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SUBSTITUTE FOR MISSING XR

June 11, 1940. H. O. ROOSENSTEIN 2,203,746

RADIO FREQUENCY DISTRIBUTION SYSTEM

Filed Sept. 3, 1938

Fig. 1

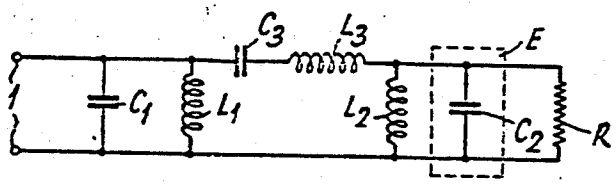


Fig. 2

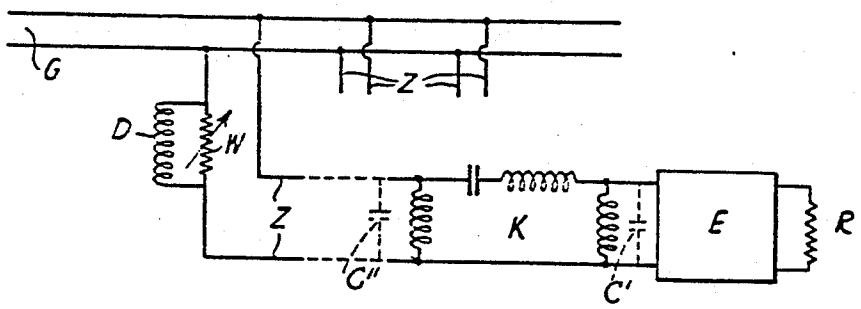


Fig. 3

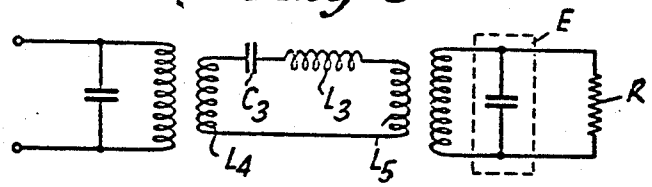
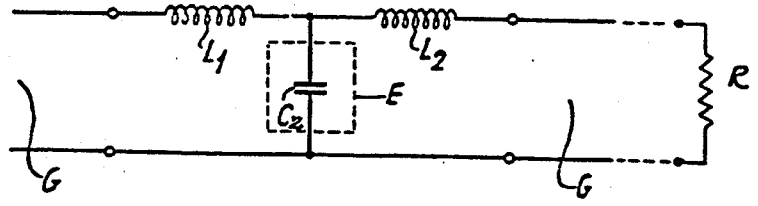


Fig. 4



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RADIO FREQUENCY DISTRIBUTION SYSTEM

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7 Claims. (Cl. 179—15)

A serious trouble met with in a great many practical cases is that in R. F. receivers or amplifiers the input impedance for the lead-in is non-ohmic in nature. More particularly, if the input potential, for instance, is to be varied by means of a series resistance cut in the line and being of ohmic nature, this regulation will become a function of the frequency as a result of the fact that the input resistance of the receiver or amplifier depends upon the frequency. A case of this kind is met with, for instance, in communal or party reception of television programs where the incoming video signals are amplified in a communal antenna amplifier and are thereupon transmitted to a party or feeder line (for instance, by way of an intermediate "carrier"), whence leads are brought to the various receivers. In such a scheme it is desirable to have available ways and means adapted to adjust the picture brightness or brilliance, and in this connection one essential condition is that this amplitude regulation or variation should be accomplishable under conditions unaffected by frequency, in other words, so that the action will be equal and uniform throughout the whole frequency band. However, such freedom from frequency effects within the entire frequency band as required in practice will be assured only if the receiver represents a purely ohmic input resistance.

According to the invention, the input impedance of the receiver or amplifier forms a part of a chain structure or recurrent network comprising inductances, capacities, and optionally also ohmic resistances, which network, when looking at it from the download end, represents an ohmic resistance which is independent of the frequency within a certain desired frequency band. The size of this ohmic resistance may be adjusted at will by choosing suitable values for the constituent elements of the chain or network structure.

