Dec. 7, 1937. R. RECHNITZER 2,101,688

TONE CONTROL DEVICE

Filed Sept. 11, 1935

Fig. 1

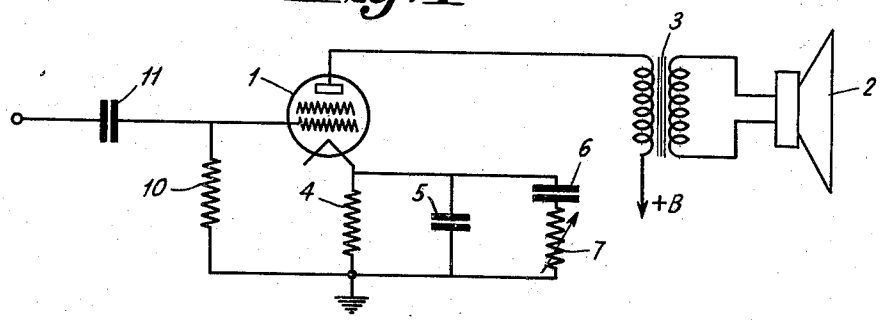


Fig. 2

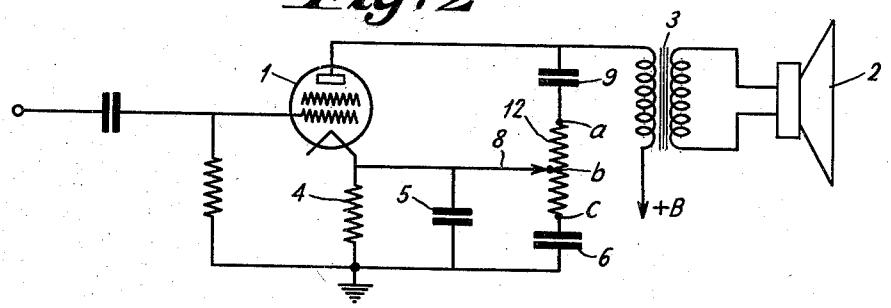


Fig. 3

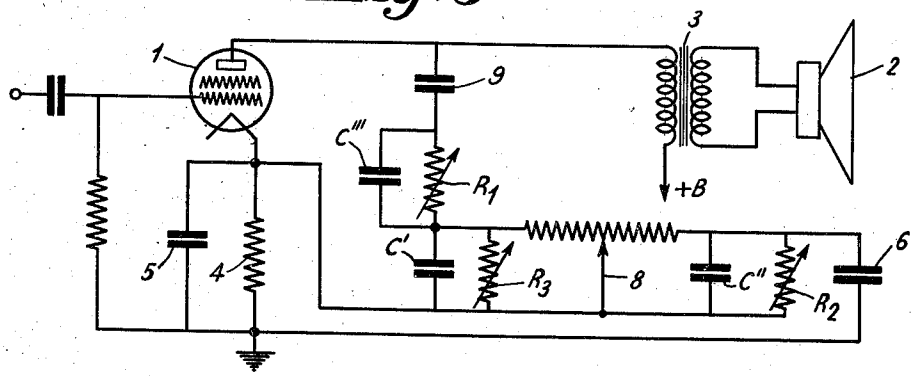
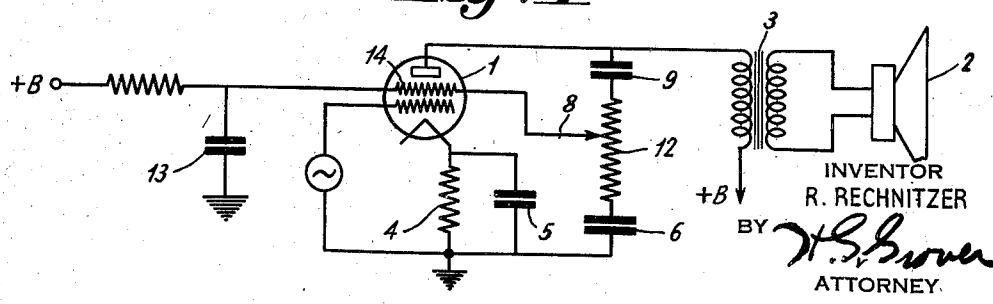


Fig. 4



INVENTOR
R. RECHNITZER
BY H. B. Brown
ATTORNEY

Patented Dec. 7, 1937

2,101,688

UNITED STATES PATENT OFFICE

2,101,688

TONE CONTROL DEVICE

Rudolf Rechnitzer, Berlin, Germany, assignor to Telefunken Gesellschaft für Drahtlose Telegraphie m. b. H., Berlin, Germany, a corporation of Germany

Application September 11, 1935, Serial No. 40,027
In Germany August 21, 1934

1 Claim. (Cl. 179—171)

As is known, the quality of reproduction of a receiver can be controlled so that either the high notes or the low notes of the frequency band to be transmitted are suppressed. A series of methods for suppressing the high frequencies has become known. For the suppression of the low frequencies it is proposed, in accordance with this invention, to provide from the output circuit of an audio frequency amplifier tube a countercoupling upon a circuit disposed ahead of said output circuit.

