

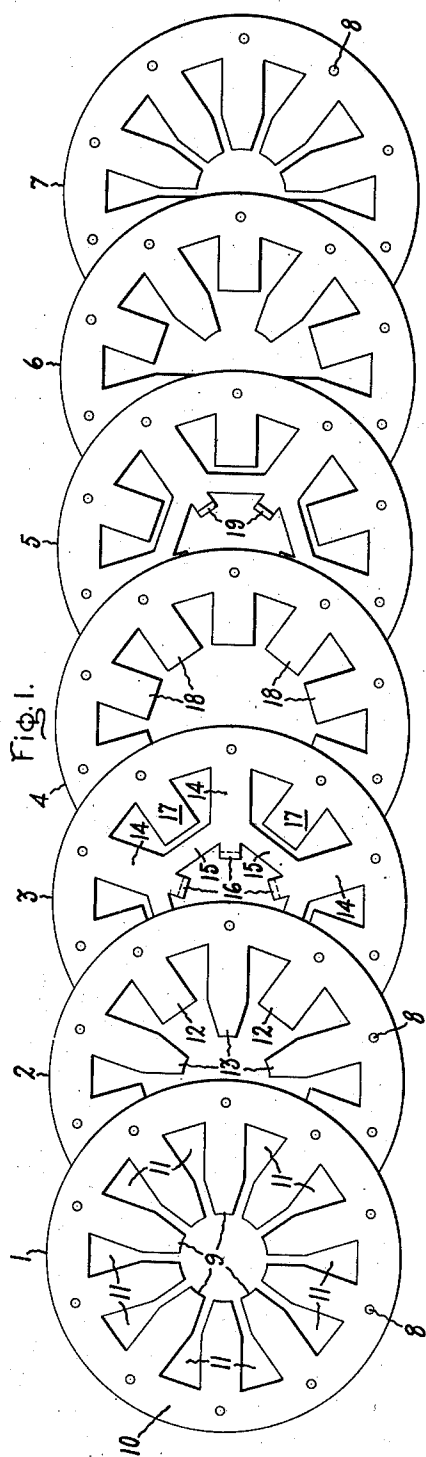
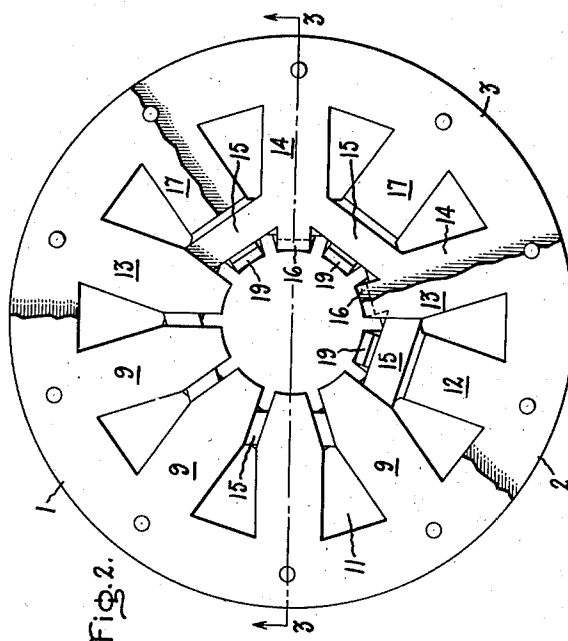
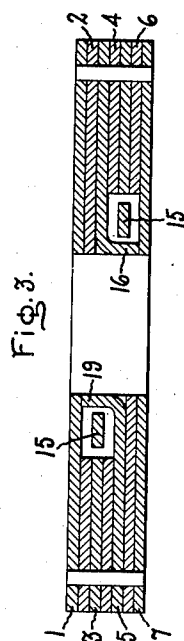
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MAGNETRON ANODE

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MAGNETRON ANODE

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1 Claim. (Cl. 315-39)

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The present invention relates to improvements in anode structures for magnetron apparatus.

Magnetron apparatus for use in the high frequency electromagnetic art, as oscillators for instance, usually comprises a group of radially extending anode segments forming at their center a generally cylindrical chamber adapted to accommodate a rotating space-charge. Between the anode segments is formed a series of resonant cavities communicating with the space-charge chamber. The anodes and resonant cavities are in general made from a solid block of material. As is well known to those skilled in the art, the normally loose coupling between the individual resonant cavities frequently causes the magnetron apparatus to function at undesired frequencies and in undesired modes.

Heretofore, to overcome this objection, it has been the practice to strap alternate anodes. Strapping was accomplished by connecting together alternate anodes at each end of the anode block. This arrangement has not been completely satisfactory, especially with anode blocks of long axial length.

What I propose is to strap alternate anode segments along the axial length of the anode structure as well as at the ends thereof. In this way a more stable operation in the magnetron apparatus is obtained, and furthermore, anode structures of longer axial length can be used with all the resultant advantages.

Therefore, it is an object of the present invention to provide an improved anode structure which is simple to construct and which has improved performance qualities.

It is a further object of the present invention to provide an anode structure with strapping of alternate anode segments along the axial length of the anode structure as well as at the ends of the anode structure.

In the exemplary embodiment shown in the drawing the foregoing objects are achieved by forming the anode section from a group of dissimilar laminations. Each lamination is so constructed such that when the group of laminations is assembled or stacked together they form an anode structure in which short-circuiting straps are formed along the length of anode structure as well as near the ends of the anode structure.

