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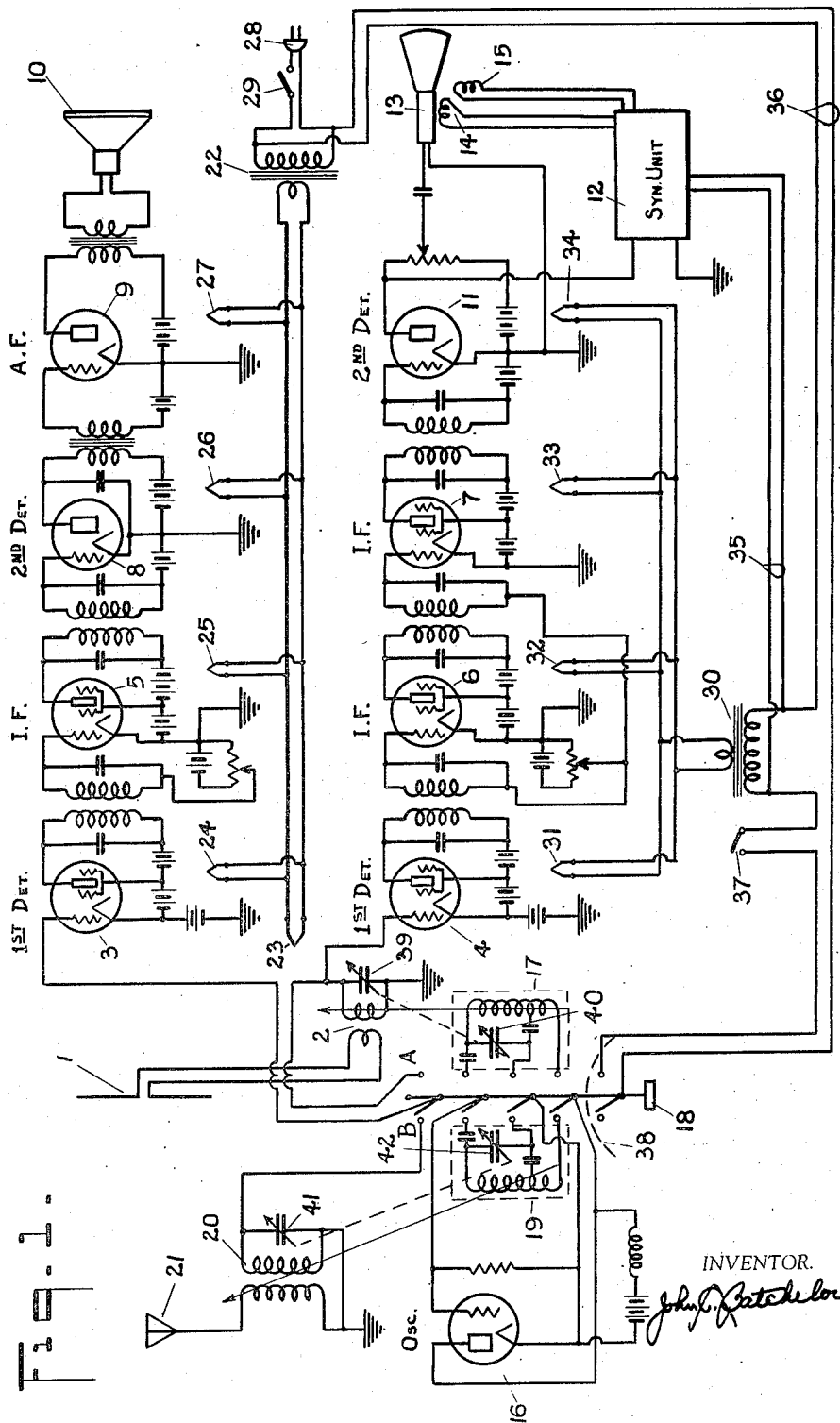
J. C. BATCHELOR

