Dec. 21, 1948. E. C. OKRESS 2,456,888

MAGNETRON

Filed Jan. 28, 1943

Fig. 1.

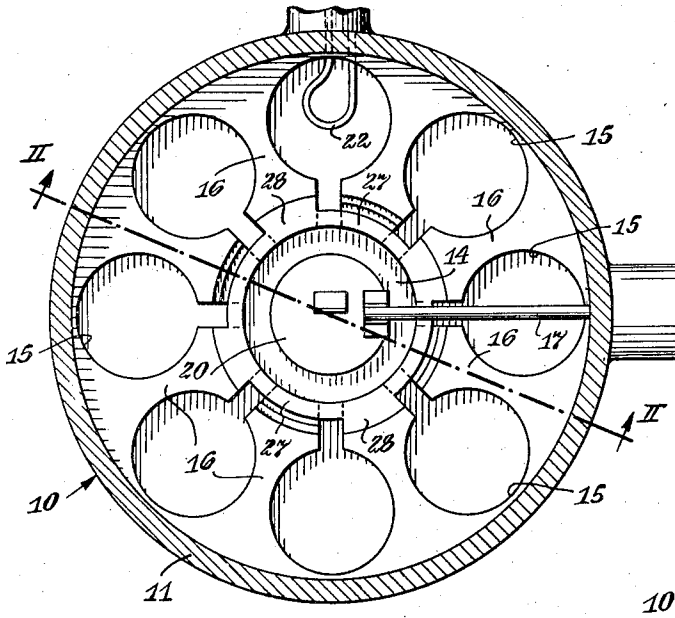


Fig. 3.

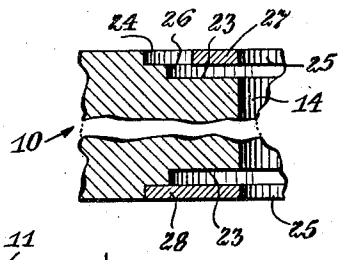


Fig. 2.

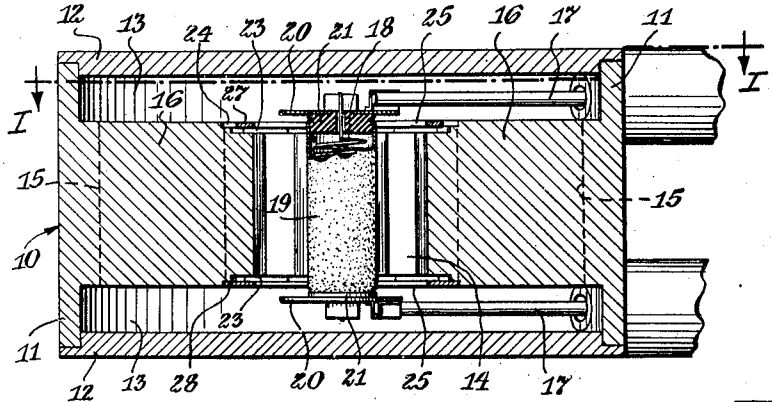


Fig. 5.

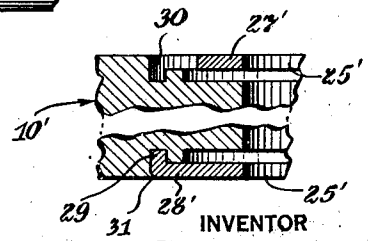
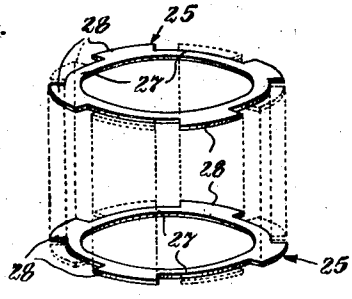


Fig. 4.



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MAGNETRON

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6 Claims. (Cl. 315—40)

1

This invention relates in general to magnetrons and particularly to anode strapping therein.

It has been heretofore determined as desirable to electrically couple or "strap" alternate partitions in magnetrons in order to operate in the

$$h=\frac{N}{2}$$

phase mode more effectively, this having been done by a plurality of lengths of wire each straddling an intervening partition with the ends soldered to the partitions being coupled. The process of applying the coupling wires is tedious. It is most desirable that any strapping means be of a character readily reproduced in quantity, of permanent shape and easily, permanently, and securely applied. These desideratums are entirely lacking in the prior art method of strapping magnetrons, so that their accomplishment constitutes the primary object of the present invention.

Specifically, an object of the invention is to provide a one-piece strap at one end of the magnetron which is duplicated by a like strap at the other end thereof.

Another object of the invention is to avoid possibility of inadvertent contact of the strap with an intervening partition or intervening partitions.

Another object of the invention is to keep the strapping means from protruding above the end plane of the several partitions or anode body, and, generally, to avoid different capacity effects in different magnetrons by the strapping means.

Still further objects of the invention will appear as the description proceeds both by direct recitation thereof and by implication from the context.

