

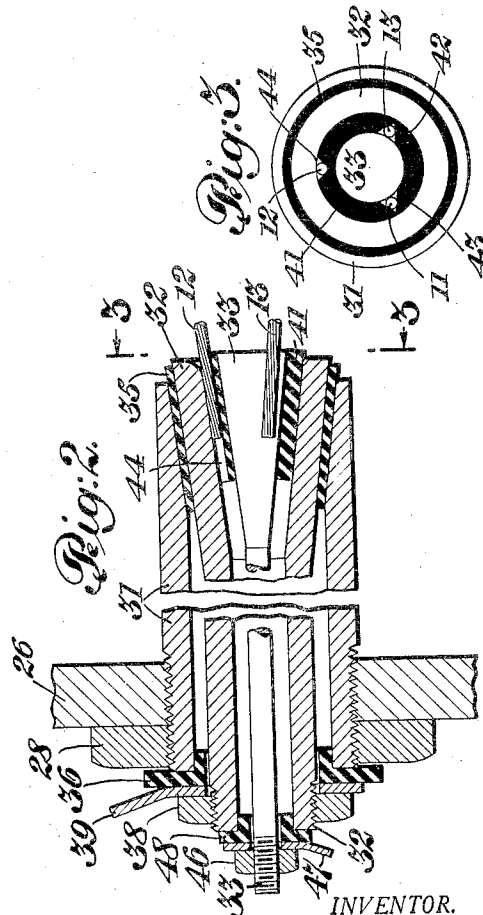
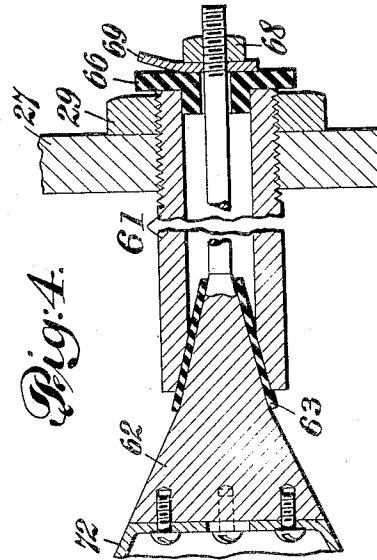
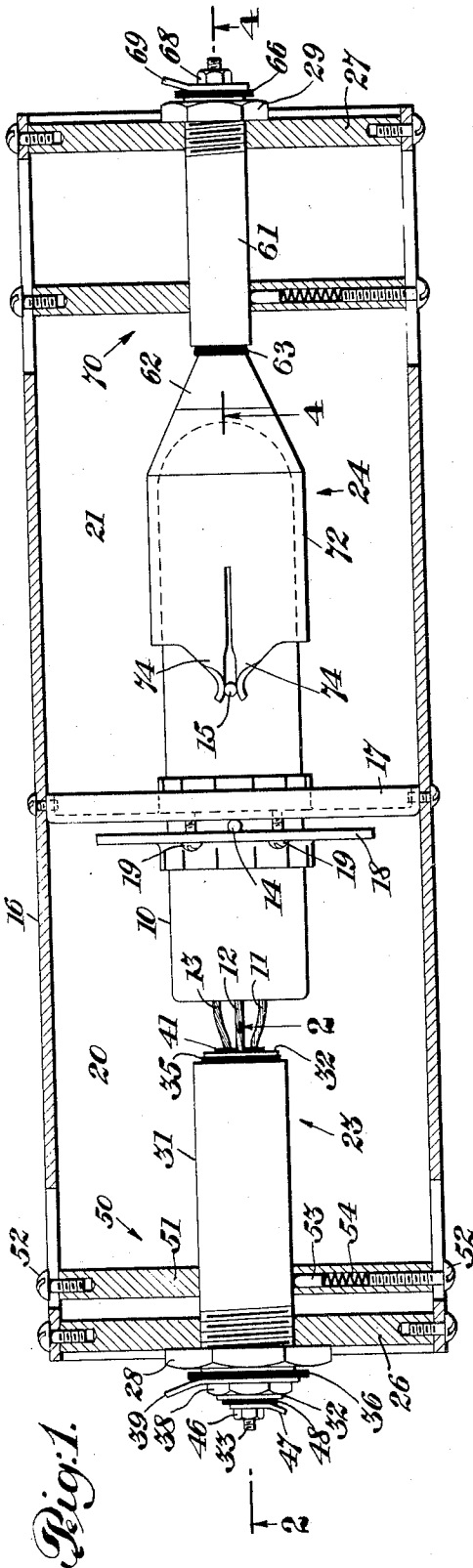
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HIGH FREQUENCY CIRCUIT STRUCTURE

