

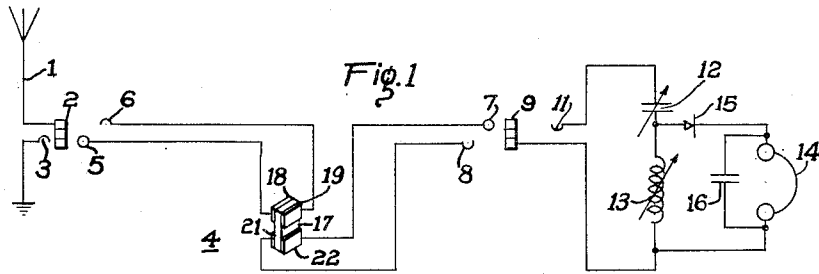
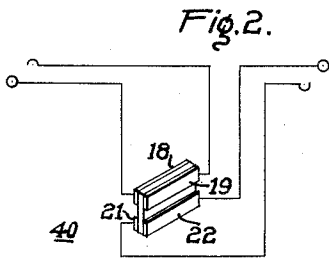
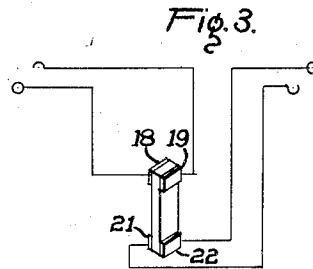
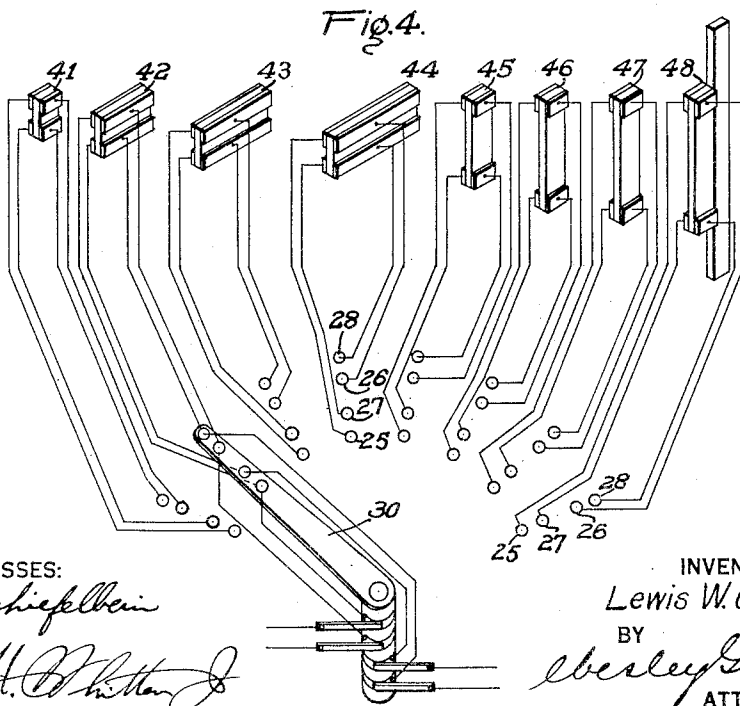
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L. W. CHUBB

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SELECTIVE COUPLING FOR RADIO SYSTEMS

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WITNESSES:

Alfred Schiefelbein
W. H. Whitman

INVENTOR

Lewis W. Chubb

BY

Charles E. Carr
ATTORNEY

UNITED STATES PATENT OFFICE

LEWIS W. CHUBB, OF SWISSVALE, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE
ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA

SELECTIVE COUPLING FOR RADIO SYSTEMS

Application filed August 30, 1923, Serial No. 690,127. Renewed August 27, 1928.

This invention relates to receiving circuits for radio signals.

It is an object of this invention to materially reduce the difficulty of tuning radio circuits.

More particularly, it is an object of this invention to provide a plurality of interchangeable tuned devices which may be connected into the receiving set and which, when so connected, will, without other adjustments, determine the frequency to which the set will respond.