Referring to the accompanying drawings in which like numerals of reference indicate similar parts throughout the several views:

Figure 1 is a sectional plan of a magnetron taken immediately below a cover plate thereof as on line I—I of Fig. 2;

Figure 2 is a vertical cross section of the magnetron on a diametric line II—II of Fig. 1;

Figure 3 is a section on larger scale than Fig. 2, taken on the same line II—II of Fig. 1 but with the greater part of the anode broken away and showing the association of the straps with the anode and their relation to each other;

Figure 4 is a perspective view of the two straps with projected relation of the straps to each other shown in dotted lines; and

2

Figure 5 is a section similar to Fig. 3 showing a modified construction of strap and mounting therefor.

In the specific embodiment of the invention illustrated in said drawing, the reference character 10 designates the anode body portion of the magnetron shown as of metal and of a generally cylindrical configuration. This body portion is provided at its exterior with opposite longitudinal end flanges 11 projecting above and below the top and bottom general end planes of the main part of the anode body. End plates or closures 12 fit upon and are sealed with respect to the respective flanges thereby establishing enclosed end spaces 13 across the top and bottom of the anode body.

The anode body is hollowed longitudinally with a middle or coaxial cavity 14 from which radiate resonant cavities 15 separated by partitions 16 of equal length and symmetric in shape and disposition. The ends of these several partitions are in a common plane and it is those ends which constitute the ends of the anode body and those planes which constitute the end planes of the anode body. While the particular radiating cavities 15 are shown herein as each having a slot formation next the middle cavity 14 which outwardly expands into a cylindrical formation, the invention is not confined to that structure, inasmuch as other cavity shapes, such as depicted in prior application (of which an example is my application Ser. No. 460,376, filed October 1, 1942, and assigned to the same assignee as the present one) may be used and the present invention applied thereto.

End spaces 13 are utilized, inter alia, for introduction radially thereof, appropriate lead-in wires 17 for a filament 18 here shown utilized for heating a cylindrical cathode 19 coaxially disposed within the middle cavity 14. The cathode has a length substantially the axial length of the anode body and opposite the ends of the cathode are discs 20 spaced beyond the end planes of the anode and carried by insulators 21 in the ends of the cathode. Each said disc 20 forms a connection between the respective lead-in wire and filament-end situated in the particular end space in which the disc is located. The lead-in wires are appropriately sealed with respect to the interior of the device and said device is evacuated so the electron flow will function in vacuum. An output coupling or loop 22 representative of any desired energy transfer means has a sealed connection through the outer wall of the body portion into one of the radiating cavities 15, said

loop being shown in the arbitrarily selected disclosure as in a cavity 90° displaced from the filament lead-in connections, but other selection of cavity in which to position the said loop may be made provided the probed portion is satisfactory for this arrangement. For convenience of description, the cavity in which the loop is located will be referred to as the output cavity.

Around the middle cavity 14 and at each end of the anode body there is provided an annular stepped recess providing what may be identified as a deep step 23 (see Fig. 3) and a shallow step 24, the deeper step being for clearance purposes and the shallower step being for mounting a strap 25 therein. The shallow step 24 has greater diameter than the deeper step and between steps is a cylindrical part constituting a riser 26. The strap 25 mentioned has portions thereof resting on the shallow step 24 of alternate partitions and other portions bridging over or otherwise avoiding contact with intervening partitions by overlying and being spaced from the deeper step 23.

Explained more in detail said strap 25 in the present showing is a flat ring, the inner diameter of which is preferably equal to the diameter of the middle or cathode cavity. The outer part of the ring presents successive sections of different diameters such that each narrow section 27 is endwise between two wide sections 28 and each wide section 28 is endwise between two narrow sections 27. The diameter of the circle defined by the outer arcuate edges of the narrow sections is less than the diameter of said riser 26 so there will be spacing of the narrow sections from said riser and from the deeper step 23. The wider sections 28 may be considered as tabs or ears projecting from a narrow ring at spaced intervals and in the plane of the ring. The length of the wider section or tab 28 is equal to the width of the contiguous part of the anode partitions, whereas the narrow section 27 exceeds the length of the wider section by a value equal to twice the gap of a radiating cavity 15 where it makes entry under the ring into the middle cavity. This construction results in a minimum amount of the ring overlying or being opposite the ends of the radiating cavities 15. The outer marginal part of the under face of each wider section 28 rests upon the contiguous face of shallow step 24, preferably completely filling said step without overlap at the ends, and is soldered or otherwise secured in place and given good electrical contact with the partition to which applied.

As emphasized by the dotted line projection of wider sections of each strap upon the other, in Figure 4, it will be clear that the alternate partitions joined by the strap at one end of the anode are entirely out of contact from the strap at the other end of the anode and that the partitions bridged over or skipped by the strap at one end of the anode are connected by the strap at the other end. If desired, the straps may be constructed with a perpendicular lip at the outer peripheral extremity of the wider sections, as shown in Figure 5. In that view, the straps 25' are similar in most respects to the ones above described, having narrow sections 27' and wider sections 28' with the outer rim 29 of the wider section bent perpendicular to the plane of the strap so it may be introduced into a corresponding groove 30 in the anode body 16'. After the strap is placed, an edge of the anode next the said groove may be peened, as at 31, to hold the strap assembled. Soldering in addition to or in place of the peening may be employed if desired.