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ENTERTAINMENT RECEIVER

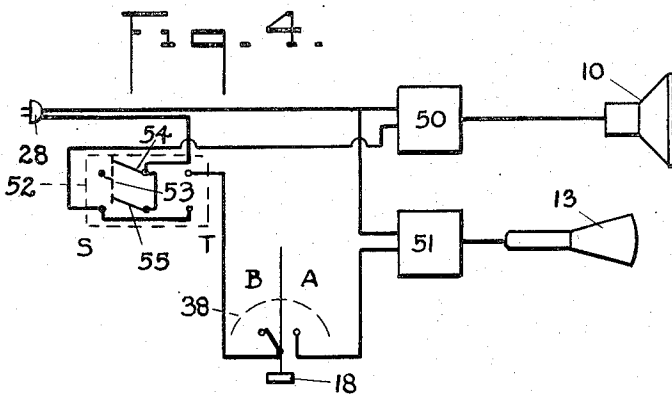
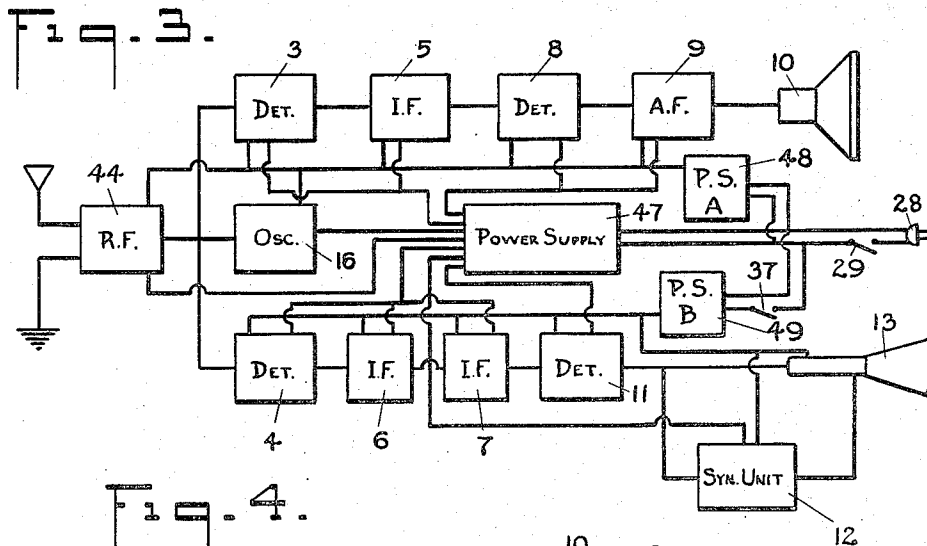
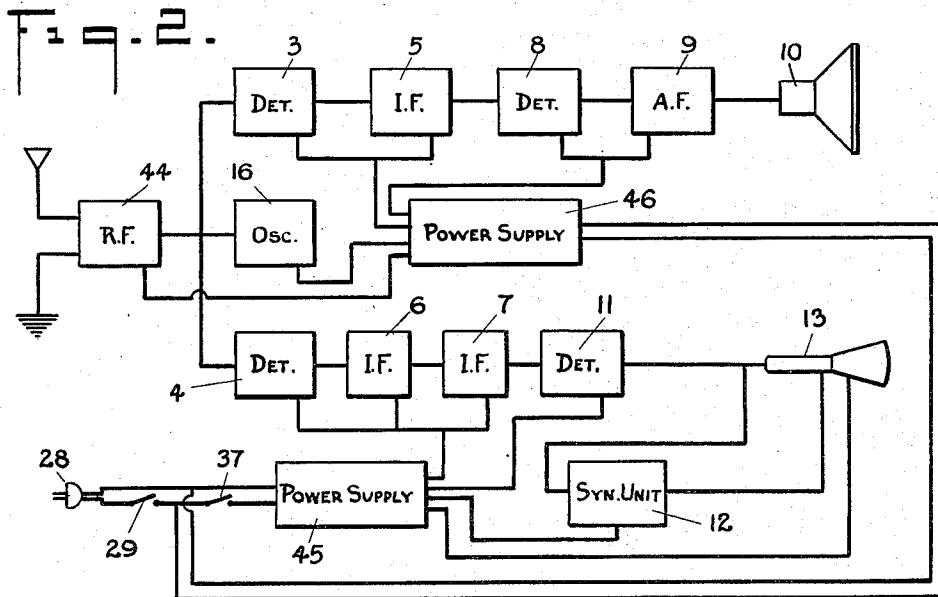
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ENTERTAINMENT RECEIVER

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2 Claims. (Cl. 250-9)

My invention relates to a system of communication, and, more particularly, to such a system for use in television image reception when sound accompaniment is to be received in conjunction with the images.