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HIGH FREQUENCY CIRCUIT STRUCTURE

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2 Claims. (Cl. 173—328)

The present invention relates to high frequency circuit structures and more particularly to such structures for use in ultra high frequency circuits which employ vacuum tubes and incorporate resonant cavities or coaxial lines as tuning means.

It is an object of this invention to provide a construction serving both as a tube engaging device and as a by-pass condenser. It is a further object to provide such a structure particularly suitable for use in circuits incorporating resonant cavities or coaxial lines.

It is a particular object of the invention to provide a combined terminal-engaging and by-passing element adapted to engage the filament or cathode heater terminals of an ultra high frequency vacuum tube of the "unbased" type while at the same time providing by-passing capacity for such terminals between each other and/or with a conductor forming part of a tuning cavity or coaxial line.

The nature of my invention may best be understood from the following description taken in conjunction with the annexed drawing in which

Fig. 1 is an elevation, partly in section, of a circuit structure for associating a vacuum tube with twin circuits of the resonant cavity (or coaxial line) type in accordance with my invention;

Fig. 2 is a sectional view of the filament-engaging portion of the structure of Fig. 1, the section being taken along the line 2—2 of Fig. 1;

Fig. 3 is a section taken along the line 3—3 of Fig. 2;

Fig. 4 is a sectional view of the anode-terminal engaging portion of the structure of Fig. 1, the section being taken along the line 4—4 of Fig. 1.

Referring more particularly to Fig. 1, 10 is a vacuum tube of the so-called "unbased" type wherein the filament connections are in the form of flexible leads 11, 12 and 13.

In the embodiment chosen for illustration, the tube 10 is an ultra high frequency triode of the type marketed by the Radio Corporation of America under the type number 1628, and is provided with two grid lead-out pins 14, of which only one is shown, and two anode lead-out pins 15, of which only one is shown, the other grid and anode pins being diametrically opposite to those shown. The leads 11, 12 and 13 are flexible stranded wires of which 11 and 13 are connected to the ends of the filament, while 12 is connected to the center thereof.

The tube 10 is supported inside of a conductive cylinder 16 by two cooperating shield members 17 and 18 clamped together by screws 19 so as to grip the grid pins 14 while, at the same time, surrounding the envelope of the tube. The shield member 17 is fixed approximately in the center of cylinder 16 so as to divide the latter into two compartments 20 and 21.

For engaging the cathode and anode of the tube 10 the generally cylindrical assemblies 23 and 24 are provided, being firmly threaded into end walls 26 and 27 and locked by nuts 28 and 29. The end walls 26 and 27 are themselves fixed to cylindrical member 16 by screws as shown.

As can best be seen by reference to Figs. 2 and 3 the assembly 23 essentially comprises three concentric conductors 31, 32 and 33, the conductor 31 being the outermost of the three and directly connected to the end wall 26 as previously described. The second conductive member 32 is centered inside of the outer member 31 by means of a thin mica cone 35 and a suitably formed insulating washer 36 and is firmly clamped in position by nut 38 under which a terminal clip 39 is preferably positioned for ease in making connection thereto. Preferably, the conical surfaces of members 31 and 32 which cooperate with mica cone 35 are accurately fitted and the mica cone 35 is made very thin so that when drawn up tight these three members form a substantially air-tight joint and provide a large capacity between members 31 and 32.

