuit. The combining of the inductive run (current lagging) winding and the capacitive start (current leading) winding would create a greater current displacement. This would increase the torque. The capacitor is placed in series with the start winding. Once the motor has attained 75 percent of its rated speed, the start capacitor and start winding can be eliminated by the centrifugal switch. It is not necessary for this motor to operate on both windings continuously. The capacitor of the capacitor-start motor improves the power factor of the electrical system .

Water level sensing cooler with remote control consist of two circuit one for remote control and other for water level sensing if water ends up the submersible pump stops working and fan will continue to work.

4.INFRARED REMOTE CONTROL:-

4.1.SPECIALITIES:-with this remote control you can put ON/OFF cooler .the distance from remote control should be 10 feet.

4.2.DESCRIPTION OF THE CIRCUIT:- this project is divided into 2 parts.one is transmission section and other is receiver section.In transmission section 1 IC 555 and 1 transistor BC558 has been used.the IC is used as a oscillator and transistor is used in the output section . when push to on switch in circuit is pressed than the oscillation pulse from output in no.3 of IC555 is given to the base of the transistor BC558 through resistance 4K7 .This makes the transistor ON and current flows through the Infra-red LED connected at the emitter circuit.the Infra-red LED gives Infra-red range.these infra-red range are received by infra-red eye connected in receiver section.Infra-red eye is assembled device.there are 3 pins in the eye positive 5V DC regulated is given to its pin no.1 . the second pin is signal output pin and third pin is grounded.the output pulse of the Infra-red eye is given to the pin no.2 of IC555. This makes IC trigger and output pulse is available at its pin no.3. this pulse is given to pin no.3 trigger pin of IC CD4027. IC CD4027 is a dual j-k bistable IC. A transistor is connected to its output pin no.1. in case it is low than it becomes high ,in case it is high than it becomes low. In case pin no.3 is high than transistor BC548 become ON and relay connected to this also become on. The output pin no.1 of IC CD4027 remains in high position unless second clock pulse does not come to the IC clock input pin no.3. in this way the relay remains

on continuously and equipment connected to its switching circuit also remains on.when the removed transistor switch is passed second time than the relay become OFF.the circuit is operated from +5V regulated supply .for regulation IC 7805 is used.

4.3.Part list :- [transmitter section]

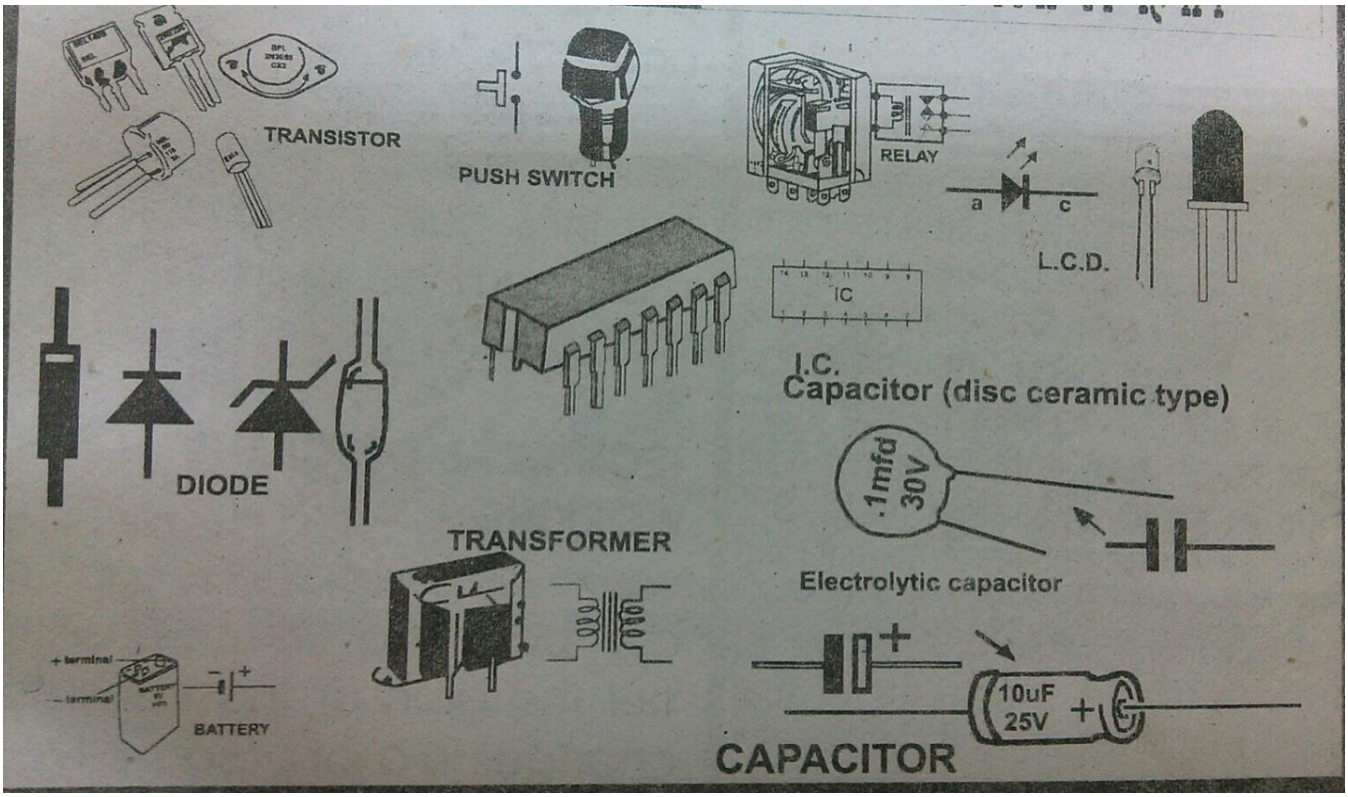
ICS,IC1-555=1 IC BASE 8 PIN=1, RESISTANCE (R1,R2-82K=2,R3-1K=1,R4-4E7=1),CONDENSOR(C1-.001,C2-.01=1,C3-0.1=1),TRANSISTOR(TR1-BEL188=1), IR DIODE=1,PUSH TO ON SWITCH=1,