More particularly, my invention relates to apparatus for use at the receiving terminal of such a system whereby it is possible to receive, in combination, sight and sound entertainment being transmitted on one or more meter waves, or alternately, to receive sound entertainment alone on either meter waves or longer waves, as desired.

In the television art it has become customary to transmit a signal corresponding to an analyzed image on one frequency of, say, 50 megacycles, and another signal corresponding to the sound accompaniment for the analyzed image on another frequency of, say, 52.5 megacycles. In such a system it is contemplated that a multiplicity of sight and sound broadcast transmitters be operated having a frequency separation between picture carriers of, say 5 megacycles, and a similar separation between sound carriers, so that there results a fixed separation of, say, 2.5 megacycles between related picture and sound carriers.

For use in such an arrangement, there have been proposed dual channel super-heterodyne receivers whereby associated sight and sound carriers may be heterodyned into two separate intermediate frequency channels, one of which is employed to amplify the picture signals, and the other of which is employed to amplify the sound signals. Thus, there may be provided a single receiver assembly adaptable to single knob control, and capable of being tuned successively to the frequencies of various entertainment transmitters, provided all of the transmitters are operated with a definite frequency of separation between the picture and sound channels, such as, in the example given, 2.5 megacycles.

This invention is based primarily upon the fact that television service is of an essentially different nature from sound broadcasting service, in that it is not necessary for a user in the latter case to devote his entire attention to the received service, whereas, in the case of television with sound accompaniment, it is necessary for the user to remain within viewing distance of the image reproducer and maintain his attention fixed upon that reproducer. It is true, however, that although the entertainment value of television programs will be enhanced when the user both listens to and looks at the received intelligence, still the program will have substantial enter-

tainment value when the user only listens, and ignores the images being transmitted. Thus, there are occasions when the television components of the receiving equipment have no utility, and only the telephone components of the receiver are of value.

Moreover, inasmuch as sound broadcasting service is being rendered today in a band of frequencies of substantially 500 to 1500 kilocycles, and television service is contemplated on a band of frequencies lying within the region of meter waves having frequencies above 30 megacycles, there will necessarily be a transition time during which all entertainment transmission will be transferred to the region of meter waves where both sight and sound communication are possible, and during this period simultaneous telephone communication will be maintained on the lower frequency channels. Although ultimately this latter band of communication will probably be cleared of broadcasting service, there will remain a substantial period during which certain intelligence will be receivable exclusively on the latter channels, and unless a user provides a receiver separate from his television receiver for intercepting this service, under present proposals, he will be denied the benefit of this transmission.

With a view to improving these conditions as outlined, it is an object of my invention to provide a plural-channel television receiver capable of receiving visual and aural intelligence, and further, provided with means for rendering the visual components of the receiver inoperative when only aural reception is required.

Another object of my invention is to provide a single sight and sound receiving apparatus whereby it is possible to receive sight and sound communication on meter waves, sound communication only on meter waves, or sound communication only on waves other than meter waves.

These and other objects will appear in the following description of my invention.

In accordance with my invention, I have provided wave receptive means whereby energy may be intercepted from a number of broadcasting stations, and a local source of unmodulated signals whereby those intercepted signals may be heterodyned into a plurality of means sensitive to various of the resultant heterodyne signals, means cooperating with those sensitive means whereby aural entertainment programs may be reproduced in accordance with the modulation of certain of the intercepted signals, and other means whereby images may be reproduced in ac-

cordance with the modulation of certain other intercepted signals.

Further, in accordance with my invention, I have provided means for selectively rendering operative the sound receiving and reproducing means independent of the condition of operation of the image receiving and reproducing components, and, under certain conditions of reception, only the sound receiving and reproducing components of the apparatus may be rendered operative.

