March 30, 1948. A. LANDMANN 2,438,784

TUNER FOR ULTRA HIGH FREQUENCIES

Filed Oct. 11, 1943

Fig. 1.

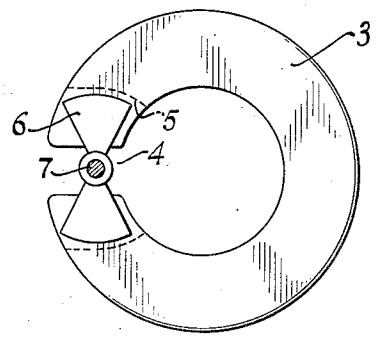
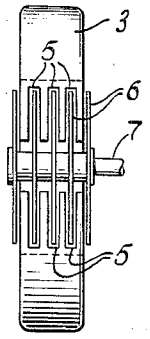


Fig. 2.



INVENTOR
ALEXANDER LANDMANN.
BY H. G. Grover
ATTORNEY

Patented Mar. 30, 1948 2,438,784

UNITED STATES PATENT OFFICE

2,438,784

TUNER FOR ULTRA HIGH FREQUENCIES

Alexander Landmann, London, England, assignor to Electric & Musical Industries Limited, Hayes, Middlesex, England, a company of Great Britain

Application October 11, 1943, Serial No. 505,726
In Great Britain April 28, 1942

Section 1, Public Law 690, August 8, 1946
Patent expires April 28, 1962

4 Claims. (Cl. 250—40)

1

This invention relates to oscillatory circuits such as are employed in radio transmitting and receiving apparatus and intending to be operated at very high frequencies.

At very high frequencies the use of a conventional form of inductance coil becomes impracticable and it is usual, therefore, to employ as a tuned circuit for operating at very high frequencies of a wavelength of one meter and below a length of metal tube a quarter of a wavelength long. However, tuned circuits of such form are not so convenient from the point of view of ease of mechanical adjustment or of compactness as those employing a tuning condenser.

The object, therefore, of the present invention is to provide an improved tunable oscillatory circuit suitable for operating at very high frequencies in which tuning can be effected by a tuning condenser and which is of compact and simple construction.

According to one feature of the present invention a tunable oscillatory circuit for very high frequencies is provided comprising a plate having a gap, said plate constituting the greater proportion of the inductance of the oscillatory circuit and a variable condenser having one or more angularly movable vanes arranged in one or more slots formed in said plate at said gap, the surfaces bounding said one or more slots forming the stator of said condenser.

According to another feature of the invention a tunable oscillatory circuit for very high frequencies is provided comprising a plate having a gap, said plate constituting the greater proportion of the inductance of the oscillatory circuit and a variable condenser comprising one or more angularly movable vanes mounted on a shaft projecting into said gap, said vane or vanes being symmetrical with respect to said shaft and arranged to co-operate with said plate so that the latter constitutes the stator of said condenser and said shaft is so arranged in said gap that substantially no high frequency currents flow in said shaft.

Said plate may take a variety of forms and whilst it is preferable to make the plate of solid metal, it is, however, possible to employ an insulating body provided with a metal coating since at the high frequencies at which the circuit is intended to be used the oscillatory currents only flow on the surface of the plate. Preferably, the plate is of ring form provided with a radial gap.

The oscillatory circuit according to the invention is thus of a very compact construction and can be satisfactorily employed as a tunable circuit of the local oscillator of a superheterodyne receiver for use at wavelengths of the order of centimeters and it is found readily possible to construct the circuit to afford a wide tuning range of, for example, 230 to 310 megacycles.

2

In order that the said invention may be clearly understood and readily carried into effect, it will now be more fully described with reference to the accompanying drawing which illustrates the preferred construction according to the invention:

Fig. 1 is a front elevation of a tunable oscillatory circuit constructed according to the invention; and

Fig. 2 is an end elevation of Fig. 1.

