May 9, 1933. J. ROBINSON 1,908,558

WIRELESS RECEIVER

Filed Nov. 21, 1930

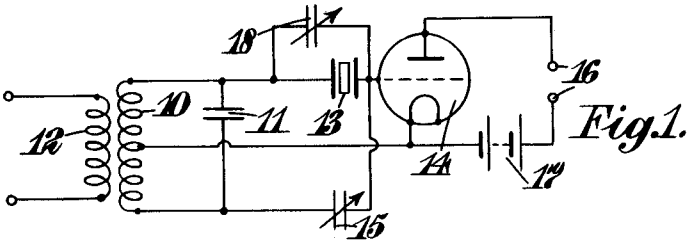

Fig.1.

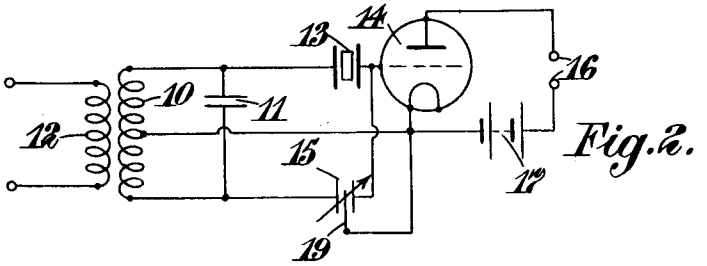

Fig.2.

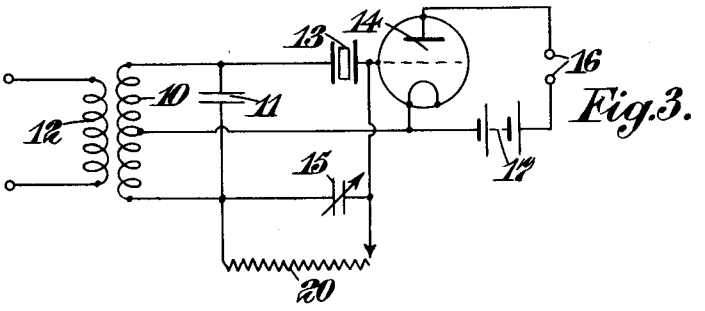

Fig.3.

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UNITED STATES PATENT OFFICE

JAMES ROBINSON, OF LONDON, ENGLAND, ASSIGNOR, BY MESNE ASSIGNMENTS, TO BRITISH RADIOSTAT CORPORATION LIMITED, A CORPORATION OF CANADA

WIRELESS RECEIVER

Application filed November 21, 1930, Serial No. 497,270, and in Great Britain December 10, 1929.

This invention is for improvements in or relating to wireless receivers, and is concerned with receiving apparatus employing piezo-electric or equivalent highly selective devices for the purpose of providing a high order of selectivity for the apparatus. Owing to this high selectivity, difficulty may be experienced in tuning in any particular given transmission particularly with such means as are normally employed for adjustment over a wide range of frequencies. One form of receiver with which this invention is concerned is described in my prior U. S. Letters Patent Nos. 1,821,032 and 1,821,033, granted September 1, 1931, and comprises a form of super-heterodyne receiver wherein piezo-electric or other highly selective means is employed in an intermediate frequency stage thereof.

One object of this invention is to simplify the tuning of these very selective receivers and the invention comprises a wireless receiver employing a highly selective device such as a piezo-electric device, wherein means are provided to render the selective device partially or wholly ineffective at will. Thus in tuning the receiver to any desired transmission the selective device may be rendered ineffective and the location of the transmission made by the adjustment of normal tuning circuits having a comparatively broad frequency response. The selectivity may then be increased up to the limit imposed by the highly selective device in order to give greatest freedom from interference.

In one form of the invention as applied to a receiver employing a piezo-electric device there is provided means for increasing the capacity of the mounting of the piezo-electric crystal such for example as a variable condenser in parallel therewith.