In order to make possible a more concise description of my invention, attention is directed to the accompanying drawings of which Figure 1 is a diagrammatic view of a receiving system in accordance with my invention; Figures 2 and 3 are block diagrams of certain modifications of my invention; Figure 4 is a diagram showing one switching system applicable to my invention.

Referring to Figure 1, a receiving antenna 1, which may be a di-pole or other suitable type which may be broadly tuned to respond to the band of meter waves wherein reception is desired, is inductively coupled through the coupling device 2 to the input circuits of the first detectors 3 and 4. The output circuit of the detector 3 is coupled to the intermediate frequency amplifier 5, the output circuit of which is in turn coupled to the input circuit of the second detector 8. The output circuit of the detector 8 is in turn coupled to the input circuit of the audio frequency amplifier 9, the output circuit of which is coupled to the sound reproducer 10.

The output circuit of the first detector 4 is coupled to the two stage intermediate frequency amplifier including the amplifier tubes 6 and 7, the output of which amplifier is coupled to the input circuit of the second detector 11. The output of the detector 11 is communicated directly to the input circuit of the synchronizing apparatus represented by the block 12, and, in addition, the output of the detector 11 is communicated to the control element of the cathode ray image reproducer 13. The image reproducer 13 may be any of the known cathode ray tubes commonly used in television systems and may be of the so-called "direct vision" type or of a type adapted to project enlarged images. The output of the synchronizing apparatus 12 is communicated to the deflecting coils 14 and 15 which are so disposed in relation to the image reproducer 13 that the electron beam in that reproducer will be caused rhythmically to scan the image reproducing screen of the tube in a predetermined routine.

Associated with the coupling device 2 is an oscillator 16 which is adapted to cooperate with the oscillating circuit 17 to produce high frequency oscillations, and the oscillating circuit 17 is coupled with the coupling device 2. A switching means 18 is provided whereby a second oscillating circuit 19 may be associated with the oscillator 16, and simultaneously, a second coupling device 20, associated with the receiving antenna 21, may be connected to the input circuit of the first detector 3; the oscillating circuit 19 is coupled to the coupling device 20. The tuning condenser 39 of the coupling device 2 and the tuning condenser 40 of the oscillating circuit 17 are mechanically connected on a common shaft; the tuning condenser 41 of the coupling device 20 and the tuning condenser 42 of the oscillating circuit 19 are similarly connected on a common shaft. In a preferred embodiment of my invention I provide but a single shaft for the four tun-

ing condensers 39, 40, 41 and 42 in a manner which will be described later.

A power transformer 22 is provided in connection with the cathode heaters 23, 24, 25, 26 and 27 of the tubes 16, 3, 5, 8 and 9, respectively, and the transformer 22 is adapted to be provided with energy from a power line through the plug connector 28; the input circuit to the transformer 22 is controlled by the main switch 29.

A second power transformer 30 is provided to supply the cathode heaters 31, 32, 33 and 34 of the tubes 4, 6, 7 and 11, respectively, and power is taken from the input terminals of the transformer 30 by the line 35 to the synchronizing apparatus 12. The input circuit of the transformer 30 is adapted to receive power in parallel with the input terminals of the transformer 22 by the line 36 at such times as the switch 37 is closed, but excitation may be removed from the transformer 30 and the synchronizing apparatus 12 20 by opening the switch 37. Further, a second series control is provided in switching means 18 whereby the transformer 30 and the synchronizing apparatus 12 may be excited only when the oscillating circuit 17 is cooperating with the oscillator 16, and that excitation is removed when the switching means 18 associates the oscillating circuit 19 with the oscillator 16. An electrostatic and electromagnetic shield 38 is provided on the switching means 18 electrically to isolate the power portion of the switching means from the radio frequency portion.

The operation of this embodiment of my invention is as follows. With the switching means 18 at the position which associates the coil 17 with the oscillator 16, and with the switches 29 and 37 closed, the oscillator 16 generates an unmodulated radio frequency of, for example, 46 megacycles, and a portion of the energy of that oscillation is introduced into the coupling device 2. If then, under this condition, two modulated radio frequency carriers are intercepted by the receiving antenna 1, one of which carriers has a fundamental frequency of 50 megacycles and is modulated by television signals, and the other has a fundamental frequency of 52.5 megacycles and is modulated by telephone signals, a mixture of signals will be impressed upon the input circuits of the first detectors 3 and 4 which, when rectified, will result in beat signals of, among others, a 4 megacycle signal modulated by a television signal and a 6.5 megacycle signal modulated by telephone signals.

