Nov. 3, 1942. S. KOCH 2,301,163

HIGH FREQUENCY TUNED OSCILLATORY CIRCUIT

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Fig. 1.

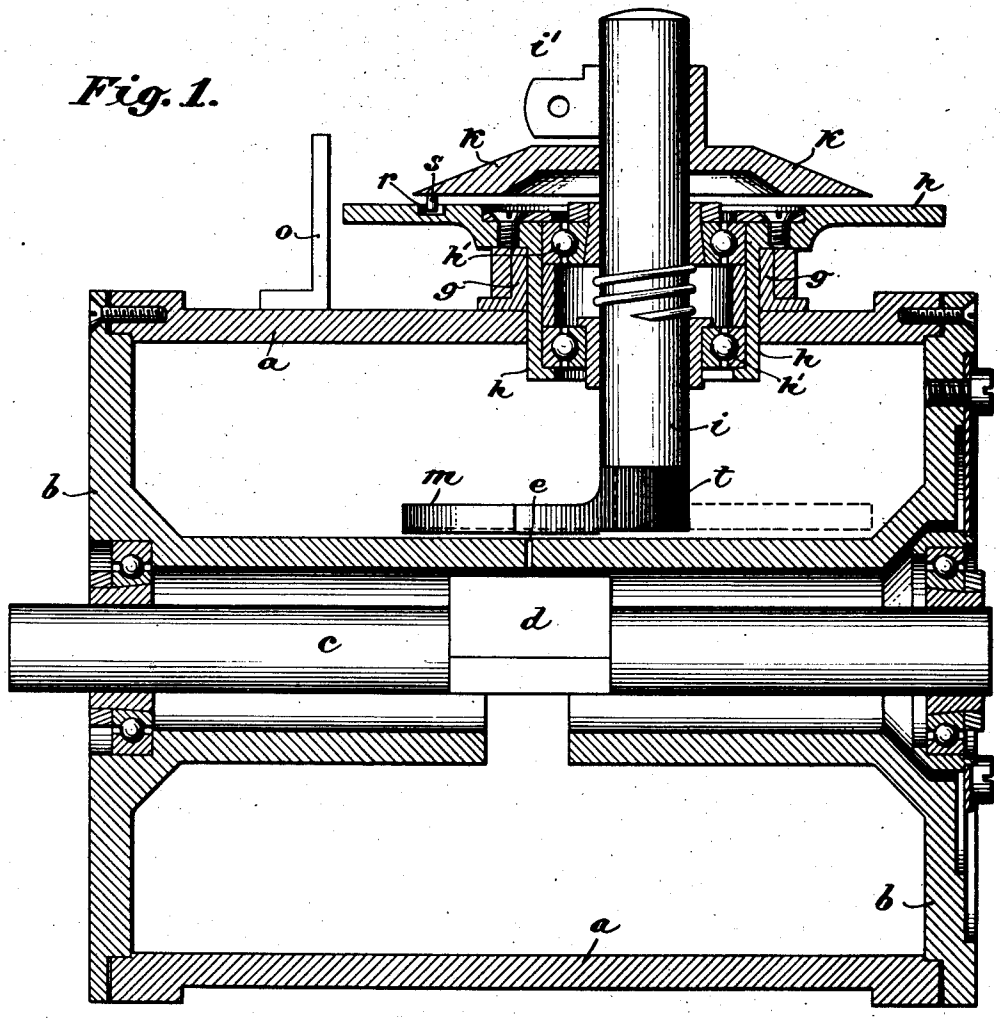
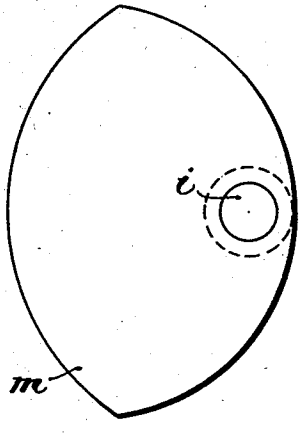


Fig. 2.



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HIGH FREQUENCY TUNED OSCILLATORY CIRCUIT

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10 Claims. (Cl. 178—44)

Tank circuits have heretofore been built for a certain frequency band which is adjustable by the aid of a rotor so that, when the circuit is to be set for another range or band, the rotor must be substituted.

