COLLEDGE ZMT

Presentation equipment ***microwave***

Performed student in the 203 group

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- *Microwave oven (also microwave oven; obsolete. microwave[1]; Accel. microwave oven) — electrical device that uses the phenomenon of heating of water-containing substances of electromagnetic radiation of the decimeter range (typically with a frequency of 2,450 GHz) and designed for quick cooking, heating or defrosIn the industry, these ovens are used for drying, defrosting, melting plastic, heating adhesives, ceramics etc.*
- *In some industrial furnaces, the radiation frequency can be changed (the so-called English. variable frequency microwave, VFM).*

- *In contrast to traditional ovens (e.g., oven or Russian stove), heating food in a microwave oven is not only the surface heat of the body, but according to his volume, containing polar molecules (e.g. water), as radio waves of this frequency to penetrate and be absorbed by food to a depth of approximately 2.5 cm This reduces the time of cookingting food*

Содержание

The principle of operation

- *The heating furnace based on the principle of so-called "dipole shear"[source unknown 627. Molecular dipole shift under the influence of an electric field occurs in materials containing polar molecules. The energy of electromagnetic waves causes the movement of molecules (in this case, possessing a dipole moment), which leads to increase the temperature of the material.*

- *The widespread opinion that the selected frequency corresponding to the resonance frequency of water, is not true — the last is 22,24 GHz[source not specified 255] while most household microwave ovens operate at a frequency of 2450 MHz, in the USA, some industrial model — at the frequency of 915 MHz.*

- *The frequency selected for a practical and constructive considerations:*

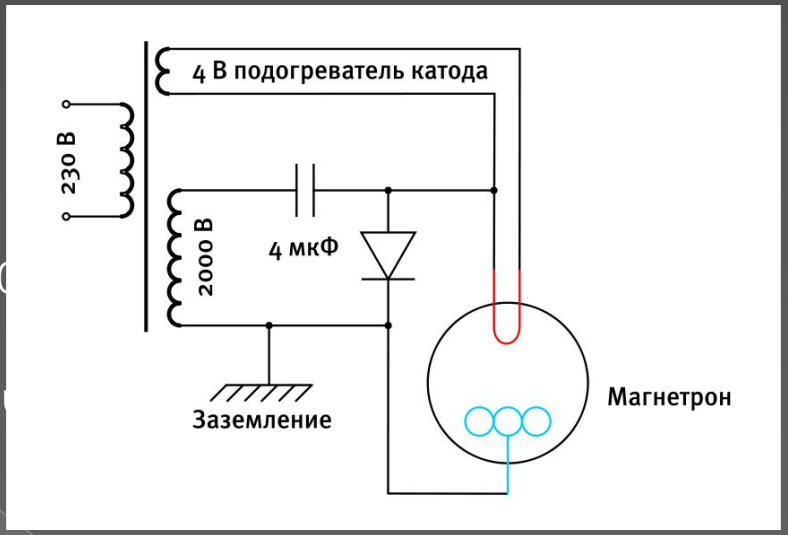
- *The magnetron, with power of 500 W, have to possess acceptable efficacy, value, and size;*
- *The frequency must be in the allowed allocated the radio frequencies (in this case, the ISM band);*
- *The penetration depth of radio waves in the object to be heated should lie in the area of several centimeters (the lower the frequency the greater the depth of penetration)*

The capacity of the furnace

- Power appliances microwave ovens range from 500 to 2500 watts and above. Almost all home ovens allow the user to adjust the power used for heating. To do this in inexpensive models of furnaces heater (magnetron) according to the setting of the power controller periodically turns on and off by changing the average amount of input power by pulse width modulation (widely used also in many other heating devices such as irons, heaters). These periods of on/off can be directly seen in the sound during operation of the furnace, and to change the appearance of some products (blowing some air products, including packages)

Device

The main components of a magnetron of the microwave oven:



- metal, metallic door, the camera (which radiation of high frequency, for example 245 are placed in heated products;
- transformer — the high voltage power so magnetron;
- circuit control and switching;
- directly microwave emitter — magnetron;
- waveguide for transmitting radiation from the magnetron to the chamber;
- auxiliary elements:
- a rotating table is required for uniform product heating from all sides;
- schemes and circuits for the control (timer) and security (lock modes) of the device;
- fan, magnetron cooling and winding the camera.

