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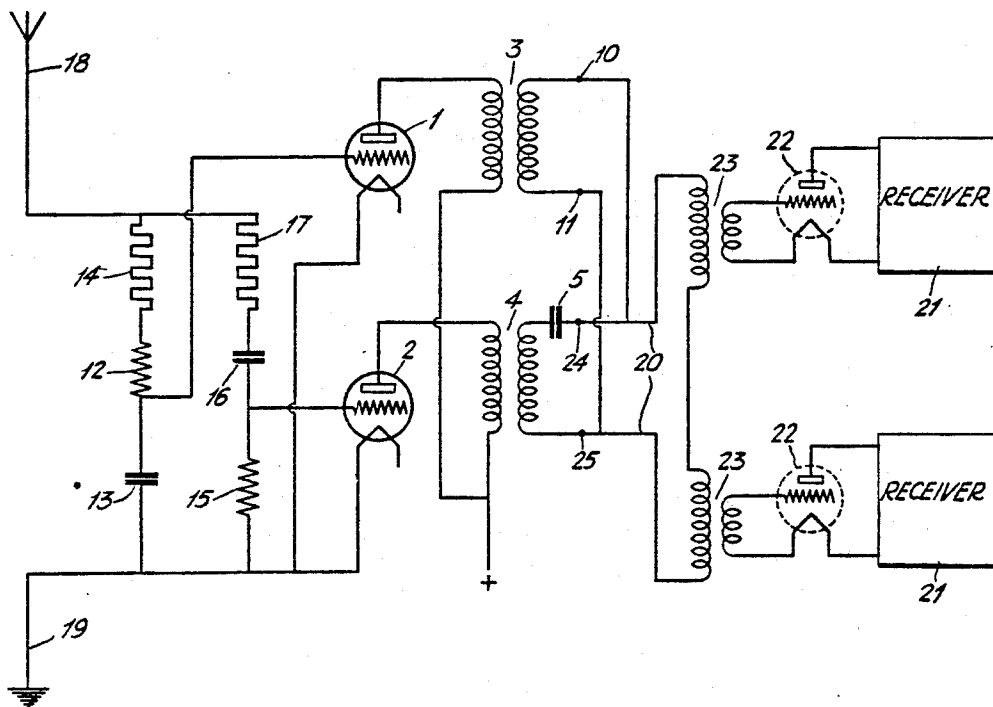
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CENTRALIZED RADIO SYSTEM

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CENTRALIZED RADIO SYSTEM

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This invention relates to a radio frequency distributing system. In such a system the input high-frequency energy is supplied through a distributing cable to a number of receiver sets connected thereto. Generally, an amplifier device is arranged between the aerial and the distributing cable. In order to obtain a favorable amplification, the output impedance of the said amplifier has to accord with the impedance of the distributing cable. This output impedance is, however, dependent upon the frequency which results in that also the conformity is optimum for a given range of frequency only and consequently in the intensity of the signals supplied to the receivers being highly dependent upon the frequency.

According to my invention this difficulty is overcome by coupling the aerial to the distributing cable through a number of amplifiers connected in parallel, each of which procures an optimum amplification for a different range of frequencies.

The output circuit of each of the amplifiers includes a transformer. The secondaries of these transformers cannot be connected in parallel or in series without additional means. If the secondaries are connected in parallel, the amplification of the oscillations of low frequency is highly decreased, as the secondary of one of the output transformers has connected in parallel with it the winding of a further output transformer the impedance of which is materially lower at these frequencies. If on the contrary the secondaries are connected in series, the amplification of oscillations of high frequency is decreased by reason of the impedance in the output circuit of the amplifiers being too high in this case.

According to the invention this problem is solved in the following manner.

The secondary of the output transformer of the amplifier for the higher frequencies is connected, in series with a condenser, in parallel with the secondary of the output transformer of the amplifier for the lower frequencies. The condenser should be of such value that its impedance is very low for the highest frequencies and is high for the lower frequencies. If the secondaries are desired to be connected in series, it is necessary to connect a small condenser in parallel with the secondary of the amplifier for the lowest frequencies.