It is a further object to provide means whereby the operator may instantaneously arrange his receiving system so that it is insensitive to the signals sent out by any but the selected one of a number of sending stations.

It is a further object of this invention to provide a system wherein it is only necessary that the operator tune a single circuit to receive the desired signal.

Piezo-electric crystal devices sometime shatter with explosive suddenness under the action of an excessively strong alternating electrostatic field of the frequency corresponding to the natural period of the crystal. It is another object of this invention to so arrange the system that accidents of this character will be unlikely.

These and other objects of my invention will be made apparent through the further description of my invention and by reference to the accompanying drawings, wherein

Figure 1 is a diagrammatic illustration of a receiving system in which my invention is employed.

Fig. 2 is a diagrammatic illustration of a device which may be interchanged with a corresponding device shown in Fig. 1.

Fig. 3 is a similar illustration of another device which may be thus interchanged.

Fig. 4 is a diagrammatic illustration of a set of devices intended to be interchangeably introduced into the system shown in Fig. 1.

In Fig. 1, an antenna 1 is provided with a jack including a ring 2 and an inner contact 3. A coupling device 4 is supplied with a plug having a tip 5 and a sleeve 6 for co-operation respectively with the inner contact

3 and the ring 2. At the other end of the coupling device, there is a plug having a tip 7 and a sleeve 8 for readily connecting the coupling device to a detector circuit. This circuit has a jack having a ring 9 and an inner contact member 11 which co-operate with the sleeve 8 and the tip 7, respectively. The detector circuit includes an adjustable condenser 12 and an adjustable conductor 13 for tuning. Shunted around one of these tuning elements, as illustrated, around the inductor, is a telephone 14 and a rectifier 15 in series. A small condenser 16 is placed in parallel with the telephone 14 in the usual way.

The essential part of the coupling device 4 is a piezo-electric crystal 17. Upon opposite faces of this crystal are conducting elements 18 and 19 connected respectively with the tip 5 and the sleeve 6. The same pair of opposite faces of the crystal 17 are also provided with conducting elements 21 and 22 connected, respectively to the tip 7 and the sleeve 6.

When the plugs are inserted in the jacks, the coupling device 4 affords a means for transferring the energy received on the antenna 1 to the detector circuit. This device acts, however, as an extremely loose coupling for all frequencies except the one frequency to which the piezo electric crystal is tuned. For this frequency, the coupling device acts as a very close coupling. The arrangement is, therefore, highly selective and very little energy will be received in the detector circuit except when the frequency of the energy is that to which the piezo-electric device is tuned. When the energy received upon the antenna is of this frequency it will be very efficiently transferred to the detector circuit. If the detector circuit is tuned for energy of this frequency, signals will be heard in the telephone 14. If not, there will be silence, since no energy of any other frequency reaches the detector circuit. The operator, therefore, is able to tune his receiving system by adjusting one circuit only, and he is not troubled with interfering sounds during this tuning.

When it is desired to receive signals of a different frequency, the coupling device 4 is

moved from the circuit and the coupling device 40, illustrated in Fig. 2 is substituted. This device is like the coupling device 4 already described except that one dimension of the piece of crystal is different. At high frequencies, the length, in the dimension required to tune the piezo-electric device, is small. In order to accommodate the conductor elements 18, 19, 21 and 22 and to locate them at a sufficient distance apart to prevent effective electrostatic induction between them, the piece of crystal must be of sufficient size. If the direction in which the crystal is cut is chosen so that the dimension which determines the frequency is parallel to the plane of the plates 19 and 22 and at right angles to the direction in which these plates are separated, the necessary saving in space will be accomplished. The crystal shown in Fig. 2 differs from that shown in Fig. 1 by having this dimension greater, but the distance separating the plates 19 and 22 in Fig. 2 remains the same as in Fig. 1, being in each case as great as is permitted by the size of the crystal from which the tuned pieces are cut.

