Sept. 5, 1944. M. KATZIN 2,357,405

AUDIO FREQUENCY LIMITER NETWORK

Filed March 11, 1941

Fig. 1.

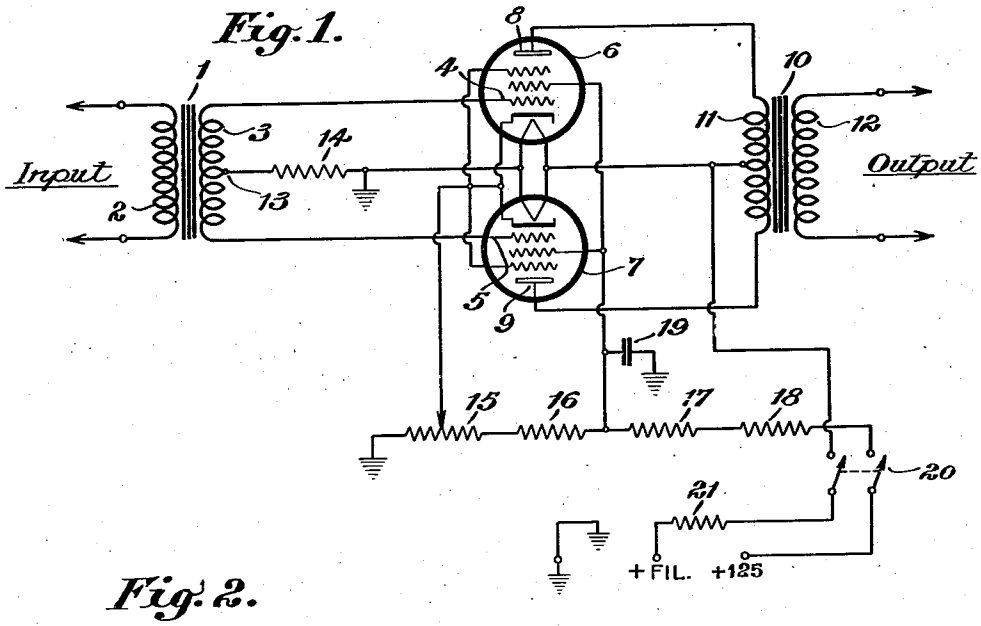
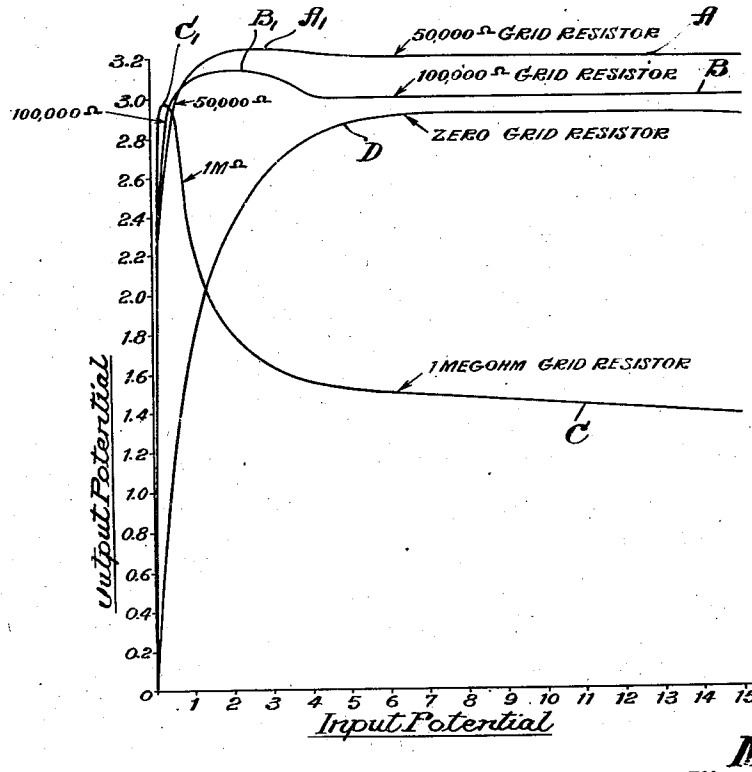


Fig. 2.



INVENTOR
Martin Katzin
BY H. H. Groves
ATTORNEY

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AUDIO FREQUENCY LIMITER NETWORK

Martin Katzin, Riverhead, N. Y., assignor to Radio Corporation of America, a corporation of Delaware

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2 Claims. (Cl. 178—44)

This invention relates to a new and useful audio frequency limiter network.

An object of the present invention is the limitation of the amplitude of audio frequency signals to certain predetermined limits.

Still another object of the present invention is to prevent signal amplitudes from reaching dangerous levels in measuring circuits and thereby damaging the measuring instruments.

A feature of this invention is the proper arrangement and choice of a grid leak resistor in an audio frequency limiter circuit whereby paralyzing effects of excess amplitudes in radio receiving circuits may be avoided.

