

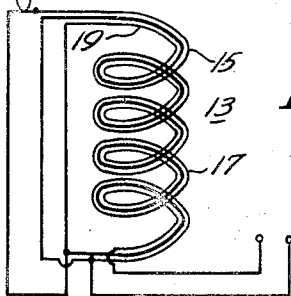
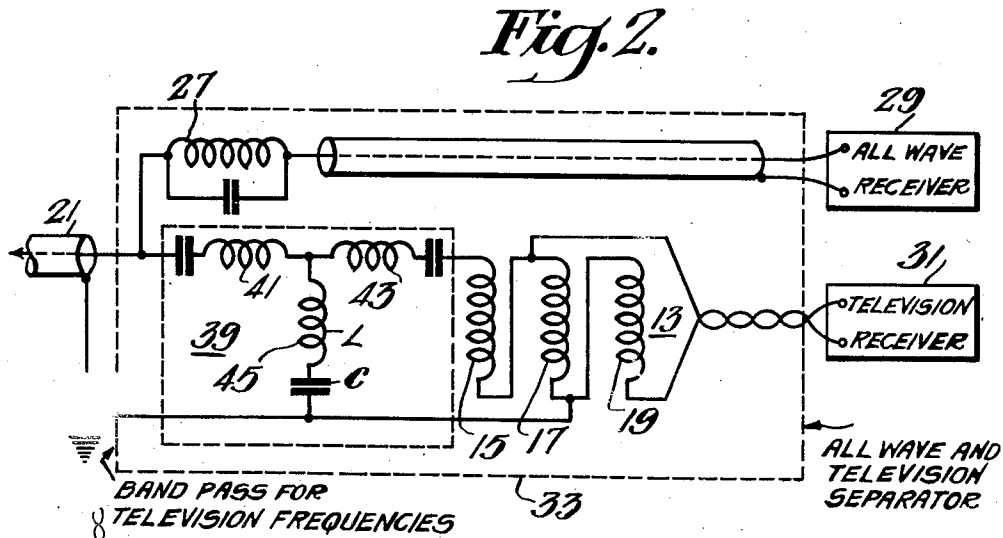
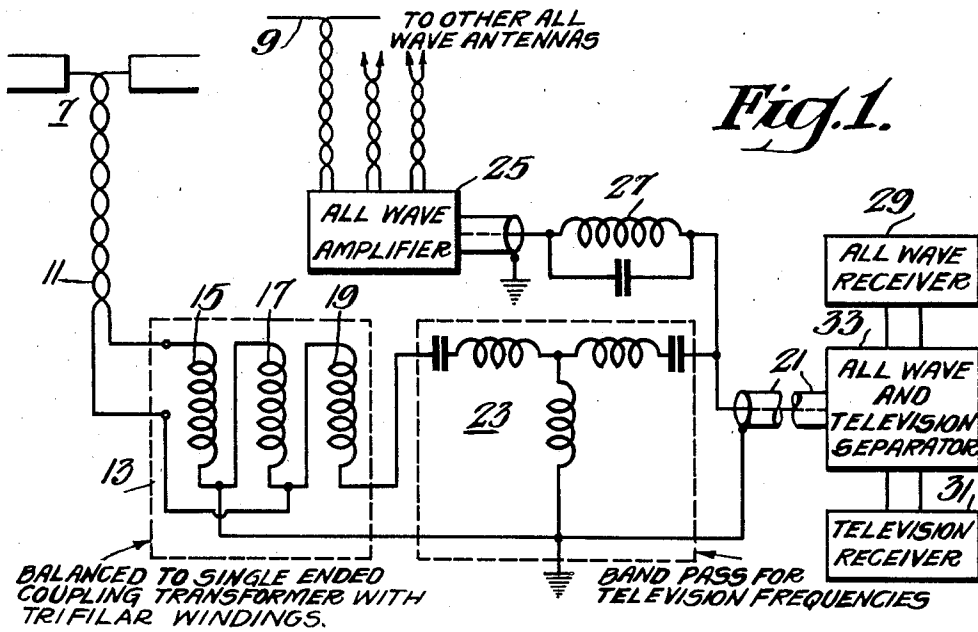
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2,358,520

COUPLING TRANSFORMER

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COUPLING TRANSFORMER

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5 Claims. (Cl. 250—33)

This application is a division of my application Serial No. 301,698, filed October 28, 1939, and entitled Television antenna amplifier. The present invention relates to coupling circuits and/or transformers for coupling balanced circuits to single ended circuits or vice versa.

An object of the invention is to provide an improved coupling means of the above-mentioned type that will pass a signal comprising a wide band of frequency components.

In the preferred embodiment of the invention, the coupling means comprises a transformer having a trifilar winding. The three windings are connected in series aiding relation and are suitably connected to the balanced and single ended circuits as described hereinafter. Because of the very tight coupling between windings, the transformer will pass a very wide frequency band.

