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UNICONTROL PERMEABILITY TUNING DEVICE FOR SUPERHETERODYNE RECEIVERS

Filed May 9, 1946

Fig. 1.

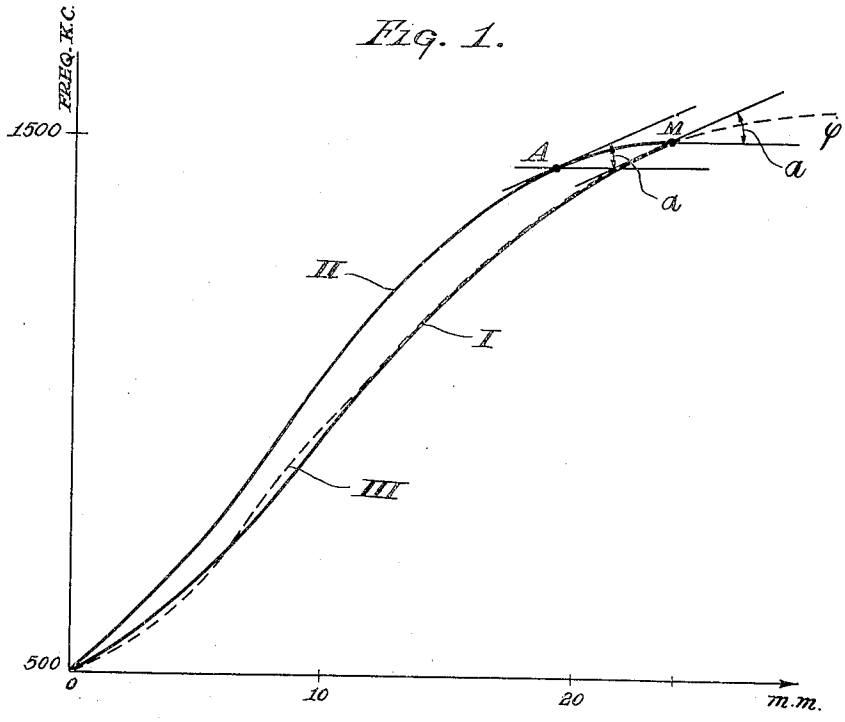
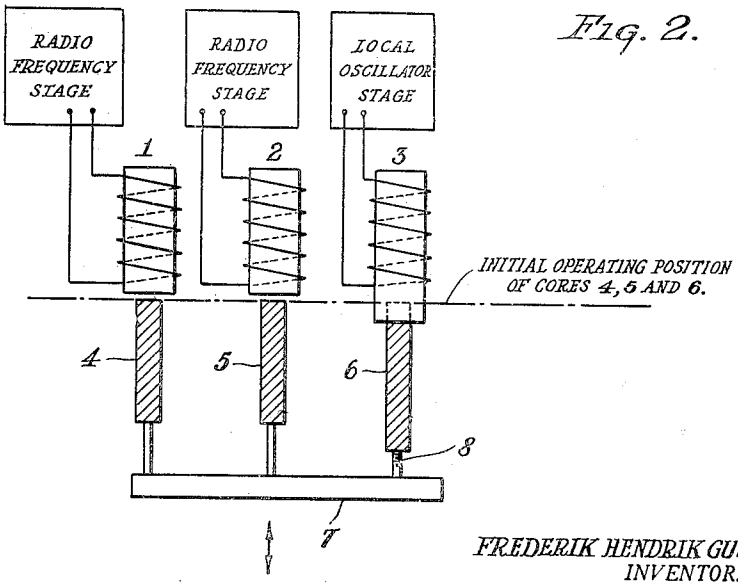


Fig. 2.



FREDERIK HENDRIK GUSDORF
INVENTOR.

BY

ATTORNEY.

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UNICONTROL PERMEABILITY TUNING DEVICE FOR SUPERHETERODYNE RECEIVERS

Frederik Hendrik Gusdorf, Eindhoven, Netherlands, assignor, by mesne assignments, to Hartford National Bank and Trust Company, Hartford, Conn., as trustee

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4 Claims. (Cl. 250—40)

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The present invention relates to a tuning device comprising slidable core coils for superheterodyne receivers, in which the desired frequency difference between the oscillator circuit and the preliminary circuits is mainly obtained by so choosing the effective permeability of the core of the oscillator coil on the one hand and of the cores of the preliminary circuits on the other hand as to be different. The effective permeability can be acted upon within different limits by the choice of the core material and the ratio between the diameter of the core and the diameter of the coil.

By adequately proportioning the different coil constants it can then be achieved that the frequency-difference between the oscillator-circuit and the preliminary circuits at the beginning and at the end of the range has exactly the correct value. Unless special precautions be taken, however, considerable deviations occur in the intermediate range. These deviations may be of the order of magnitude of 80 kc.

In order to make up for these deviations from the nominal difference-frequency various methods have already been proposed, all of which are comparatively complicated. The invention purports a very simple solution of this problem.

According to the invention this solution consists in that the oscillator coil is made longer than the coil of the preliminary circuits, the slide cores being at the same time provided in such manner that the core of the oscillator-coil extends already in the coil when the other cores are still beyond the corresponding coils. According to the invention the initial position of the core of the oscillator coil is preferably adjustable with respect to the oscillator-coil so that the minimum value of the inductance of this coil can be controlled.

The invention will be more fully explained by reference to Figure 1 of the accompanying drawing.

