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DUPLEX TELEGRAPH SYSTEM

Filed Oct. 30, 1928

Fig. 1.

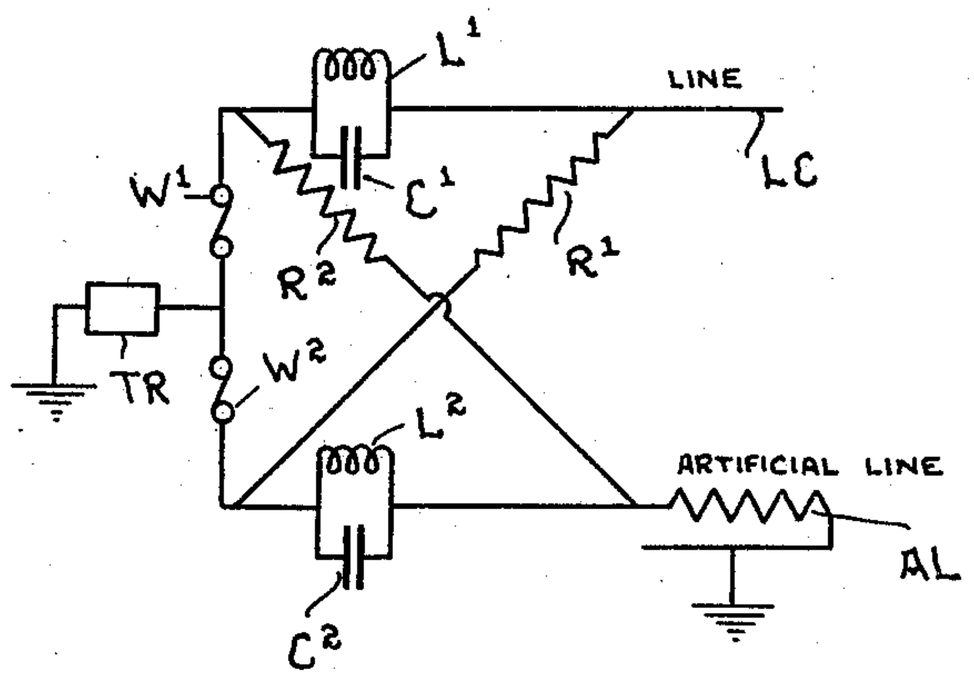
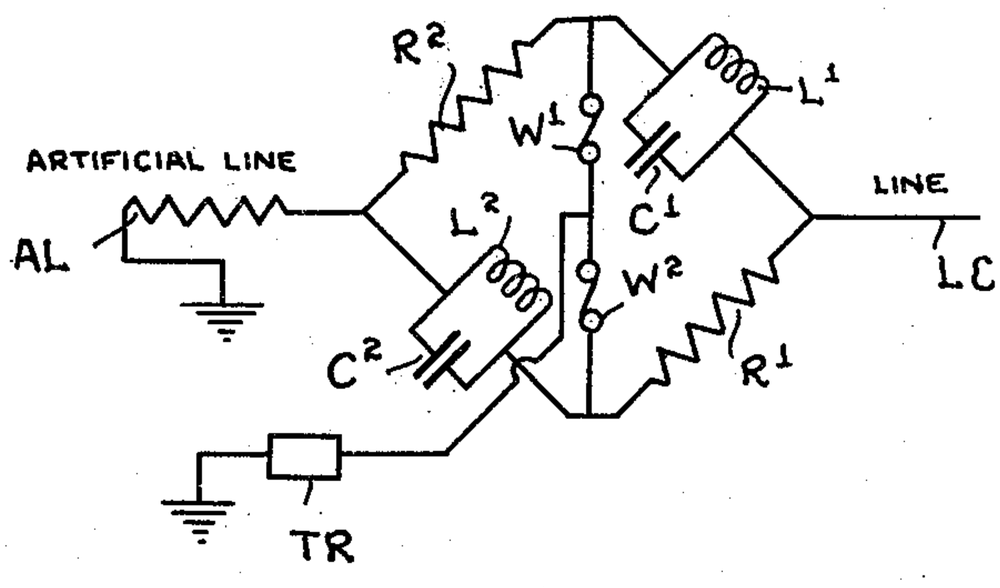


Fig. 1a.



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UNITED STATES PATENT OFFICE

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DUPLEX TELEGRAPH SYSTEM

Application filed October 30, 1928. Serial No. 316,019.