A further object is to provide a capacitive path which is common to both the grid and plate circuits of an amplifier tube and means for varying the impedance of said path for the purpose of controlling the lower audio frequencies in the band of frequencies being amplified.

For a better understanding of the invention reference is made to the accompanying drawing in which;

Figs. 1 to 3 are schematic circuit diagrams of vacuum tube amplifiers in which the control is effected by a capacitive path common to the grid and plate circuits and,

Fig. 4 is a schematic circuit diagram in which the capacitive control path is common to the control grid and screen grid circuits.

A simple circuit for carrying out this idea, is shown in Fig. 1, in which 1 denotes the end or power tube of a radio receiver in whose plate circuit the sound reproducer 2 is placed across an audio frequency transformer 3. The grid bias is produced in the known manner, namely the direct plate current produces through a resistor 4 in the cathode lead-in, a voltage drop, while the grid is connected to this resistor at its end remote from the cathode. The resistor 4 is bridged by a parallel connection of a condenser 5 and a series circuit containing a condenser 6 and a variable resistor 7. The size of the condenser 5 is so chosen that a countercoupling with the grid circuit is therewith established. The capacity of 5 is such that it offers a substantial impedance to the lower audio frequency currents, so that the voltage developed across 5 is applied to the control grid in substantially opposite phase to the signal voltage as applied by condenser 11, thereby causing a degenerative action at these lower frequencies. The condenser 6 is very much larger than the condenser 5, and is in parallel to the latter if the variable resistor 7 is very small or zero, thereby decreasing the countercoupling. If however, the resistor 7 is large the condenser 6 is ineffective. The size of the condenser 5, which may for instance be 2 microfarads, determines the frequency limit at which a countercoupling takes place. The condenser 6 may then have a value of 8 microfarads. As shown, a leak resistor 10 is connected between the control grid and the lower end of 4, and a condenser 11 is connected to the control grid, the modulated audio frequency voltages being applied to condenser 11 from a preceding amplifier tube of the receiver in a known manner.

Often it is desirable to simultaneously carry out a control of the lower and higher notes. With the arrangement in accordance with the invention, this combined control is easily possible by the aid of a potentiometer. An example thereof is shown in Fig. 2. In place of resistor 7, a potentiometer 12 is provided whose slide 8 is connected to the tube cathode, while the two ends thereof are connected across condensers 9 and 6 respectively, to the anode and to the end of the biasing resistor 4 remote from the cathode. In the position, *a*, the slide of the potentiometer produces a wide cutting away of the high and low frequencies, since for the high frequencies the series connection of the condensers 9 and 5 represent a parallel connection across the output circuit and condenser 5, being common to the grid and plate circuits, causes a decrease in the amplification of the low frequencies due to degeneration just as in the case of the arrangement of Fig. 1. In the position *c*, neither the high nor the low frequencies will be suppressed. The center position is designated by *b*.

In order to influence the control performance in favor of the high or of the low frequencies, additional variable or fixed blind and/or active resistors are combined with the potentiometer, such as schematically indicated in Fig. 3. Herein, condensers C′, C″, C‴ are provided whose actions can be varied by the resistors R_1, R_2, R_3.

In the examples shown the countercoupling acts from the output circuit upon the control grid circuit. Obviously also other electrodes may be resorted to for the purpose of control such as shown in Fig. 4 in connection with a screen grid. In this case it will obviously be necessary to choose the condenser 5, which bridges the grid bias resistor, so large that no appreciable countercoupling upon the control grid circuit takes place. However, the condenser 13 connecting the screen grid 14 to ground, is to be chosen in this case so small that a sufficiently large voltage drop for the low frequencies will be produced therein. Resistor 12 is again the control potentiometer whose slide 8 in this case however, is connected to the screen grid.

Having described my invention, what I claim as novel and desire to secure by Letters Patent is:

An amplifier for a wide band of audio frequency currents comprising in combination, a vacuum tube having a cathode, a control grid and a plate, an input circuit connecting said cathode and control grid, an output circuit connected to said plate, a resistor common to said input and output circuits, a condenser shunted across said resistor, a series circuit including two separated condensers and a central resistor connected between the plate and the low potential end of said first named resistor and a conductive connection between an intermediate point of said central resistor and said cathode.

RUDOLF RECHNITZER.