

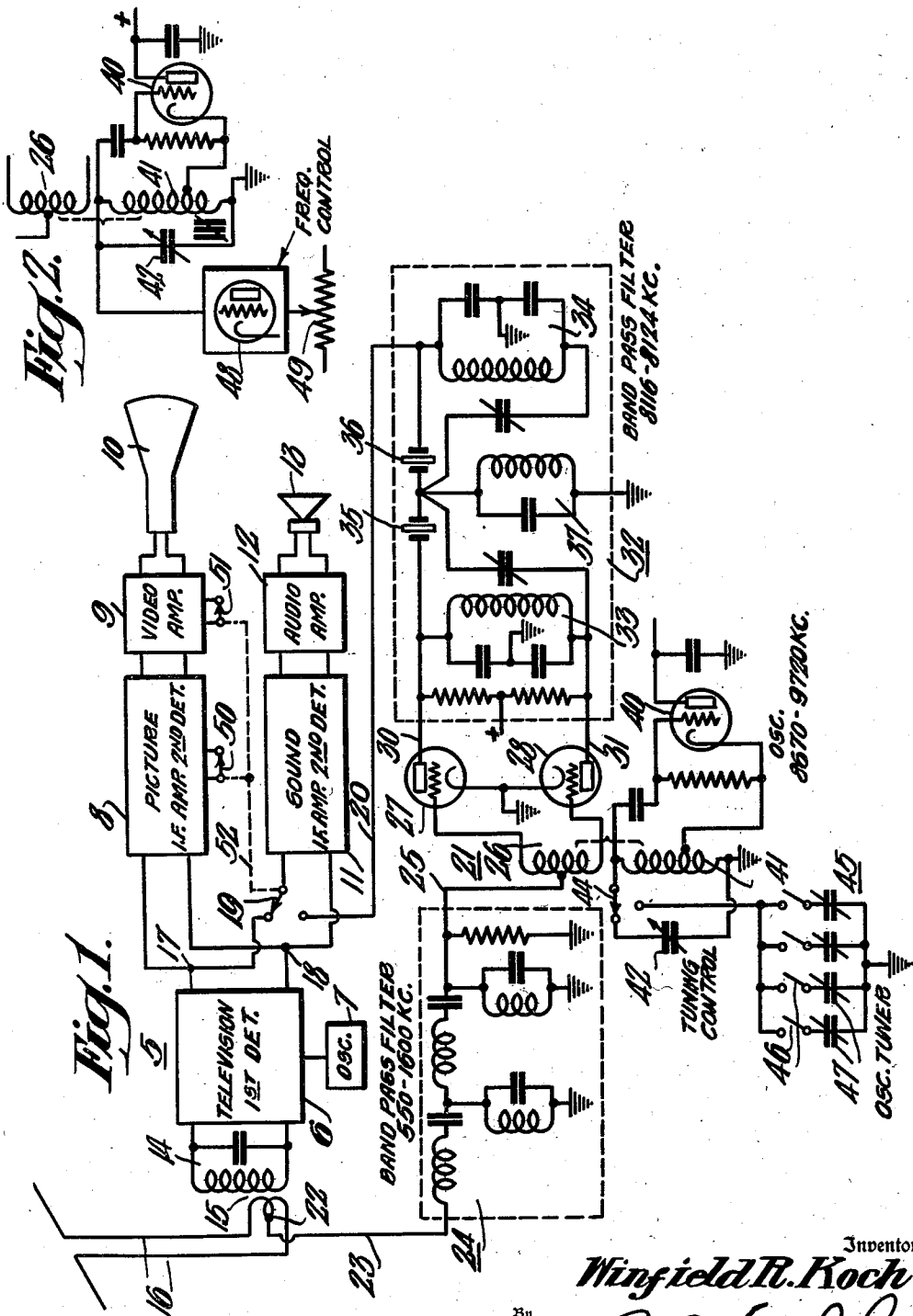
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LOW FREQUENCY TUNING SYSTEM

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LOW FREQUENCY TUNING SYSTEM

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6 Claims. (Cl. 250—20)

This invention relates to a low frequency or broadcast signal tuning system for adapting a television or other high frequency receiver to be used for broadcast or low frequency reception, and has for its primary object to provide an improved and simplified system of this character.

It is also an object of this invention to provide a combined television or high frequency and broadcast or low frequency signal receiving system, wherein the high frequency sound I.-F. amplifier and audio frequency amplifier portion of the high frequency receiver may be utilized for broadcast reception with minimum apparatus, and with effective selectivity with a tunable oscillator circuit alone in the low frequency or broadcast band tuning.

