May 16, 1939. W. C. HILL 2,158,822

RADIO FREQUENCY SELECTION AND OSCILLATORY AMPLIFICATION ELEMENT

Filed March 16, 1936

FIG 1.

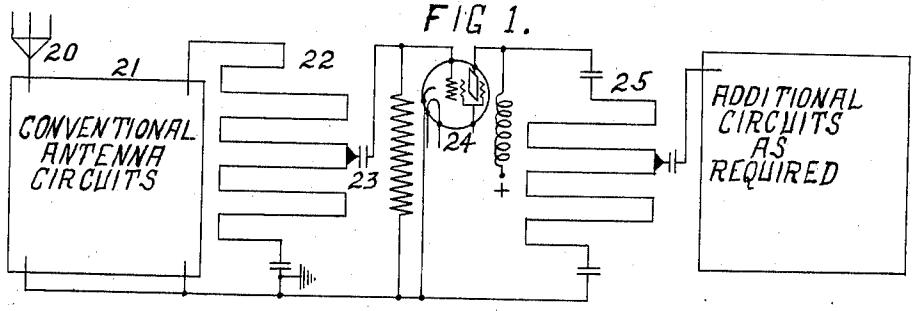


FIG 2.

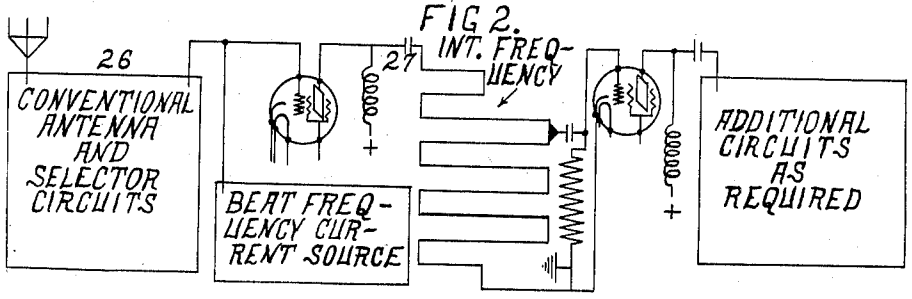


FIG 3.

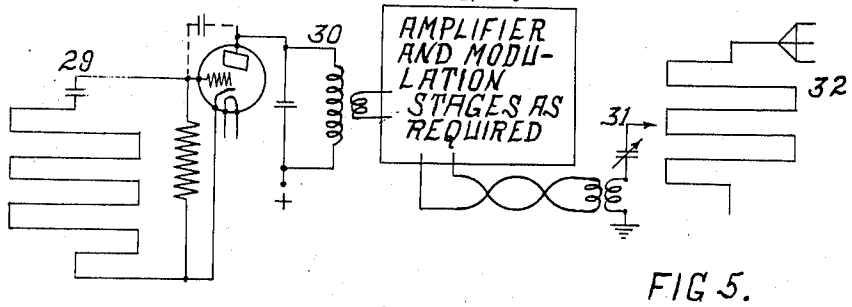


FIG 4.

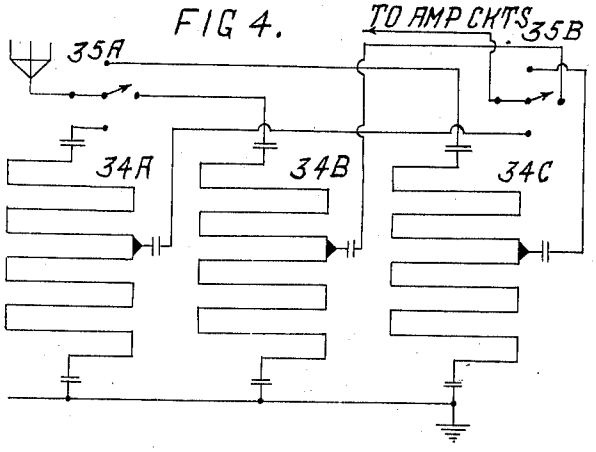
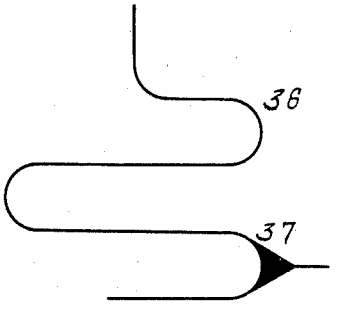


FIG 5.



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RADIO FREQUENCY SELECTION AND OSCILLATORY AMPLIFICATION ELEMENT

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2 Claims. (Cl. 178—44)

My invention relates generally to the use of an independent circuit element consisting of a calibrated length of wire, wound or folded so that there will not be any effective self inductance in the wire as a whole. The object of this invention is to show various communication systems and units which employ this circuit element.

The noninductive length of wire elements described as this invention are intended to be used when practicable in place of the conventional capacity-inductance tuned circuits which are now generally utilized for frequency selection and oscillatory amplification means.