The features of the invention desired to be protected are pointed out in the appended claim. The invention itself together with its further objects and advantages may be understood by reference to the following description and to the appended drawing in which Fig. 1 shows an expanded view of a unit group of laminations; Fig. 2

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shows a plan view in partial section of the laminations of Fig. 1 stacked together to form a unit group; Fig. 3 shows a side view in section of the lamination of Fig. 1 stacked together to form a unit group.

Referring now to Fig. 1 there is shown a group of laminations 1, 2, 3, 4, 5, 6 and 7 of the kind utilized to form the improved anode structure of the invention. From an examination of this figure it is readily apparent that generally speaking each of the laminations are constructed in a manner so that when the laminations of the group are stacked together they form a unit section of an anode structure in which alternate anode segments are strapped together. The laminations are made from the usual conductive material employed in anode structures, for example, copper. Around the periphery of each of the laminations are distributed a series of aligning holes 8. These holes are for the purpose of receiving pins to hold the laminations in alignment while they are soldered together. An alloy of silver and copper, or a similar solder, is suitable for this purpose. If desired, in order to decrease the losses in the anode structure, the anode structure may be plated with silver. It should be understood that unit groups of laminations may be stacked together to form an anode structure of relatively long axial length in which there is strapping distributed along the axial length, one pair of straps being incorporated in each unit group. When an anode structure of this construction is incorporated into the magnetron device an improved magnetron device free from the aforementioned defects is obtained.

Referring now to a detailed description of the laminations shown in Fig. 1, lamination 1 comprises a series of radially extending anode sections 9 in insulated relationship at their inner ends and forming at their inner ends a generally cylindrical space adapted to accommodate a rotating space-charge. The other ends of the anode sections are conductively connected by a ring 10 so that in effect a series of openings 11 is formed between adjacent anode sections. These openings 11 communicate with the aforementioned space-charge space. The openings 11 comprise the resonators of the magnetron when the individual laminations are stacked together in operative relationship. Lamination 2 comprises a thin plate similar to lamination 1 except that the alternate anode sections 12 are truncated in the manner shown to about half the length of the other anode section 13. Lamination 3 is similar to the second lamination except that the long anode sections 14 are connected

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together by means of shorting bars 15. In addition, at the end of each long anode section is located a protuberance 16 about the width of the tip of the long anode section extending perpendicular to the plane of the laminations for three thicknesses of an individual lamination. The truncated sections 17 of lamination 3 do not make contact with the short-circuiting straps 15 or with the long anode section 14 at their truncated ends. Lamination 4 comprises a structure similar to the structure of the lamination 2 except that all of the anode sections 18 are truncated. Lamination 5 comprises a structure identical with the structure of the lamination 3. However, when lamination 5 is assembled with the other laminations the protuberances 19 of this lamination face in opposite direction from the protuberances on lamination 3 and the protuberances of lamination 5 are aligned so that the long anode sections on the lamination 5 are stacked over the short lamination sections on lamination 3. With this stacking arrangement the protuberances of the fifth and the third anode sections are located side by side and separated from each other when all of the laminations are stacked together as shown in Fig. 2. In lamination 5 as well as in lamination 3, the portion of the short-circuiting strap between long anode sections is recessed so as to accommodate the protuberance from the other anode section. It is essential that these protuberances avoid conductive contact with the shorting straps. Lamination 6 is identical with the second anode lamination except that in the assembly of the group of laminations lamination 6 is stacked so that its truncated anode sections are located over the long anode sections of the lamination 2.

Referring now to Figs. 2 and 3, there are shown, respectively, plan and side views of the laminations of Fig. 1 assembled to form a magnetron anode structure. Fig. 3 is a sectional view taken along section 3-3 of Fig. 2. On the assembled anode structure the aforementioned short-circuiting straps connect alternate composite anode sections. Elements 15 in Fig. 3 are short-circuiting straps. While a unit group of an anode structure has been described, it is readily appreciated that by stacking unit groups of laminations together an anode structure of long axially length is obtained with all the resultant advantages of a long anode structure. With the strapping along the axial length of the anode structure, the magnetron apparatus in which it is incorporated has considerably less tendency to operate at undesired frequencies.

While I have shown and described particular embodiments of my invention, it will be obvious

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to those skilled in the art that various changes and modifications may be made without departing from my invention in its broader aspects and I, therefore, aim in the appended claim to cover all such changes and modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent in the United States is:

A laminated magnetron anode structure comprising a first lamination having a series of radially extending anode sections at one end forming a portion of a generally cylindrical chamber and at the other end terminated in a ring to form an opening in said lamination between said anode sections and communicating with said chamber; a second lamination similar to said first lamination and having alternate anode sections truncated; a third lamination similar to said second except that the long anode sections are connected together by a short-circuiting strap, said long anode section having a protuberance on the end thereof perpendicular to the plane of said lamination, said short-circuiting strap being recessed from the extreme end of the long anode section, said truncated anode sections making no direct conductive connection with a long anode section at the end adjacent the chamber, the length of said protuberances being about the thickness of three laminations; a fourth lamination having all anode sections truncated; a fifth anode lamination similar to said third lamination except with said protuberances facing in the opposite direction and with the alternate set of anode sections truncated; a sixth anode lamination identical to said second lamination except with the alternate set of anode sections truncated; said anode laminations held in registry so that a magnetron anode structure is formed comprising a group of anodes forming a generally cylindrical chamber adapted to accommodate a rotating space-charge, with resonant circuits formed between adjacent anode segments within said anode structure communicating with said chambers and short-circuiting straps conductively connecting alternate anodes within the body of said anode structure.

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