



VA-FABLAB, INDIA

Automatic plant watering system

Project Abstract:

Problem:

- 1) Wastage of water due to supply more than required.
- 2) Not watering plants whenever required.

Solution:

- 1) An electronic device that will water the plant automatically as on when required.
- 2) Sensors which will switch on LED to give reminder or will switch on electric pump to water the plants.

Model:

- The circuit is designed to sense dryness of the soil and subsequently switch on the electric pump to start the supply of water and switch off the pump whenever sufficient water is supplied.
- The Materials used are : Transistor 548, Resistor 1k, Variable resistor 47k Ω , Diode 1N4007, Relay 5v, LED, DC converter, Circuit board, Probes, AC water pump, Water reservoir, etc.
- Two probes of the circuit are to be inserted in the soil around plant.

Observations:

The circuit works as follow.

Soil status	Working of circuit
Dry	Circuit is switched on and pump starts
Wet	Circuit is switched off and pump stops

Further plan:

Solar panel will be installed in the circuit to save electricity

Message:

Electronics is multipurpose tool, useful even to water plants.

Circuit diagram:

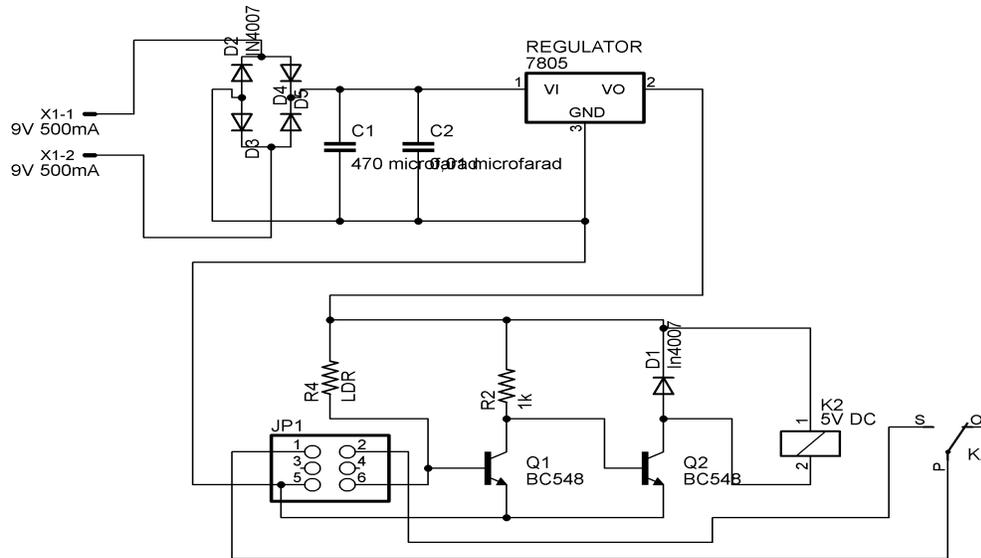
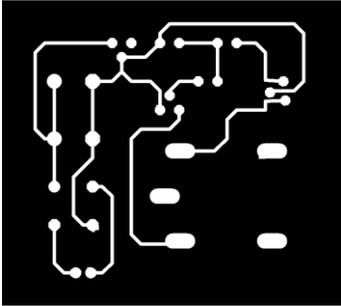


Fig: Circuit diagram of plant watering system

Circuit working:

When the soil is dry then there would be high resistance which will allow the flow of current and transistor T2 will get switch on, this will let the current flow towards the diode and thus relay will get switch on. When the relay gets switched on, 230V current will be supplied to water pump and water will be supplied to the plants. As soon as soil gets wet; two probes of the circuit will conduct electricity due to presence of the ions in the soil and soon transistor T1 will get switch on due to low resistance between probes, thus switches off the pump and water supply to be stopped. The circuit is also consists of a variable resistor through which sensitivity of probes can be adjusted.