It is thus consequently possible to obtain a favorable conformity to any frequency.

Now, it has, however, been found that by reason of the non-linearity of the characteristic of the amplifier tube, sum and difference frequencies

occur which bring about disturbances. Thus, for example, two oscillations having comparatively low or high frequencies which themselves are not transmitted to the distributing cable by a given amplifier may bring about sum and difference frequencies falling within the range for which the said amplifier is made to accord with the cable. According to the invention this difficulty is overcome by supplying to each amplifier only the frequencies to be amplified in it. For this purpose, the input circuit of each of the amplifiers includes a filter which allows the passage of a part only of the total range of frequency, that is to say that part which is amplified in the optimum manner by the particular amplifier.

If, in addition, care is taken that the range of frequency is only so large that the sum or difference frequencies of two oscillations falling within this range are always external to the particular range, the disturbances due to the sum and difference frequencies are entirely prevented.

In order that the invention may be clearly understood and readily carried into effect, one embodiment thereof will now be described more fully with reference to the accompanying drawing, in which the figure shows an amplifier system adapted to be arranged between an aerial and a high frequency distributing cable.

Cable 20 may be a long two wire cable or transmission line as shown and designed to transmit all the frequencies of the broadcast band such as 550 to 1500 kilocycles to a plurality of radio receivers 21 located at different points along the cable. The receivers 21 may be connected to the cable by means of radio frequency amplifier vacuum tubes 22, the grid circuits of the tubes being connected to the cable through any means such as radio frequency transformers 23 as shown.

In the example shown the range of frequency to be transmitted (broadcast band) is divided into two portions or parts. One of these portions, such as the range from 550 to 1000 kilocycles, is supplied to the grid of a vacuum tube amplifier 1 while the remaining portion of the frequency band (1000 to 1500 k. c.) is supplied to the grid of a vacuum tube amplifier 2. The output circuits of tubes 1 and 2 are connected to cable 20 by transformers 3 and 4. The transformer 3 is so designed that its impedance, as measured across its output terminals 10—11, matches the impedance of the distributing cable 20 over the lower portion or half of the frequency band (550 to 1000 k. c.). Transformer 4 is so designed that its impedance as measured

across the output terminals 24—25 matches the impedance of cable 20 over the upper half or portion of the frequency band.

As shown the secondary of 4 has a condenser 5 connected in series therewith, the capacity of which may be chosen of about 5000 centimeters. It will thus be seen that the secondary of 3 is shunted across or in parallel with the series combination of the secondary of 4 and condenser 5, which series combination has a relatively high impedance for the lower range of frequencies transmitted through transformer 3 but a much lower impedance for frequencies of 1000 to 1500 k. c.

The input circuit of tubes 1 and 2 includes filters which are so proportioned that the tube 1 has applied to it only the oscillations over the lower portion of the frequency band and the tube 2 only the oscillations over the higher portion or half of the band. This may be accomplished by inserting in the antenna circuit a coil 12 and condenser 13 which form a circuit resonant at a frequency of about 550 kilocycles, the grid and cathode of 1 being connected to the opposite terminals of 13 as shown. To broaden the tuning of this resonant circuit to any desired extent a resistor 14 may be added, as shown. In the antenna circuit may also be included a resonant circuit including coil 15 and condenser 16, which may be tuned to a frequency of about 1500 kilocycles and a resistor 17 may be added to broaden its tuning to any desired extent, if desired. The branch circuit 15, 16 will, therefore, offer a low impedance to oscillations over the upper half of the broadcast band, while the branch 12, 13 will offer a low impedance to frequencies over the lower half of the band but a substantially high impedance to those over the upper half or portion of the band. By the use of these filter circuits, oscillations having frequencies higher and lower than the broadcast band which are picked up on the antenna do not create disturbances by reason of their sum and difference frequencies getting into cable 20 and the receivers 21. When the resonant circuits 12, 13 or 15, 16 are only partly suppressed by choosing resistors 14 and 17 of suitable low values, any non-linearity occurring in the frequency characteristic of either of the amplifier stages 22 may be compensated for by giving the filters an output energy or voltage characteristic in the reversed sense as a function of the frequency.

