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MULTIRANGE TUNING MEANS FOR RADIO FREQUENCY GENERATORS

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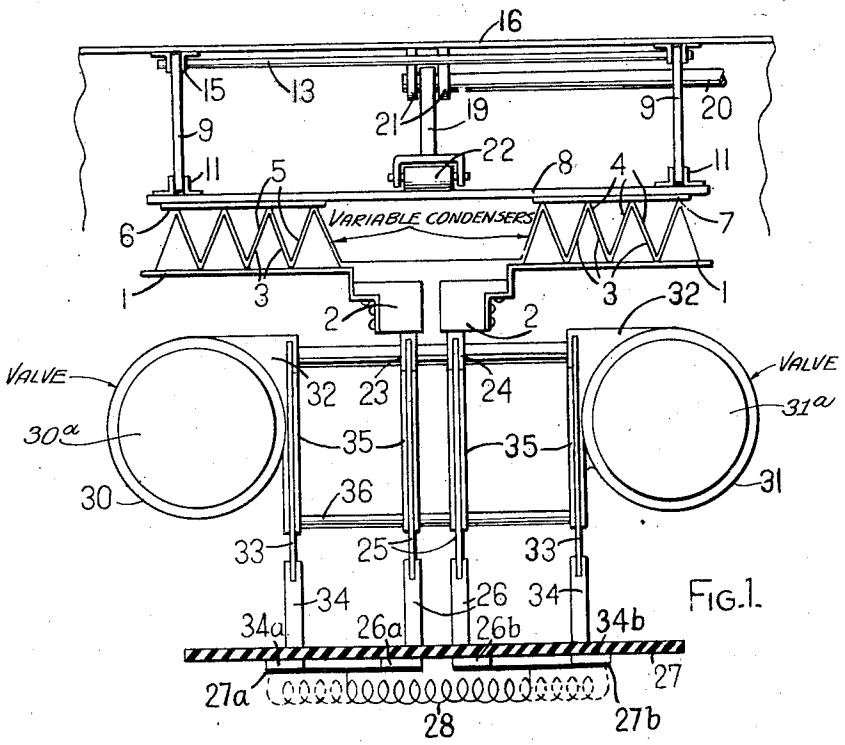


FIG. 1.

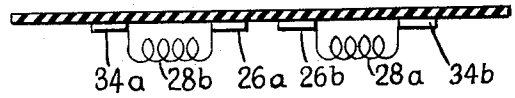


FIG. 1a.

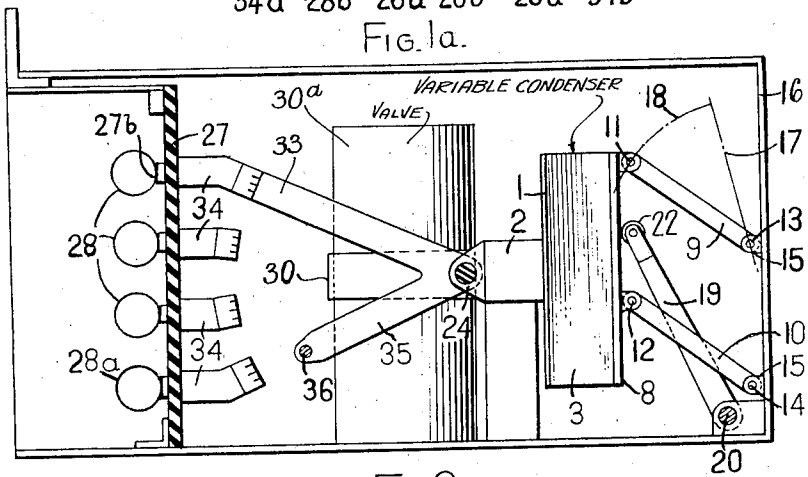


FIG. 2.

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MULTIRANGE TUNING MEANS FOR RADIO FREQUENCY GENERATORS

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8 Claims. (Cl. 250—40)

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This invention relates to the high frequency high voltage circuits of high power radio valves and more particularly the grid circuits of transmitting valves although the invention is applicable in other situations, the invention involving the variable condensers for varying or adjusting the tuning of circuits such as aforesaid.

Considering first an anode circuit having an inductance and a variable condenser connected in parallel therewith, the tuning conditions require that there is always the same peak voltage from anode to cathode and thus the same voltage across the aforesaid variable condenser. Therefore in order that an even stress may be desirably maintained in the dielectric of said condenser the latter is preferably of such a nature that its capacity can be varied whilst mantaining constant the spacing between its elements. This desideratum is, of course, obtained in a condenser of the well known interleaved vane type wherein one set of vanes is moved into or out of another set of vanes for varying the condenser capacity.

