ABOUT MICROWAVE RADIATION SYSTEM SLOT RADIATOR ANTENNA TYPE

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Abstract
Last year has determined the intensification of the concern for the microwave utilization in the heating processes with industrial applications. The microwave heating is son alternative for the exceeding of the difficulties generated by the classical technologies, with high energy consumption. The experts foresee a progressive growth of the industrial utilization of the microwave owing to the microwaves technology improvements and inventions of the new technologies.

Key words: loss factor, microwave field, load.

INTRODUCTION

In generally an antenna is looking like an impedance transformer from the transmitting line impedance at the free space. The impedance of the both system has circuit elements like resistance and reactance. Like a radiator the function of the antenna is to produce an electromagnetic field at the certain distance. That property is generated by diffracted principals of Fraunfoher (Foster K., Ayyaswamy P., 1982).

A cut slot in certain conductor plan is governable by an parallel magnetic field with her length and can be look like complete emitting dipole element. The parallelism from the slot radiator – emitted electric dipole is an expression of Babinet principle.

Using some system admitting an optimal functioning (adopted) of microwave generator source. (Hippel A., 1983)

MATERIALS AND METHODS

In applicator the construction of a radian type energy distribution is necessary to make a radiant surface form by alignment of elementary radiant source. This surface is not necessary to be plane can be disposed in the treated product neighborhood the assembly is place in closed electric enclosure.

This radiant surface is like a bi-dimensional elementary source network (slot radiator) can be obtained with a calculus method help. We must follow the necessary electric parameters of the slot (radiant power, resistance, and conductance).

In correspondent microwave frequencies gamma the electric dipole is a radiant element. Properties like: current distribution, entrance impedance and radiation resistance depend on dipole characteristic. The radiant dipole can be making with direct connection at the coaxial line or coupling at the wave guide.

A cut slot in to conducting surface whom is applied a parallel magnetic field with her longitudinal axes is the complementary magnetic component of the electric dipole. The relation between slot radiant and electric dipole is an extrapolation between the first optic named Babinet principles. (Fig. 1)

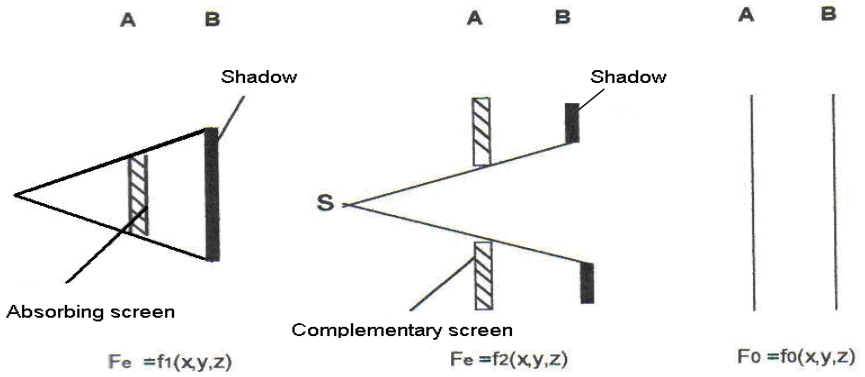

Fig. 1 –Babinet Principles

This principle affirmation is if between one light source and a B plan is interpose a screen A or a complementary screen the obtain effects on the B plan is the same with the obtain effect in screen default.

$$f_1(x,y,z) + f_2(x,y,z) = f_0(x,y,z) \qquad (1)$$

This principle is valid in optics and the extrapolation in the case of electromagnetic radiation is the same with the vectorial character of this.

RESULTS AND DISCUSSIONS

The radiation system is the object of this work paper and is presented in figure 2.

This kind of radiant distribution type permitted the total transfer of the energy in thermal processing with microwave.

This radiation system permitted thermal processing of diverse material on metal holder non-affected the normal functioning of the generator.

In case of the distribution system is composed from radiant slot guide is coupling to a main guide in microwave energy is injected from microwave generator. The microwave energy is in slot radiator on the large side of the radiant guide.

A uniform guide with dielectric without loss and perfect metal wall conductor is characterized into critical frequencies.

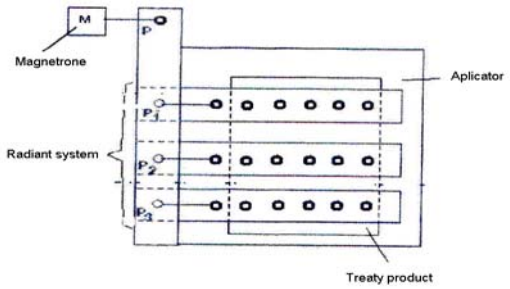

Fig. 2 – Radiant system with 3 radiant guide direct connections to intermediary guide

In figure 3a is presented current line and in figure 3b the magnetic field lines. The magnetic lines appears in rectangular guide section where is propagated the module TE_{10} (m = 1, n = 0).

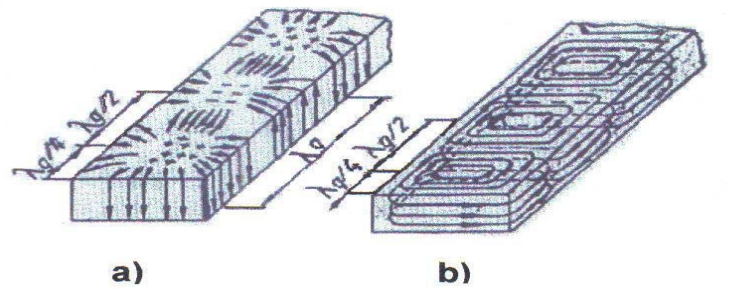

Fig. 3 – The electric and magnetic field lines in rectangular guide section functioning on oscillation module TE_{10}

Can be observing on the interior surface the current guide grouped in two categories:

- One group of longitudinal current traveling from the entrance to the exit of the guide in median plane.
- One group of transversal current there is closing on the bigger side of the guide travelling on the smaller side of this.

CONCLUSIONS

All obstacles in the longitudinal current circulation can be in series with the entrance and the exit of the guide. In the same time every obstacles in transversal current circulation can be in parallel with the guide.

If the slot is sectioning just the longitudinal current we obtain a series of guide named serial slot.

The slot that's intersected only the transversal current is a shunt slot and is working on the small side of the guide at certain angle of them axes.

The slot radiate with maximum intensity if the entrance impedance of the slot has a active part (resistance), or the slot length is correlated with resonant wave length.

The microwave energy is perpendicularly directed on the slot surface of the guide.

This kind of wave guide is used on large side more radiant slot and is short circuit at the end and is named radiation system (fig. 4)

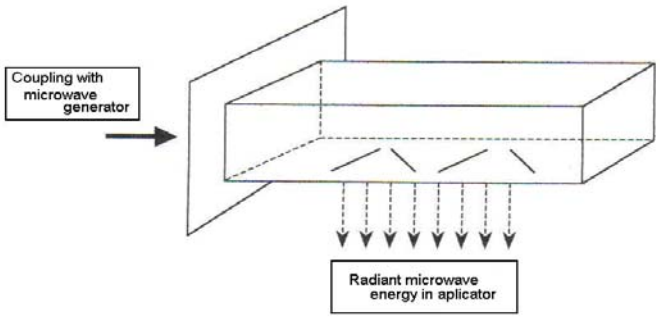

Fig. 4 – Wave guide with slot radiator

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