The invention shall now be explained in more detail by reference to the attached drawing wherein Fig. 1 shows a circuit embodying the invention coupled to the input of an R. F. receiver, Fig. 2 shows a practical embodiment and use of the circuit scheme shown in Fig. 1, and Figs. 3 and 4 are modified forms of the circuit shown in Fig. 1. Referring to Fig. 1, E denotes the receiver and C_2 connected across its input terminals represents its input capacity. (This will, as a matter of fact, be true in most instances.) In the conventional type of receiver schemes the said capacity will mainly consist of the grid-filament capacitance of the first or input tube, or else, in the case of television receiver apparatus, it will consist, for instance, of the input capacity of the Braun cathode-ray tube. Capacity C_2 is tuned by the inductance L_2 to the mean frequency of the frequency band to be transmitted, and this circuit is suitably used to form one of two equivalent cross arms of a chain structure or network, the line or series arm of which consists of the tuned series connection of the capacity C_3 and the inductance L_3. The shunt or cross element C_1 L_1 connected across the input terminals 1 of the network is homogeneous or similar to the cross elements L_2 C_2 contained in the receiver. The entire network is terminated by a resistance R which, for the purpose of insuring optimal transmission properties for the chain structure or network is chosen slightly higher than the surge impedance of the network.

In Fig. 2 there is illustrated a practical embodiment and use of a circuit scheme of the kind shown in Fig. 1. In this figure G denotes the joint line or lead of a television receiving scheme known as a party or communal arrangement whence the various leads Z are brought down to the different receiver apparatus E. For the sake of simplicity, only one such installation has been shown. Now, the input impedance of the receiver E (represented by the dotted line condenser C') forms part of the chain structure or network so that the receiver represents an ohmic resistance. In the circuit scheme shown in Fig. 2 also the capacity of the leads Z (represented by the dotted line condenser C'') serves at the same time as part of the said network so that one of the cross elements consists solely of an inductance and the leads Z. For the purpose of varying the picture brilliance or amplitude a variable ohmic resistance W is included in one of the leads Z, the said resistance, if desired, being accommodated directly inside the socket serving to connect the lead Z with the communal or party line G. The resistance W is shunted or bridged by a choke-coil D or else by a band-pass filter for the tonal frequencies (A. F.) which are directly transmitted through the line G, so that the tone will not be altered by variation of the resistance W. If the resistance of the chain structure K is chosen sufficiently high, say, a few thousand ohms, then, as can be readily seen, disconnection of the leads Z from the communal line G will affect the latter not at all or only very slightly so; and the result is that the other receivers will not be disturbed in their operation by such connection or disconnection.

In choosing the dimensions for the network K in Fig. 2, values may under certain circumstances be required for the various elements of the structure which are with difficulty realizable by conventional or practical means. For example, if it is discovered that the inductance of the line elements is very high, while the capacity must become very small, this will practically be irrealizable, for the reason that the coil that is required would involve such a high self-capacitance that its capacitive reactance becomes less than its inductive reactance.

In instances of this kind it will be found advantageous, as illustrated in Fig. 3, to couple the line or series element with the shunt or cross elements by virtue of transformer action through coupling coils L_4 and L_5, it being thus feasible, by suitable choice of the ratio of transformation, to choose values for the network elements which in practice are quite readily obtainable. Looking away from the input in Fig. 3, there first occurs stepping down and following thereafter stepping up, and this creates conditions so that the elements C_3 and L_3 may consist of standard commercial condensers and inductance coils. As to the rest, Fig. 3 corresponds to Fig. 1.