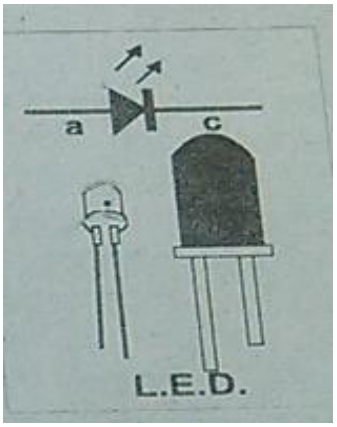
{RECEIVER SECTION}

ICS,IC-2-555=1,IC BASE 8PIN =1,IC3-4027=1,IC BASE 16 PIN=1,IC4-7805=1, RESISTANCE(R5,R7-47K=2,R6-1.5K=1,R8-410E=1),CONDENSOR(C4,C5 1MFD/16V=2,C6-220MFD/25V=1,C7-1000MFD/25V=1,C8-.01=1),TRANSISTOR(TR2-BC548=1),DIODE(D1,D2-IN4007=2),IR EYE=1,RELAY-9V=1 ,PCB CODE 5TP01

4.4.LED:- LED (light emitting diode) is a special diode that emits light when an electric voltage is applied to it terminal.it is common electronic component that is widely used in electronic circuit.generally for indicating purpose .they are available in various colors like red ,white,blue .etc.

To supply input voltage .there are two leads of an LED (light emitting diode).the longer lead is positive and known as ‘positive +ve’, and the smaller is known as‘Anvil –ve’.A metal cup is placed on the negative lead(Anvil) which holds a semiconductor die. The semiconductor die is a combination of two semiconductor material –N type and P type and an active region (known as P-N junction) between them.