Having described my invention in a particular embodiment, it will be understood that I do not limit myself to the form shown but include within its scope all arrangements coming within the terms of the following claims.

What I claim and desire to secure by Letters Patent is:

1. In a device of the class described, the combination of a two wire transmission line designed to transmit a broad band of radio frequency currents, a plurality of radio receivers coupled to said line at spaced apart points along the length of said line, a transformer having its secondary connected across one end of said transmission line, said transformer being designed so that its impedance is substantially equal to that of said transmission line for the frequencies within the upper half of said band of frequencies, means for impressing current frequencies within the upper half of said band only on the primary of said transformer, a second transformer having its secondary connected across the end of said line, said second transformer being designed

so that its impedance is substantially equal to that of said line for the frequencies within the lower half of said band of frequencies, and means for impressing current frequencies within the lower half of said band on the primary of said second transformer.

2. The combination defined in the preceding claim in which a condenser of small capacity value is inserted between the secondary of said first named transformer and said transmission line.

3. In a system of the class described, the combination of a line adapted to transmit two adjacent bands of currents of higher and lower radio frequencies, a transformer having its secondary connected across said line, means for impressing currents of the lower frequency band on the primary of said transformer, a second transformer having its secondary connected across said line, means for impressing currents of the higher frequency band on the primary of said second transformer and a condenser connected in series between the secondary of said second named transformer and said line, said condenser having a capacity value such that it has a low impedance for currents of the higher frequency band and a substantial high impedance for currents of the lower frequency band.

4. In an amplifying system, the combination of two vacuum tube radio frequency amplifiers having cathodes, grid and plate circuits, an antenna circuit having two branches one of which includes a coil and condenser connected in series and of such values that a first branch is resonant at a high radio frequency, means connecting the coil across the grid and cathode of one of said amplifiers, the second branch of said antenna circuit including a coil and condenser connected in series and of such values that the second branch is resonant at a substantially lower radio frequency than said first branch, means connecting the condenser of said second branch across the grid and cathode of the other of said amplifiers and a transmission line coupled to the plate circuits of each of said amplifiers.

5. The combination of the preceding claim in which at least one of said branch antenna circuits includes a resistor in series therewith.

6. In an amplifying system, the combination of two radio frequency amplifier tubes having cathodes, grids and plate circuits, a single antenna circuit having two parallel branches, the first branch including the series connection of a coil and a condenser having such values as to form a circuit which resonates at a frequency of the order of 550 kilocycles, means connecting the grid and cathode of one of said tubes to opposite sides of said condenser, the second branch of said antenna circuit including the series connection of a second coil and condenser having such values as to form a circuit which resonates at a frequency of the order of 1500 kilocycles, means connecting the grid and cathode of the other of said tubes to the ends of said second coil, a radio frequency transmission line designed to transmit the band of frequencies from 550 to 1500 kilocycles, and means coupling the plate circuits of said tubes to the end of said transmission line.

7. In a transmission system for radio frequency currents, the combination of two electron discharge tube radio frequency amplifiers having cathodes, grids and plate circuits, an input circuit having two branches, the first branch including a coil and condenser connected in series and of such values as to form a circuit resonant at a

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frequency within the upper half of a broad band of radio frequencies, a pair of leads connecting the grid and cathode of one of said amplifiers to the opposite ends of said coil, the second of said
5 branches comprising a coil and condenser connected in series and of such values as to form a circuit resonant at a frequency within the low-

er half of said broad band of frequencies, a pair of leads connecting the grid and cathode of said second named amplifier to the opposite sides of said last named condenser, and a common transmission line coupled to each of said plate circuits. 5

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