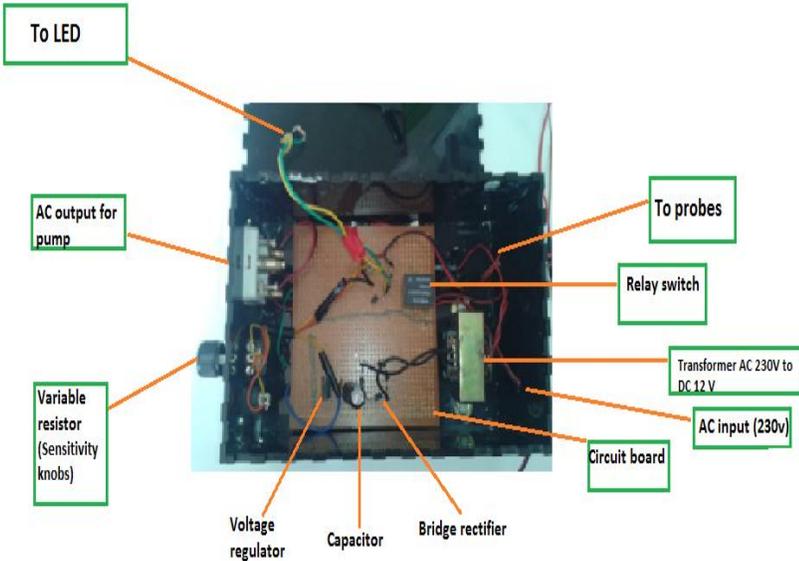
PCB Layout:

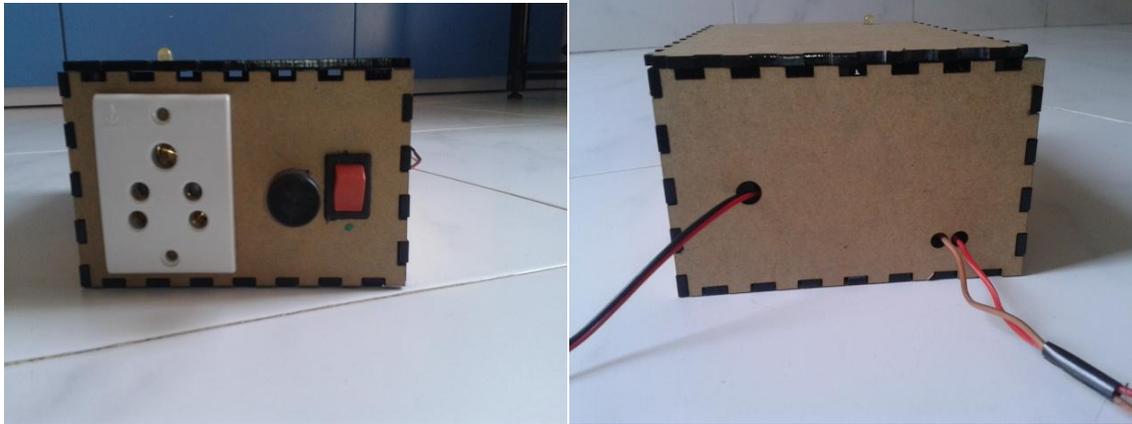


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Fig: PCB Layout

Structural diagram:





Picture: Casing and functional blocks

Material list and description:

1. LED (Light Emitting diode):



It is type of semiconducting vacuum diode which gives out light when electricity passed through it. The electrons flows through the gap between Anode (+ve) and Cathode (-ve), releases energy through form of photon. In the above device it is used to indicate whether circuit is on or off.

2. DIODE :



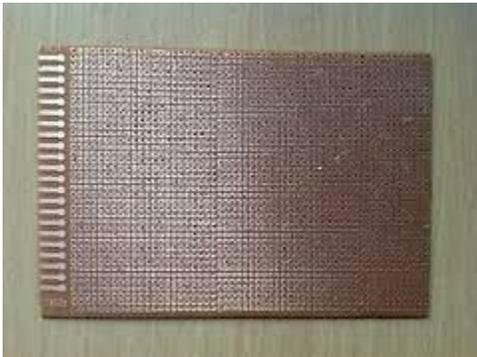
A diode is an electronic semiconductor type component. It allows electric current to flow in one direction called forward direction and blocks the current coming from the opposite direction. They are made up of silicon.

3. VARIABLE RESISTOR (Potentiometer):



Variable resistor is type of three terminals resistor in which, resistance can be set according to requirement. In the above device it is used to set sensitivity of the probes.