TRANSISTOR
PUSH SWITCH
RELAY
a
c
L.C.D.
IC
I.C.
Capacitor (disc ceramic type)
DIODE
.1mfd
30V
TRANSFORMER
Electrolytic capacitor
+ terminal
- terminal
BATTERY
10uF
25V
CAPACITOR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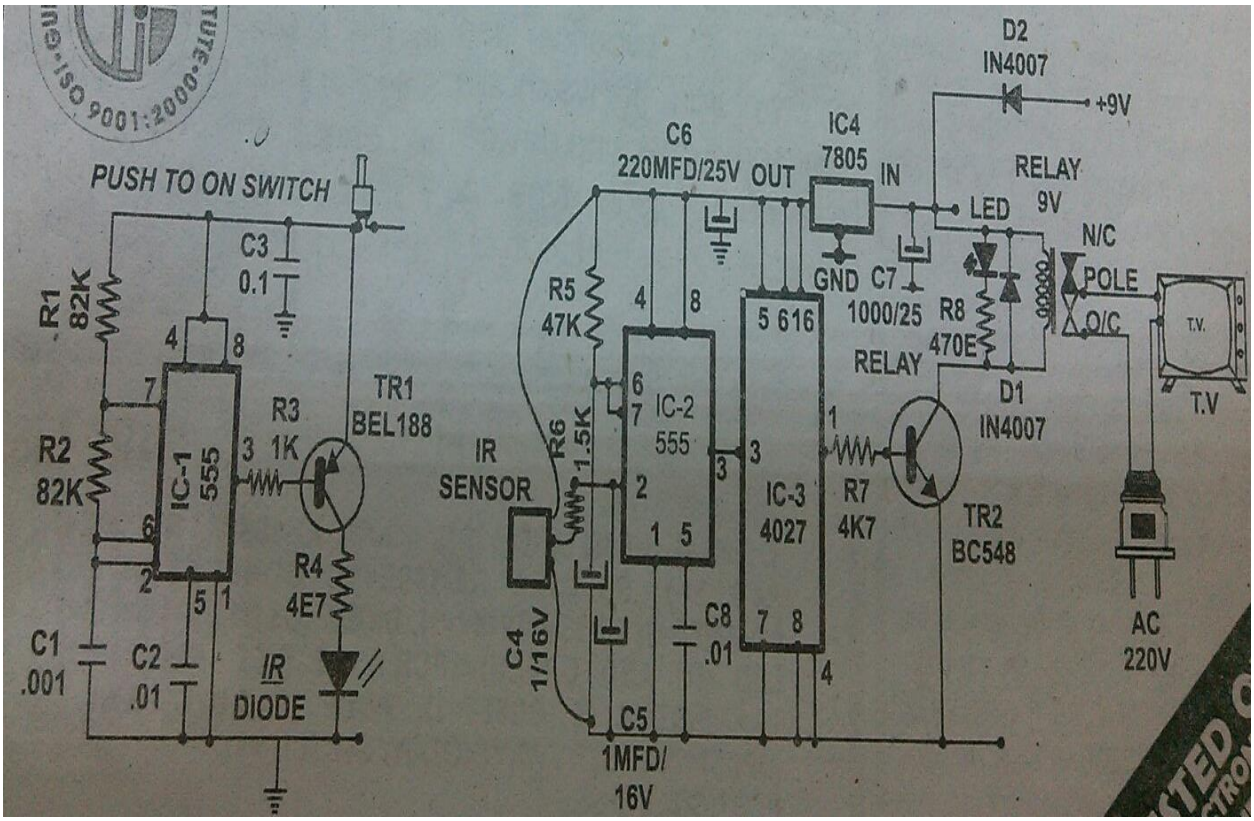


4.5.PRECAUTIONS WHILE ASSEMBLING THE CIRCUIT:-

1) Use IC base for a CMOS IC .never solder CMOS IC directly on PCB.

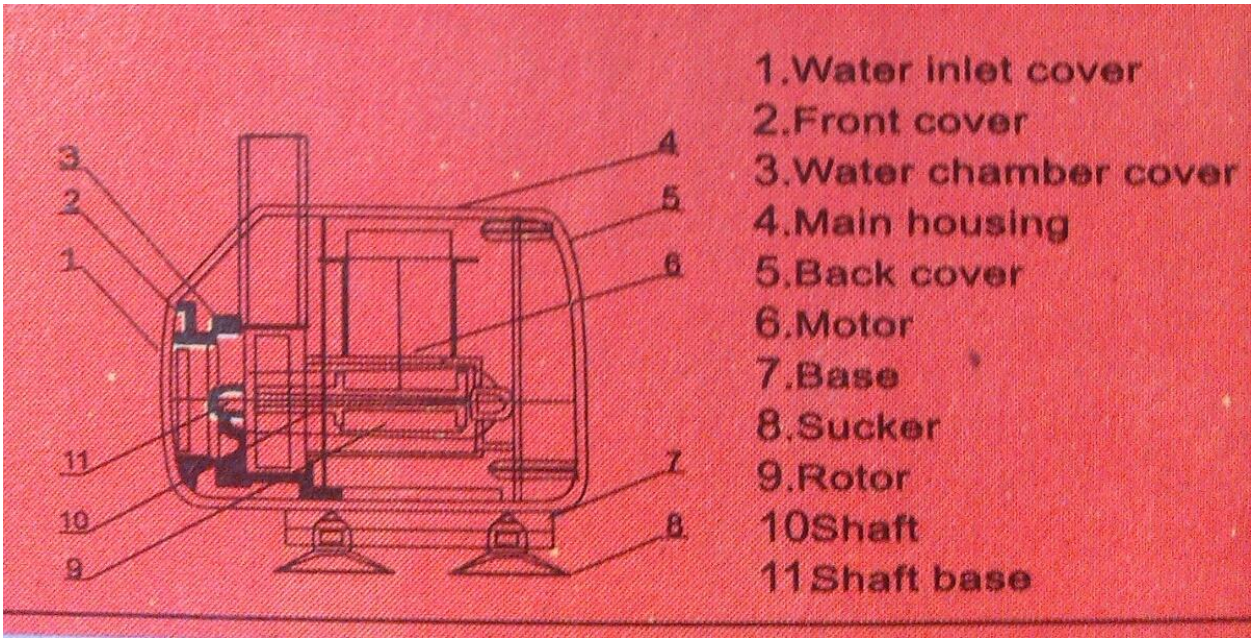
2) CMOS IC gets spoiled due to anti static charge .it should not be touched by hand because human body is charged with electric current some times .