It will be understood that the invention is not restricted to the particular form of network here illustrated, in fact, it may be carried out in practice by the use of any desired system of chain structure or recurrent network. For instance, another exemplified embodiment shall be described by reference to Fig. 4. Receiver E is again represented as having a capacity C_2 at its input impedance. By the use, for instance, of two series or line coils L1 and L2 and of the receiver capacitance C_2 constituting the shunt or cross element, it is then possible to design a network whose surge impedance is equal to the surge impedance of the communal or party line G. It is then feasible to include the network comprising the receiver directly in series with the communal line, without the line incidentally being affected in any way and without the other receivers being troubled. As a matter of fact, the receiver simply acts like an additional line portion by which the communal line is extended in length, without its electrical properties being altered incidentally. The inductances L1 and L2 are preferably built fixedly into the communal line, whereas the receiver together with its lead-in is capable of being disconnected. In order that no disturbing actions may be occasioned upon disconnection and connection, it is preferable to cut in a substitute (ballast) capacitance conjointly with the disconnection of the receiver, so that, after removal of the receiver, the network comprising L1, L2 and C_2 may stay unvaried. The said substitute or ballast condenser may be located directly in the socket and the same may be so disposed that it is cut out of circuit when the receiver lead is plugged in. In an arrangement of circuits as shown in Fig. 4, the chain structure or network need not be terminated by any additional ohmic resistance seeing that its terminating resistance is formed by the onward-extending communal line G. As a matter of fact, it is solely at the last branch-off point at the end of the communal line G where a resistance R equal to the surge impedance of the line must be provided as a termination.

What I claim is:

1. A system for the distribution of radio frequency signals including television, comprising a main transmission line and a plurality of branch lines, the latter each having connected thereto at least one receiver of such signals, characterized in that the input impedance of each receiver constitutes an element of a filter network included in the branch line, said network having such values of inductance and capacity as to constitute an ohmic resistance which is substantially constant over the received frequency range or band.

2. A system for the distribution of radio frequency signals including television, comprising a main transmission line and a plurality of branch lines, the latter each having connected thereto a receiver of such signals, characterized in that the input impedance of each receiver constitutes an element of a filter network which comprises a series tuned circuit and a pair of parallel tuned circuits, said network having such values of inductance and capacity as to constitute an ohmic resistance which is substantially constant over the received frequency range or band.

3. A system for the distribution of radio frequency signals including television, comprising a main transmission line and a plurality of branch lines, the latter each having connected thereto a receiver of such signals, a filter network included in each branch line and coupled to its respective receiver, said network comprising a pair of parallel tuned circuits constituting the shunt sections of the filter network and a series tuned circuit connected between the parallel tuned circuits and constituting the line section of said network, said network having such values of inductance and capacity as to constitute an ohmic resistance which is substantially constant over the received frequency range or band, the capacity element of one of the parallel tuned circuits being constituted by the input impedance of the receiver and the capacity element of the other parallel tuned circuit being constituted by the capacitance of the branch line.

4. A system as defined in claim 3, wherein a variable resistance is serially connected in the branch line for regulating the amplitude of the signals fed to the receiver.

5. A system for the distribution of radio frequency signals including television, comprising a main transmission line and a plurality of branch lines, the latter each having connected thereto a receiver of such signals characterized in that the input impedance of each receiver constitutes an element of a filter network included in the branch line, said network comprising a pair of parallel tuned circuits and a series-tuned circuit transformer coupled to said parallel tuned circuits and having such values of inductance and capacity as to constitute an ohmic resistance which is independent of frequency within the received frequency range or band.

6. A system for the distribution of radio frequency signals including television, comprising a main transmission line and a plurality of branch lines, the latter having connected thereto a plurality of receivers, characterized in that the input impedance of each receiver constitutes an element of a filter network comprising a series section and a pair of shunt sections, said network having such values of inductance and capacity as to constitute an ohmic resistance which is substantially constant over the received frequency range or band, and further characterized in that the input impedance of the receiver comprises a capacity, an inductance shunting said capacity and forming a tuned circuit which constitutes one of the shunt sections, said filter network being terminated at the end to which the receiver is

connected by an ohmic resistance which is equal approximately to the characteristic surge impedance of the network.

7. A system for the distribution of radio frequency signals including television, comprising a main transmission line and a plurality of branch lines, the latter having connected thereto a plurality of receivers, characterized in that the input impedance of each receiver constitutes an element of a filter network comprising a series section and a pair of shunt sections, said network having such values of inductance and capacity as to constitute an ohmic resistance which is substantially constant over the received frequency range or band, and further characterized in that the input impedance of the receiver comprises a capacity and the leads of the branch line also constitute a capacity, an inductance forming with each of said capacities a pair of tuned circuits which constitute the shunt sections, said filter network being terminated at the end to which the receiver is connected by an ohmic resistance which is equal approximately to the characteristic surge impedance of the network.

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