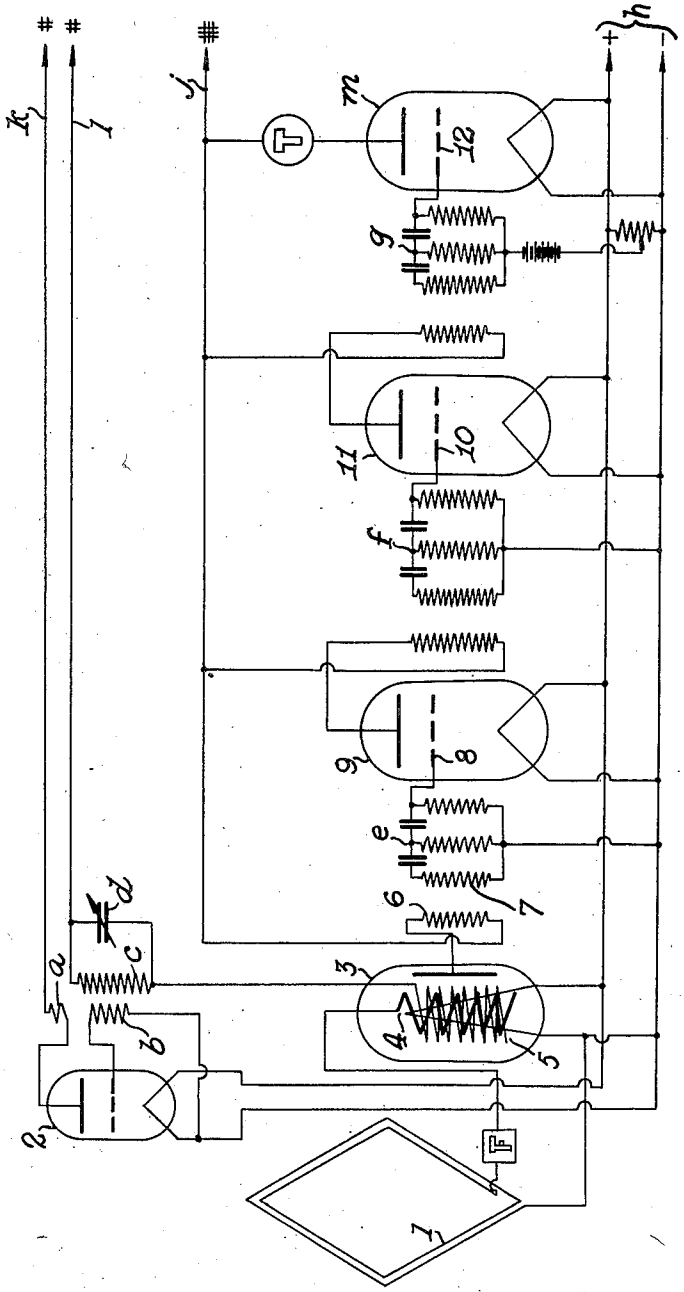
Feb. 2, 1937. L. L. DE KRAMOLIN 2,069,405

RADIO RECEIVING ARRANGEMENT

Filed June 6, 1929.



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Patented Feb. 2, 1937 2,069,405

UNITED STATES PATENT OFFICE

2,069,405

RADIO RECEIVING ARRANGEMENT

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Application June 6, 1929, Serial No. 368,870
In Germany June 8, 1928

3 Claims. (Cl. 250—20)

My invention relates to electrical wave signalling systems and particularly to such systems employing the heterodyne method of detecting signals.

In my prior specification Serial No. 322,426, Patent No. 1,968,335, July 31, 1934, a radio receiving system is described having an aperiodic pick-up circuit in combination with a frequency changing circuit and an intermediate amplifier arrangement which is adapted to amplify at the new frequencies, whereby the whole tuning of the system is carried out in the frequency changing circuit.

It is known that a transmission from a telephony transmitter occupies a small band of frequencies some 10 kilocycles in width, occupied by the carrier frequency and modulating frequencies, the high modulating notes being carried by the outer edges of the band. These high notes are lost when a normal superheterodyne receiver is used due to the tuned input or antenna circuit, which generally has a pointed response curve much narrower particularly at the apex than the band of frequencies occupied by the carrier frequency and modulating frequencies. The high notes are consequently attenuated and the quality of reproduction is hollow due to the preponderance of the bass notes.

To avoid this disadvantage according to my above prior specification, the input circuit is made aperiodic or semi-aperiodic by the employment of electric wave filters. It has been found, however, that in order to give results of a high quality the intermediate frequency amplifier must be highly selective. In order to satisfy this condition, but at the same time to avoid cutting of the side bands, tunable filters may be employed instead of individual tuned circuits. Since each filter, however, contains two variable condensers for tuning purposes, a two stage high frequency amplifier followed by a tuned detector stage would be provided with at least six variable condensers. For each tuning of the receiver to a different frequency these condensers would have to be operated and even if individual operation can be avoided to some extent by mechanically coupling or ganging the condensers a complicated structure is generally the result.

