

TECHNICAL DESCRIPTION

MICROWAVE

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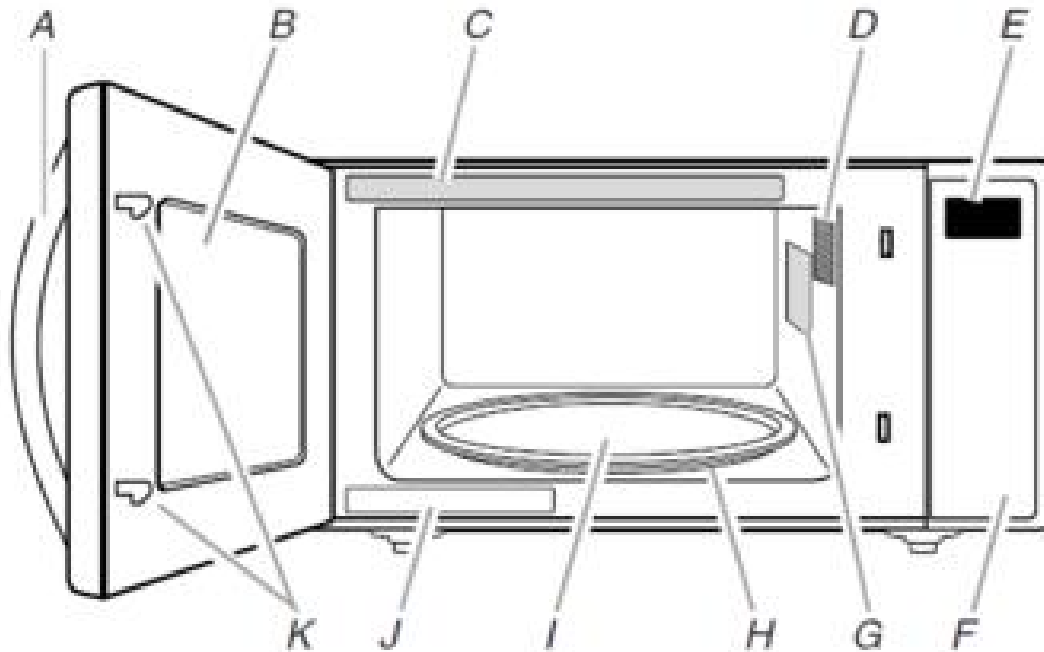
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Percy Spencer's invention of the microwave oven was a big breakthrough in the world of kitchen appliances. Spencer, an American engineer with a particular interest in electromagnetism, was performing research on radar systems during WWII when he accidentally discovered the concept of the microwave oven. He found the chocolate bar in his pocket had melted while testing a radar device. Spencer became fascinated by this phenomena and began experimenting with the use of microwaves for cooking.

Spencer's discovery paved the path for the development of the Radarange, the first commercially available microwave oven. Initially, this device was huge and expensive, and it was mostly used in commercial kitchens and restaurants. Spencer's invention, on the other hand, opened up new possibilities for home cooking, and smaller, more cheap variants that became available in the 1960s.

Today, microwave ovens are indispensable kitchen appliances to many families worldwide, offering a simple, quick, and energy-efficient manner of cooking, heating, and defrosting food. Microwave ovens work by using electromagnetic waves, specifically microwaves, to excite water molecules in food, causing them to vibrate and generate heat. This heat then cooks or reheats the food.

Door handle Window Cooking guide label Microwave oven light Display



Door lock system Model and serial number plate Glass turntable Removable turntable support Microwave inlet cover Control panel

To understand how a microwave oven works, you must first know the many components that form this appliance. The magnetron, waveguide, cavity, and control panel are the four most important components of a microwave oven. The magnetron is considered the microwave's core since it provides the microwaves needed for the heating and cooking process. The magnetron, which consists of a cathode, anode, and a filament, operates by heating the cathode, which then causes the electrons to be released into the filament. Then Microwaves for cooking are created in the anode, which is made up of resonant cavities that generate a magnetic field and drive electrons to flow in a circular pattern. After then, the electrons are guided and propelled toward the anode. The waveguide in a microwave oven is in charge of transporting the microwaves emitted by the magnetron into the cavity(where the food is put). It is designed to be a hollow

metal tube that transports these microwaves into the cavity of the oven while simultaneously preventing any radiation leakage. The cavity of the microwave oven is where the food is put and cooked/heated. It is a metal rectangle-shaped box that reflects microwaves and disperses them equally within the cavity. The cavity's interior is fully covered with a conductive material, that also serves to reflect and spread microwaves throughout the cavity. The control panel of a microwave allows the person using it to fully control the functions from choosing the desired cooking time and temperature to what type of food is being cooked. It has a display screen, buttons, and knobs that let the user to customize the cooking parameters. To guarantee that the cooking process is carried out properly, the control panel communicates with the microwave's other components, such as the magnetron and waveguide. The microwave oven is composed of a number of other different parts in addition to these four major components. The door, the safety interlock switches, and the high voltage transformer are just some of these important components. The door allows the user to access the cavity to put in food while also being able to see the process while providing safety to the user from radiation. It also includes a safety feature that stops the microwave from turning on while the door is open. The safety interlock switches are incorporated to prevent the microwave oven from starting the cooking process unless the door is properly shut. It works by sensing how the door of the microwave is positioned and whether it's closed and communicates with the control panel to guarantee that the microwave oven is only activated when the door is closed. The high voltage transformer is in charge of converting the low voltage from the power supply to the high voltage needed by the magnetron in order to properly function. It works by wrapping two wire coils, one primary and one secondary, around a magnetic core. When an alternating current is applied to the main coil, a

magnetic field is then created in the core, which causes a voltage to be generated in the secondary coil. The magnetron is then powered by this voltage.

Now that we know what the microwave is made up of and how it really works, we can start to understand what we can really use it for. It's complex but it makes our lives so much easier. One of the most typical applications for a microwave is cooking food, particularly warming leftovers or rapidly making simple meals. Cooking vegetables, pasta, rice, and even sweets like cakes and muffins in the microwave is possible with the right equipment and microwave-safe containers. A microwave's quickness and efficiency make it excellent for people with a big appetite but very little time. Microwave ovens may be used for more than just cooking. They can, for example, be used to sterilize and disinfect things such as baby bottles, sponges, etc... Microwaves' high temperatures can kill germs and other harmful bacteria, making it a quick and effective way to keep home things clean and safe. That's just the tip of iceberg, this little daily kitchen appliance has so many uses that I can barely name them all.

In conclusion, the microwave has become an important part of today's kitchens, offering quick and effective cooking alternatives for individuals who can't find the time to use a normal oven. Its four fundamental components - the magnetron, waveguide, cavity, and control panel - work in tandem to create a culinary powerhouse capable of handling a wide range of cooking duties. The microwave oven has a wide assortment of functions that make it a useful and important piece of equipment in any home, from warming leftovers to defrosting frozen meals, cooking vegetables and meats, creating popcorn, and even baking cakes. Apart from household use, microwaves have made their way into a wide range of industries including restaurants and

food processing, where rapid and efficient cooking is crucial. They are also utilized in research laboratories for experimentation and scientific reasons such as material studies and substance analysis. The microwave has evolved into a common and versatile piece of technology with uses that are beyond just cooking meals. Its impact on modern society is undeniable, and it will undoubtedly continue to play a crucial role in various fields for years to come.

References:

<https://www.popularmechanics.com/technology/gadgets/a19567/how-the-microwave-was-invented-by-accident/>

<https://celcook.ca/the-accidental-invention-of-the-microwave/>

<https://www.homenish.com/parts-of-a-microwave/>