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MIXER AMPLIFIER

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Fig. 1

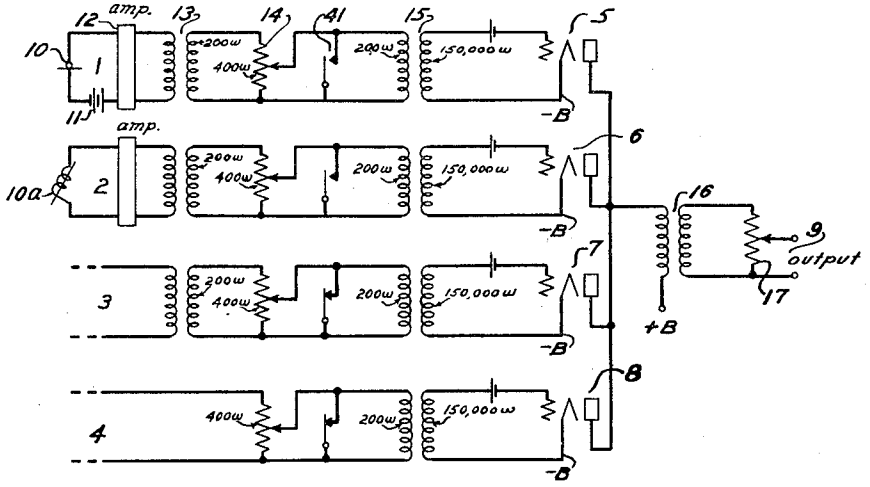
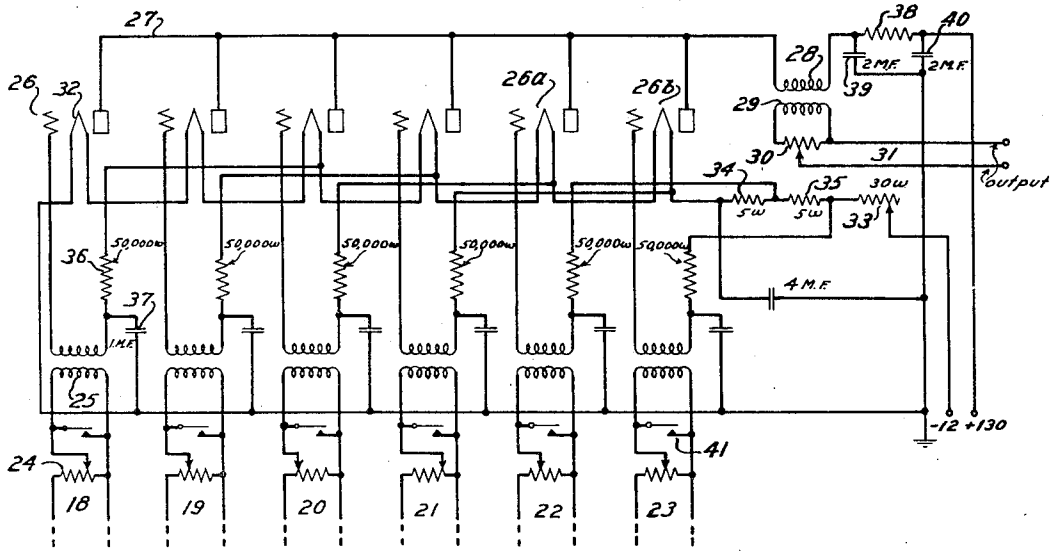


Fig. 2



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MIXER AMPLIFIER

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10 Claims. (Cl. 179—100.4)

The invention relates to mixer amplifiers wherein use is made of a plurality of pick-up devices, such as microphones, phonograph pick-ups, or other sources of electrical wave energy, and wherein the output therefrom is amplified and led to a common output circuit.

This arrangement requires that a potentiometer or the like be employed so that the relative intensity of the energy in each of the pick-up circuits may be controlled or adjusted to proper intensity.

An object of the present invention is to regulate the current in each of the pick-up or input circuits without thereby affecting the intensity of the current in the other input circuits.

Another object is to regulate the current in the common or output circuit without thereby affecting the intensity of the currents in the input circuits.

A further object is to make the impedances of the input circuits and of the common circuit independent of each other.

Still another object is to make the impedance of the common circuit independent of the number of input circuits operatively associated with the common circuit.

These objects are accomplished by taking advantage of the unilateral conducting property of an ordinary audion amplifier or other electron discharge device which is employed to isolate each input circuit from the effects of the potentiometers or the like in the other circuits and which may also amplify the current in each input circuit.