In the case where the variable tuning condenser is in series with the inductance the tuning conditions required are also such that the same peak voltage between anode and cathode is established at the various tuning positions obtained by varying the capacity of the condenser. It is assumed that the same value of circulating current passes through the condenser as through the effective anode/cathode capacity of the valve. In this case the voltage across the tuning condenser is inversely proportional to its capacity. Therefore in order to maintain the same voltage stress in the dielectric of the condenser it is desirable that its capacity and spacing of its plates should vary inversely with one another. This may be readily achieved by varying the capacity by variably separating the plates, whilst maintaining constant the area of the plates which are in juxtaposition.

From considerations of volumetric space under certain conditions it is sometimes desirable to employ by appropriate switching arrangements a single variable condenser either for a series tune or a parallel tune, at will. Such requirement has been found to arise with some advantage in the wave changing arrangements forming the subject of our applications Serial No. 516,103 and Serial No. 516,104, both filed on December 29, 1943, and our U. S. Patent No. 2,420,657, issued May 20, 1947.

The present invention involves the use of a per se known type of condenser the plates or elements of which are corrugated and relatively movable to and away from one another so that a compromise is obtained, since when the corrugated plates or elements are close together with their corrugations interleaved their relative movements are mainly similar in effect to that obtained in a vane type condenser wherein the amount of overlap is varied, whilst when the corrugated plates or elements are more separated the condenser tends to operate mainly as a condenser of the variable gap type. The corrugations are conveniently angular rather than curved.

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According to the present invention, for or as part of a generator of high power-wavelength ratio, a corrugated condenser as above indicated is used in combination with a series-parallel switching means for connecting at will said variable condenser in series or in parallel with an inductance or inductances.

The invention also comprises, as part of a radio transmitter a control grid circuit compartment or chamber containing the corrugated condenser and switch combination, at least one valve control grid terminal, a plurality of inductances of different values, and switching means for selectively connecting said inductances with said condenser.

To enable the invention to be clearly understood one arrangement and application thereof by way of example will now be described with reference to the accompanying drawings in which—

Figure 1 is a plan view showing one example of a corrugated condenser applied in accordance with the invention to a pair of valves in push-pull and located in a control grid compartment or chamber wherein there are inductance switches in accordance with said application Serial No. 516,103 and for series-parallel operation, only the parallel operation being shown.

Fig. 1*a* is a plan view of part of the apparatus showing the series operation, and

Fig. 2 is a side elevation looking toward Figure 1 from the right but with the right-hand valve omitted.

Referring to the drawings the corrugated condenser, according to a subsidiary feature of the invention, is a divided condenser which is symmetrical with respect to earth.

As shown in Fig. 1 the symmetrical corrugated condenser comprises two metal plate members 1 rigidly supported from post members 2 which are insulated from each other. Said members 1 have soldered to them corrugated sheet metal members as indicated at 3, these members constituting the fixed plates of the condenser. The common moving plate of the condenser comprises the corrugated members 4 and 5 which are connected together and are soldered to metal plates 6 and 7

which are secured with good electrical connection to the main plate 8. The latter is carried at the right and left-hand ends by respective pairs of levers 9 and 10 (Figs. 1 and 2), these levers being pivoted to the plate 8 at 11 and 12 and at their other ends at 13 and 14 to brackets 15 secured to the wall portion 16 of the metal control grid compartment or chamber.

A spring or counter-weight or the equivalent (not shown) is provided for urging the main plate 8 upwards and away from the fixed plates of the condenser to the remote position indicated by the intersection of the dotted line 17 and the dotted arc 18. The condenser therefore is normally biased to its minimum capacity from which the capacity can be increased by means of a lever 19 keyed to a shaft 20 carried in a forked bracket 21. The lever 19 carries at its upper end a roller 22 bearing against the vertical centre line of the main plate 8. The arrangement is therefore such that by rotating the shaft 20 in one direction or the other the capacity of the corrugated condenser may be raised or lowered symmetrically with respect to earth.

The posts 2 carry brackets 23 and 24 in which are pivoted the switch arms or blades 25 adapted to engage in the sets of contact jaws 26 secured to an insulating panel 27 upon the other side of which are corresponding sets of terminals 26*a* and 26*b*. In Fig. 1, 30 and 31 respectively represent the grid terminals of valves indicated at 30*a* and 31*a* which are preferably in accordance with British Letters Patent No. 414,753. These control grid terminals have secured to them bracket members 32 to which are pivoted further switch blades 33 adapted to engage in further contact jaws 34 also secured to the panel 27 upon the other side of which are the sets of terminals 34*a* and 34*b*.