In the arrangement shown in Fig. 1, the inductance of the oscillatory circuit is constituted by a metal plate 3 in the form of a ring having a radial gap 4, the plate 3 in effect constituting a single turn inductance. The diameter of the ring is suitably chosen so as to afford an inductance of appropriate value to suit the tuning range desired. The adjacent ends of the ring at the gap are provided with oppositely disposed slots 5 lying in planes parallel to the medial plane of the ring 3. The slots 5 are arranged to accommodate the angularly movable vanes 6 of the rotor of a variable condenser the stator of the condenser being constituted by the surfaces bounding the slots 5. Such a construction avoids the necessity of leads or other mechanical connections between the inductance and a conventional type of condenser, so reducing losses and the introduction of undesired inductive effects. The vanes 6, as will be seen from Fig. 1, are mounted on a shaft 7 which projects through the gap 4 and are of butterfly type, i. e., similar to the vanes of a differential condenser so that the vanes are symmetrically disposed with respect to the shaft 7. The shaft 7 is arranged to pass through a position in the slot 4 at which a voltage antinode is set up whereby, in conjunction with the symmetrical vanes 6, substantially no high frequency currents will flow in the shaft 7 when the circuit is in operation. The size of the slots 5 are, of course, suitably determined in order to accommodate the vanes of the condenser to permit the latter to be angularly moved freely within the slots. The exact shape of the rotor plates will, of course, be determined according to the desired capacity law. The shaft 7 is mounted in suitable bearings, not shown, which may, if desired, be carried by the ring 3 and suitably insulated therefrom, or said bearings may be mounted independently of said ring. In con-

necting the circuit to a valve oscillator the ends of the ring 3 are connected respectively to the grid and anode of the valve of the oscillator, or the grid and anode of said valve may be connected to any point on the outer or inner surface of the ring near its ends.

Although three slots 5 are shown in Fig. 2, it will be understood that the invention is not limited to such number of slots since a larger or smaller number of slots with a corresponding larger or smaller number of vanes may be employed. Furthermore, although in the specific invention described in Fig. 1 or 2 each end of the ring is provided with slots accommodating the vanes of the variable condenser it will be understood that in some cases only one end of said ring may be provided with a slot or slots to accommodate one or more rotor plates, although in this case it may be found that high frequency currents will flow in the spindle of the condenser. It is, of course, not essential that the inductance be formed as a ring 3 since, in some cases, a rectangular plate or a plate of other form may be employed, said plate having a gap formed therein in which the rotor of the condenser is accommodated.

The material of the plate may be suitably chosen in relation to the material from which the condenser vanes 5 are formed so that any change in the dimensions of the plate on a change of temperature is compensated by a change in dimensions of the vanes 5 so that the resonant frequency of the circuit remains substantially constant with variations in temperature.

I claim:

1. A resonant circuit arrangement tunable in a range of very high frequencies comprising a single incomplete ring of conductive material constituting the greater portion of the inductance of said resonant circuit and having a gap, the adjacent ends of said ring having plurality of slots whose principal surfaces are disposed in parallel planes which are perpendicular to the axis of the ring, and a metallic member located in said gap and rotatable on an axis parallel to said ring axis and having vanes disposed in capacitive relation to the surfaces of said slots.

2. A resonant circuit arrangement tunable in a range of very high frequencies comprising an incomplete ring of conductive material having substantial thickness and having a gap, the adjacent ends of said ring having a plurality of slots, the principal slot surfaces being disposed in planes parallel to the ring faces, and a metallic rotor member located in said gap and having a plurality of vanes rotatable within and without said slots thereby to vary the capacitance between the vane surfaces and the slot surfaces.

3. A resonant circuit arrangement according to claim 2 and having a spindle for said rotor member disposed on an axis which precludes the flow of high frequency currents therein.

4. A tunable resonant circuit for use at ultra high frequencies, comprising an inductor in the form of an incomplete ring of electrically conductive material having a gap whose distance thereacross is small compared to the peripheral dimensions of said ring, the adjacent ends of said ring which define the boundaries of said gap having physically parallel slots therein which are perpendicular to the axis of said ring, the dimensions of said ring being such that said gap is located at a voltage anti-node, a rotatable shaft located in said gap between the ends of said ring and arranged along a line parallel to the axis of said ring, and metallic vanes fixedly supported on said shaft and symmetrically located on opposite sides of said shaft, said vanes being movable in said slots upon rotation of said shaft and in capacitive relation to the adjacent ends of said ring.

ALEXANDER LANDMANN.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,664,518	Lindberg	Apr. 3, 1928
2,120,518	Dreyer, Jr.	June 14, 1938
2,193,500	Usselman	Mar. 12, 1940
2,246,928	Schick	June 24, 1941
2,341,345	Billiard	Feb. 8, 1944
2,367,681	Karplus et al.	Jan. 23, 1945