For making a clamping connection to the three flexible cathode leads 11, 12 and 13 of tube 10, use is made of the third conductive member 33, as well as of a conical insulating member 41 which is placed over the member 33 so as to be interposed between the latter and the intermediate member 32. As is more clearly shown in Fig. 3 the insulating cone 41 is provided with three longitudinally extending grooves 42, 43 and 44, the grooves 42 and 43 being in the interior surface of the cone and the groove 44 being in the exterior surface thereof. The three flexible conductors 11, 12 and 13 from the tube 10 are respectively inserted into the grooves 42, 44 and 43 and then the inner conductor 33 of the assembly 23 is pulled up tight by means of a nut 46 which bears upon terminal clip 47 and insulating washer 48, as shown in Figs. 1 and 2.

By so tightening the inner conductor 33, the two leads 11 and 13 are clamped between this inner conductor and cone 41 while the remaining lead 12 is clamped between cone 41 and the

intermediate conducting sleeve 32. Thus, from a galvanic standpoint the lead 12 which extends from the center of the filament is connected to terminal clip 39, while leads 11 and 13 which extend from the ends of the filament are connected in parallel to terminal clip 47 (all three of these leads being galvanically insulated from the outer sleeve 31). Heating current can thus readily be applied through the two halves of the filament in parallel by making connection to the external terminal clips 47 and 39.

So far as radio frequencies are concerned, however, the central filament lead 12 is bypassed by a large capacity to the external sleeve 31, while the other filament leads are likewise bypassed through a slightly smaller capacity to the intermediate member 32, which is in turn bypassed to the external sleeve 31. It will be noted also that the external sleeve 31 of coaxial assembly 23 is galvanically connected to the walls of the cavity 20 without the need for interposition of any condenser therebetween. This very greatly facilitates not only the mounting of assembly 23 in the end wall 26 but also the construction of the adjusting device 50.

In accordance with a feature of my invention the adjusting device 50 essentially comprises a disc shaped member 51 adapted to connect sleeve 31 to housing 16 in simple galvanic fashion. This member 51 is secured to the cylindrical housing 16 by six screws 52, which extend through slots so as to permit adjustment of the disc 51 lengthwise of the cylinder 16. In order to insure good contact with sleeve 31 of assembly 23 the screw holes for three of the screws 52 are extended through to the center opening of the disc 51 and are provided with contacting plugs 53 pressed inwardly by springs 54 as is shown. Thus the device 50 makes firm galvanic contact with the assembly 23 at a definite point, rather than having to make an indefinite capacitative contact therewith, as would be the case if the outer sleeve 31 were at cathode potential and therefore required to be galvanically insulated from the housing 16.

At the right-hand end of tube 10 the assembly 24 serves to make connection to the tube anode pins 15 while at the same time providing the required by-pass condenser for galvanically insulating the anode lead-out from the housing 16. The construction of device 24 is most clearly shown by reference to Fig. 4 and is, in some respects, like the construction of device 23 except that only two coaxial conductive members 61 and 62 are provided. As best seen in Fig. 4 the inner conductive member 62 is spaced from the outer sleeve 61 by mica cone 63 and insulating washer 66. Preferably, the mica cone is a little thicker and the flashover distance across the ends thereof are a little longer than in the case of mica cone 35 of assembly 23, since the anode/grid voltage difference is ordinarily somewhat greater than the cathode-grid voltage difference. The inner conductor 62 is clamped in position by a nut 68 under which there is provided a terminal clip 69 for connection of anode supply voltage. The tuning of right-hand cavity 21 is adjusted by a variable end wall device 70 exactly similar to the device 50 previously described.

