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OSCILLATOR CIRCUIT

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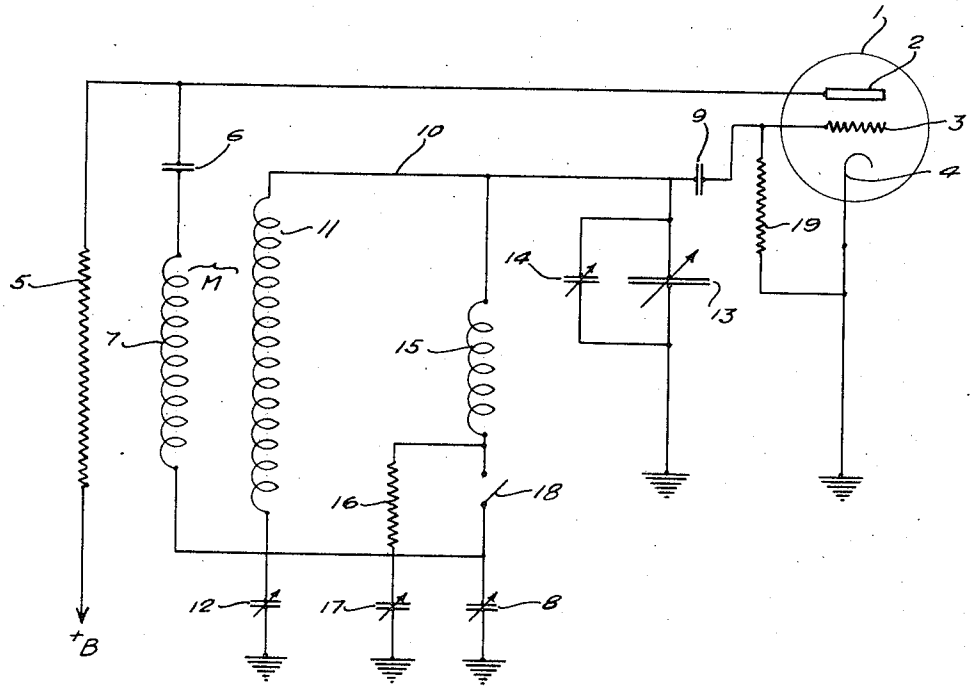

INVENTORS
WILLIAM F. COTTER
& MARION E. BOND
BY
ATTORNEY

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OSCILLATOR CIRCUIT

William F. Cotter and Marion E. Bond, Springfield, Mass., assignors to United American Bosch Corporation, Springfield, Mass., a corporation of New York

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6 Claims. (Cl. 250—36)

This invention relates to tuned oscillator circuits and more particularly to oscillator circuits which may be tuned to different frequency bands.

It is desirable to have superheterodyne receivers which are adapted to receive a total frequency range much greater than that included in the present broadcast band. These receivers have an intermediate amplifier which operates at a fixed frequency and the function of the oscillator is to beat with any received frequency and produce the resultant frequency for which the intermediate amplifier was designed. The oscillator circuit may be tuned to a frequency equal to a given signal frequency plus or minus the intermediate frequency, and the proper intermediate beat frequency will result. In single control receivers having ganged tuning condensers on a single shaft, an auxiliary combination of parallel and series capacities must be added to the oscillator section in order to maintain the proper frequency differential between the oscillator output and the incoming signal over the entire tuning range of the oscillator condenser. The values of these additional capacities are a function of the oscillator coverage ratio, which is obtained by dividing the high frequency end of a given tuning range by the low frequency end. In the broadcast band, which usually terminates in the lowest frequency to which the receiver can be tuned, the oscillator coverage ratio is the least. The parallel or oscillator "trim" condenser therefore needs to be larger, and conversely the series or "lag" condenser needs to be smaller, than those employed in the higher frequency bands, in order to have the oscillator track at the proper frequency differential with the pre-selector tuning condensers. The nearer in ratio the intermediate frequency is to the lowest carrier frequency of a given band, the more important these values become. The explanation of circuits to be made later will disclose an improved means of altering the values of these additional capacities in accordance with the change of tuning bands. In the higher frequency tuning ranges, the energy output of the oscillator drops under the usual type of circuit design, whereas it should always bear a definite ratio with the energy of the signal in the modulator tube. We propose an auxiliary means of energy transfer between elements of the oscillator circuit which will maintain the oscillator output more constant under a wide range of frequency variation.

The primary object of this invention is, therefore, to provide an improved oscillator circuit which is more efficient.

Another object is to provide an oscillator having a more constant energy output over a wide frequency range.

A further object is to provide an oscillator which will maintain a more accurate frequency differential with the preselector tuning elements.

Other objects and advantages will in part be obvious and in part be set forth in the accompanying specification and claims when read in connection with the drawing showing the improved oscillator circuit diagrammatically.

