

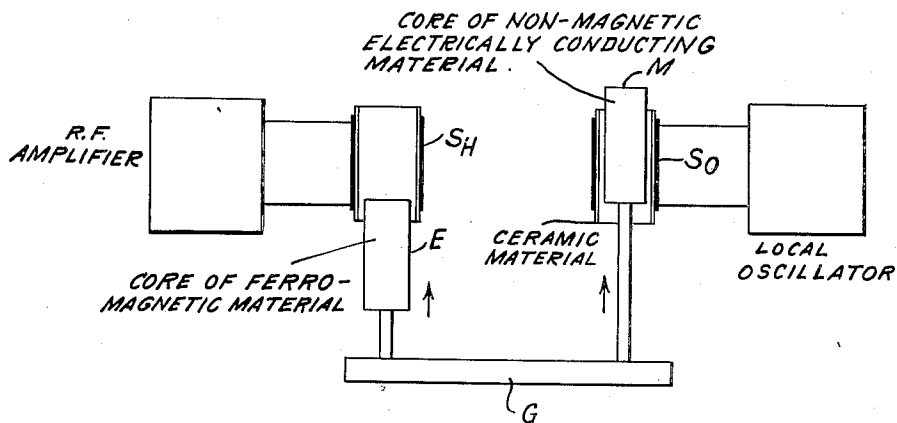
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SUPERHETERODYNE RECEIVER

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SUPERHETERODYNE RECEIVER

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It is known in the art to tune the oscillation circuits of a receiver apparatus by the aid of variometers comprising a coil with introducible ferro-magnetic core, say, a dust-core. The advantage of this tuning method is that the dimensions of the receiver may be reduced and that the tuning means are inexpensive, not to mention the fact that an absolutely constant bandwidth is obtainable inside a certain range. One shortcoming of the said tuning method, however, is that the oscillation circuits are not sufficiently insensitive to temperature effects. This drawback may be avoided, if, as known in the art, a non-magnetic, but electrically conducting metal, for instance, copper is employed for tuning rather than ferromagnetic cores.

But this tuning method using an electrically conducting core in turn involves the shortcoming that the damping coefficient is very much greater than when dust-cores are employed for the tuning, that is to say, it amounts to a few percent, whereas in the use of dust-cores the damping coefficient amounts to only up to 1 percent.

Now, the invention resides in the fact that the said two tuning methods known in the prior art are united and combined in the following way: In a superheterodyne apparatus the variometer of the oscillator according to the invention which is unaffected by temperature effects as far as frequency is concerned, consists of a coil with a movable, non-magnetic, electrically-conducting metal core, whereas the variometers of the RF circuits tuning to the incoming or signal frequency and which are less unaffected by temperature effects consist of coils comprising moving ferromagnetic cores.

It is known that in a superheterodyne apparatus it is particularly important that the oscillator operation should be unaffected by temperature actions seeing that the oscillator frequency determines the IF and that the main selection takes place in the IF stages. By the use of electrically conducting metal it is an easy matter to make a variometer and its operation independent of temperature effects, say, by the use of a ceramic body bearing a layer or film of metal brought thereon by some suitable method. If the demands regarding temperature stability are very severe then the coil may consist of a hollow ceramic body or support with a winding applied thereon, for instance, by burning or heat action.

In the RF stages the problem of temperature constancy or stability is not quite so serious, for it will be remembered that in the RF stage or

stages which, as known serve chiefly for precluding the image frequencies and suppressing the tendency to cross modulation in the case of powerful transmitter stations, selection even where the band-pass filter principle is resorted to is still so low that it hardly plays any part at all in comparison with IF selection. In the case of telegraphic signal reception inadequate and defective temperature stability in the RF circuits, of course, is still less important than in the case of reception of telephonic signals.

However, what is essential for the RF stages is that the input value, in other words, the ratio between the RF or signal potential at the grid of the first or input tube to the RF potential supplied from the antenna and the amplification should be high, if for no other reason than that of noise reduction. Hence, the use of ferromagnetic cores in the RF stages is advantageous. In the oscillator, on the other hand, the disadvantage inherent in the use of a metallic core, namely, its damping effect and the incidental loss in gain, can be eliminated by adequate feedback quite easily.

It will thus be seen that the invention takes advantage simultaneously of the merits of both tuning methods while making conditions so that the drawbacks thereof, which, in the use of either of the two tuning methods alone becomes unbearable, play only a secondary and unimportant role.

The invention is schematically illustrated in the appended drawing which shows an exemplified embodiment thereof. The coil of the RF oscillation circuit is denoted by SH while the corresponding coil of the oscillator is denoted by SO.

In the coil SH the iron-core coil E is shifted, while at the same time by the agency of the coupling rod G the core M consisting of electrically conducting material is withdrawn from the corresponding coil SO. It will be remembered that the iron-core produces an inductance-raising effect, while a core made of electrically conducting material causes a reduction in inductance.

The tendency of the frequency characteristics of both variometer types as a function of the depth of introduction of the cores is similar for non-magnetic metals and RF iron. The exact adjustment to synchronism or the equalization of disparities of the curves is effected either mechanically, say, by compensator cams or else by choosing different forms for the elements that are telescoped.

In order to obtain synchronism between the RF circuits and the oscillator circuit it is, as known in the earlier art, possible to connect in parallel to the circuit of the higher frequency (which mostly is the oscillator circuit) an inductance the value of which is fixed once and for all, and to connect in series another fixed inductance.

I claim:

1. In a superheterodyne radio receiver of the type having a variable inductance coil for tuning the radio frequency stage and a second variable inductance coil for tuning the local oscillator stage, characterized in that a core solely of ferro-magnetic material is associated with the radio frequency coil and a core solely of non-magnetic, electrically conducting material is associated with the oscillator coil.

2. In a superheterodyne radio receiver of the type having a variable inductance coil for tuning the radio frequency stage and a second variable inductance coil for tuning the local oscillator stage, characterized in that a core solely of ferro-magnetic material is associated with the radio frequency coil and a core solely of non-magnetic, electrical conducting material is associated with the oscillator coil, a single means for adjusting

said two cores in unison, and said single means being adjusted between one extreme position, wherein one of said cores is substantially fully inserted within its coil while the other of said cores is substantially completely out side of its coil, and another extreme position wherein said last named core is substantially completely inserted within its coil while the other core is substantially completely outside its coil.

3. In a superheterodyne receiver having a tunable radio frequency stage and a tunable local oscillator stage, a tuning element for said radio frequency stage comprising an inductance coil having a movable core composed substantially solely of ferro-magnetic material, a tuning element for said local oscillator stage comprising an inductance coil having a movable core composed substantially solely of non-magnetic conducting material, and a single means for adjusting said two cores in unison, said last named inductance coil being wound on a form of material having a low temperature coefficient of expansion to thereby minimize the effect of temperature changes on the frequency of the local oscillator.

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