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MULTIPLE WAY CONNECTION FOR A PLURALITY OF LINES

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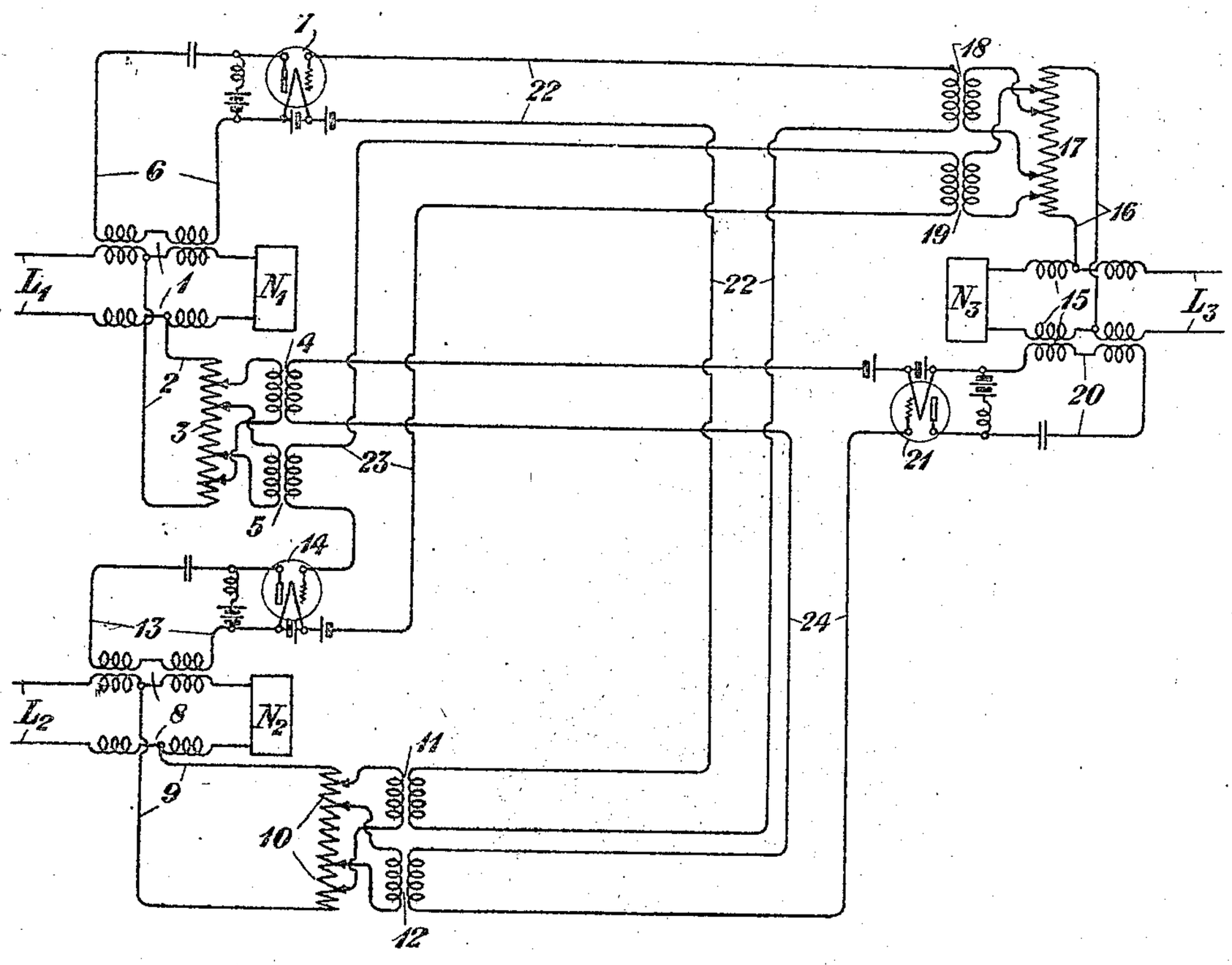

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MULTIPLE-WAY CONNECTION FOR A PLURALITY OF LINES.