4. CIRCUIT BOARD :



Circuit board is the plate on which electronic components are fixed. It consists of many tiny holes in which components are soldered. It's plating done with copper metal.

5. RELAY :



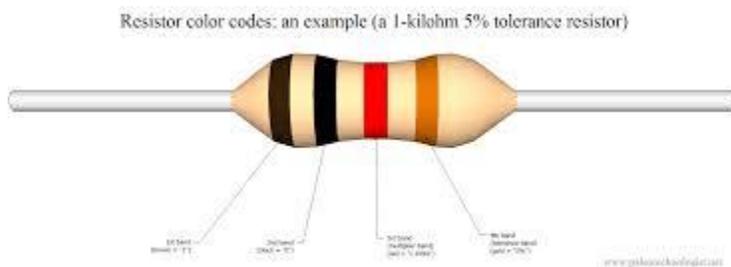
Relay is type of switch which is activated when electric current passed through. It has two poles A (+ve) and B (-ve). When electric current is passed through them an inbuilt electromagnet is activated and the common pole and the other poles get connected and circuit gets complete. In this circuit the common pole has one connection of AC pump and other pole has connection of AC input.

6. TRANSISTOR:



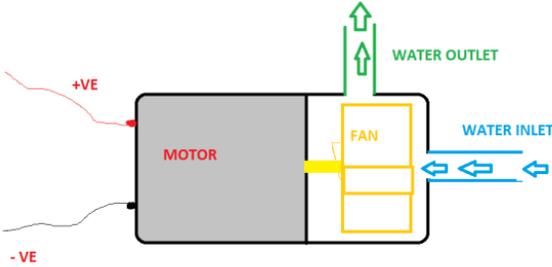
A transistor is a type of semi-conductor, it acts like an amplifier or like a switch. It has three terminals i.e. collector, base and emitter. There are two types of transistors NPN (-ve to +ve) and PNP (+ve to -ve). In this circuit BC 548 transistor is used. BC548 is a NPN bipolar junction transistor.

7. RESISTOR :



A resistor is an electronic component which is used to reduce the current. There are various types of resistors classified based on amount of voltage they resist. There are specific color bands which denote the value of resistor. Resistance is measured in ohm (Ω). In the above circuit a resistor of $1k\ \Omega$ is used.