In another form of the invention as applied to a wireless receiver employing a piezo-electric device and a condenser for balancing out undesirable effects due to the piezo-electric device (for example as described in application Ser. No. 460,054, filed 9th June 1930), means are provided for producing a temporary unbalance, such for example as an additional movable electrode for the condenser aforesaid.

Alternatively, instead of employing the additional electrode aforesaid a variable resistance may be provided (for example in parallel with the condenser) which assists in reducing the undesirable effects above-mentioned and is adjustable at will to render the piezo-electric device partially ineffective.

Further objects and features of the invention will be apparent from the following description taken in connection with the accompanying drawing, in which

Figure 1 is a diagrammatic representation of the central portions of a receiving circuit embodying the principles of the present invention; and

Figures 2 and 3 are diagrammatic representations of modified forms of the invention.

Several specific selective systems embodying the invention are illustrated by way of example in the accompanying drawing in which only those parts of receivers which are concerned in this invention are shown, but it will be understood that amplifying or other devices normal to wireless receivers will be used.

The selective system shown in the drawing employs a piezo-electric crystal in order to provide high selectivity, and is primarily intended to form part of the intermediary frequency stage of a super-heterodyne receiver. It will be understood however that highly selective devices other than piezo-electric devices may be employed and in those cases where the highly selective devices are tunable they may be applied to receivers other than those of the super-heterodyne type.

Referring to the drawing in which like references indicate like parts there is shown in Figure 1 a tuned circuit comprising a coil 10 and a condenser 11 which is energized by means of an input coil 12, electromagnetically coupled to the coil 10. A piezo-electric device 13 is connected in series between one side of the tuned circuit and the input electrode of a thermionic valve 14 and a variable condenser 15 is connected in series between

the other side of the tuned circuit and the input electrode of the valve. A tapping upon the coil 10 is connected to the cathode of the valve, and the anode circuit of the valve includes output terminals 16 and a battery 17.

The condenser 15 is employed to balance out or suppress undesirable effects due mainly to the capacity of the piezo-electric device 13 as described in application Ser. No. 460,054, filed June 9th, 1930.

In accordance with this invention an additional variable condenser 18 is provided in parallel with the piezo-electric device. Normally if the system is operated for maximum selectivity the condenser 18 is adjusted to the zero or other predetermined low value, and when it is desired to decrease the selectivity of a system this condenser is adjusted to increase its capacity to a greater or lesser extent according to the broadness of the tuning desired. The condenser 18 thus constitutes a bye-pass for the piezo-electric device which is not compensated for by the condenser 15. Although the condenser 15 can in effect be adjusted to provide this bye-passing effect, consequent resetting will be necessary upon each occasion whereas by employing the condenser 18 it has only to be returned to a definite position such as a zero position for which a mechanical stop may be provided.

Instead of employing the condenser 18 connected in parallel with the piezo-electric device 13 this condenser may be connected in parallel with the condenser 15 or simply, as shown in Figure 2, there is provided for the condenser 15 an additional electrode 19 which is adjustable into and out of the dielectric gap between the electrodes of the condenser 15. With the electrode 19 withdrawn from the condenser 15 the selective arrangement is operated to provide maximum selectivity, and by introducing the electrode 19 between the electrodes of the condenser 15 the correcting effect of this condenser is upset and the system becomes less selective.

In the embodiment shown in Figure 3 instead of the condenser 18 or the electrode 19, there is provided a variable resistance 20 connected in parallel with the condenser 15. This variable resistance serves to assist the condenser 15 in balancing or suppressing undesirable effects passing the piezo-electric device 13. By adjustment of this resistance from the normal position for best selectivity the piezo-electric device is rendered partially effective without disturbing the adjustment of the condenser 15 which serves to balance or suppress the major portion of the undesirable effects passing the piezo-electric device 13. Instead of coupling the variable resistance 20 in parallel with the condenser 15 it may be connected across the upper portion of the coil 10, or provided the resistance has an infinity position it may be connected in parallel with the piezo-electric device 13.