The invention will be further understood from the following description when considered in connection with the accompanying drawing, and its scope is pointed out in the appended claims.

In the drawing:

Figure 1 is a schematic circuit diagram of a signal receiving system embodying the invention; and

Figure 2 is a similar schematic circuit diagram of a portion of the circuit of Fig. 1 showing a modification thereof.

Referring to Fig. 1, 5 is a television receiver comprising a first detector 6, an oscillator 7, a picture I.-F. amplifier and second detector 8, a video amplifier 9 and a suitable viewing tube 10, which may be of the type indicated in the drawing, known in the commercial market as a Kinescope. The deflecting and synchronizing circuits may be considered to be part of the video amplifier indicated in the drawing. The remainder of the television receiver includes a sound I.-F. amplifier and second detector 11, an audio frequency amplifier 12 coupled thereto and a suitable loudspeaker device 13.

The first detector is coupled through the input circuit 14 and a coupling transformer 15 to a diode or other suitable antenna 16, and is provided with output circuit connections 17—18 for the picture and sound channels. The sound channel is provided with a switch 19 for connecting the input side of the sound I.-F. amplifier to an auxiliary input circuit 20 which forms the output circuit for broadcast or low frequency tuning system 21. Signals are applied to the low frequency tuning system, preferably although not necessarily from the same antenna system 16. In the present example, a tap connection 22 on the dipole circuit connects the dipoles in parallel to the low frequency input circuit 23—24. The latter is of the fixed band pass type for limiting the signal response of the system to a desired frequency range, such as the frequency range between 550 and 1600 kc., for example.

The output circuit connection 25 from the band pass filter input circuit is connected to a bal-

anced detector circuit 26 and a push-pull detector comprising two amplifier tubes 27 and 28 arranged in balanced relation to the input circuit 26 and to an output circuit 30—31 which is connected to a high frequency band pass filter 32.

The filter 32 comprises two tuned circuits 33 and 34 at the input and output ends, between which are interposed two neutralized piezoelectric crystals 35 and 36 in series together with a resonant circuit 37 connected in shunt across the filter, providing for the transmission of signals from the detector 27—28 to the circuit 20 in a predetermined frequency band such as that indicated, suitable for application to the I.-F. amplifier of the sound channel of the television receiving system.

Assuming a television I.-F. amplifier for sound signals to have a response frequency of the order of 8 megacycles, and passing a band of signals of the order of 100 kc. in width, it has been found that this channel may not be made sufficiently sharp, that is it may not have sufficient selectivity by utilizing electrical circuits to be used as the intermediate frequency amplifier of a broadcast receiver. However, by providing an input system as shown, including the band pass filter 32, sufficient selectivity may be secured for reception of signals in the low frequency or broadcast band.

With the input system shown and the relatively high frequency I.-F. amplifier as here provided, tuning in a low or broadcast frequency range by means of the oscillator circuit only is made possible. Thus a simple, inexpensive tuning unit may be provided including an oscillator circuit tuning inductance 41 and a suitable variable tuning capacitor 42 in connection therewith. The oscillator circuit may be coupled in any suitable manner such as by the inductance 41, with the input circuit 26 of the detector to provide for broadcast or low frequency reception in the range of frequencies indicated.

The oscillator is tunable in the present example through a frequency range of 8670 to 9720 kc., thereby providing an intermediate frequency in a range between 8116 and 8124 kc., which is readily passed through the sound I.-F. amplifier and second detector of the television or high frequency portion of the system.

The tuning capacitor 42 may be a relatively small and inexpensive type giving substantially straight-line frequency calibration, and the entire unit may be of relatively small size occupying a minimum of space in the television receiver.

Push button control for preselected tuning may likewise be provided in connection with the oscillator circuit through the medium of suitable switching indicated at 44 for placing in circuit a push button tuning unit indicated at 45 comprising selector switches 46 and individually

adjustable tuning capacitors 47 for tuning the inductance 41 to various selected frequencies for stations in the low frequency or broadcast tuning band.

Referring to Fig. 2, by utilizing a frequency or variable reactance control tube indicated schematically at 48 in conjunction with the oscillator circuit and controlling the oscillator frequency in the usual manner through an adjustable bias control means 49 for the tube 48, remote tuning control of the oscillator may be effected. While such control of the oscillator in a limited frequency range is common in automatic frequency control systems, the control here may provide full tuning of the receiving system for broadcast reception in a wide frequency band.