The invention will be better understood from the following description when considered in connection with the accompanying drawing, in which Figure 1 is a circuit diagram showing the invention applied to an input circuit arrangement for a distribution system; in which Figure 2 is a circuit diagram showing the invention applied to a circuit for connecting receivers to a transmission line; and in which Figure 3 is a diagram of the trifilar winding transformer of Figures 1 and 2.

The invention will be explained by reference to a system designed for operation in a low frequency band which may include either the normal broadcast band or the broadcast and the short wave band usually covered by commercial receivers which extends up to 18 or 20 megacycles, and a high frequency band including the television frequencies between 44 and 56 megacycles. These arbitrary frequency ranges are merely by way of illustration, however, as the system may be used for other frequency bands or a greater number of separate bands without departing from the spirit of this invention.

Referring to Fig. 1, an antenna 7 is provided, which may be of any type such as a dipole suitable for the reception of television signals. The television antenna 7 is connected by a balanced transmission line 11, such as a pair of twisted conductors, to the input of a coupling transformer 13. This transformer is designed to couple a balanced transmission line to an unbalanced or concentric line. It consists of three interwound coils 15, 17, 19 which are formed as indicated in Figures 1 and 3 by winding three juxtapositioned conductors on a coil form. The three coils are connected in series aiding and the input is connected across the first and second

coils 15 and 17 while the output is connected across the second and third coils 17 and 19. The mutual coupling between the coils is very high so that the transformation is made with a minimum loss.

The coupling transformer output is connected to the concentric distribution line 21 through a band pass filter 23 designed to pass the ultra high frequency television band. Low frequency reception is provided by means of an antenna 9 connected to an "all wave" amplifier 25, the output of which is connected to the concentric line 21 through a series wave trap 27. The wave trap 27 is tuned to the center of the television band, and its purpose is to prevent the loss of high frequency signals through the all wave amplifier. The band pass filter 23 is used to prevent reradiation of signals from the all wave amplifier 25 through the television antenna. If permitted, such reradiation would provide an effective feed back circuit around the amplifier which would produce oscillations.

The low and high frequency signals are carried by the concentric line 21 to the all wave receiver 29 and the television receiver 31. A separator 33 is used to direct high and low frequency signals to the respective receivers.

Fig. 2 shows a preferred form of separator which includes a band pass filter 39. The filter 39 incorporates a wave trap which prevents signals near the intermediate frequency of the television receiver from causing interference. The filter 39 comprises a T-section, the two series arms 41, 43 of which are series resonant in the television band. The inductance L in the shunt arm 45 is tuned to series resonance at the intermediate frequency, in the vicinity of 10 to 12 megacycles, for example, by a capacitor C. At high television frequencies the impedance of C is negligible so that the inductance L alone constitutes the impedance of the shunt arm 45. One arm L, C of the band pass filter 39 is, therefore, used as a wave trap as well as a filter section. The low frequency channel which connects the line 21 to the all wave receiver 29 includes a wave trap 27, identical to the one shown in Fig. 1, which blocks the television or high frequency signals from the all wave receiver. If the television receiver is provided with balanced input terminals a coupling transformer 13 is used to couple the band pass filter to the receiver.

I claim as my invention:

1. A system for radio frequency signals including an unbalanced transmission line, a balanced line and a coupling transformer inter-

connecting said lines, said transformer comprising three interwound inductors in which each turn of one inductor is adjacent the corresponding turns of the other inductors, said inductors being connected in series aiding, said balanced line being connected across the first and second inductors, and the unbalanced line being connected across the second and third inductors.

2. In a distribution system for radio frequency signals, the combination including a dipole antenna having balanced lead-in conductors, a concentric line conductor for distributing signals to receivers at remote points, and means coupling said antenna to said concentric line, said means including a trifilar winding having three interwound coils connected in series aiding, said lead-in conductor being connected across the first and second of said coils, and said concentric line conductors being connected across the second and third of said coils.

3. A transformer for connecting a balanced signal circuit to an unbalanced signal circuit comprising three interwound inductors in which each turn of one inductor is adjacent the corresponding turns of the other inductors, said inductors being connected in series aiding, said

balanced circuit being connected across the first and second inductors, and the unbalanced circuit being connected across the second and third inductors.

5 4. A transformer for coupling an unbalanced line and a balanced line, said transformer comprising a trifilar winding whereby there are three interwound inductors in which each turn of one inductor is adjacent the corresponding turns of
10 the other inductors, said inductors being connected in series aiding, said balanced line being connected across the first and second inductors, and the unbalanced line being connected across the second and third inductors.

15 5. In combination, an unbalanced transmission line and a balanced line, a coupling transformer interconnecting said lines, said transformer comprising three interwound inductors in which each turn of one inductor is adjacent the
20 corresponding turns of the other inductors, said inductors being connected in series aiding, said balanced line being connected across the first and second inductors, and the unbalanced line being connected across the second and third in-
25 ductors.

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