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MAGNETRON AMPLIFIER

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FIG. 1.

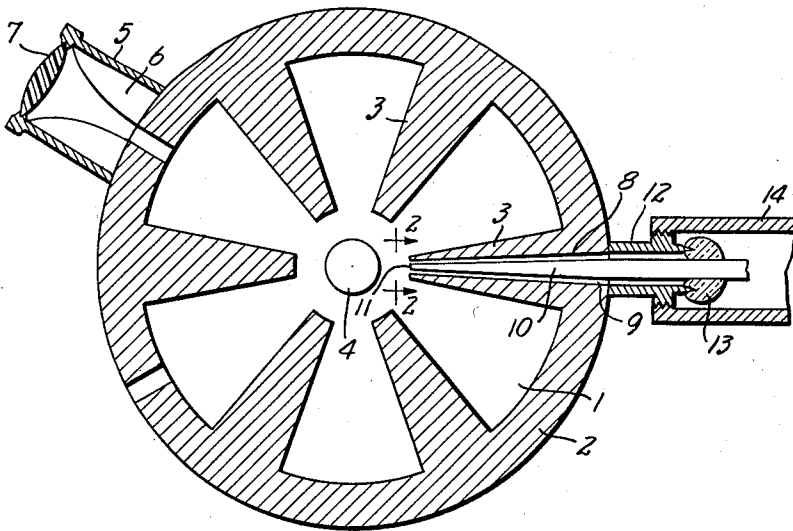


FIG. 3.

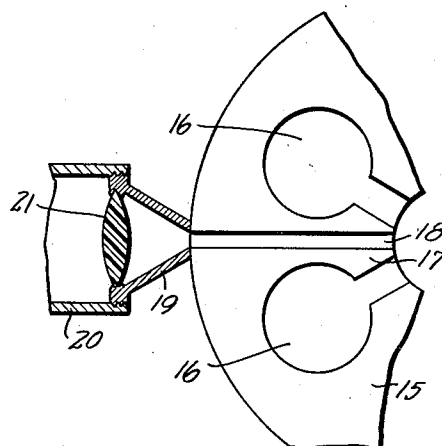
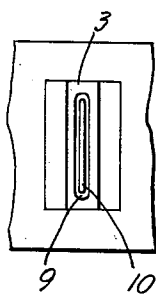


FIG. 2.



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MAGNETRON AMPLIFIER

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3 Claims. (Cl. 315—39)

This invention relates to magnetrons, and more particularly to magnetrons in which energy may be injected for amplification or control purposes.

Magnetron oscillators, amplifiers or modulators have been proposed in the past for which external energy, to be amplified or to control the frequency of the magnetron, is introduced from some external source into the resonators of the magnetron. This is generally accomplished by inserting a loop or probe into the resonator at some point adjacent the outer wall of the magnetron. The coupling at this point however, is in a high energy field within the resonator and in a portion thereof which is predominantly inductive. Accordingly, these coupling circuits have the draw-back that there is a considerable back-coupling of energy from the resonator to the coupled line. This may be minimised to some extent by impedance control but is difficult to reduce the back-coupling to a value lower than 10% of the energy generated in the magnetron.

It is an object of this invention to provide an energy input coupling arrangement for magnetrons wherein the energy may be supplied to the magnetron by a coupling unit which is relatively free from this undesired back-coupling effect.

According to a feature of this invention there is provided a coupling means which may extend through the wall in the partition separating the resonators of a multi-resonator magnetron, into a point substantially flush with the inner edge of this partition wall. The energy thus is introduced at a low energy point of the normal magnetron operation and is, therefore, substantially free from the back-coupling effects often encountered.

The above-mentioned and other features and objects of this invention 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 structure embodying the principle of this invention.

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

Figure 3 is a fragmentary portion of a magnetron illustrating the alternative coupling arrangement in accordance with this invention.

In Fig. 1 there is shown a magnetron anode 1 having a body portion 2 and a plurality of partitioning walls or vanes 3 forming a plurality of individual resonators. The usual cathode 4 may be provided centrally of these resonators. The energy output coupling is illustrated at 5 and may comprise a wave guide with an impedance matching ramp 6 and a sealed window 7.

The input energy, controlling the magnetron, may be applied to a special coupling means 8 illustrated in Figs. 1 and 2 as a coaxial line consisting of an outer conductor formed by the wall of an opening 9 in one of the vanes 3. An inner conductor 10 is mounted within this opening 9 and spaced from the wall. The inner end 11 of conductor 10 may terminate substantially flush with the inner end

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of the partitioning wall 3. In order to complete the input coupling an outer conductor extension 12 may be brazed or otherwise secured to the outer surface of the magnetron body 2 and this may be sealed to the inner conductor 9 by means of a glass bead 13. The energy input coupling may then consist of a coaxial line coupler 14 which may be coupled to conductors 9 and 13 as illustrated.

It will be apparent that if energy supplied over coupler 8 is of the same frequency as the normal operating frequency of the magnetron, an effective amplification to this energy may be achieved. If some other frequency is used a heating effect may be produced within the magnetron serving to vary the tuning of the magnetron. This may be used selectively to control the outer frequency of the magnetron for a given frequency value or may be used to produce a frequency modulated output from the magnetron as a whole.

It will be noted that the input energy is coupled only at the point of spacing between the inner end of conductor 10 and the inner edge of vane 3. Accordingly, energy is introduced at a point where relatively little, if any, back coupling can occur.

In Fig. 3 is illustrated a fragmentary portion of a magnetron anode illustrating an alternative method of input energy coupling. In this view the magnetron anode body 15 is shown as a different form of multi-cavity resonator in which substantially circular resonators are formed as indicated at 16. The partitioning wall then is the portion 17 of the magnetron body 15 intermediate adjacent cavities 16. In partitioning wall 17 is provided an opening 18 extending from the inner edge thereof to the external surface of the magnetron 15. Opening 18 is dimensioned as a wave guide of suitable value to carry the energy used to modify the magnetron operation. This wave guide formed by opening 18 may be coupled through any desired means such as the horn 19 to an external wave guide 20. Closure of the magnetron may be effected by means of an insulating window 21 as shown.

It will be understood that the particular type of input coupling lead is not dependent upon the type of multi-resonator magnetron used. Accordingly other of the couplers shown in Figs. 1 and 3 may readily be interchanged so far as their use with the particular form of magnetron is concerned.

Furthermore, it is clear that if desired an open two-conductor line could be connected to the coupling means 8 of Fig. 1 instead of the coaxial input line 14 illustrated.

While I have described above the principles of this 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 the invention, as set forth in the objects thereof and in the accompanying claims.

What is claimed is:

1. A magnetron comprising an anode having a body portion and a plurality of inwardly extending radial partition walls forming a plurality of resonators, a cathode positioned near the inner ends of said partition walls, and a coupling means for introducing energy into said magnetron to modify the energy developed in said resonators comprising an opening extending from one end through one of said partition walls to the external surface of said anode, the walls of said opening being formed by said one partition wall whereby the only energy transfer opening into said magnetron is at the inner end of said one partition wall.

2. A magnetron according to claim 1, wherein said coupling means further comprises a conductor positioned concentrically of said opening and terminating at its inner end substantially at the inner end of said one partition wall, forming a coaxial input coupler with the walls of said opening.

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3. A coupler according to claim 1, further comprising a coupler external of said magnetron for attaching an energy input lead, said coupler and said coupling means being interconnected in energy transfer relationship.

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