3) while soldering the transistor its base emitter and collector should be checked with multimeter.

4) takes special care to observe the polarity of the condenser fixed on pin no.6 of IC555.

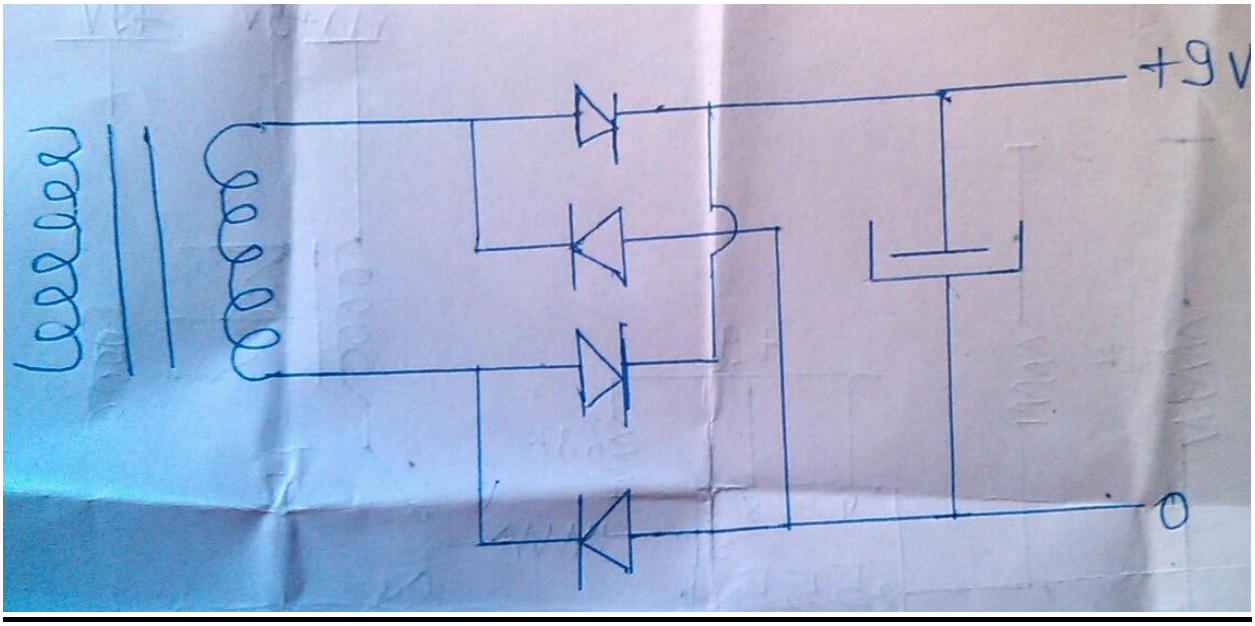
5.SMALL SUBMERSIBLE PUMP USED IN COOLER:-

Smallest submersible water pump is used in household water cooler to wet the shade present on the wall of cooler . so that the air becomes cooler by process of evaporation.