In this figure the line I represents the frequency of the preliminary circuits as a function of the position of the iron core. At the point O the core is assumed to be entirely inserted, and at the point M the core is assumed to be entirely moved out. The curve II represents the frequency variation of the oscillator circuit, it being supposed that by adequately proportioning the coil and the effective permeability the desired frequency-difference with respect to the preliminary circuits exists at O and M. In order to facilitate a comparison of the shape of the two curves the curve II is shifted over a distance corresponding to the desired frequency-difference

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so that the points O and M of both curves coincide. In the ideal case the curves should completely cover each other, but actually this is not the case.

The invention is based on the recognition that more particularly in the proximity of point M the slopes of the curves exhibit a considerable difference. The slope at M of curve I, which is determined by the angle α, is found only at point A in curve II.

According to the invention a great improvement in shape of curve II is obtained by using the point A to constitute the end point of the stroke of the core of the oscillator coil; in this case the core is consequently not entirely moved out for the minimum value of the inductance (maximum frequency) of the oscillator coil. In order to attain the same stroke as in the preliminary circuits and the correct minimum inductance the length of the coil must be increased at the same time. In order to obtain the correct initial and final value of the inductance the number of turns and/or the effective permeability may, if desired, be slightly varied at the same time.

The frequency curve of the oscillator circuit obtained according to the invention, by taking these measures extends relatively to those of the preliminary circuits as indicated by the dash curve III. This curve may be imagined to originate from curve II by turning and drawing out the last-mentioned curve in such manner that point A coincides with point M. In this case the deviations with respect to the ideal shape are extremely small. The portion MQ of curve III, which corresponds to the portion AM of curve II, is consequently not utilised since in the position corresponding to the minimum value of the inductance the core of the oscillator coil is not entirely moved out.

Fig. 2 represents one embodiment of the invention. This figure shows two preliminary circuit coils 1 and 2 respectively and an oscillator coil 3 which, according to the invention, has a greater length than coils 1 and 2 and, moreover, may have a slightly larger diameter. The corresponding iron cores are denoted by 4, 5 and 6 and in this form of construction the core 6 is longer than the cores 4 and 5. The cores are represented in the position of minimum inductance of the range in which the cores 4 and 5 are entirely moved out of the correspoding coils, the core 6 being still surrounded by a part of coil 3. The cores 4, 5 and 6 may be jointly moved in a direction of the axis

of the coils by means of the strip 7 in order to obtain the desired tuning of the circuits.

In this embodiment the core 6 is adjustable relatively to the strip 7 by means of the screw thread 8 so that the initial position of the core can be controlled with respect to the oscillator coil.

What I claim is:

1. A unicontrol permeability tuning device for a superheterodyne receiver having a plurality of radio frequency stages and a local oscillator stage, said device comprising a plurality of identical solenoid inductances for tuning said radio frequency stages, a plurality of identical insertable magnetic cores for varying the values of the respective inductances, a solenoid inductance element for tuning said oscillator stage and having a length exceeding the length of said inductances, a magnetic insertable core member for varying the value of said element and having a length exceeding the length of said cores, and control means mechanically connecting said cores and said member for simultaneous movement, said core and said member being arranged relative to said control means so that at the initial position of said control means said cores are entirely withdrawn from their associated inductances and said member is partially inserted in said element.

2. A unicontrol permeability tuning device for a superheterodyne receiver having a plurality of radio frequency stages and a local oscillator stage, said device comprising a plurality of identical solenoid inductances for tuning said radio frequency stages, a plurality of identical insertable magnetic cores for varying the values of the respective inductances, a solenoid inductance element for tuning said oscillator stage and having a length exceeding the length of said inductances, a magnetic insertable core member for varying the value of said element and having a length exceeding the length of said cores, control means mechanically connecting said cores and said member for simultaneous movement, said core and said member being arranged relative to said control means so that at the initial position of said control means said cores are entirely withdrawn from their associated inductances and said member is partially inserted in said element, and means to adjust the extent of insertion of said member within said element at the initial position of said control means.

3. A unicontrol permeability tuning device for a superheterodyne receiver provided with a radio frequency stage and a local oscillator stage, said tuning device comprising a solenoid inductor for tuning said radio frequency stage, a first magnetic core insertable in said inductor for varying the value thereof, a solenoid inductance element for tuning said oscillator stage, said inductance element having a length exceeding the length of said inductor, a second magnetic core insertable in said inductance element for varying the value thereof, and unitary control means mechanically ganging said first and second cores for effecting simultaneous axial movement thereof, said cores being arranged at points relative to said control means at which in the initial position of said control means said first core is entirely withdrawn from said inductor while said second core is partially inserted in said inductance element.

4. A unicontrol permeability tuning device for a superheterodyne receiver provided with a radio frequency stage and a local oscillator stage, said tuning device comprising a solenoid inductor for tuning said radio frequency stage, a first magnetic core insertable in said inductor for varying the value thereof, a solenoid inductance element for tuning said oscillator stage, said inductance element having a length exceeding the length of said inductor, a second magnetic core insertable in said inductance element for varying the value thereof, a controllable bridge member mechanically ganging said first and second cores for effecting simultaneous axial movement thereof, said cores being arranged at points relative to said bridge member at which in the initial position of said bridge member said first core is entirely withdrawn from said inductor while said second core is partially inserted in said inductance element, and means interposed between said bridge member and said second core to adjust the extent of insertion of said second core within said element at the initial position of said bridge member.

FREDERIK HENDRIK GUSDORF.

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