For further details of the invention, reference may be made to the accompanying drawing, wherein:

Figs. 1 and 2 illustrate alternative circuit arrangements which may be employed.

Referring to Fig. 1, there are employed a plurality of input circuits 1, 2, 3, 4, connected individually to the input circuits of vacuum tube amplifiers 5, 6, 7 and 8, respectively. The output circuits of the amplifiers 5 to 8, inclusive, are connected in parallel and feed into a common output circuit 9.

The input circuit 1 comprises a microphone pick-up 10 in circuit with a polarizing battery 11, amplifier 12, and the primary winding of a transformer 13. Across the secondary winding of the transformer 13 is connected a potentiometer 14 in circuit with a transformer 15, the secondary winding of which is connected in the input circuit of amplifier 5.

The other input circuits 2, 3 and 4 are similarly connected to their respective amplifiers 6, 7 and 8 with this difference: Instead of the microphone 10 as a pick-up device, use may be made in one or more or all of the input circuits of phonograph pick-ups, such as 10*a*. Alternatively, some of the pick-up devices may be phonograph pick-ups, while others are microphones, or other sources of audio frequency energy, whereby there may be supplied to the common output circuit 9 current corresponding either to sound waves impressed upon a plurality of microphones or to electric currents produced by a plurality of phonograph pick-ups reproducing from phonograph records, or to electric currents from other sources, or to a combination of these sources of energy. Input circuits not in use may be short circuited by switches or plugs, such as 41.

Transformers 13 and 15, and the corresponding transformers in the other input circuits, substantially match the impedances in their respective input and output circuits, as is well known in the art.

The common output circuit 9, which may lead, for example, to a recording device for wax or film recording, or both, or to a reproducer or the like, comprises a transformer 16, in the secondary circuit of which is provided a master potentiometer 17 for controlling the intensity of the combined current to the recording or other device.

On referring to Fig. 1, it will be seen that the use of the amplifiers 5, 6, 7 and 8 individual to the input circuits will prevent the adjustment of potentiometer 14, or the corresponding potentiometers in the other input circuits, or the operation of switches, such as 41, from effecting the impedance of the remaining input circuits; and these amplifiers will also prevent the adjustment of the master potentiometer 17 from affecting the impedance of the individual input circuits.

The above noted advantages are also present in the circuit of Fig. 2, wherein the input circuits 18, 19, 20, 21, 22, 23, each comprising a potentiometer, such as 24, transformer 25, and input circuit of vacuum tube amplifier 26, work into a common output circuit 27 comprising a parallel connection of the plate circuits of the amplifiers, such as 26.

The common output circuit 27 comprises a transformer 28, the secondary winding 29 of which is in circuit with a master potentiometer 30 connected in an output circuit 31, which leads to the film or wax recorder, reproducer, or the like.

The filamentary cathodes, such as 32, of all

of the amplifiers, such as 26, in Fig. 2, are connected in series with a suitable source, as indicated. A master resistance for all of the filaments is illustrated at 33. The grid bias for each of the vacuum tubes, such as 26, is obtained by a connection through a resistance, such as 36, to a more negative point in the filament circuit. Resistances 34 and 35 are connected in series with the cathodes to provide grid bias for vacuum tubes 26*a* and 26*b* in Fig. 2. Resistances 36 and the like are connected in series with the secondary windings of transformers, such as 25, and are of the order of 50,000 ohms, their purpose being, in cooperation with bypass condensers, such as 37, to prevent or reduce cross talk between the input circuits and to reduce disturbances which may be picked up by the connections to the filament supply.

In order to suppress any fluctuations that may exist in the plate supply of the amplifiers, such as 26, there is employed a filter comprising a resistance 38, of about 10,000 ohms, shunted by two condensers 39 and 40, the mid-point of these condensers being connected to ground, and this filter as a whole being in series with the plate circuit.

The impedances, voltages and capacities indicated in the drawings have been found to give good results in practice. It should be understood, however, that the invention is not dependent upon the particular values of the impedances, voltages or capacities shown therein.

The embodiments of the invention illustrated and described herein have been selected for the purpose of clearly setting forth the principles involved. Further embodiments may be made, however, without departure from the inventive concept disclosed, and it is intended that the invention be limited only by the spirit and scope of the appended claims.