This difficulty is avoided in the invention by shifting the frequency band a certain amount by the agency of accessory regulator means, this device being preferably mounted at right angles to the tank circuit and being so designed that shifting thereof in longitudinal or axial direction results in very coarse adjustment, while rotation about this axis results in regulation which is accomplishable by very fine steps by adjustment of the capacity.

It has been suggested in the prior art of tank circuits to provide a screw in the shell of the tank circuit positioned at right angles to the longitudinal axis of the tank circuit and to use the same (by variation of its distance to the axis of the tank circuit) for varying the mean wavelength of the tank circuit. However, what has heretofore been lacking is a chance to shift the frequency band of the tank circuit by a definite amount by a simple switch motion. This result is attained, according to the invention, by the agency of a pivotal plate which is mounted vane-fashion on a shaft supported at right angles to the axis of the tank circuit and which is capable of being adjusted by turning the shaft an angle of 180°, so that in the position above the gap the initial capacity and in the other position the inductance is varied. Incidentally, an increase in the capacity proceeds parallel to an increase in the inductance, and vice versa, with the result that the adjustability of the vane is increased.

The shaft which supports the vane is adjustable in longitudinal direction for the purpose of insuring a rather coarse setting of the shifting range. The surface of the vane itself is wholly or partly helical in shape and of such dimensions that the flat portion of the said vane serves for coarse adjustment on up and down movement, whereas the other part thereof, being of oblique or twisted surface form, is used for fine settings on turning the vane as a result of a change in position of the helical surface in respect to the gap. In manufacture, the vane suitably is made as part of a helix.

The laterally extending shaft of the vane is turned by the agency of a knob which has yielding lugs which engage in arrester means provided on the shell of the tank circuit in order to fix once and for all definite positions of the vane. The position of the arrester means which may be changed is determined empirically.

The drawing shows, by way of example, an embodiment of the tank circuit here disclosed. Fig. 1 is a median section taken through the tank circuit of the invention, while Fig. 2 is a top view of the vane.

Fitted into the cylinder *a* are the metallic covers or lids (end plates) *b*, the latter being provided with bearings *c* for journaling the rotor member *d* of the tank circuit.

Cylinder *a* has a lateral opening with a tubular extension *g* in which a bush *h* is supported. Journaled in ball bearings *h'* in the latter is a shaft *i*. Fitted on one end of the shaft *i* by means of a clip *i'* is a scale knob or the like indicated at *k*, while at the other end is attached a vane *m*. In the position indicated by solid line in Fig. 1, the said vane *m* occupies a position just over the gap *e*, while the other extreme position of the said vane *m* is indicated by the dash-lines.

Bush *h* is shiftable in the tubular extension *g* so that the vane *m* may be withdrawn more or less from the gap *e*. On a scale *o* to be mounted on the shell *a*, the setting of the bush with shaft *i* may be read. Longitudinal movement of the shaft *i* serves for the coarse adjustment of the tank circuit, while fine tuning is effected by turning the shaft *i*. For this purpose the knob *k* is provided with yielding lugs *s* which engage in adjustable arrester means *r* on the flange of the bush *h*, the said means *r* being preferably ascertained empirically in the test shop. As a result, the frequencies for the tank circuit of the invention can be fixed with a degree of accuracy heretofore unattainable.

For fine tuning, the outer surface of the vane may preferably be divided into two parts. One part indicated at *t*, for instance, (the part near the shaft *i*) is flat, whereas the rest is made helical. In this way fine setting in respect to the gap *e* is feasible by turning the shaft *i* a certain angle. If the surface of the vane *m* were perfectly planar throughout, no substantial change of the capacity would be brought about by turning through this angle.

The new tank circuit here disclosed is capable of coarse adjustment by the shifting of the bush *g* with the shaft *i* and the movement can be read off on the scale *o*. Once this has been accomplished, turning of the shaft *i* is accomplished with the scale *k*. In the initial part of this movement coarse adjustment is obtained, but as rotation proceeds the helical surface por-

tion x becomes operative with an incidental fine tuning of the circuit.

I claim:

1. In a high frequency tuned oscillatory circuit, the combination of an outer conductor having the form of a metallic casing, a hollow inner conductor divided by a gap of varying width into two stator parts located end to end, electrically conductive end plates connecting both ends of the casing to said stator parts, an electrically conductive rotor adapted to be rotated within the stator parts and in capacity coupling relation to both said stator parts, and a shaft secured to said rotor and extending externally of said tuned circuit.