The output circuit of the first detector 3 and the input and output circuits of the intermediate frequency amplifier 5 are, in this example, tuned to a fundamental frequency of 6.5 megacycles, and are sufficiently broadly tuned to admit the passage of a band of intelligence corresponding in width to the highest frequency present in the telephone signals, and may for example, be a band of from 6.475 to 6.525 megacycles. The input circuit of the second detector 8 is also similarly tuned, and consequently, the output of the detector 8, amplified by the audio frequency amplifier 9, will produce a signal which, when impressed upon the loud speaker 10, will produce sounds in accordance with the modulation on the intercepted 52.5 megacycle carrier, which is, in this example, the sound accompaniment to the television program being broadcast.

The output circuit of the first detector 4 and the input and output circuits of the intermediate frequency amplifiers 6 and 7 are tuned to the 4 megacycle beat frequency which results be-

tween the intercepted 50 megacycle carrier and the local 46 megacycle signal, and these circuits are sufficiently broadly tuned to pass a band of frequencies corresponding to the side-band width of the television channel, which may be, for example, one megacycle on either side of the fundamental, or a band of frequencies, in this case, of from 3 to 5 megacycles. In addition, the input circuit of the second detector 11 is similarly tuned, and thus, a signal is impressed upon the second detector which, when rectified, will produce an output signal corresponding to the television modulation of the received 50 megacycle carrier.

The output signal from the second detector 11 is suitably conducted to the control element of the cathode ray tube 13 and to the input circuit of the synchronizing device 12, and the controlled electron beam in the cathode ray tube 13, deflected rhythmically by the output of the synchronizing device 12 in the deflecting coils 14 and 15, will reproduce an image in accordance with the modulated 50 megacycle signal intercepted by the receiving antenna 1.

Thus, in full operation as a television receiver with the switches 29 and 37 closed and the switching means 18 in position A, the complete apparatus is in service as a combined television and telephone receiver, and under these circumstances, all vacuum tubes in the set are called upon to perform their normal functions.

If now it is desired to discontinue use of the image receiving and reproducing portion of the receiver, and continue to use the sound reproducing components in order to receive only the aural portion of the program being broadcast, it is desirable to remove from service the portions of the apparatus which are not operative in that sound reproduction. This may be done in my invention by opening the switch 37, whereby excitation is removed from the transformer 30 and the power supply is eliminated from the synchronizing apparatus 12, and thus the picture portion of the receiver is rendered inoperative. Thus, in my invention I have provided means whereby the life of the receiver components, and more particularly, the life of the vacuum tubes employed, may be substantially increased by rendering them inoperative at all times when they are not actually called upon to function, and in addition, substantial economy is realized in conservation of electrical power which would otherwise be used without providing service to the user of the set.

Under a third mode of operation, the performance of my apparatus is as follows. With the switching means 18 in position B, and regardless of the condition of the switch 37, the excitation is removed from the transformer 30 and the synchronizing apparatus 12, and consequently, the image receiving and reproducing components of my set are rendered inoperative as in the preceding case.

Moreover, the coupling device 20 is electrically associated with the input circuit of the first detector 3, and still further, the oscillating circuit 19 is associated with the oscillator 16.

In this case, if, for example, a modulated signal having a fundamental frequency of 1000 kilocycles is intercepted by the receiving antenna 21, and a local steady oscillatory current having a frequency of, for example, 5500 kilocycles is generated by the oscillator 16 in cooperation with the oscillating circuit 19 and coupled into the coupling device 20, there will be introduced into the

first detector 3 a mixture of signals which, when rectified, will produce, among others, a modulated heterodyne signal having a fundamental frequency of 6500 kilocycles or 6.5 megacycles. Following the manner of operation described in connection with the first embodiment of my invention, intermediate frequency amplification will be accomplished by the amplifier 5, detection will be accomplished by the second detector 8, audio frequency amplification will be accomplished by the amplifier 9, and sounds will be reproduced in accordance with the modulation of the 1000 kilocycle wave intercepted by the receiving antenna 21. Thus, means have been provided whereby independent sound broadcast programs may be received and reproduced from frequencies of radiant energy different from those used in the broadcasting of combined sound and television entertainment programs, and during the times of such reception, the television receiving components of my receiver have been rendered inoperative.

