June 21, 1938. F. A. COWAN 2,121,287

COMPOSITE SET

Filed March 3, 1937

FIG. 1

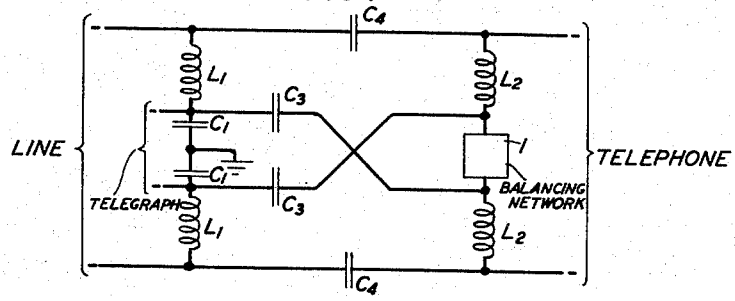


FIG. 2

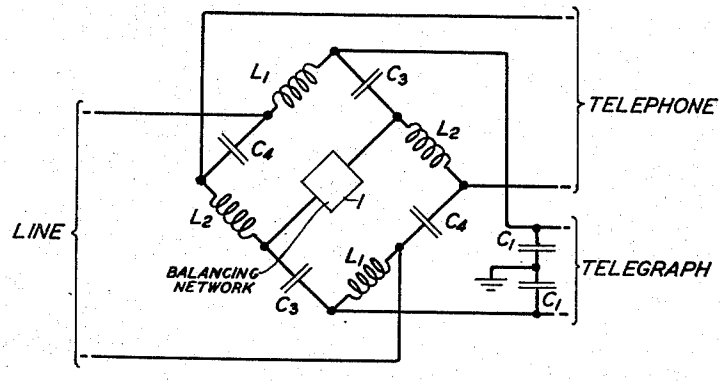
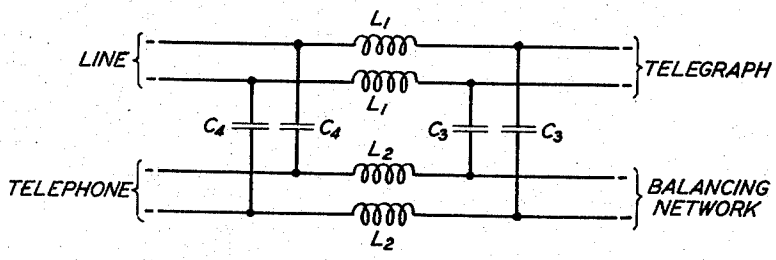


FIG. 3



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COMPOSITE SET

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Application March 3, 1937, Serial No. 128,839

3 Claims. (Cl. 179—4)

This invention relates to multiplex signaling systems and more particularly to improvements in arrangements, such as composite sets, usually associated with the terminal facilities of the lines of such systems to prevent the different currents utilized from interfering with each other.

An object of the invention is to permit the interconnection of two communication circuits, employing currents of different frequencies, with a common transmission line, so that both balance and frequency descrimination will be established between said circuits, and between the transmission line and the balancing network of the composite set, and frequency discrimination will be provided between each communication circuit and the balancing network whereby energy dissipation in the balancing network will be reduced.

In common with other composite sets it is the function of the composite set of this invention to permit the simultaneous use of both telephone and telegraph facilities or the like over a common system of transmission lines, to permit the separation of the telephone and telegraph currents at terminals and to prevent interference between the currents of these facilities. The composite set of this invention makes use of the well-known combined balance and frequency discrimination which may be obtained by a Wheatstone bridge employing reactive elements.

The composite set of this invention is similar to that shown and described in United States Patent 1,681,216 issued August 21, 1928 to D. E. Branson and R. B. Shanck, except that by a rearrangement of the elements of the bridge circuit the set of this invention tends to exclude both the telephone and telegraph currents from the balancing network. In the composite set of the above patent approximately half the energy of both telephone and telegraph transmission is dissipated in the balancing network.