I claim:

1. In combination, a plurality of individual lines each comprising a source of audio frequency energy, a potentiometer connected across the line, an impedance-matching transformer inserted in the line between the source and the potentiometer, an electron tube having a grid circuit and an anode circuit connected therewith, and a second impedance-matching transformer inserted in the line intermediate the potentiometer and the grid circuit of said tube and having its primary winding connected to a variable tap on said potentiometer; an output transformer, a master potentiometer connected across the secondary winding of said output transformer, a connection common to the plate circuits of the electron tubes in said individual lines and the primary winding of said output transformer, and an output circuit connected to a variable tap on said master potentiometer whereby the level of audio frequency energy from any of said sources may be changed independently and the level of the combined audio frequency energy in said output circuit may be changed without affecting the relative levels of the audio frequency energy in the individual lines.

2. The combination of a plurality of vacuum tube devices each having a grid, a cathode and a plate, an in-put circuit connected to each of said grids, a grounded source of potential connected to said cathodes in series, circuits for said plates, one of said in-put circuits comprising a connection from the grid of one of said tubes to the cathode of another of said tubes, said connection comprising a high resistance, and a condenser path to ground for said high resistance.

3. The combination of a plurality of vacuum tube devices each having a grid, a cathode and a plate, an in-put circuit connected to each of said grids, a grounded source of potential connected to said cathodes in series, circuits for said plates, one of said in-put circuits comprising a connection from the grid of one of said tubes to the cathode of another of said tubes, and means for preventing or reducing interference which would otherwise occur between said in-put circuits due to said connection.

4. The combination of a plurality of vacuum tube devices each having a grid, a cathode and a plate, an in-put circuit for each of said grids, a common out-put circuit for said plates, said cathodes being connected in series and a grounded source of potential therefor, a plurality of paths each including a high resistance, and a condenser connected at one terminal to ground and at the other terminal to various points along said cathode circuit, and connections between each of a plurality of said grids and a particular one of said high resistances respectively.

5. The combination of a plurality of vacuum tube devices each having a grid, a cathode and a plate, an in-put circuit connected to each of said grids, a common out-put circuit, said plates being connected in parallel and to said out-put circut, said cathodes being connected in series and a grounded source of potential therefor, connections between each of said grids and the cathode of a succeeding tube respectively, said last-mentioned connections each including a high resistance one terminal of which leads to the cathode circuit and the other terminal of which leads through a condenser to ground.

6. A mixer circuit comprising a plurality of individual lines, each comprising a source of audio frequency energy, a potentiometer connected across the line, a vacuum tube having a grid, a cathode and a plate for each line, a transformer in each line between the potentiometer and its associated vacuum tube, a common out-put circuit, means for connecting said plates in parallel and to said out-put circuit, a circuit for connecting said cathodes in series, a grounded source of potential for said cathode circuit, a secondary winding of each of said transformers being in circuit with the grid of one of said tubes and with the cathode of another of said tubes, a high resistance of the order of several thousand ohms in each of said last-mentioned circuits and connected between the secondary winding for one tube and the cathode of another tube, and a path to ground including a condenser connected between each of said high resistances and its associated secondary winding whereby interference between associated in-put circuits is reduced.

7. A mixer circuit comprising a plurality of in-put circuits each having a vacuum tube amplifier, each amplifier having an in-put circuit and an out-put circuit, each of said amplifiers having a grid, a cathode and a plate, circuits for said plates, and a connection from the grid of each of said tubes to the cathode of another tube comprising means for reducing interference between associated in-put circuits.

8. The combination of a plurality of vacuum tube devices each having a grid, a cathode and a plate, an in-put circuit connected to each of said grids, a grounded source of potential connected to said cathodes in series, circuits for said plates, a high resistance connected between the

grid of one of said tubes and the cathode of another of said tubes, and a condenser connected between the grid terminal of said high resistance and a point in said series cathode circuit.

9. The combination of a plurality of vacuum tube devices each having a grid, a cathode and a plate, an in-put circuit connected to each of said grids, a grounded source of potential connected to said cathodes in series, circuits for said plates, one of said in-put circuits comprising a grid biasing high resistance in shunt between the grid terminal of said high resistance and the cathode of the tube for which said high resistance serves as a grid bias.

10. The combination of a plurality of vacuum tube devices each having a grid, a cathode and a plate, an in-put circuit connected to each of said grids, a common out-put circuit, said plates being connected in parallel and to said out-put circuit, said cathodes being connected in series and a grounded source of potential therefor, grid biasing connections comprising a high resistance between each of said grids and the cathode of a succeeding tube respectively, and a condenser path for each of said high resistances and connected in shunt to the grid terminal of its respective high resistance at one terminal, and at the other terminal to the cathode of the tube for which the respective high resistance serves as a grid bias.

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