When reception in the low frequency or broadcast channel is desired, the switch 19 is connected with the circuit 20 and at the same time the picture and video amplifiers may be deenergized by suitable control switches indicated at 50 and 51. These may be interconnected with the switch 19, as indicated by the dotted connection 52.

From the foregoing description, it will be seen that only the oscillator of the low frequency or broadcast tuning system requires tuning, and that by utilizing a piezoelectric resonator controlled filter between the broadcast or low frequency detector and the high frequency I.-F. amplifier, sufficient selectivity may be secured for operation of the system with only a band pass filter interposed between the signal source and the input side of the detector. Thus, a simple, inexpensive unit consisting of a band pass filter for the low frequency band, a detector with an adjustable frequency oscillator, and a crystal filter permits low frequency or broadcast reception in connection with a relatively wide band and relatively high frequency I.F. amplifier and the subsequent circuits, including the sound channel of the high frequency receiver.

I claim as my invention:

1. The combination with a signal receiving system having a high frequency broad band signal amplifier, of a balanced detector circuit for signals in a low frequency receiving band, means including a high frequency band pass filter providing a balanced output circuit for said detector, said filter comprising piezo-electric resonator elements, means for connecting the high frequency amplifier to said filter as an alternative signal source, a low frequency band pass filter connected with the balanced detector circuit, and means for applying signals to said circuit through said filter.
2. The combination with a sound intermediate frequency amplifier for a high frequency receiver, of means for applying broadcast low frequency signals thereto comprising a low frequency signal input circuit including a band pass filter, a balanced detector circuit connected with the output end of said filter, a high frequency oscillator coupled to said detector, said oscillator being tunable in a predetermined high frequency band for producing an intermediate frequency signal within the pass band of said amplifier, a balanced output circuit for said detector, a high frequency band pass filter including piezo-electric resonator elements connected with said output circuit, and a circuit for connecting the output end of said last named filter to the input end of said high frequency amplifier.

3. In a signal receiving system, the combination with a main signal amplifying channel and a high intermediate frequency amplifier connected therewith, of an auxiliary signal input circuit for said amplifier, means for connecting said amplifier with said circuit to the exclusion of the main signal channel of the receiver, a low frequency broadcast signal channel connected with said circuit, a signal converter in said last named channel including means for tuning said channel within a predetermined low frequency band, a band pass filter preceding said converter in said last named channel, and a high frequency band pass filter including piezo-electric resonator elements interposed between said converter and said auxiliary input circuit.

4. The combination with a signal receiving system having a high intermediate frequency broad-band amplifier, of a tuning system comprising a band pass filter responsive to signals in a relatively low frequency band, a balanced signal detector connected therewith, a high frequency oscillator coupled to said detector and including variable tuning means effective to cause the frequency of the oscillator to be varied in a predetermined high frequency range to provide an intermediate frequency falling within the pass band of the said intermediate frequency amplifier, and a piezoelectric resonator filter circuit interposed between said detector and said intermediate frequency amplifier for confining the output response of said tuning system within the pass band of said I.-F. amplifier.

5. The combination with a signal receiving system having a high frequency broad band signal amplifier, a balanced detector circuit for signals in a low frequency receiving band, means including a high frequency band pass filter providing a balanced output circuit for said detector, said filter comprising piezo-electric resonator elements, means for connecting the high frequency amplifier to said filter as an alternative signal source, a low frequency band pass filter connected with the balanced detector circuit, means for applying signals to said circuit through said filter, a high frequency oscillator coupled to said balanced detector circuit, and means for tuning said oscillator in a predetermined high frequency band to convert signals in the low frequency signal band into high frequency signals within the pass band of said high frequency band pass filter and of said high frequency amplifier.

6. The combination with a sound intermediate frequency amplifier for a high frequency receiver, of means for applying broadcast low frequency signals thereto comprising a low frequency signal input circuit including a band pass filter, a balanced detector circuit connected with the output end of said filter, a tunable high frequency oscillator coupled to said detector for producing an intermediate frequency signal within the pass band of said amplifier, a balanced output circuit for said detector, a high frequency band pass filter including piezo-electric resonator elements connected with said output circuit, a circuit for connecting the output end of said last named filter to the input end of said high frequency amplifier, said high frequency band pass filter having a tuned input circuit, a tuned output circuit, and a pair of series connected piezo-electric resonator elements therebetween for confining the output response of said tuning system within the pass band of the high frequency amplifier.