Clearly, additional oscillating circuits similar to the oscillating circuit 19 may be provided in cooperation with additional positions on the switching means 18 whereby radiation in still other portions of the radio spectrum may be received, and power switching contacts may be supplied in the switching means 18 associated with the circuit 36 whereby the image receiving portion of the receiver may be rendered operative only on such bands as include both telephone and television signals.

The fact that many modifications are possible within the scope of my invention is well borne out by the embodiments shown in Figures 2 and 3. In Figure 2 the first detectors 3 and 4, the intermediate frequency amplifiers 5, 6 and 7, the second detectors 8 and 11 and the audio frequency amplifier 9 are provided in association similar to that shown in Figure 1. Moreover, the sound reproducer 10, the image reproducer 13 and the synchronizing apparatus 12 are also provided.

In the embodiment shown in Figure 2, however, instead of providing independently controlled cathode heater supplies, separate power supply units are provided for the two portions of the apparatus which are to be independently controllable. Moreover, in this embodiment a radio frequency amplifier 44 is provided, the output of which is mixed with the output of the oscillator 16 and conducted to the first detectors 3 and 4. It may be seen by following Figure 2 that power supplied to the plug connector 28 when the main switch 29 is closed is supplied to the power supply unit 46 which supplies power to the circuit components 3, 5, 8, 9, 16 and 44. The remaining components 4, 6, 7, 11, 12 and 13 are supplied by the power supply unit 45, and by means of the switch 37 the latter power supply may be disconnected, thus rendering inoperative the television components of the apparatus, leaving in operation only the telephone components.

The radio frequency amplifier 44 has been added to this embodiment of my invention only as an example of one possible modification, and its presence in Figure 2 should not be construed as definitely associating it with the embodiment of my invention wherein separate power supply units are used for excitation of the television and telephone components of my receiver.

A second modification is shown in Figure 3 which is different from Figure 2 only in the manner of division of the power supply components. In this case, a power supply unit 47 is provided

to supply the plate power for all of the components of the receiver, the power supply unit 48 is provided to supply the cathode heaters of the telephone components, and the power supply unit 49 is provided to supply the cathode heaters of the television components. Energy will be supplied through the plug connector 28 to the power supply units 47 and 48 at all times when the switch 29 is closed, but the power supply unit 49 may be selectively excited and independently controlled by the switch 37, whereby the television components of the receiver may be rendered inoperative at will.

In the embodiments shown in Figures 2 and 3, the components of the set and the appropriate interlocking means for providing reception of signals in the low frequency portion of the spectrum which are customarily transmitted without television signals have been omitted only for the sake of improvement of the clarity of representation of my invention, and it should be clearly understood that the employment of my means for multiple channel reception is applicable to any or all embodiments of my invention.

The switching means involved in an additional embodiment of my invention is shown in Figure 4. In this case, one conductor from the plug connector 28 may be connected to the telephone components 50 and the television components 51 of the receiver. The second side of the line is controlled by the switch 52 which is provided with two positions in addition to an intermediate "off" position. The movable element 53 of the switch 52 consists of two movable contact members 54 and 55 and is so constructed that when the element 53 is moved from the neutral or "off" position to the position S, the power circuit to the telephone components 50 is closed, but the circuit to the television components 51 remains open. With the element 53 in the position marked T, the contact member 55 closes the circuit to provide power to the telephone components 50 and the contact member 54 closes the circuit to the television components 51 provided the switching means 18 is adjusted to position A. Thus, a single main control switch is provided by the switching means 52 to make possible adjusting the receiver to receive telephone communication only, or, alternately, to receive telephone and television signals.

It is not material to my invention whether the local oscillator in general has a frequency above or below the frequency of the intercepted signal, and the value of that frequency will be determined by a consideration of the particular conditions in the band of frequencies to be received.