2. In a high frequency tuned oscillatory circuit, the combination of an electrically conductive casing, a hollow electrically conductive stator within the casing, electrically conductive end plates connecting both ends of said casing and said stator, said stator having a gap of varying width, an electrically conductive rotor arranged within the stator bridging said gap and in capacity coupling relation to said stator, a shaft for moving said rotor, an adjustable metallic plate located between said casing and stator, and adapted to cooperate with the stator for changing the tuning of said oscillatory circuit, and means for adjusting the position of said plate.

3. In a high frequency tuned oscillatory circuit, the combination of an electrically conductive casing, a condenser therein, said condenser including a stator divided by a gap into two electrically conductive parts, metallic plates connecting said two parts to the ends of said casing, a metallic tuning plate of continuously changing radial dimensions arranged above the gap between the stator parts, and means for changing the position of said tuning plate.

4. In a high frequency tuned oscillatory circuit, the combination of an electrically conductive casing, a condenser therein, the stator of which is provided with a gap intermediate the ends thereof, a rotatable tuning electrically conductive plate of varying radial dimensions cooperating with said condenser, said tuning plate in one position being across said gap to provide capacity to both parts of said stator, and means adapted to adjust the tuning plate with respect to the distance between said plate and the condenser and with respect to the position of the plate over said gap.

5. In a high frequency tuned oscillatory circuit, the combination of an electrically conductive casing, a condenser therein, a metallic tuning plate positioned and adapted in one position to capacitively couple to the parts of said condenser, a shaft mounted at right angles to the axis of said casing and carrying the plate and adapted to be rotated and to be moved in the direction of its length, and means for adjusting the rotation and the motion of said shaft at right angles to the longitudinal axis of said casing.

6. In a high frequency tuned oscillatory circuit, the combination of an outer conductor, a hollow inner conductor divided by a gap of variable width into two parts arranged end to end, metallic end plates connecting the ends of said outer conductor to the two parts of said inner conductor, a metallic rotor within said inner conductor and having an electrically conductive cam-shaped electrode cooperating with the gap of the inner conductor, and a metallic plate located between said outer and inner conductors for providing a coarse and a fine tuning of the oscillatory circuit.

7. In a high frequency tuned oscillatory circuit, the combination of an outer and a hollow inner conductor connected with one another, the inner conductor being divided by a gap into two parts, said gap having a varying width, a metallic rotor arranged within the inner conductor and having an electrically conductive cam-shaped electrode capacitively coupled to said two parts of the inner conductor at the gap, and means at right angles to the axis of the inner conductor and electrically coupled thereto for providing a coarse and a fine tuning of the oscillatory circuit.

8. In a high frequency tuned oscillatory circuit, the combination of an outer conductor, a divided condenser therein in the form of an inner conductor having two spaced parts capacitively coupled together, and a metallic plate bridging the space between said two parts and having its plane parallel to the axis of the conductors, said plate having a helicoidal surface for producing a desired change in the tuning of said tuned circuit with movement of said plate.

9. A concentric line tank circuit having an outer and an inner conductor suitably connected together, said inner conductor comprising two elements arranged end to end and spaced apart by a gap at their adjacent ends, a rotatable metallic plate adapted in one position to be located across said gap for capacitive coupling to the two elements of said inner conductor and in another position to be adjacent only one of said elements, whereby both the capacity and inductance of said tank circuit change simultaneously with movement of said plate, and a rotatable shaft supporting said rotatable plate at such a location as to move said plate from one of said positions to the other.

10. A concentric line tank circuit having an outer and an inner conductor suitably connected together, said inner conductor comprising two elements arranged end to end and spaced apart by a gap at their adjacent ends, a rotatable metallic plate adapted in one position to be located across said gap for capacitive coupling to the two elements of said inner conductor and in another position to be adjacent only one of said elements, whereby both the capacity and inductance of said tank circuit change simultaneously with movement of said plate, and a rotatable shaft directly associated with said metallic plate and arranged at right angles to the longitudinal axis of said conductors for changing the spacing between the plate and inner conductor and for rotating said plate to assume either one of said two positions.

SIEGFRIED KOCH.