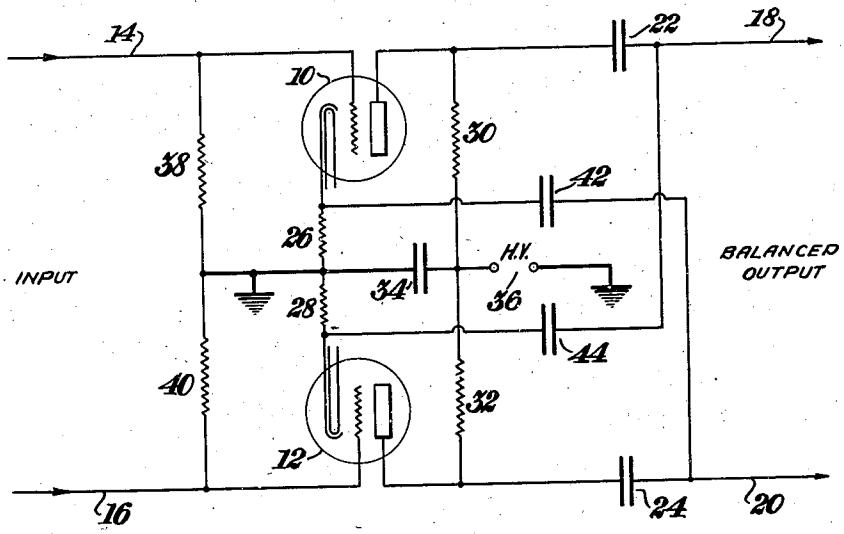
Nov. 26, 1946. H. G. BUSIGNIES 2,411,517

COUPLING AMPLIFIER

Filed Jan. 16, 1943



INVENTOR.
HENRI G. BUSIGNIES

BY

ATTORNEY

Patented Nov. 26, 1946 2,411,517

UNITED STATES PATENT OFFICE

2,411,517

COUPLING AMPLIFIER

Henri G. Busignies, Forest Hills, N. Y., assignor to Federal Telephone and Radio Corporation, Newark, N. J., a corporation of Delaware

Application January 16, 1943, Serial No. 472,589

3 Claims. (Cl. 179—171)

1

This invention relates to improvements in coupling amplifiers, and more particularly to such amplifiers to be used between an input circuit and a balanced output circuit, as between a directive antenna and its transmission line.

An object of this invention is to provide a novel coupling amplifier between a balanced or a partially unbalanced input circuit and a balanced output circuit.

More specifically, the invention is directed to a novel coupling circuit which amplifies a balanced input, but inherently prevents the amplification and through passage of parallel input currents or voltages to the output circuit.

In another sense, the invention provides a neutralized push-pull amplifier which blocks out unbalanced input currents but amplifies balanced input currents.

These and other objects and advantages of the present invention will appear from the following description of a preferred embodiment thereof, taken in connection with the following drawing in which the single figure is a circuit diagram of a preferred form of coupling amplifier according to the present invention.

In the preferred form of invention illustrated, I use two vacuum tubes 10 and 12 which may be triodes, as illustrated, generally connected in push-pull relationship. Input lead 14 will be connected to the grid of triode 10, while input lead 16 will be connected to the grid of triode 12. The output leads 18 and 20 are respectively connected to the anodes of the tubes 10 and 12 through suitable condensers 22 and 24. In the cathode circuit of each tube is placed a resistor, such as the resistors 26 and 28, the common mid-point between these resistors being grounded. The anodes of the two tubes are serially connected with one another through resistors 30 and 32, the mid-point connection of which is grounded for high frequency currents through the condenser 34. A high voltage source indicated at 36 will also be connected to the mid-point between resistors 30 and 32. Grid-leak resistors 38 and 40 are respectively connected between the individual grids and ground.

In addition to the circuit connections just outlined, it will be also noted that each cathode of the individual tubes is respectively connected to the output lead of the opposite tube. For example, the cathode of tube 10 is connected through condenser 42 to the output lead 20, while the cathode of tube 12 is connected through condenser 44 to the output lead 18. By means of this cross-connection, a balanced output from the

2

amplifier is assured. For example, if at any chosen instant the polarity of the input lead 14 is positive and the polarity of the input lead 16 is negative, the coupling will act as an amplifier. A negative potential will exist on the output lead 18 due to phase reversal through the tube 10 while a positive potential will appear on the output lead 20 due to phase reversal through the tube 12. The potential on the output lead 18 derived from the cathode of tube 12 through condenser 44 will likewise be negative, while the potential on the lead 20 derived from the cathode on the tube 10 through condenser 42 will be positive. Thus, when a balanced load is placed upon the leads 14 and 16, a balanced output on the leads 18 and 20 results.

However, if the potential on both leads 14 and 16, is for example, positive, the amplifier will act to block the passage of current, rather than amplify it. This is due to the fact that while, in such a case, the potential on the lead 18 derived from the anode of the tube 10 will be negative, the derived voltage values as determined by the proper adjustment of resistors 28 and 30 will be of such value that this potential will be neutralized by the positive potential derived from the cathode of the tube 12. Likewise, by properly proportioning resistors 26 and 32, the negative potential on the lead 20 derived from the anode of the tube 12 will be neutralized by the potential derived from the cathode of the tube 10. The amount of resulting neutralization will, of course, depend upon the amount of unbalance present in the input circuit.

While the invention has been particularly described in connection with an amplifier using triodes, it can be adapted for use with other multi-electrode tubes. The described amplifier is particularly well adapted for use as coupling units between direction finding antennae and transmission lines, in directive antenna coupling systems and generally in all balanced types of transmission circuits in which the transmission of parallel voltages or currents or straight reception is to be avoided. Furthermore, while, in order to comply with the statutes, I have illustrated and described a single specific embodiment of my invention, it is contemplated that various changes may be made in the circuit as will appear obvious to those skilled in this art and it is therefore to be clearly understood that this description is made by way of example and not as a limitation on the scope of my invention as set forth in the objects and the accompanying claims.

I claim:

1. A coupling amplifier comprising a pair of triodes, input leads connected to the grids of said triodes, resistors individually connecting each cathode to ground, a pair of output leads, means for capacitatively coupling one output lead to the anode of one triode and the cathode of the other triode, means for capacitatively coupling the other output lead to the anode of the other triode and the cathode of the one triode, and means including individual resistors and a common condenser for connecting each anode to ground.

2. A coupling amplifier, including in combination a pair of electron discharge devices each having an anode, a cathode and a grid, a pair of input leads, one connected to each grid, a pair of output leads, a first pair of condensers, one condenser connecting one outlet lead to the anode of one electron discharge device and the other condenser connecting the other output lead to the

anode of the other electron discharge device, a second pair of condensers, one condenser connecting the one output lead to the cathode of the other electron discharge device and the other condenser connecting the other output lead to the cathode of the one electron discharge device, a first pair of resistors serially connected between said anodes, a second pair of resistors serially connected between said cathodes, and means for coupling the mid-points between said pairs of resistors.

3. The combination according to claim 2, in which said last means is a condenser, in combination with means for grounding the mid-point between said second pair of resistors, and a high potential source connected to the mid-point between said first pair of resistors.

HENRI G. BUSIGNIES.