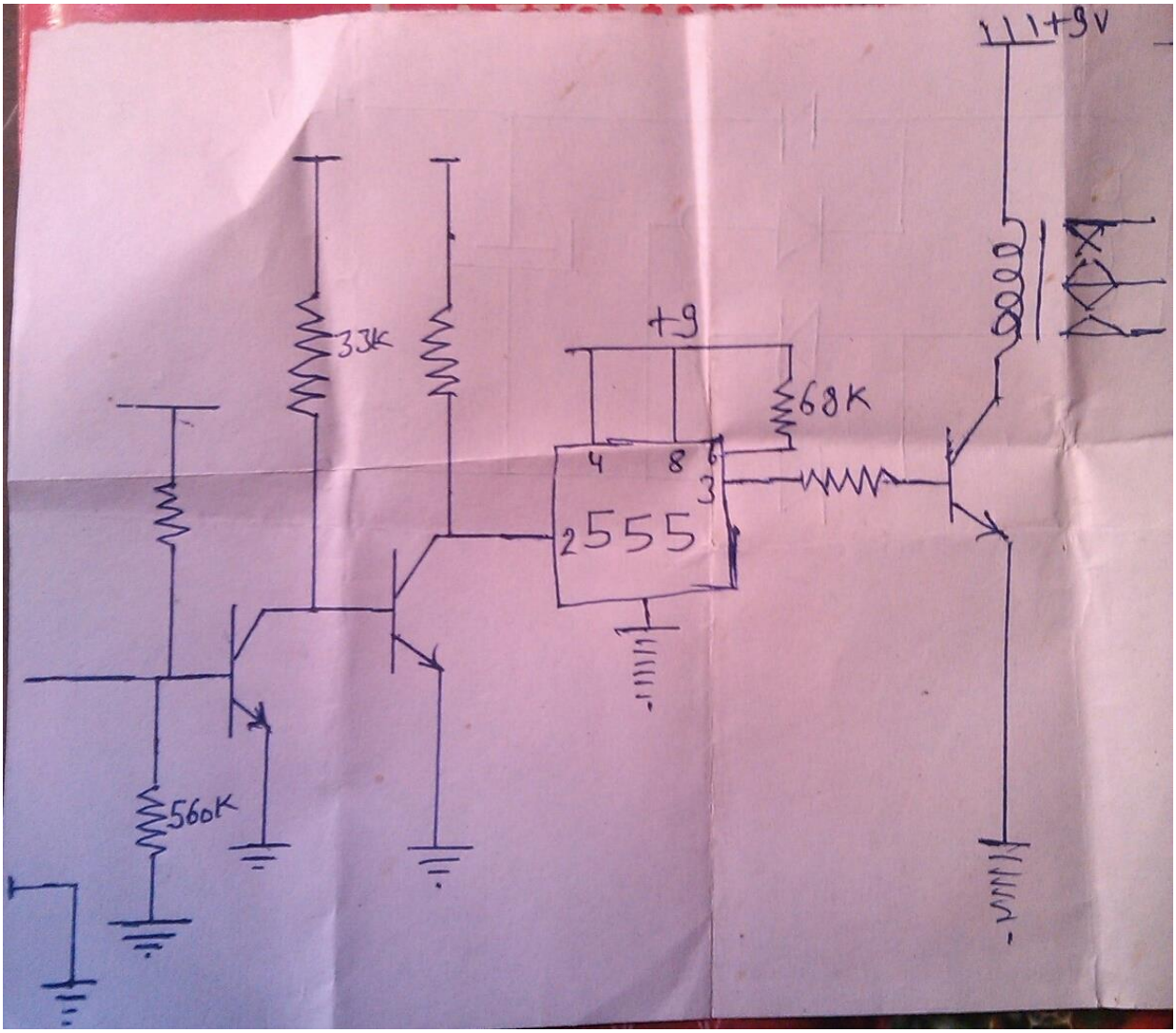
This motor works on 220-240V ,50HZ and 18W and through water upto 6 feet height.

6.Water level sensing circuit:- (6.1. general circuit)



This circuit is made by 4 transistors, one transformer,one relay, and 6 resistance. The brief diagram of this circuit is given below.

6.2.Detailed circuit:-



In this earth are provided by putting wire in the tank.when left most transistor wire is putted in water tank this transistor becomes off .due to this second left transistor is off.and 2nd pin have low so 3rd pin have high and pump continue to work . when water tanks becomes empty the earth provided is removed.then left transistor becomes ON.due to this second left transistor becomes ON. And 2nd pin have high and 3rd pin have low .relay operates and circuit becomes OFF. And fan continues to work.

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