8. AC Water pump:



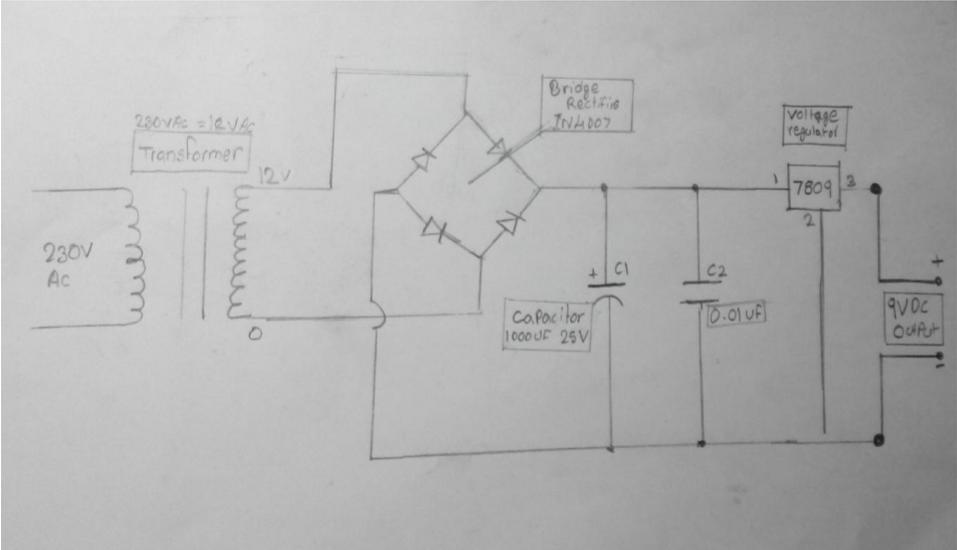
AC PUMP

Diagram of pump

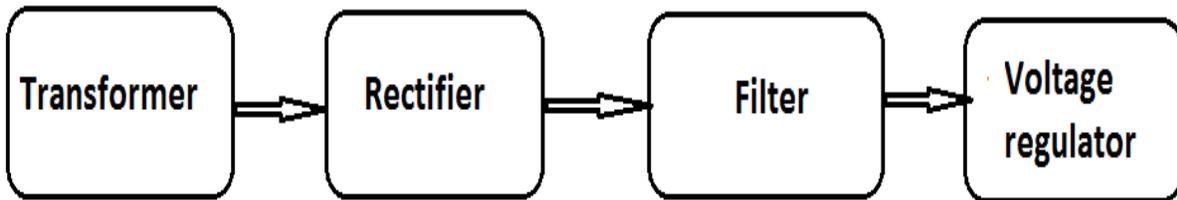
Water pump is a device which runs with an electrical motor. It consists of blades in one block attached to the shaft of the electrical motor, which creates force to throw out water. In this circuit, the pump gets switched on after a command from sensing probes.

Power Supply unit:

Circuit diagram:



Block diagram:

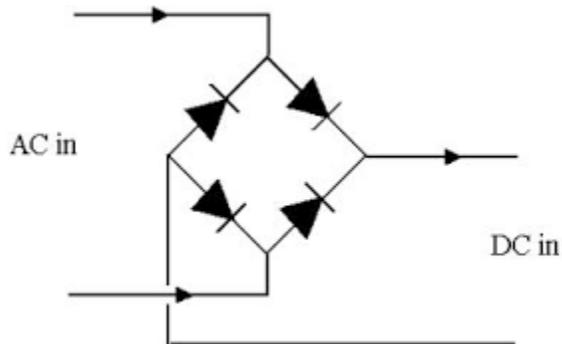


1. Transformer :



Transformer is an electrical device that transfers energy two or more circuits through electromagnetic induction. A varying current in the transformer's primary winding creates a varying magnetic flux in the core and varying magnetic field impinging on the secondary winding. This varying magnetic field at the secondary induces a varying electromagnetic force or voltage in the secondary winding. Making use of Faraday's law in conjunction with high magnetic permeability core properties, transformers can thus be designed to efficiently change AC from one voltage level to another within power networks. In above circuit step down transformer is used to convert current of 230V to 12V.

2. Rectifier :



A rectifier is an electrical device that converts alternating current (AC), which periodically reverses direction, to direct current (DC) which flows in only one direction. There are three types of rectifiers 1) Half wave rectifier: This transfers only half wave of AC to DC. 2) Full wave rectifier: This converts full waves of AC to partial DC. 3) Bridge rectifier: This converts whole AC to DC. In this circuit bridge rectifier is used.

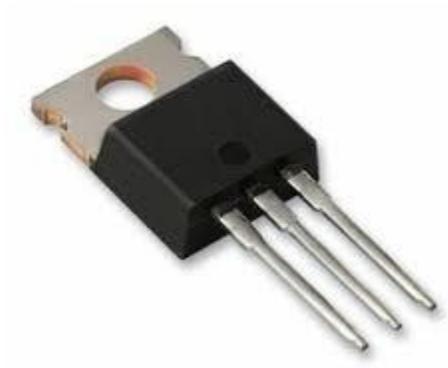
3. Filter :

The rectified current required to be filter for its intended use. In this circuit capacitor is used as filters.