For engaging anode pins 15 the inner conductive member 62 of the assembly 24 is provided with an enlarged hollow end portion 72 shaped to embrace more or less closely the envelope of tube 10 and provided with four clip portions 74 (of which only two are shown).

Although my invention has been above de-

scribed as applied to a tube of the well-known 1628 type, it is clear that the invention is capable of modification to cooperate with tubes of many different types. Thus, for example, the double anode pin gripping member 72 could be replaced by a smaller and simpler anode engaging member in the case of tubes having a single anode lead-out at the end of the tube. Likewise, in the case of tubes having an indirectly heated cathode with three lead-out wires connected to the heater and cathode, respectively, the notches 42, 43 and 44 in insulating cone 41 could be modified so that two of these notches were on the outside and one on the inside of the cone; then one heater wire could be clamped inside of this cone 41 against the inner conductor 33 while the other heater wires and the cathode lead are both clamped outside of the cone 41 against the intermediate sleeve 32. In the case of a tube having an indirectly heated cathode with one of the heater wires internally connected to the cathode so as to require only two lead-outs, only two notches in the cone 41 would be required. Preferably, in the case of tubes having indirectly heated cathodes, the cathode lead should be placed outside of the cone 41 so as to make connection with the intermediate sleeve 32 rather than the inner sleeve 33, since this provides slightly better by-passing of the cathode. In the case of center-tapped filaments, the center tap is preferably connected outside of the insulating cone 41 so as to give maximum by-passing with respect to this center tap.

In the case of a non-tapped filament having only two leads it is desirable that both filament leads should be very well by-passed to the external sleeve 31. For this purpose the cone 41 may be somewhat reduced in thickness and the conical surface of conductors 33 and 32 which cooperate with such member 41 may be increased in area. Thus the resulting structure would provide three coaxial conductors interconnected by two by-pass condensers. Such increase of the by-passing capacity between conductors 31 and 32 may be desirable even in the case of center tapped filaments such as those of the 1628 tube shown. In some cases by-passing to the center tap is sufficient and in such cases the insulating cone 41 may be constructed to provide very little by-passing.

Whether one or two by-passing condensers are provided in accordance with my invention, the conical form of condenser disposed adjacent the end of the elongated assembly 23 presents the great advantage that it provides the by-pass capacitance at the point of maximum impedance of the tuned coaxial line so that a comparatively small by-passing capacitance is as effective as a much larger capacitance would be if positioned at some other point.

Although I have described my invention in detail in connection with the preferred form shown, it is clear that many modifications, additions and omissions may be made within the scope and spirit thereof as defined in the appended claims. What I claim is:

1. A gripping device for two flexible leads of a vacuum tube, comprising an inner conductive member having a conical configuration and an outer conductive member disposed outside thereof and having a conical recess surrounding said conical configuration, a generally conical insulating member interposed between the outside of said conical configuration and the inner surface of said recess, a connecting member attached to

the inner member and arranged to exert pressure on the outer member to move the inner member longitudinally with respect to the outer member, the insulating member being clamped between the inner surface of the conical recess and the outer surface of the conical configuration by pressure exerted by said surfaces substantially normal to said direction of movement, said pair of flexible leads being respectively disposed inside and outside of said insulating member so as to be clamped against said inner and outer conductive members respectively.

2. A structure for association with a vacuum tube having a pair of flexible leads, comprising a compartment within which said tube is to be arranged, means for supporting said tube in said compartment, a closure member at one end of said compartment, an outer conductive sleeve fixed to

said closure member and extending towards said tube, an inner conductive member arranged inside said sleeve and terminating in a conical portion, said sleeve having a conical recess surrounding said conical portion, a generally conical insulating member interposed between the outside of said conical portion and the inner surface of said recess, means for moving the inner member longitudinally towards the closure member to thereby clamp the insulating member between the inner surface of the conical recess and the outer surface of the conical portion, said pair of flexible leads being respectively disposed inside and outside of said insulating member so as to be clamped against said inner and outer conductive members respectively.

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