It will be understood that the invention is not limited to the use of a piezo-electric device in order to obtain high selectivity, nor to the particular means specifically described for rendering the piezo-electric device partially or wholly ineffective.

I claim:—

1. Radio receiving apparatus comprising in combination a broadly tuned resonator for applied signals, a highly selective mechanical resonator associated with said broadly tuned resonator for effecting a close selection of the wanted signals, and means associated with the said highly selective resonator and operable at will to render the latter substantially ineffective, whereby initial tuning by means of the broadly tuned resonator is facilitated.

2. Radio receiving apparatus comprising a broadly tuned resonator for applied signals, a highly selective mechanical resonator fed by said broadly tuned resonator and effecting a close selection of the wanted signals, and means associated with the said highly selective mechanical resonator operable at will to render the latter substantially ineffective.

3. Radio receiving apparatus comprising in combination a broadly tuned resonator for applied signals, a highly selective mechanical resonator associated with said broadly tuned resonator for closely selecting the wanted signals but responding also to a small degree to other signals, means for suppressing the undesired signals passing the highly selective resonator, and means associated with the said highly selective resonator to render the latter substantially ineffective at will.

4. Radio receiving apparatus comprising in combination a broadly tuned resonator for incoming signals, a piezo-electric device associated with said broadly tuned resonator to effect a close selection of the wanted signals, said piezo-electric device having an inherent shunt capacity, and means operable at will for increasing the shunt capacity of the piezo-electric device to an extent sufficient to render the latter substantially ineffective.

5. Radio receiving apparatus comprising in combination a broadly tuned resonator for incoming signals, a piezo-electric device associated with said broadly tuned resonator to effect a close selection of the wanted signals, said piezo-electric device having an inherent shunt capacity, and a variable condenser in shunt with the piezo-electric device for increasing at will the capacity of the piezo-electric device to an extent sufficient to

render the latter substantially ineffective.

6. Radio receiving apparatus comprising in combination a broadly tuned resonator for the incoming signals, a piezo-electric device associated with said broadly tuned resonator to effect a close selection of the wanted signals but responding also to a small degree to other signals of different frequency, a condenser connected in balanced relation with said piezo-electric device to suppress undesired signals passing the piezo-electric device, and means operable at will for effecting a substantial variation of the capacity of the said condenser to render the piezo-electric device substantially ineffective.

7. Radio receiving apparatus comprising in combination a broadly tuned resonator for the incoming signals, a piezo-electric device associated with said broadly tuned resonator to effect a close selection of the wanted signals but responding also to a small degree to other signals of different frequency, a condenser having at least two electrodes and connected in balanced relation with said piezo-electric device to suppress undesired signals passing the piezo-electric device, and an auxiliary electrode movable between the said electrodes of the condenser to render the piezo-electric device substantially ineffective.

8. Radio receiving apparatus comprising in combination a broadly tuned resonator for incoming signals, a piezo-electric device associated with said broadly tuned resonator for closely selecting the wanted signals but responding also to a small degree to other signals of different frequency, a condenser connected in balanced circuit relation with the piezo-electric device to reduce undesired signals passing the latter, and a variable impedance connected to said balanced circuit and operable at will to render the piezo-electric device substantially ineffective.

9. Radio receiving apparatus comprising in combination a broadly tuned resonator for incoming signals, a piezo-electric device associated with said broadly tuned resonator for closely selecting the wanted signals but responding also to a small degree to other signals of different frequency, a condenser connected in balanced circuit relation with said piezo-electric device to reduce undesired signals passing the latter, and a variable resistance connected in parallel with the said condenser and operable at will alternatively to render the balanced circuit effective to prevent the undesired effects passing the crystals, and to render the piezo-electric device substantially ineffective.

In testimony whereof I affix my signature.

JAMES ROBINSON.