In order to render a receiver of my invention capable of being controlled by a single tuning knob, I prefer, as previously indicated, to dispose all variable tuning elements on a single common shaft controllable by a single knob. An indicating dial may be provided in cooperation with the shaft and knob to indicate the frequency to which the set is tuned, and a number of indices may be provided on the dial for indication of the condition of tuning of the various ranges over which the receiver is tunable. In general, only part of the variable tuning elements will be operative under any given set of operating conditions of the receiver, but no harmful effect results from controlling all tuning elements in unison.

Still further, the values of the intermediate frequencies used in the described embodiment of my invention were chosen purely as typical

examples of what may be used, and it should be clearly understood that wide variations are possible in the selection of those values; also, a certain advantage exists in use of a television intermediate frequency greater than that used in the telephone components of my receiver, in that the greater the intermediate frequency used in the television components, the greater will be the ease of producing sufficiently broad tuning in the intermediate frequency coupling components.

Moreover, the relation and separation between the sight and sound channels given in the example are purely representative, and my receiver may be adapted for use in receiving signals in any band wherein any systematic scheme of separation is employed between adjacent stations. For example, with 5 megacycle separation between adjacent television carrier frequencies, it is possible and sometimes advantageous to use a sound carrier having a fundamental frequency of 57.5 megacycles to carry the sound accompaniment of a 50 megacycle television transmitter, in which case a television carrier of another broadcasting station having a value of 55 megacycles will lie between the sight and sound channels of the former station. In this case, the sound channel for the 55 megacycle television station will have a carrier frequency of 62.5 megacycles. Moreover, this system of separation of stations within the channel may be inverted to cause the carrier frequencies of sound carriers to lie below the carriers of the television stations.

Still further, the broad principle of my invention is applicable to combined television and telephone receivers adapted to receive signals of the type wherein both television and telephone communication is confined to a single channel by, for example, modulating a carrier signal by the television signals to produce side bands of plus and minus 750,000 cycles per second, and further, modulating said carrier with a secondary carrier frequency of one million cycles per second, this latter frequency being itself modulated with telephone signals to produce side bands of, say, plus and minus 10,000 cycles per second on the secondary carrier. It is clear that in such a receiver, certain components of the apparatus are operative only in conjunction with the reception of television signals and certain other components of the apparatus are operative only in the reception of telephone signals, and consequently, my invention is applicable to render inoperative such components of the apparatus as are of service only in the reception of television signals.

Throughout the foregoing description of my invention, I have used the term "television" to mean the transmission at a distance of intelligence designed to be most clearly appreciated by the sense of sight, and "telephone" to mean the transmission at a distance of intelligence which is most clearly appreciated by the sense of hearing.

In mentioning frequencies, such as 50 megacycles, the words "per second" have been dropped, but it is understood that they are implied in such denomination.

I claim:

1. In combination, a sound-reproducing system, an image-reproducing system, a first receiving antenna and a first coupling device associated therewith, a first oscillating circuit coupled with said first coupling device, a second antenna and a second coupling device associated therewith, a second oscillating circuit coupled with said second coupling device, an oscillator

common with respect to said first and second oscillating circuits, switch means for connecting said oscillating circuits to said oscillator selectively, connections between said switch means
5 and said sound-reproducing and image-reproducing systems, a power-supply circuit for said image-reproducing system, a switch device forming part of said power-supply circuit and actuated by said switch means to open said power supply circuit when said switch means is in position
10 to connect one of said oscillating circuits to said oscillator, and a switch for opening said power supply circuit independently of said switch means and said switch device.

causing said sound-reproducing system to respond to various different frequency bands and comprising an oscillator and first and second oscillating circuits and switch means for associating said circuits selectively with said oscillator, connections between said switch means and
5 said sound-reproducing and image-reproducing systems, a power-supply circuit for said image-reproducing system, and a switch device forming part of said power supply circuit and actuated by
10 said switch means to open said power supply circuit when said first-named means is effective to cause said sound-reproducing system to respond to a given frequency band.

15 2. In combination, a sound-reproducing system, an image-reproducing system, means for

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