The principal object of this invention is to provide an amplifier, the individual stages of which are coupled by means of band-pass electric wave filters, so that a band of frequencies 10 kilocycles in width may be passed in the intermediate frequency stages of a superheterodyne radio receiving system employing an aperiodic pick-up circuit such as is described in my above mentioned application. In this way a complicated tuning control is avoided and at the same time selectivity is obtained without cutting of the side bands.

My invention will now be described with reference to the accompanying drawing which represents a circuit arrangement according to the invention.

The aperiodic pick-up circuit comprises a frame 1 which is not tuned or is only very roughly tuned by suitable selection of the number of turns. This frame is connected through a filter F to eliminate undesired frequencies to a tube 3 provided with separate, screened grids 4 and 5 (for example a Hull vacuum tube). Locally generated oscillations are conducted to the grid 5 which is adapted to work as a commutator grid. For such operation in the disclosed embodiment, the grid 5 may be given a voltage approximately half the anode voltage. Oscillations generated in the tube 2 are applied by way of coil *c* to this grid and in the tube 3 therefore, in every half cycle of the oscillations applied to the grid 5 the oscillations conveyed to the grid 4 through the pick-up circuit are powerfully supplied, while in the succeeding half period the anode voltage and the oscillation voltage applied to the grid 5 counteract and nullify one another thus cutting off the tube and stopping its action.

In the anode circuit of the tube 3 is provided an inductance 6 which is in inductive relation with the inductance 7 forming a part of a filter circuit *e*, through which a band of frequencies is passed to the grid 8 of the amplifier tube 9. The output of the amplifier tube 9 passes through another filter circuit *f* to the grid 10 of a second amplifier tube 11. Finally the output of this amplifier tube is applied through a third filter circuit *g* to the control grid 12 of a detector tube *m*. A frequency band, the width of which is determined by the constants of the intermediate frequency filter circuits *e*, *f*, *g*, is thus passed on to the detector *m*, in the output circuit of which a telephone or like indicating instrument T is connected. The local oscillations are generated by the tube 2, due to the coupling coils *a* and *b* in the grid and anode circuit thereof, the oscillatory voltage produced being conducted to the grid 5 from the circuit *c*, *d*. The frequency of the oscillations may be altered by means of the variable condenser *d* which constitutes the sole tuning means. The leads *h* are connected to a suitable source of current for heating the

filaments and the lead *j* supplies the voltage for the anodes. Leads *k* and *l* provide voltage for the anode of the oscillator tube, and the commutator grid of the mixing tube respectively. If large amplification factors are desired there is a danger of the intermediate frequency amplifier becoming unstable on account of an excessive number of stages. Then stabilization can be produced by stages involving a multiplication of frequency.

I claim:—

1. A radio receiver comprising in combination an aperiodic pick-up circuit, a local oscillation generating circuit, a tube for mixing the energies from said two circuits comprising an anode, an electron-emitting element, a control grid and an auxiliary grid, means for conveying oscillations from said pick-up circuit to the control grid of said tube, means for conveying oscillations generated in said oscillation generating circuit to said auxiliary grid, an output circuit coupled to said anode, and an amplifier coupled with said anode circuit adapted to amplify a predetermined band of frequencies.

2. A radio receiver comprising in combination an aperiodic pick-up circuit, a local oscillation generating circuit, a tube for mixing the energies from said two circuits comprising an anode, an electron-emitting element, a control grid and an auxiliary grid, means for conveying oscillations from said pick-up circuit to the control grid of said tube, means for conveying oscillations generated in said oscillation generating circuit to said auxiliary grid, an output circuit coupled to said anode, and an amplifier coupled with said anode circuit adapted to amplify a predetermined band of frequencies, said amplifier comprising a plurality of thermionic repeating devices, said devices being coupled by fixed band-pass filters so designed that a band of frequencies of predetermined extent may be amplified.

3. A radio receiver comprising in combination an aperiodic pick-up circuit, a local oscillation generating circuit, means for varying the frequency of said local oscillation generator circuit, a tube for mixing the energies from said two circuits comprising an anode, an electron-emitting element, a control grid and an auxiliary grid, means for conveying oscillations from said pick-up circuit to the control grid of said tube, means for conveying oscillations generated in said oscillation generating circuit to said auxiliary grid, an output circuit coupled to said anode, and an amplifier coupled with said anode circuit adapted to amplify a predetermined band of frequencies, comprising a plurality of stages coupled by band-pass filters, said first-mentioned means constituting the sole means for tuning the receiver.

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