My length of wire element is composed of an electrical conductor wound or folded so that the electrostatic and electromagnetic fields created by the resonant frequency current in one portion of the element are effectively opposed and cancelled by the fields created by the current in another portion of the element. In practical construction the length of wire element is composed of a group of substantially parallel wires, lying in the same general plane, and connected in series to form a substantially noninductive conductor which can oscillate at the working frequency when it is properly connected to the resonate frequency power.

When the length of wire element circuit is terminated at each end by a series resonant force—such as the plate and cathode terminals on an associated radio tube—the electrical length in the circuit including the length of wire element should be equal to a one half wavelength, or a multiple thereof, of the working frequency. The voltage potential is at a maximum difference between electrical midpoints, or half wavelength points, in the element circuit.

The self inductance of the element is minimized by construction as the presence of self inductance in the element will introduce to the element circuit the loss factor that is always associated with nonresonate inductance. Series condensers do not affect the operativeness of the element circuit, and so may be used as desired.

In the drawing:

Figure 1 shows the length of wire element being employed as the frequency selection and oscillatory amplification means in a single frequency receiving system.

Figure 2 shows the length of wire element utilized in the intermediate frequency selection and oscillatory amplification circuit in a conventional superheterodyne receiving system.

Figure 3 shows the length of wire element utilized as the frequency determination means in a master oscillator circuit.

Figure 4 shows three length of wire elements, the selection being accomplished by a conventional receiver gang switch. This figure indicates the intention of this invention that a multiple number of different frequency length of wire elements may be employed in a receiving system so as to provide for multiple frequency reception. Conventional shielding of the length of wire elements may be employed.

Figure 5 indicates what is meant by a "fanned" output connection to a length of wire element.

Referring to the drawing the numeral **20** indicates a receiving antenna. **21** indicates conventional antenna circuits. **22** is a length of wire element which is operating in a full wavelength circuit. Only all phase values of one cycle of the working frequency are included in a full wavelength circuit. The output conductor **23** is located at the electrical mid-point, or half wavelength point, in the element circuit. Item **24** is the first amplifier tube. **25** is a second length of wire element which is similar to the first length of wire element item **22**.

Numeral **26** indicates the conventional antenna and selector circuits in a superheterodyne receiving system. The beat frequency oscillator current beats against the incoming signal to form the intermediate frequency signal. Item **27** is a full wavelength length of wire element in a circuit operating on the receiver intermediate frequency. **28** indicates the optimum width output connection to the length of wire element, at the electrical mid-point of the element circuit.

Numeral **29** shows a half wavelength of wire element which serves as the frequency determination means for the master oscillator circuit. The electrical midpoint, or half wavelength point, in this element circuit is located at the extreme end of the element circuit. Item **30** indicates a conventional capacity-inductance tuned circuit which may be utilized in this master oscillator circuit. **31** is a variable RF power tap to a noninductive length-of-wire item **32**. By properly varying the RF power tap on the noninductive length-of-wire the radiating antenna may be made the exact desired electrical length.

Items **34***a*, **34***b*, and **34***c* are different operating frequency length of wire elements. The selection of any element and its associated output conductor may be accomplished by the gang switches **35***a* and **35***b*.

Item **37** is an optimum width output conductor connected to the length of wire element item **36**.

The sharpness to which the length-of-wire receiving circuit elements tune is governed to a limited degree by the width of the coupling employed at the connection of the midpoint output wire. If this coupling wire is fanned at the point of contact with the length-of-wire element the frequency response will be made relatively broad. Conversely, when the output coupling wire is sharp at the point of contact the tuning will be relatively sharp. Tuning in this sense means the ability of the length-of-wire element to respond to a more or less wide band of frequencies.

There are several methods whereby the length-of-wire circuit element may be constructed so as to form a compact element. It is only necessary that the fields of one length of wire be in the opposite direction to the fields of one of the wires adjacent to it. Occasionally the purposes of this invention can be served by employing a straight length of wire in place of the folded wire. This would generally be possible on only the highest frequencies inasmuch as the length of the wire would be prohibitive on the lower frequencies.

Although I have shown and described herein preferred embodiments of my invention, it is to be definitely understood that I do not desire to limit application of the invention thereto, and any change or changes may be made in the structure and arrangement of the parts within the spirit of the invention and scope of the subjoined claims.

What is claimed is:

1. A radio frequency selection element, including in combination, a group of substantially parallel wires connected in series forming a substantially noninductive conductor that can oscillate at the working frequency, and an output conductor connected to the noninductive conductor at the electrical middlepoint of the latter.

2. A radio frequency selection element, including in combination, a group of substantially parallel wires connected in series forming a substantially noninductive conductor that can oscillate at the working frequency, and an output conductor connected to the noninductive conductor with a fanned connection of optimum width.

WARREN C. HILL.