A number of crystals of different length are provided in order that the receiving system may be readily adapted to receive signals of several different wave lengths. When the length of the crystal, in the direction that will determine the frequency to which it is tuned, becomes great enough to afford the necessary separation between the plates 19 and 22, the piece is cut from the crystal in the direction at right angles to that used for the smaller pieces; so that the distance, selected because it determines the frequency, automatically provides for the separation of the condenser elements. Crystals cut in this way need be no wider than the smallest of the crystals cut in the other way. For still greater periods, instead of attempting to provide very long pieces of crystal, pieces may be used whose period is increased by the addition of a suitable loading mass cemented to the crystal, as illustrated in Fig. 4.

It will be obvious that, instead of separate devices, a set of such devices, assembled within a single case, may be used. Fig. 4 is intended to illustrate such a set. The several coupling devices 41 to 48, differ in length in the direction which determines their frequencies. The coupling devices beginning with 45 shown the change of direction in cutting the piece of crystal for the longer periods and the coupling device shown at 48 shows the provision for further increasing the period by loading the piece of crystal. When a set of coupling devices is arranged within one case, as described, any convenient method may be used for connecting any selected device into the circuit illustrated in Fig. 1. For example, the conductors running from each of the conducting elements may be to

contact devices 25, 26, 27 and 28 which correspond to the contact devices 5, 6, 7 and 8 in Fig. 1. These contact devices may be arranged in arcuate relation about a pivoted handle 30, carrying contacts which correspond to the jacks illustrated in Fig. 1. Any suitable connections on the handle may be employed to complete the connection. If preferred, a pivoted handle may be replaced by a separate switching device for each coupler and these devices may be actuated by push buttons, snap switches, or the like.

Although I have illustrated and described in detail a limited number of embodiments of my invention, it will be apparent to those skilled in the art that many modifications may be made and the structural details may be varied through a great range without departing from the spirit of this invention, I therefore, do not intend the patent to be limited except as necessitated by the prior art or indicated by the claims.

I claim as my invention:

1. In a receiving system, a plurality of piezo-electric devices each provided with connecting means, a receiving system including co-operating connecting means, the connecting means upon the piezo-electric devices being adapted to interchangeably co-operate with the connecting means in the receiving system, whereby any one of the piezo-electric devices may be connected at will into said receiving system.

2. A tuning device for a receiving system comprising a plurality of piezo-electric crystals of graduated length and means whereby any one of said crystals may be connected into the system.

3. A selective device for a radio receiving system comprising a plurality of piezo-electric coupling devices assembled into a set and connecting means associated with said set whereby any of said coupling devices may be connected in circuit.

4. In a radio receiving system, an untuned antenna circuit, a tuned detector circuit, and a piezo-electric coupling device between said circuits.

5. In combination, non-selective radiant energy collecting means, a tunable circuit, a coupling device comprising a pre-calibrated piezo-electric crystal section interposed between said means and said circuit, and indicating means controlled by said circuit, whereby said indicating means is influenced only by radiant energy corresponding in frequency to the pre-calibration of said piezo-electric crystal section and the selectivity corresponding to a plurality of successive similarly tunable circuits is obtained.

6. In combination, non-selective radiant energy collecting means, a tunable circuit, a coupling device comprising a plurality of pre-calibrated piezo-electric crystal sections, means for at will utilizing any one of said

sections for coupling said means to said circuit, and indicating means controlled by said circuit, whereby said indicating means is influenced only by radiant energy corresponding in frequency to the selected crystal section to the exclusion of neighboring frequencies, and the selectivity corresponding to a plurality of successive similarly tunable circuits is obtained.

7. In a signaling system, an energy-converting device, an input circuit for impressing high-frequency oscillatory energy on said device, an output circuit associated with said device, and a plurality of piezo-electric crystals each having a different fundamental frequency arranged to be capacitatively included in said input circuit.

8. In a signaling system, an energy-converting device, an input circuit for impressing high-frequency oscillatory energy on said device, an output circuit associated with said device, a plurality of piezo-electric crystals each having a different fundamental frequency, and means for electrostatically associating a selected one of said crystals with said input circuit.

In testimony whereof, I have hereunto subscribed my name this 23rd day of August, 1928.

LEWIS W. CHUBB.