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MAGNETRON OUTPUT COUPLER

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FIG. 1.

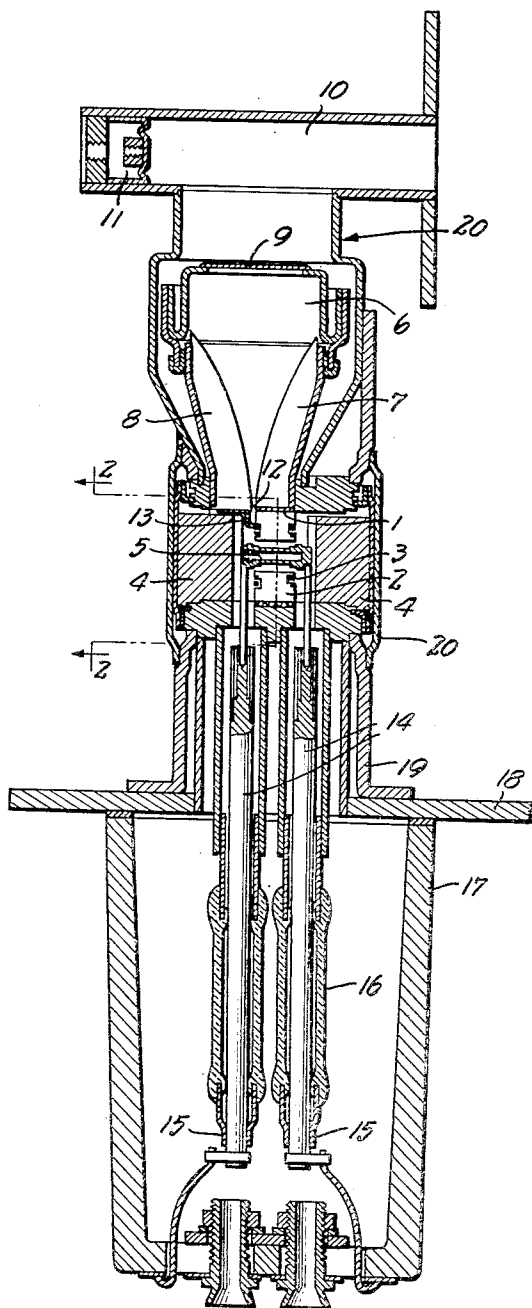


FIG. 2.

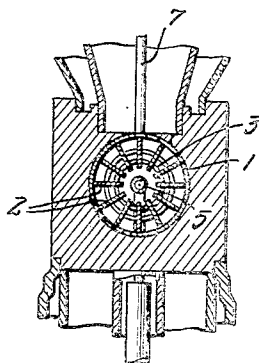
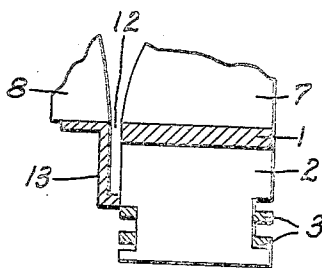


FIG. 3.

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MAGNETRON OUTPUT COUPLER

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4 Claims. (Cl. 315—39.53)

This invention relates to magnetrons, and more particularly to output couplers for extracting energy from magnetrons.

Multi-cavity systems for extracting output energy have been proposed, in which the energy coupling may be effected by a loop extending into the cavity of the resonator. Other forms have been used in which energy is extracted by means of an opening from the resonator cavity into a wave guide. In this latter form it has been proposed to secure an impedance match between the resonator and the wave guide, tapered ridges or ramps, normal to the walls separating the resonators, have been provided in the wave guide adjacent the output opening.

In some magnetron applications it is required that energy be brought out, polarized in such a plane that a loop coupling is normally called for. In such structures it has been found difficult to use the normal type of loop coupling as the processing of the magnetrons is so rigorous as to tend to cause failure in the coupling. However, the ramp coupler which can take the rigorous processing, brings out the energy with the E vector in a plane 90° with respect to that desired with transmission in the TE01 mode.

It is, accordingly, an object of the invention to provide a coupler that will withstand the most rigorous processing of a magnetron tube, and will bring out this energy therefrom polarized in the desired plane.

According to a feature of this invention there is provided a magnetron having a body portion from which extend a plurality of radial partitions, which may be formed of vanes, to define a plurality of cavity resonators, wherein an output coupling is formed by an opening in the body adjacent one end of one partition opening into a wave guide and a conductor extending through this opening into contact with the upper edge of the partition, the other end of the conductor being connected to an opposed wall of the wave guide. Preferably, the wave guide is provided with impedance matching ramps, having their wall dimensions parallel with the partitions, the loop coupling conductor being connected to one of these ramps at one end, and to the partition at its other end.

The above-mentioned and other features and objects of this invention and the manner of attaining them will become more apparent and the invention itself will be best understood by reference to the following description of an embodiment of the invention taken in conjunction with the accompanying drawings, in which

Figure 1 is a sectional view of a magnetron incorporating the features of this invention,

Figure 2 is a fragmentary cross sectional view along the line 2—2 of Fig. 1, and

Fig. 3 is an enlarged fragmentary view illustrating the coupling connection.