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To all whom it may concern:

Be it known that I, GEORGE CRISSON, a citizen of the United States, residing at East Orange, in the county of Essex and State of New Jersey, have invented certain Improvements in Multiple-Way Connections for a Plurality of Lines, of which the following is a specification.

This invention relates to arrangements for establishing a multiple way connection between a plurality of telephone lines. By a multiple way connection is meant an arrangement whereby a plurality of subscribers may be so connected together that speech originating with any subscriber may be heard by all the other subscribers. In other words, by the arrangements of this invention a greater number than two subscribers may all be brought together for purposes of joint conversation.

The arrangements of the invention are applicable to many uses, a particular one of which might be for purposes of conference between a number of single subscribers or groups of subscribers located at distant points. They might also be useful in connection with the distribution of public speeches in which at one or more points on a line it may be desirable to permit audiences to hear speech coming from one or more points and at the same time permit talking into the line from these various stations. The invention might find further application in other fields, such as on leased wire telephone lines in which service is to be distributed to three or more stations in a manner to permit any one station to talk to any other station. The arrangements might also be utilized for monitoring purposes where it is desirable for a supervisor to talk into a line as well as to listen on the line.

In the arrangements of the invention, there is provided for each line entering the multiple way connection, a hybrid coil, or three winding transformer, a vacuum tube amplifier, a potentiometer and a balancing network. If the number of lines entering the multiple way connection be represented as N, then each potentiometer will be provided with N—1 pairs of adjustable contacts and will be associated thereby with N—1 input transformers making a total of N^2—N input transformers for the complete arrangement. The grid circuit of each vacuum tube is connected in series through the secondary winding of one of the input transformers associated with each line except the one to which its plate circuit is connected and can thus receive transmission from any or all of these lines without causing interference between them. By adjusting the individual potentiometers the transmission gains between any of the lines may be regulated as desired. Further features of the invention will be clear from the detailed description hereinafter given.

The invention may be more fully understood from the following description together with the accompanying drawing in the figure of which is shown a circuit diagram illustrating the arrangements of the invention.

In the drawing are shown arrangements for establishing a multiple way connection between three telephone lines L_1, L_2 and L_3. However, it is to be understood that the number of lines which may be interconnected in this manner may be greater than three if desired. The line L_1 terminates in the balancing network N_1 and the hybrid coil 1. Bridged across the midpoints of windings of the hybrid coil 1 is an input circuit 2 which is connected to a potentiometer 3. The potentiometer 3 is shown with two pairs of adjustable contacts which are connected to the primary windings of the transformers 4 and 5. The secondary winding of transformer 4 is connected over circuit 24 to the input of the vacuum tube amplifier 21 associated with the line L_3 by the output circuit 20. The secondary winding of transformer 5 is connected over circuit 23 to the input of the vacuum tube amplifier 14 associated with the line L_2 by the output circuit 13. The line L_2 terminates in the balancing network N_2 and the hybrid coil 8. Bridged across the midpoints of windings of hybrid coil 8 is the input circuit 9 which is connected to the potentiometer 10. The potentiometer 10 has two sets of contacts which are connected to the primary windings of the transformers 11 and 12. The secondary winding of transformer 11 is connected over circuit 22 to the input of the vacuum tube amplifier 7 which is connected to line L_1 by the output circuit 6. The secondary winding of transformer 12 is connected by circuit 24 to the input of vacuum tube amplifier 21. The line L_3 terminates

in the balancing network N_3 and the hybrid coil 15. Bridged across the midpoints of hybrid coil 15 is the input circuit 16 which is connected to the potentiometer 17. Potentiometer 17 has two sets of contacts which are connected to the primary windings of transformers 18 and 19. The secondary winding of transformer 18 is connected over circuit 22 to the input of vacuum tube 7 and the secondary winding of transformer 19 is connected over circuit 23 to the input of vacuum tube 14.