This invention relates to a duplex telegraphic system and in particular to a duplex system provided with means to reduce or eliminate the effect of disturbing currents upon the receiving instruments.

An object of this invention is to devise a system for excluding from the receiving relay circuit disturbing currents induced into the line conductor by neighboring power circuits and the like.

A further object of this invention is to provide a telegraph system wherein means are provided for excluding disturbing currents from the receiving relay circuit and provision is also made for duplex transmission over the receiving conductor without disturbing the receiving relay.

The invention is illustrated in the accompanying drawing in which like parts in the various figures are indicated by the same reference characters.

Figure 1 is a circuit diagram of the invention;

Figure 1[a] illustrates the circuit of Figure 1 arranged in a different manner for the purpose of explaining its operation.

Referring to the drawing, LC indicates a line conductor over which telegraphic messages are to be received and transmitted. The line conductor is subject to disturbing currents induced therein by neighboring power circuits and the like.

In Figure 1, a circuit is completed from the line conductor LC through a resistance R^1, through two windings W^1 and W^2 of a receiving relay, through resistance R^2, and through an artificial line AL to ground. The operating windings W^1 and W^2 of the receiving relay are connected in series, and a transmitter TR is connected at one terminal to a point between the windings W^1 and W^2 and at the other terminal to the ground. A tuned path, including inductance coil L^1 and a condenser C^1 in parallel, is connected in shunt to resistance R^1 and windings W^1 and W^2. In a like manner, a tuned path, including inductance coil L^2 and condenser C^2 in parallel, is connected in shunt to windings W^1 and W^2, and resistance R^2. By reference to Figure 1[a], it will be seen that the resistance R^1 and R^2, and the two tuned paths, constitute, respectively, the arms of a balanced Wheatstone bridge with the receiving relay circuit connected in a diagonal of the bridge.

The operation is as follows:

The two tuned arms of the bridge are adjusted to resonance with the disturbing currents, which are usually alternating currents of 25 or 60 cycles frequency induced by neighboring power lines. Resistance R^1 is adjusted in value to equal the resonant impedance of the tuned arm including coil L^1 and condenser C^1. Also, resistance R^2 is adjusted in value to equal the resonant impedance of the tuned arm including condenser C^2 and coil L^2. Under the foregoing conditions, the bridge will be balanced with respect to the disturbing currents, and the receiving relay will not be operated thereby. However, for incoming telegraphic signals the tuned arms of the bridge will not be balanced by the resistance arms, and signal currents will flow through windings W^1 and W^2 of the relay and effect its operation. Upon transmitting signals from transmitter TR, the transmitted current flows through windings W^1 and W^2 in opposite directions and, therefore, the receiving relay will not be operated. Artificial line AL is adjusted in impedance to produce a balanced relation between transmitter TR and the receiving relay. In other words, transmitter TR is in conjugate relation with the receiving relay.

Due to the fact that the tuned arms of the bridge include the parallel resonant circuits, the resonant impedances of these arms will be relatively high, and resistances R^1 and R^2 will be correspondingly high, as compared with the impedance of series tuned circuits including the same elements.

One of the advantages of the invention is its simplicity and its adaptability to standard duplex and multiplex systems already in operation without modification of the telegraph equipment.

We claim:

1. In a duplex telegraph system, the combination of a line conductor subject to disturbing currents, a return path for said line conductor, an artificial line connected to said

return path, a Wheatstone bridge connected between the line and the artificial line and comprising two opposite arms each of which includes a parallel resonant circuit tuned to the disturbing current, and two opposite resistance arms, a receiving relay connected in a diagonal of said bridge, and a transmitting circuit in conjugate relation with said relay, said resistance arms being adjusted in value to equal the resonant impedances of the adjacent arms respectively, and said artificial line having an impedance such as to produce a duplex balance of the system.

2. In a duplex telegraph system, the combination of a line conductor subject to disturbing currents, a return path for said line conductor, an artificial line connected to said return path, a balanced Wheatstone bridge connected between said artificial line and said line conductor, two opposite arms of said bridge each including a parallel resonant circuit tuned to the disturbing current, and the two opposite remaining arms comprising resistance elements equal in value to the resonant impedances of the adjacent tuned arms respectively, a receiving relay having two operating windings connected in series in a diagonal of said bridge, and a transmitting circuit connected between said return path and a point between said operating windings, said artificial line being of such value that said system is balanced for duplex operation.

In testimony whereof we affix our signatures.

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