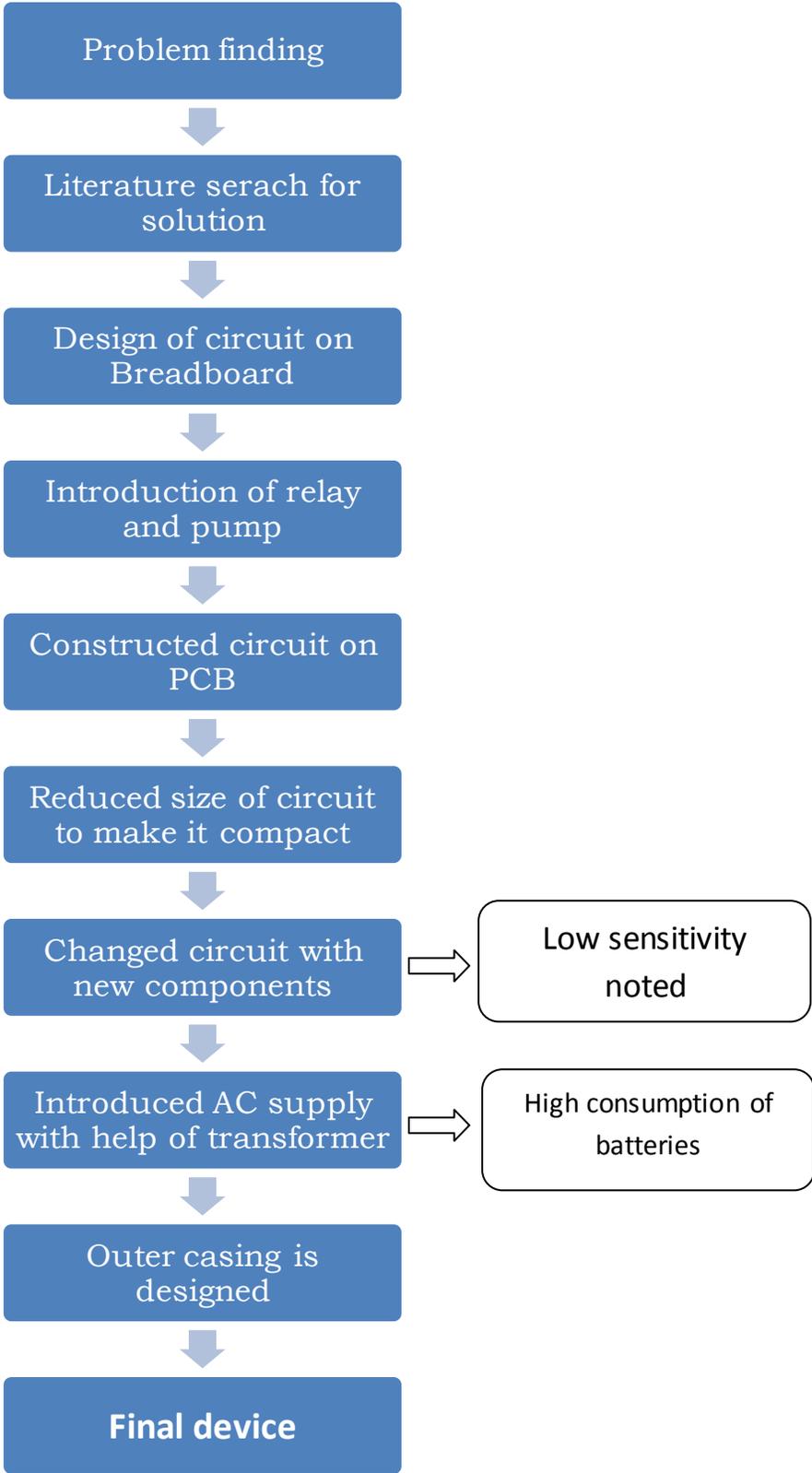
Capacitor : It is a passive two-terminal electrical component used to store energy electro-statically in an electric field. There are two types of capacitor ceramic and electrolytic. In this circuit both are used.

4. Voltage regulator:



A voltage regulator is designed to automatically maintain a constant voltage level. A voltage regulator may be simple “feed-forward” design or may include negative feedback control loops. It may use an electromechanical mechanism or electronic components.

Flow chart of project development:



Principle - working of device:

The device works on following principle:

The soil contains different types of ions which carries current from one probe to another. Ion is an atom or molecule in which the total number of electrons is not equal to total number of protons, giving the atom net positive or negative electrical charge. The ion which carries negative charge called anions and cations which carries positive charge.

Presence of ions in the soil can be confirmed with help of flame test.

Flame test:

A flame test is procedure which is used in chemistry to detect certain elements, primarily metal ions, based on each element's characteristic emission spectrum. or ion.

The test involves introducing a sample of soil to a hot, non-luminous flame, and observing the color of the flame that results.

Positive feedback: Positive feedback is also known as regenerative feedback; it is when the output process is given back to the input procedure to increase the output process.

Negative feedback: Negative feedback is also known as degenerative feedback; it is when the output process is given back to the input procedure to decrease the output process.

References:

Wikipedia

by- Ashish Mohite.

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