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ANALYSIS OF PRODUCT PROCESSING AT EXTREMELY HIGH FREQUENCY

Ibragimov R. R.
N. Z. Sharipov
M.S. Narziyev
Bukhara engineering technological institute

Abstract
Today, among the developed countries of the world, interest in the issue is increasing with the heating of high-frequency and ultra-high-frequency dielectrics, as well as the development of semiconductors. A number of foreign and domestic scientists have conducted a lot of scientific research on the mechanism of heat treatment of various materials under the influence of a high-frequency field.

Keywords: high frequency heating, drying process, high-frequency electric field, technological processes.

Introduction

High frequency heating is characterized by a rapid increase in the temperature inside the product, as a result of which there is an excess pressure of steam compared to the ambient pressure. This gradient greatly accelerates the drying process, as the passage of steam is also filtered through the pores and capillaries of the material by molecular diffusion.

Heating materials in a high-frequency electric field has several advantages:

1. Compared to conventional surface heat exchangers, due to the increase in the heat flow capacity, the heat exchanger provides an opportunity to reduce the duration of the process.
2. Uniform heating of the volume of the material increases the rate of heat exchange. Intensive heating of the material in the high-frequency electric field, in some cases the temperature on the surface of the material is lower than the temperature of the inner layers, leads to increased migration of moisture from the inner layer to the surface of the material through thermodiffusion.

Relatively low inertia of the device used as a high frequency source .

4. Allows adjustment during heat exchange.
5. It is easy to adjust the heat flux value.
6. The possibility of using flow methods in production.
7. It allows to improve sanitary conditions in production.

8. It allows high-quality sterilization of the product.

In recent years, extremely high frequency currents have been widely used in technological processes. This is explained as follows:

- non-contact heating and achieving uniform temperature distribution in the product, in self-adjusting heating mode;
- the ability to transfer energy at the speed of light and distribute power in a volumetric unit, which none of the traditional methods of providing energy can do;
- high-humidity materials, plant and animal products absorb a large amount of high-frequency electromagnetic field energy;
- instantaneous switching on and off of the heat effect, this condition ensures the adjustment of the mode of thermal inertia and high accuracy of heating;
- UWC in conversion of ultra-high-frequency energy into heat energy released from the heated material is about 60%, energy losses in the working chamber are low;

Another method of electrophysical processing of food products is the pasteurization and sterilization of liquid products using ultra-high-frequency electromagnetic field (EMF) energy.

this regard, various works are being carried out to create high-efficiency ultra-high frequency sterilization and pasteurization equipment. Because the energy of O'YuCh EMM penetrates liquid food very easily and quickly kills microorganisms in a short time and at low temperatures and preserves the quality of the product.

Beam, resonator and wave electrodynamic systems are used in ultra-high frequency pasteurization and sterilization of products. Bright on devices of energy radiation face from the device is used. Spoken of the device energy local effect shows created in USA face at a frequency of 2450 MHz in an ultra high sterilizer mouthpiece product form customized and this in progress products one in the plane to heat up achieved. Illuminators of the camera into installed yeast products in a bowl being mass of the camera inside turning around standing up pasteurized.

Continuous sterilization device has been developed in the USA, in which a special tunnel electromagnetic field is created and the product is transferred through it using a conveyor. Tests have shown that the sterilization process is performed 10-20 times faster than in a normal autoclave. It is in process All products are stored in glass or polyethylene containers . In order to carry out the process in an optimal mode, a chamber with a resonator is used, and a system that controls the energy density is used in it.

In France, a continuous high-frequency device is used to sterilize liquids. The device consists of an electric magnetic field energy generator, a wave transmitter, and a chamber with a cylindrical resonator, inside of which are installed serpentine tubes.

Processed liquid products are passed through it and sterilized. In the camera, EMM waves are transmitted through special slots.

A sterilizer based on a continuous right-angle wave transmitter was produced in Sweden. This device is used to kill microorganisms in solid food products in their cardboard or polyethylene packaging. Its working frequency is 2450 MHz, a transporter is used inside the hermetic chamber. A special hermetically sealed inlet and outlet device is installed for the entry and exit of products. From this except dishes cracked don't go for to the camera pressure under air is sent. Bread Sterilization takes 2-3 min at 65-70 ^{o}C goes like this again processed of bread use time noticeable level extends.

in Switzerland liquid products for work developed sterilizer extremely high frequency 4 common sources power 8.8 kW from the magnetron is used. Worker to the camera liquid product pump through is transmitted. On the device from being used after cleaning up washing in the eye caught, cleaned after clamped air with again one there is clean up is dried. Sterilized product watery in the refrigerator is cooled.

Last year's one different didn't happen liquid mixtures from each other separate for electrical contact method one type calculated electro flotation process efficient applied is coming. Electro flotation process juices, food - food in the industry used waters in cleaning, from bards to eat yeasts in taking, starch work in release, gluten work in release, grape juice cleaning liquids from fat in cleaning and in others using is coming.

One of the main elements of an ultra-high frequency device is a magnetron. A magnetron is in the form of a double-electrode electronic lamp, which generates ultra-high-frequency radiation due to the movement of electrons under mutually perpendicular electric and magnetic fields. It consists of several resonators located around a cathode located in the center. Generator lamps of ultra-high-frequency radio and radar transmitters are used as generator lamps.

When the device is placed between the strong magnetic poles, the electrons emitted by the cathode move along a circular trajectory under the influence of the magnetic field, cross the open slots of the resonators at defined time intervals and give off their kinetic energy, causing vibrations in the resonator. Then the electrons return to the cathode and the process repeats .

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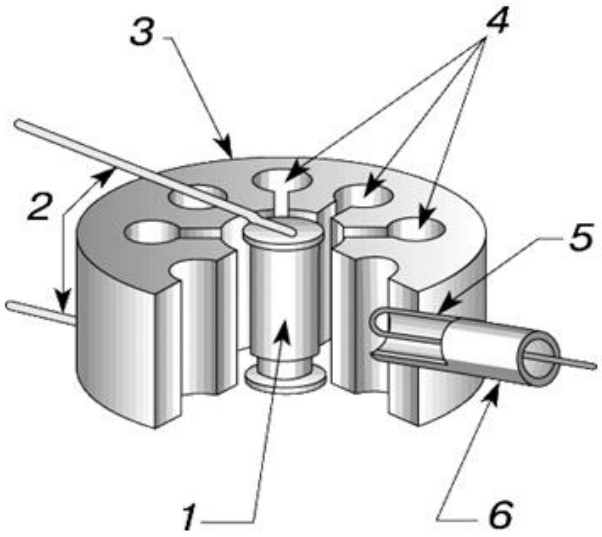

Figure 1. Magnetron (partial cut-away view showing internal device).1 – cathode; 2 - supply current to the heater; 3 – anode block; 4 – volumetric resonators; 5 – output ring of communication; 6 – coaxial wire.

The klystron of an electrovacuum device based on a slightly different principle does not require an external magnetic field. In a klystron, electrons travel in a straight line from the cathode to the reflector and back. At this time, they cross the open holes of the circular (bubble) volumetric resonator. The control grid and the resonator grid group the electrons separately, and the electrons cross the resonator holes only at a certain time. The gaps between the groups are adapted to the resonant frequency of the resonator so that the kinetic energy of the electrons is transferred to the resonator, as a result of which electromagnetic vibrations with a large power are determined in it.

In conclusion, we can say that the implementation of high-frequency heat treatment in the technology of product processing has a positive effect on the improvement of the quality of the products obtained at the same time as the process efficiency is increased.

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