Turning now to the drawings, there is illustrated a magnetron having a body portion 1 and a plurality of vanes 2 forming the conventional magnetron anode resonator. The vanes 2 are interconnected by the usual strap-

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ping rings 3. Pole pieces 4 may be arranged positioned on opposite ends of the anode assembly. The usual cathode is shown at 5. An output wave guide is shown at 6 provided with a pair of ramps or wave guide ridges 7 and 8 which serve to match the impedance of the resonator to the wave guide. A transparent window 9 is provided in the end of wave guide 6 so that energy may be transmitted into an external wave guide circuit 10. An adjustable plunger 11 may be provided in wave guide 10 to achieve the desired impedance effect.

It will be noted that wave guide 10 is so oriented that the energy transmitted from the magnetron, for example in the TE01 mode, requires a rotation of the electric vector of the wave 90° from that provided with the normal wave guide and matching ramp construction. In such a type of arrangement it has been the practice in the past to utilize a simple coupling loop within one resonator cavity so that the desired field rotation could be obtained. However, in operating in the higher frequency fields such a loop construction will not readily withstand the rigorous processing necessary to evacuate completely the magnetron structure.

Accordingly, in accordance with this invention there is provided a coupling arrangement which will permit the rigorous outgassing processes and, at the same time provide for the desired rotation of the electric vector in the output wave. This is accomplished by providing the output opening from the magnetron as shown at 12 at a point above the anode assembly. The ramp 7 is substantially aligned with one of the vanes 2 as will be clear by reference to Fig. 2. A coupling loop 13 is provided in the opening between the anode assembly and one of the pole pieces 4 as shown in Fig. 1. This loop comprises a conductive wire connected at one end to the upper end of vane 3, the other end being connected to the opposing hole of the wave guide 6. In the illustrated embodiment this connection is made directly to impedance ramp 8 as shown.

By utilizing this coupling loop as shown, together with the wave guide arrangement the desired output relationship of the electric vector of the wave is obtained while maintaining a constriction which is sufficiently rigid to withstand the various treatments necessary in preparation of the tube.

In order to illustrate a complete magnetron structure the stem is shown with cathode output leads 14 which may be sealed to energizing terminals 15 by glass seals 16. A protecting cap 17 is shown about the lower end of this stem portion fastened to the support plate 18. A cylindrical member 19 may be mounted on plate 18 for supporting the magnetron body assembly and a steel cylinder 20 may be connected between element 19 and the output assembly indicated generally at 20 in order to prevent damage to the magnetron by possible displacement of this relatively heavy output assembly.

While the invention has been described above in connection with a particular arrangement, it will be understood that many changes may be made without departing from the invention by those skilled in the art. For example, the coupling loop 13 may be positioned at different points along the vane 2 in order to secure the desired energy coupling. Likewise, this conductor may be made of different dimensions depending on the impedance requirements of the structure.

While I have described above the principles of my invention in connection with specific apparatus, it is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of my invention as set forth in the objects thereof and in the accompanying claims.

What is claimed is:

1. A magnetron comprising a body portion and a plu-

ality of partitions extending inwardly and defining with the inner surface of said body a plurality of cavity resonators, and an output wave guide for energy of said magnetron, characterized in that said wave guide is provided with an opening, communicating with said magnetron through an opening in said body at one edge of one partition, said wave guide having one portion connected to said one partition, and a coupling conductor having one end connected to the upper edge of said one partition and the other end to a portion of said wave guide opposed to said one portion.

2. A magnetron according to claim 1 wherein said coupling conductor is connected to said vane edge at a point intermediate the ends of said vane.

3. A magnetron comprising a ring-shaped body portion and a plurality of radial partitions extending inwardly and defining with the inner surface of said body, a plurality of cavity resonators, and an output wave guide for energy of said magnetrons having an impedance matching ramp with two opposed portions mounted therein, characterized in that said wave guide is provided with a coupling opening communicating with said magnetron through an opening in said body at one edge of one partition, said ramp having one portion parallel and in alignment with said one partition and connected thereto, and a coupling conductor having one end connected to the upper edge of said one partition and the other

end to a portion of said ramp diametrically opposed to said one portion.

4. A magnetron comprising a ring-shaped body portion and a plurality of radial vanes extending inwardly and defining with the inner surface of said body a plurality of cavity resonators, strapping rings near the inner ends of said vanes and an output wave guide for energy of said magnetron having an impedance matching ramp with two opposed portions mounted therein, characterized in that said wave guide is provided with a coupling opening communicating with said magnetrons through an opening in said body at one edge of one vane, said ramp having one portion parallel and in alignment with said one radial vane and connected thereto, and a coupling conductor having one end connected to the upper edge of said one vane adjacent said strapping rings, and the other end to a portion of said ramp diametrically opposed to said one portion.

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