The present invention is particularly useful where it is desired to read weak telegraph signals in the presence of crashes of static and other noise of considerable amplitude. By passing the audio frequency signal as received through a limiter, constructed in accordance with the principles of the present invention, the paralyzing effects of excess amplitudes may be avoided.

Audio frequency circuits including frequency limiting devices are well-known in the prior art, however, I have found a very curious effect is obtained when different values of grid leak resistance are inserted in the audio frequency circuits, as will be explained in more detail by the accompanying drawing, in which:

Fig. 1 is a circuit diagram of an audio frequency circuit of this invention; and

Fig. 2 is a curve showing the results obtained in the circuit of Fig. 1, using different values of resistors.

Referring now in detail to Fig. 1 of the drawing, the input circuit is connected to an audio frequency transformer 1, which includes input primary 2 and secondary 3. The outside ends of secondary 3 are connected to the input grids 4 and 5 of electron discharge devices 6 and 7 of the 6C6 triple-grid detector amplifier type. The plates 8 and 9 of the electron discharge devices are connected to the primary of output transformer 10 having a primary 11 and secondary 12, the outside of the secondary 12 being connected to any suitable output. The midpoint of winding 11 is connected to the positive side of the filament supply source. Thus, with tubes of the type specified the applied plate voltage is of the order of 6.3 volts. The midpoint tap 13 of input transformer 1 is connected to a point of potential which is lower with respect to the grids of electron discharge devices 6 and 7 by having connected therebetween a resistor 14 of which I have found the values between 40,000 to 50,000 ohms, to give a very satisfactory response in the output transformer 10. The screen grids of tubes 6 and 7 are connected together and thence to a potential divider network, including resistances 15, 16, 17 and 18 and bypassed to ground by means of a condenser 19. The suppressor grids are connected together and to the cathodes which are connected to a variable tap on resistor 15. Thus, the cathodes are maintained positive with respect to ground by an amount depending on the proportion of resistor 15 between the tap and ground to the resistance of the whole of potential divider networks 15, 16, 17 and 18. A double pole switch 20 is provided to simultaneously connect or disconnect the high potential source and the filament supply source from the circuit.

As mentioned above, I have found a very curious effect when different values of grid leak resistor 15 are employed in the circuit. The curves shown by Fig. 2 give the characteristic obtained for employing four different values for the resistor 14. It will be seen that the inclusion of the resistance increases the steepness of the initial rise considerably, but that too high a value of resistance produces a pronounced hump in the characteristic. With a proper value of resistance, this hump is eliminated. The curve A employs a grid resistance of 50,000 ohms and shows a preferred value of grid leak resistance which represents almost the optimum value. A slightly lower value, perhaps somewhere between 40,000 and 50,000 ohms, would probably eliminate the very slight hump which still remains at A1. The curve at B indicates that when a grid resistor of 100,000 ohms is employed, the hump B1 is greater. Curve C indicates the use of a 1-megohm resistor having a very pronounced hump at C1. Curve D represents zero grid resistance and is shown to give the comparative differences between the selected values of grid resistors. The values of resistors shown in the curves of Fig. 2 are with the use of 6C6 triple-grid detector amplifier tubes. Other values of the circuit arrangement are 6,500 ohms for resistors 15 and 16 and 17,000 ohms for resistors 17 and 18. In a particular arrangement as constructed, a filament dropping resistor 21 was found necessary since the filament supply voltage was higher than the rated filament voltage for tubes 6 and 7. The bypass condenser 19 is preferably in the order of one micro-farad.

While this invention has been described as employing a certain value of grid leak resistance, for the tubes 6 and 7 and transformers 1 and 10, it is to be distinctly understood that these values may change slightly for different component parts

used in the circuit. Therefore, this invention should not be limited precisely to the exact values shown by the curves of Fig. 2.

What is claimed is:

1. A limiter circuit including a thermionic discharge device having at least a cathode, a control grid, a screen grid and a plate, means for applying a low positive potential with respect to ground to said cathode, means for applying a high positive potential with respect to ground to said screen grid, an input circuit including a transformer winding and a resistor connected in series between said control grid and ground, an output circuit coupled to said plate, means for applying a low positive potential with respect to ground to said plate whereby the amplitude of signals applied to said input circuit and appearing in said output circuit is limited to a predetermined value, said resistor in said input circuit having such value that said predetermined value is attained for lower input levels than in its absence and that the amplitude is maintained substantially constant for greater signal input levels.

2. A limiter circuit including a pair of thermionic discharge devices, each having at least a cathode, a control grid, a screen grid and a plate, means for applying a low positive potential with respect to ground to said cathodes, means for applying a high positive potential with respect to ground to said screen grids, an input circuit including a transformer winding and a resistor connected in series between said control grid and ground, an output circuit coupled to said plate, means for applying a low positive potential with respect to ground to said plate whereby the amplitude of signals applied to said input circuit and appearing in said output circuit is limited to a predetermined value, said resistor in said input circuit having such value that said predetermined value is attained for lower input levels than in its absence and that the amplitude is maintained substantially constant for greater signal input levels, said value being of the order of 50,000 ohms.

MARTIN KATZIN.