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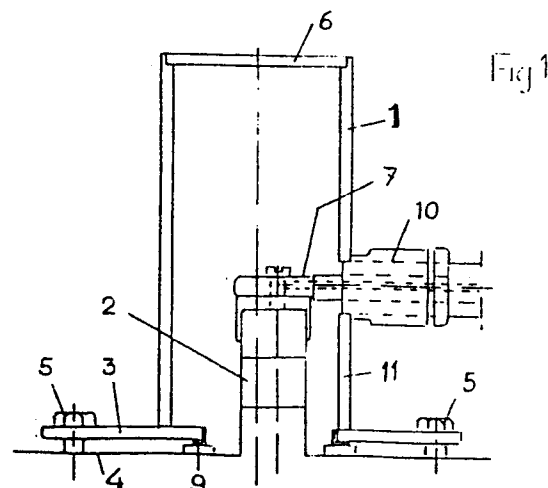
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54 **Co-axial transition of a magnetron.**

57 The invention consists of a coupling device from a magnetron with a quarter-wave antenna directly to a coaxial line, without an intermediate structure using a common rectangular TE₁₀ waveshape.

The magnetron antenna is surrounded by a parallel but axially displaced metal tube, from which the coaxial line starts at right angle (radially). The exit port is situated in the approximate level of the top of the magnetron antenna. The center conductor of the coaxial line is fixed to the antenna with galvanic contact. The matching of the system is by choice of tube diameter (less than for cut-off) and the displacement specified above.



The present invention consists of a coupling device from a magnetron with a quarter-wave antenna directly to a coaxial line, without an intermediate structure using a common rectangular TE₁₀ wave type.

The exit ports of magnetrons for the frequency 2.45 GHz for microwave heating purposes are standardized for common types in the power range 500 - 1500 W. The magnetron is normally coupled to a TE₁₀ waveguide by a common transverse transition, the typical guide cross section being 50 x 90 mm and the distance to the short-circuiting wall from the magnetron antenna axis 20 - 25 mm. In many types of microwave ovens of multiresonant cavity type, the coupling is however directly into the cavity, in which a secondary metal antenna (normally rotating) in close vicinity to the magnetron antenna acts as a matching element.

These types of transitions require rather much space. In many applications there is a need for a physically smaller transition. As the coaxial line is the only simple, contained propagation line for microwaves which can be made very small, a direct transition from the magnetron is of interest. The matching properties of the standard magnetron however makes the design of a simple direct coaxial transition with coinciding axes almost impossible. Furthermore, such a transition would be axially too long and rather complicated to assemble.

The invention is described below, with reference to the attached figures 1 and 2 which show the transition from two directions.

The object of the invention is built firstly of a cylindrical metal tube 1 around the magnetron antenna 2. The tube is fixed to a plate 3 which fits the connection devices 4 of the magnetron, with screws 5 and a directly contacting sealing ring 9. The tube diameter is less than that for cut-off of the lowest mode, allowing it to be open at the top without causing any leakage. A simple protecting device 6 may however be used, against mechanical influences and to eliminate contamination.

The tube operates with a combination of the coaxial TEM and the cylindrical TM₀₁ modes. An essential property is that the capacitance to the magnetron antenna can be adjusted for matching by parallel displacement of the tube axis in relation to that of the magnetron

A metal conductor 7 is fixed and in metal contact by e.g. a screw to the magnetron antenna. The conductor is at a right angle to the magnetron antenna axis and is later converted to inner conductor of the coaxial line. The coaxial outer conductor 10 is fixed to a hole in the tube wall.

The metal conductor forms an inductive element together with the magnetron antenna and the adjacent tube wall part 11. The magnitude is determined by e.g. the conductor height above the bottom plate 3 and by the distance between the magnetron antenna and the wall part 11. The inductive element can thus be varied by the same parallel displacement of the tube 1 in relation to the magnetron axis as has been discussed above.

As the antenna dimensions and the matching data of the magnetron are known, a relatively accurate specification of a transition according to the invention may be made. The example below is chosen with the smallest reasonable diameter of the tube 1 with regard to the risk of arcing. Other combinations of dimensions are of course possible within the scope of the invention. - In a version for 800 - 850 W standard magnetrons with antenna diameter 15 mm, the inner diameter of the tube 1 is 41 mm. The diameter of the contacting seal 9 is 32 mm and the axial displacement of the tube towards the coaxial output port is 4.5 mm. The distance from the bottom plate 3 to the axis of the coaxial line output port is 32 mm, the diameter of the hole 8 is about 7 mm and the characteristic impedance of the coaxial line is 50 ohm.

What is claimed is:

1. A microwave transition from a magnetron with a metallic quarterwave antenna (2) as exit port, directly into a coaxial line directed by 90 degrees into radial direction, where
 - the magnetron antenna is surrounded by a parallel metal tube (1)
 - the tube axis is displaced in a plane incorporating the coaxial line
 - the tube has a diameter less than the cut-off diameter for the lowest cylindrical mode
 - the tube is sealed by a metal plate contacting the magnetron sealing ring (9)
 - the coaxial line protrudes radially out of the tube, in that area being surrounded by a smaller metal tube (10) fixed to the tube wall and constituting the outer conductor of the coaxial line.

 2. A microwave transition according to claim 1, for the ISM frequency 2.45 GHz and standard magnetrons 500 - 1500 W, where the tube (1) diameter is 35 to 45 mm, the axial displacement of it is 3 to 6 mm away from the coaxial output port, and the coaxial line characteristic impedance is 50 ohm.
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