From the foregoing description, it will now be clear that the strap of the present invention is one which may be stamped from sheet metal, such as copper, with accuracy, speed and economy. It likewise will be clear that the straps are readily and easily assembled without any special skill on the part of the operator and without manipulations and exercise of critical judgment or performance of any shaping operations. Also, it may be emphasized that the soldering of the strap in place is a simple operation, the strap being exposed to the operator where to be soldered without hindrance by any parts of the device in front of such place of soldering. Only a very small portion of the effective anode surface is removed in making the stepped recess for accommodating the strap, the shallow step preferably being just the thickness of the strap material so the upper face of the strap is in the same plane as the upper face of the anode body. Furthermore, capacity loading between the strap and the partitions bridged over without connection thereto can be accurately controlled in manufacture, and is not left to judgment of the operator assembling the device. These and other advantages, uses and structures will be understood by those skilled in the art and as falling within the scope of the invention, which, through necessity, as specifically shown in the drawing, is to be considered from its generic aspects under the terms employed and description given herein.

I claim:

1. A strapped anode for a magnetron comprising an anode body providing a plurality of radiating partitions the longitudinal ends whereof are in common planes and form the end plane of the anode, said anode having a circular recess in the end thereof, said recess being stepped so as to be deeper next one periphery of the recess than the other, and a strap overlying the deeper part of said recess out of contact thereat from the anode, said strap having projections in the less deep part of the recess and in contact with and supported by selected ones of said partitions.

2. A strapped anode for a magnetron comprising an anode body providing a plurality of radiating partitions the longitudinal ends whereof are in common planes and form the end plane of the anode, said anode having a circular recess in the end thereof and next the radially inward margin of said partitions, said recess being stepped so as to be deeper next one periphery of the recess than the other, and a strap overlying the deeper part of said recess out of contact thereat from the anode, said strap having projections in the less deep part of the recess extending to the periphery of the recess and in contact with and supported by selected ones of said partitions.

3. A strapped anode for a magnetron comprising an anode body providing a plurality of radiating partitions the longitudinal ends whereof are in common planes and form the end plane of the anode, said anode having a circular recess in the end thereof and next the radially inward margin of said partitions, said recess being stepped with a deeper part next the smaller periphery of the recess and a less deep part next the larger periphery of the recess, and a strap overlying the deeper part of said recess out of contact thereat from the anode, said strap having radially outward projections in the less deep part of the recess extending to the periphery of the recess and in contact with and supported by selected ones of said partitions.

4. A strapped anode for a magnetron compris-

ing an anode body providing a plurality of radiating partitions the longitudinal ends whereof are in common planes and form the end planes of the anode, said anode having a circular recess in the end thereof, said recess being stepped so as to be deeper next one periphery of the recess than the other, and a substantially flat strap having thickness approximating the depth of the outermost part of said recess and an outer diameter less than the inner diameter of said outermost part and having radially outward projections projecting into and applied flatwise upon said outermost part, whereby said strap is in the said end plane of the anode overlying the deeper part of the said recess and making sole contact with the anode by support of said projections on the outermost part of selected ones of said partitions.

5. A magnetron comprising an anode having a longitudinal cylindrical cavity for the cathode, a cathode in said cavity, a ring-like strap having an inside diameter substantially equal to the diameter of the cylindrical cathode cavity, said anode providing partitions radiating from said cathode cavity, and said strap having half as many projections thereon as there are partitions, said projections making contact with an equal number of partitions and constituting the only contacting portions of the said strap with the anode.

6. A magnetron comprising an anode having a longitudinal cylindrical cavity for the cathode, a cathode in said cavity, a ring-like strap having an inside diameter substantially equal to the diameter of the cylindrical cathode cavity, said anode providing partitions radiating from said cathode cavity, and said strap having half as many projections thereon as there are partitions, said projections making contact with an equal number of partitions and constituting the only contacting portions of the said strap with the anode, and each said projection having a length in a direction circumferentially of the ring equal to the thickness of the part of the partition where said projection contacts said partition.

ERNEST C. OKRESS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,063,342	Samuel	Dec. 8, 1936
2,069,867	Wilson	Feb. 9, 1937
2,128,237	Dallenbach	Aug. 30, 1938
2,147,159	Gutton et al.	Feb. 14, 1939
2,154,758	Dallenbach	Apr. 18, 1939
2,163,157	Samuel	June 20, 1939
2,167,201	Dallenbach	July 25, 1939
2,201,216	Baier et al.	May 21, 1940
2,417,789	Spencer	Mar. 18, 1947

FOREIGN PATENTS

Number	Country	Date
215,600	Switzerland	Oct. 16, 1941
445,084	Great Britain	Apr. 2, 1936