MICROWAVE OVEN

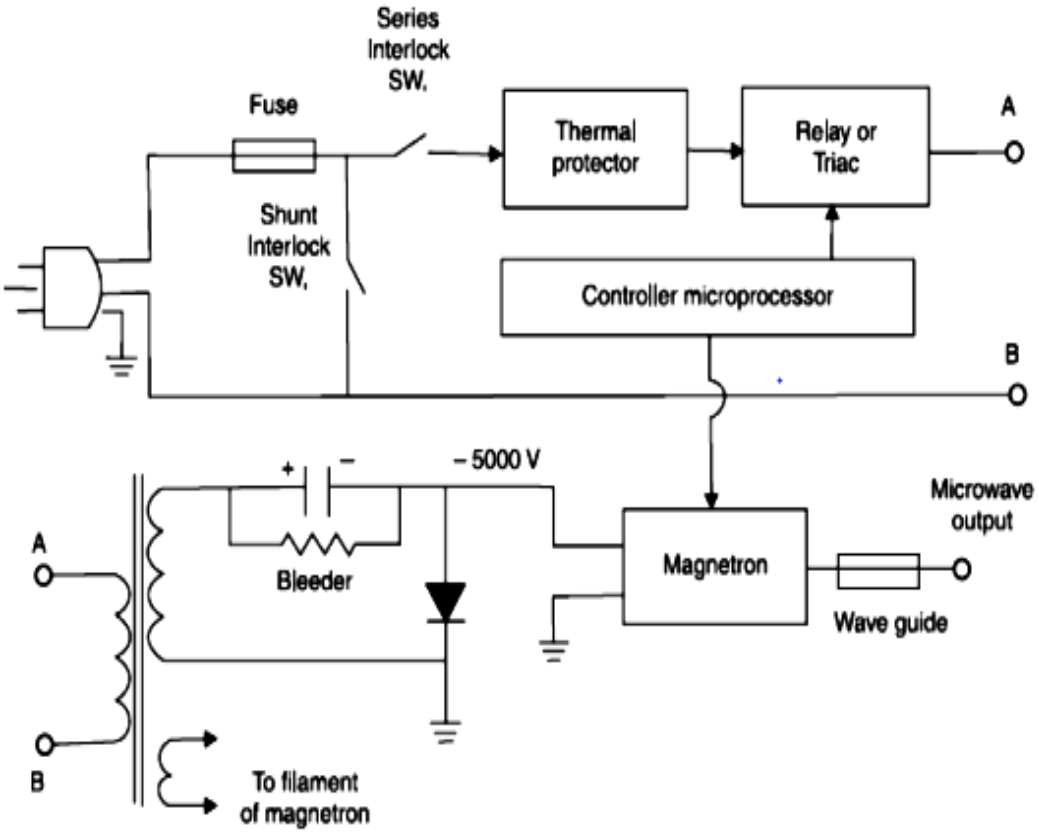
INTRODUCTION:

A microwave oven is a kitchen appliance that can come in many different sizes and styles employing microwave radiation primarily to cook or heat food. This is accomplished by using microwaves, almost always emitted from a magnetron to excite water and other polarized molecules within the food to be heated.

WHAT ARE MICROWAVES?

- Microwaves are a form of electromagnetic energy like light waves or radio waves.
- Microwaves are used extensively in communication such as relay long distance telephone signals, television programs and computer information across the earth or to a satellite in space.
- Good for transmitting information because it can penetrate haze, light rain and snow, clouds, and smoke.
- It is also used in radars and in detecting speeding cars.
- Microwave has been become most familiar as the energy source for coking food.

BLOCK DIAGRAM:



A microwave oven heats food by passing microwave radiation through it. Microwaves are a form of non-ionizing electromagnetic radiation with a frequency higher than ordinary radio waves but lower than infrared light. Microwave ovens use frequencies in one of the ISM (industrial, scientific, medical) bands, which are reserved for this use, so they don't interfere with other vital radio services. The mains plug and socket are three-pin earthing type. The fast blow ceramic fuse is of 15A, 250 V. Interlock switches are linked with the oven door. Power will be applied to the mains transformer only when the oven door is closed. At least one interlock switch is in series with the transformer primary, hence even a spot of dirt in the relay or trial, and cannot turn the oven on when the door is open. Consumer ovens usually use 2.45 GHz, a wavelength of 12.2 cm (4.80 in) while large industrial/commercial ovens often use 915 MHz 32.8 cm (12.9 in). Water, fat, and other substances in the food absorb energy from the microwaves in a process called dielectric heating. Many molecules (such as those of water) are electric dipoles, meaning that they have a partial positive charge at one end and a partial negative charge at the other, and therefore rotate as they try to align themselves with the alternating electric field of the microwaves. Rotating molecules hit other molecules and put them into motion, thus dispersing energy. This energy, when dispersed as molecular vibration in solids and liquids. . Microwave ovens heat foods quickly and efficiently because excitation is fairly uniform in the outer25–38 mm (1–1.5 inches) of a homogenous (high water content) food item; food is more evenly heated throughout (except in heterogeneous, dense objects) than generally occurs in other cooking techniques.