The numeral 1 indicates a vacuum tube oscillator, having a plate 2, a control grid 3, and a cathode 4. The customary cathode heater element is not shown since it is not connected in any manner to the various circuits and elements comprising this invention. The plate 2 is connected to a suitable source of potential through a resistance 5. Between the resistance 5 and the plate is connected one side of a blocking condenser 6, the other side of which leads to a plate feedback inductance 7. A lead runs from one side of a high frequency lag condenser 8 to inductance 7, and the other side of the condenser is grounded. From the grid 3, a connection goes to a condenser 9, and a lead 10 joins the opposite condenser terminal to a tuned grid circuit. A grid inductance 11 is included in the circuit, and is magnetically coupled (M) with the feedback inductance 7. A low frequency lag condenser 12 is connected between the end of inductance 11 and ground. A main grid tuning condenser 13, having a high frequency trim condenser 14 shunted across it, is in the circuit between ground and grid lead 10. A high frequency circuit which serially includes inductance 15, resistance 16, and the low frequency trim condenser 17, is connected in parallel with the grid inductance 11 between lead 10 and ground. A frequency changing switch 18 is connected between the ungrounded side of the high frequency lag condenser 8 and the lower end of the high frequency inductance 15. The grid 3 and cathode 4 of the oscillator tube are joined by a resistance 19.

The operation is as follows. When the switch 18 is open, the oscillator operates on the lower frequency band and oscillation is maintained in the circuit including inductance 7, the magnetic coupling (M), inductance 11 and the high frequency lag condenser 8. Feedback is maintained through the coupling (M) between inductances 7 and 11. The main tuning condenser 13 is shunted by an effective trim capacity comprising condensers 14 and 17 plus any stray capacity to ground of inductance 15, and the ef-

fective oscillator tracking or lag condenser is 12. The resistance 16 serves to damp out any secondary oscillations of higher frequency due to inductance 15 being also in the circuit. The reactance of inductance 15, resistance 16, and condenser 17 is essentially capacitive and does no harm on the lower frequency band.

When the switch 18 is closed the system operates on the higher frequency band. The effective trim capacity is condenser 14, the effective track or lag condenser is 8. The resistance 16 and condenser 17 are in effect absorbed in the much greater capacity of the high frequency lag condenser 8. Oscillation is now maintained by the feedback of the voltage appearing across condenser 8, which is common to the plate and grid circuit, assisting the relatively weak magnetic coupling between the inductances 7 and 15. The high frequency inductance 15 is of such low value that the effect of inductance 11 becomes negligible in the tuning of the circuit, and very little current flows through it.

It will be seen then, that oscillation feedback is maintained in the lower frequency band, only by means of magnetic coupling. On the higher band it is maintained through a combination of magnetic and capacity feedback, resulting from the voltage drop across the high frequency lag condenser 8.

It will be apparent that many changes and modifications may be made by anyone skilled in the art without departing from the true spirit and scope of the invention as expressed in the following claims.

Having described the invention, what is claimed is:

1. In an oscillator circuit for operation over a plurality of frequency bands, an oscillator tube, a plate and a grid circuit connected to said tube, a plate feedback inductance and a plurality of parallel connected grid inductances of different values, means for establishing a magnetic coupling between said plate inductance and said grid inductances, a band changing switch connected to the smaller of said grid inductances, a capacity connected in series with said switch, and means including said capacity for establishing a capacitive feedback in assistance to said magnetic feedback when said switch is closed.

2. In an oscillator tube circuit for operation over a plurality of frequency bands, a plate and a grid circuit connected to said tube, a plate feedback inductance and a plurality of parallel connected grid inductances of different values, means for establishing a magnetic feedback coupling between said plate inductance and said grid inductances, and means in series with one of said grid inductances for adding a capacitive feedback to said magnetic feedback when operating at a frequency higher than those comprising the lowest of said frequency bands.

3. In an oscillator tube circuit for operation over a plurality of frequency bands, a plate and a grid circuit connected to said tube, a plate feedback inductance, a grid inductance for operation in one frequency band, a smaller grid inductance connected in parallel with said first named grid inductance for operation in a higher frequency band, means for establishing a magnetic feedback coupling between said plate inductance and said grid inductances, and means in series with said smaller grid inductance for adding a capacitive feedback to said magnetic feedback between said plate inductance and said smaller grid inductance.

4. In an oscillator tube circuit for operation over a plurality of frequency bands, a plate and a grid circuit connected to said tube, a plate feedback inductance, a grid inductance for operation in one frequency band, a smaller inductance in parallel with said grid inductance for operation in a higher frequency band, means for effectively including any one of said grid inductances in said grid circuit, means for establishing a magnetic feedback coupling between said plate inductance and said grid inductances, and means for adding a capacitive feedback to said magnetic feedback between said plate inductance and said smaller grid inductance.

5. In an oscillator tube circuit for operating over a plurality of frequency bands, a plate and a grid circuit connected to said tube, a plate feedback inductance and a plurality of parallel connected grid inductances of different values, means for establishing a magnetic feedback coupling between said plate inductance and said grid inductances, a resistance in series connection with one of said grid inductances, and a band changing switch connected in parallel with said resistance and in series with said last named grid inductance.

6. In an oscillator tube circuit for operating over a plurality of frequency bands, a plate and a grid circuit connected to said tube, a plate feedback inductance and a plurality of parallel connected grid inductances of different values, means for establishing a magnetic feedback coupling between said plate inductance and said grid inductances, a resistance in series connection with one of said grid inductances, a band changing switch connected in parallel with said resistance and in series with said last named grid inductance, and means controlled by said switch for adding a capacitive feedback to said magnetic feedback when operating at a frequency higher than those included in the lowest of said frequency bands.

WILLIAM F. COTTER.
MARION E. BOND.