For connecting the condenser in parallel with the inductances 28 the terminals 34*a* and 26*a* are connected together by horizontal copper plates or strips 27*a* whilst the terminals 26*b* and 34*b* are connected together by similar strips 27*b*. The inductances 28 for the longer wavelengths, and of varying axial length, as shown diagrammatically, are connected to such strips 27*a* and 27*b* at different points along them.

For the minimum wavelength the switch blades are moved to the lowermost jaws 26, 34, the terminals of which are not connected together by copper strips 27*a*, 27*b*, but have two inductance coils 28*a* and 28*b* connected across them, as shown in Fig. 1*a*. The coils 28*a* and 28*b* thus constitute a divided inductance with which the divided condenser is symmetrically connected in series.

The switch arms 25 and 33 are of the bell crank type having lower portions 35 which may be linked together by an insulating rod 36 whereby wavelength changing may be effected by means (not shown) linked with the rod 36. Such means may be in accordance with said U. S. Patent No. 2,420,657, and more particularly with the arrangement shown in Fig. 3 of that patent, it being understood that in the case of the grid circuits the shaft 20 of the lever 19 shown in the accompanying drawings may be rocked by the cam member as determined by the fixed but adjustable abutments as described more particularly in Fig. 3 of the patent just above mentioned.

We claim:

1. In a radio transmitter, a condenser including opposed corrugated plate elements, a movable switch member connected to one of said condenser plate elements, a series of fixed contacts arranged in the path of movement of said movable switch member, a valve including a grid terminal, a second movable switch member connected to said grid terminal, a second series of fixed contacts arranged in the path of movement of said second switch member, the contacts of said two series being respectively arranged in pairs, at least one of said pairs of fixed contacts being connected only by an inductance, and other pairs being connected by an inductance and conducting means in parallel with said inductance.

2. In a radio transmitter, tuning means comprising a condenser including co-acting plates, said plates being corrugated and respectively having substantially similar contours, means for varying the relative spacing of said plates along a direction perpendicular to their mean planes, at least two inductances of different values, switching means for connecting the inductance of higher value in parallel with said condenser, and additional switching means for connecting the inductance of lower value in series with the condenser.

3. In a radio transmitter, tuning means comprising a condenser including a fixed plate and a movable plate, means including a parallel link motion for carrying said movable plate and so arranged that at close spacings the movable plate has a relatively large component of movement parallel to the mean planes of said plates, but at large displacements the movable plate has a relatively large component of movement perpendicular to the mean planes of said plates, at least two inductances of different values, switching means for connecting the inductance of higher value in parallel with said condenser, and additional switching means for connecting the inductance of lower value in series with the same condenser.

4. In a radio transmitter, tuning means comprising a condenser including co-acting fixed and moving plates, said plates being corrugated and respectively having substantially similar contours, means including a parallel link motion for carrying said movable plate and so arranged that at close spacings the movable plate has a relatively large component of movement parallel to the mean planes of said plates but at large displacements the movable plate has a relatively large component of movement perpendicular to the mean planes of said plates, at least two inductances of different values, switching means for connecting the inductance of higher value in parallel with said condenser and switching means for connecting the inductance of lower value in series with the same condenser.

5. In a high power wave length ratio radio transmitter, a condenser including two corrugated plate elements opposed to each other, a plurality of inductances of different values, switch means for alternately placing at least one of said inductances in parallel with one element of said condenser and at least another of said inductances in series with the same element of the condenser, a valve including a grid terminal, a second switch means connecting said valve grid terminal successively with said inductances to form an oscillatory circuit for said valve and means connecting said two switch means for simultaneous operation.

6. In a radio transmitter of the character defined in claim 5, means to move the plate elements of said condenser toward and away from each other.

7. In a radio transmitter of the character defined in claim 5, means to move the plate elements of said condenser toward and away from each other by translational movement.

8. In a radio transmitter, a pair of push-pull valves each including a control grid terminal, said valves being equidistantly positioned on each side of a predetermined line, a condenser including a pair of opposed plate portions, with each portion equidistantly positioned on one side of said line, a plurality of inductances of different values, and switch means for selectively placing at least one of said inductances in parallel with one pair of opposed plate portions of said condenser and at least another of said inductances in series with the same pair of opposed plate portions of the condenser, a second switch means connecting each of said control grid terminals on the valves successively with said inductances to form a common oscillatory circuit for said valves and means connecting said two switch means for simultaneous operation.

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