The invention may be more fully understood from the following description together with the accompanying drawing in Figs. 1, 2 and 3 of which the invention is illustrated:

Figure 1 shows a circuit diagram embodying a preferred form of the invention.

Fig. 2 shows in diagrammatic form the composite set of this invention; and

Fig. 3 shows in schematic form the bridge circuit employed.

In Fig. 1 is shown a line circuit connected through condenser C_4 to a telephone circuit and through retardation coils L_1 to a pair of telegraph legs. Condensers C_1 shunted across the telegraph circuit and provided with a midpoint ground assist in suppressing noise from the telegraph circuit which might produce cross-talk into the telephone circuit. Condensers C_4 serve to exclude telegraph currents from the telephone circuit and coils L_1 serve to exclude telephone currents from the telegraph circuit. Coils L_2 and condensers C_3 are then added as indicated to provide balancing arms for a Wheatstone bridge and network I is added to simulate and balance the line impedance. The functions of these elements may be more readily perceived in Figs. 2 and 3. It is apparent from these two figures that the network I simulating the line impedance, cannot absorb an appreciable amount of the telephone currents from the telephone line because of the high impedance offered such currents by coils L_2 nor can it absorb an appreciable amount of energy from the telegraph circuit because of condensers C_3.

From Fig. 3 it is apparent that the conditions for balance of the bridge circuit are that $L_1=L_2$ and $C_3=C_4$. For satisfactory operation the impedance of the bridge, which is equal to the impedance of one of its four equal arms, should equal the impedance of the lines connecting thereto.

The bridge of this invention may be considered as a device for interconnecting two pairs of circuits so that the circuits of each pair will be conjugate and so that transmission to and from either circuit of one pair employing currents of different frequencies, for example, telephone-telegraph circuits, will tend to be excluded from a particular circuit, viz. the balancing network circuit, of the other conjugate pair. This results in more efficient operation than with the usual devices of the prior art in which these currents divide equally between the transmission line and the balancing network.

For perfect balance of the bridge of this invention the line and balancing network impedances should be equal and the impedances of the two communication circuits should be equal. In practice these impedances need be only reasonably well matched for satisfactory operation.

It is to be understood of course that the arrangement shown in the drawing and described hereinbefore is purely diagrammatic and illustrative of the principle involved and that the invention is capable of embodiment in different forms without departing from the spirit of the invention and the scope of the appended claims.

What is claimed is:

1. Static means for interconnecting a transmission line with a telegraphic circuit and a

telephone circuit, said means including a line balancing network and a Wheatstone bridge, each arm of said bridge comprising an inductance and a capacity in series, said arms being connected so that at each junction of two arms of said bridge an inductance of one arm connects with a capacity of the other arm whereby in addition to the usual balance and frequency discrimination between the telegraphic and telephone circuits, discrimination against the dissipation of both telegraphic and telephone currents in the line balancing network is obtained.

2. Static means for interconnecting a transmission line with two communication circuits employing currents of different frequencies, said means including a line balancing network and a Wheatstone bridge each arm of said bridge comprising a plurality of unlike reactances in series, said arms being connected so that at each junction of two arms of said bridge, unlike reactances are connected together whereby in addition to the usual balance and frequency discrimination between said two communication circuits, discrimination against the dissipation of currents of both circuits in the line balancing network is obtained.

3. Static means for interconnecting two pairs of circuits, the circuits of each pair being made conjugate through said means, the circuits of the first of said pairs being designed to transmit and receive currents of different frequencies, said static means including a Wheatstone bridge each arm of said bridge comprising an inductance and a capacity in series, said arms being connected so that at each junction of two arms of said bridge an inductance of one arm connects with a capacity of the other arm whereby, in addition to the usual balance and frequency discrimination between the circuits of said first pair, discrimination against the dissipation of currents of both said first pair of circuits in a particular circuit of said second pair is obtained.

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