Varieties

Design type microwave ovens are divided into:

- solo — only microwave radiation; without grill and convection.
- grill has a built — in quartz or electic grill.
- convection — the fan pumps the hot air chamber, thereby providing more uniform baking, similar to the oven.

- The type of control microwave ovens are divided into:

- mechanical — uses mechanical regulators of time and power.
- keypad — the control panel consists of a set of buttons.
- touch — buttons touch-type.

History

American engineer Percy Spencer noticed for the first time the ability of microwave radiation to heat products and patented microwave. At the time of invention, the Spencer was working with Raytheon, a producer of equipment for radars. According to legend, when he experimented with another magnetron, Spencer noticed that a piece of chocolate in his pocket melted. According to another version, he noticed that hot sandwich, put on the included magnetron. Perhaps the reason for the invention was just a burn, but for commercial reasons the image of the device was impractical to spoil.

A patent for a microwave oven was issued in 1946. The world's first microwave oven "Radarange" was released in 1947 by Raytheon and was not meant for cooking and for quick defrosting of products, and used exclusively by the military (canteens and dining rooms of military hospitals). Its height was approximately equal to human growth, weight 340 kg, power — 3 kW, which is approximately two times the power a modern household microwave oven. In 1949 they started their serial production. This oven cost about $3000.

October 25, 1955, the American company "Tappan Company" introduced household microwave oven.

The first serial domestic microwave oven was produced by the

In the USSR since the early 80s microwave oven was produced in the plants:

ZIL (model "ZIL") and Pivdenmash machine-building plant (model "dream MV")
Tambov plant "Elektropribor" (Model, "electronics");
The Dneprovsky machine-building plant. Lenin (DMZ) produced "Dnepryanka-1" (1990, 32 liters, the magnetron M-105-1, power consumption 1300 watts, the power of the microwave radiation of 600 watts, weight 41 kg, price 350 RUB)[3] and "Dnepryanka-2

- *17 may 2011 the newspaper "Trud" reported in its issue of 13 June 1941 in the article was described by a special apparatus used ultra-high frequency currents for the treatment of meat products and developed in the laboratory of magnetic waves of the all-Union scientific research Institute of meat industry*

Precautions during operation

Microwave radiation can not penetrate the metal objects, so it is impossible to cook food in a metal container.

It is undesirable to place in a microwave bowl with a metallic coating ("the Golden platter") — even this thin layer of metal heats up eddy currents that can destroy the utensils in the field of metal deposition.

Do not heat in a microwave oven, the liquid in sealed containers and whole bird eggs — because of the strong evaporation of water inside them creates a high pressure and, consequently, they may explode. From these considerations, highly desirable to reheat the sausage product, covered with plastic wrap (or before heating to pierce each sausage with a fork).

It is forbidden to turn on an empty microwave. You must at least put it in a glass of water

Warming up in the microwave the water, also use caution — the water is capable of overheating, i.e. heating above the boiling point. Superheated liquid is able to almost instantly boil because of a careless motion. This applies not only to the distilled water, but any water that contains few suspended particles. The more smooth and uniform is the inner surface of the vessel with water, the higher the risk. If a vessel with a narrow neck, it is likely that at the beginning of the boiling hot water will pour out and burn your hands.

Myths about microwave ovens

- Microwave effect supposedly changes the structure of water and food, making the useful minerals into carcinogens. In fact, the influence of microwave radiation in the oven for substances associated with the usual warm-up. Although chemists and studied (very rare) reaction, the progress of which, in their opinion, the effect of non-thermal effects of microwave radiation[8], independent experiments[9] it was found that the observed "non-thermal" effects are actually determined by the uniformity of heating, and the assumption of existence of nonthermal microwave effects has to be reconsidered. Besides, water (except frozen), according to modern scientific data may not have any structure (see relevant article).
- The first microwave oven, called "Radiomissor", was allegedly created by German scientists during the Second world war, it was used in the current German army, for heating food, but turned out to be unsafe and it was abandoned[10] (however, the Russian sites at the same time refer to foreign, and foreign — on study of the Soviet Union, conducted in a non-existent Russian cities "Minsk" and "Rajasthan").
- Microwave oven (with door removed) can supposedly be used in the military for an inexpensive simulation of radar, to force the enemy to spend for their expensive ammo or suppression resources aircraft jamming. Publications usually refer to the experience of the Serbian army in Kosovo

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