The speech currents coming in over line L_1 would be transmitted to potentiometer 3 in the usual manner. The potential drops in the portions of potentiometer 3 to which the input windings of transformers 4 and 5 are connected are repeated into their secondary windings and thence are applied over circuits 23 and 24 to the grids of vacuum tube amplifiers 14 and 21 respectively. These vacuum tubes will repeat the speech variations over circuits 13 and 20 into the lines L_2 and L_3. In a like manner the speech currents coming in over line L_2 may be repeated into lines L_1 and L_3 and the speech currents coming in over line L_3 may be repeated into lines L_2 and L_1. The transmission gains between line L_1 and lines L_2 and L_3 may be adjusted by shifting the setting of the potentiometer contacts associated with the input transformers 4 and 5. To vary the gain between any of the other lines the setting of the contacts of potentiometers 10 and 17 should be changed. By this means it is possible to provide for independently adjustable transmission gains between any of the lines. If it should be desired to interconnect additional lines with these arrangements additional input transformers, similar to 4 and 5, would be connected to each of the potentiometers and to the grid circuits of the amplifiers in the manner shown.

While the arrangements of the invention have been disclosed as embodied in certain specific arrangements which are deemed desirable, it is understood that they are capable of embodiment in many and other widely varied forms without departing from the spirit of the invention as defined in the appended claims.

What is claimed is:

1. A multiple way connection for a plurality of transmission lines terminating at a station comprising input circuits associated with each of said lines, output circuits associated with each of said lines, a plurality of transformers associated with each of said input circuits, a plurality of vacuum tube amplifiers each having its plate circuit connected to one of said output circuits, and circuit arrangements for serially connecting the grid of each amplifier with windings of said transformers at each of said input circuits except the input circuit associated with the line with which the plate circuit of the amplifier itself is associated.

2. A multiple way connection between a plurality of transmission lines terminating at a station comprising input circuits associated with each of said lines, output circuits associated with each of said lines, potentiometers associated with said input circuits, a plurality of transformers associated with each of said input circuits through said potentiometers, a plurality of vacuum tube amplifiers each having its plate circuit connected to one of said output circuits, and circuit arrangements for serially connecting the grid of each amplifier with windings of said transformers at each of said input circuits except the input circuit associated with the line with which the plate circuit of the amplifier itself is associated.

3. A multiple way connection for a plurality of transmission lines terminating at a station in balancing networks and hybrid coils comprising input circuits bridged across the midpoints of the windings of each of said hybrid coils, output circuits associated with each of said hybrid coils, a plurality of transformers associated with each of said input circuits, a plurality of vacuum tube amplifiers each having its plate circuit connected to one of said output circuits, and circuit arrangements for serially connecting the grid of each amplifier with windings of said transformers at each of said input circuits except the input circuit associated with the line with which the plate circuit of the amplifier itself is associated.

4. A multiple way connection for a plurality of transmission lines terminating at a station comprising input circuits associated with each of said lines, output circuits associated with each of said lines, a plurality of transformers associated with each of said input circuits, a plurality of vacuum tube amplifiers each having its plate circuit connected to one of said output circuits, circuit arrangements for serially connecting the grid of each amplifier with windings of said transformers at each of said input circuits except the input circuit associated with the line with which the plate circuit of the amplifier itself is associated, and means for independently controlling the gain in each direction between each pair of said transmission lines.

5. A multiple way connection between a plurality of transmission lines terminating at a station comprising input circuits associated with each of said lines, output circuits associated with each of said lines, potentiometers associated with said input circuits, a plurality of transformers associated with each of said input circuits through said potentiometers, a plurality of

vacuum tube amplifiers each having its plate circuit connected to one of said output circuits, and circuit arrangements for serially connecting the grid of each amplifier with windings of said transformers at each of said input circuits except the input circuit associated with the line with which the plate circuit of the amplifier itself is associated, said potentiometers being so arranged with respect to said transformers that the gain in each direction between each pair of said transmission lines may be independently controlled.

6. A multiple way connection for a plurality of transmission lines comprising an amplifier for each line having its output circuit associated with said line and its input circuit associated with each of the other of said lines so as to receive signals from each of said last mentioned lines without causing interference between them, and independent means for controlling the gain in each direction between each pair of said transmission lines.

In testimony whereof, I have signed my name to this specification this 16th day of January, 1924.

GEORGE CRISSON.