PRINCIPLE:

Microwave radiations generated by a magnetron pass through the exposed food, create dielectric heating within the food, this is the basic principle on which a microwave oven works. A microwave oven uses microwaves to heat food. Microwaves are radio waves. In the case of microwave ovens, the commonly used radio wave frequency is roughly 2.500 megahertz (2.5 gigahertz).

Construction:

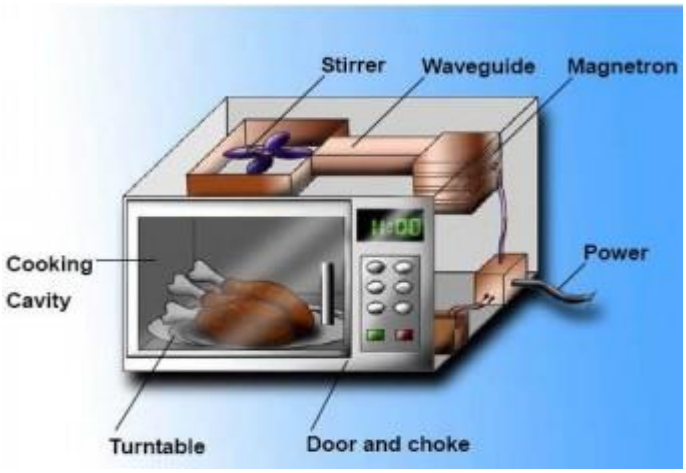
Magnetron is the combination of a simple diode vacuum tube with built in cavity resonators and an extremely powerful permanent magnet. The typical magnet consists of a circular anode into which has been machined with an even number of resonant cavities. The diameter of each cavity is equal to a one half wavelength at the desired operating frequency. The anode is usually made of copper and is connected to a high-voltage positive direct current. In the center of the anode, called the interaction chamber, is a circular cathode

Operation of Magnetron:

All cavity magnetrons consist of a hot filament (cathode) kept at, or pulsed to, a high negative potential by a high-voltage, direct-current power supply. The cathode is built into the center of an evacuated, lobed, circular chamber. Circular cathode that emits electrons when heated. In a normal diode vacuum tube, the electrons would flow directly from the cathode straight to the anode, causing a high current to flow. In a magnetron tube, however, the direction of the electrons is modified because the tube is surrounded by a strong magnetic field. The field is usually applied by a C-shape permanent magnet centered over the interaction chamber.

The magnetic fields of the moving electrons interact with the strong field supplied by the magnet. The result is that the path for the electron flow from the cathode is not directly to the anode, but instead is curved. By properly adjusting the anode voltage and the strength of the magnetic field, the electrons can be made to bend such that they rarely reach the anode and cause current flow. The path becomes circular loops. Eventually, the electrons do reach the anode and cause current flow. By adjusting the de anode voltage and the strength of the magnetic field, the electron path is made circular. In making

their circular passes in the interaction chamber, electrons excite the resonant cavities into oscillation. Magnetron, therefore, is an oscillator, not an amplifier. A takeoff loop in one cavity provides the output. Magnetrons are capable if developing extremely high levels of microwave power. Thousand and even millions of watts of power can be produced by a magnetron. When operated in a pulse mode, magnetron can generate several megawatts of power in the microwave region. Pulsed magnetron are commonly used in radar systems. Continuous-wave magnetrons are also used and can generate hundreds and even thousands of watts of power. A typical application for a continuous magnetron is for heating purposes in microwave ovens.



CHARACTERISTICS OF MICROWAVE OVEN:

- The food particles that contain water, fats, and sugars absorb microwave radiation through atoms and molecules of food and absorption of this radiation gives energy make the move significantly and collide to produce heat for heating cooling.
- That the material plastic and glass, ceramics and pottery does not absorb microwave radiation and it is not affected, and this means that they will not rise the temperature, and the shiny metallic materials such as aluminum that reflects the rays is therefore prohibited for use within microwave oven.

APPLICATIONS:

- Microwave ovens are popular for reheating cooked foods and cooked vegetables.
- They are also useful for rapid heating of otherwise slowly prepared cooking items, such as hot butter, fats, and chocolates.
- The oven is used to heat frying oil and other items such as bacon which attains higher temperatures than that of boiling water.

ADVANTAGE:

- Ability to heat quick heating
- Ability to set timers
- Easily reheating foods
- Easy to clean
- Variable heat settings

- Cleaning the cooking area of microwave is also easy because of the smooth finish inside the oven with a glass finish inside the oven with a glass finish. It requires only a towel to wipe off the spills if you found any that too not very often.
- No change in taste and nutrition
- Low energy consumption

DISADVANTAGE:

- Cooking food in a microwave might result in overcooking and drying out certain meals due to high heat intensity.
- Food up to limited capacity can be cooked and due this they are not the best option for large families
- Microwave can lead to dehydration. This microwave cooks food by water molecules and reduces the water content in it which results in dry food. Sometimes the food can come out half cooked.