

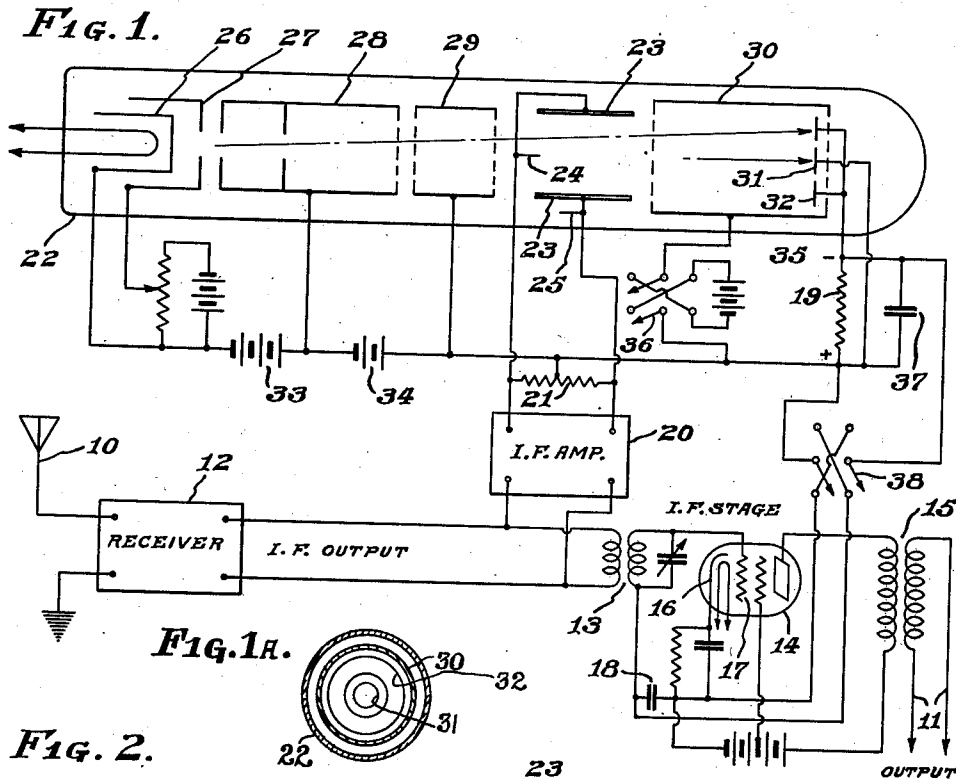
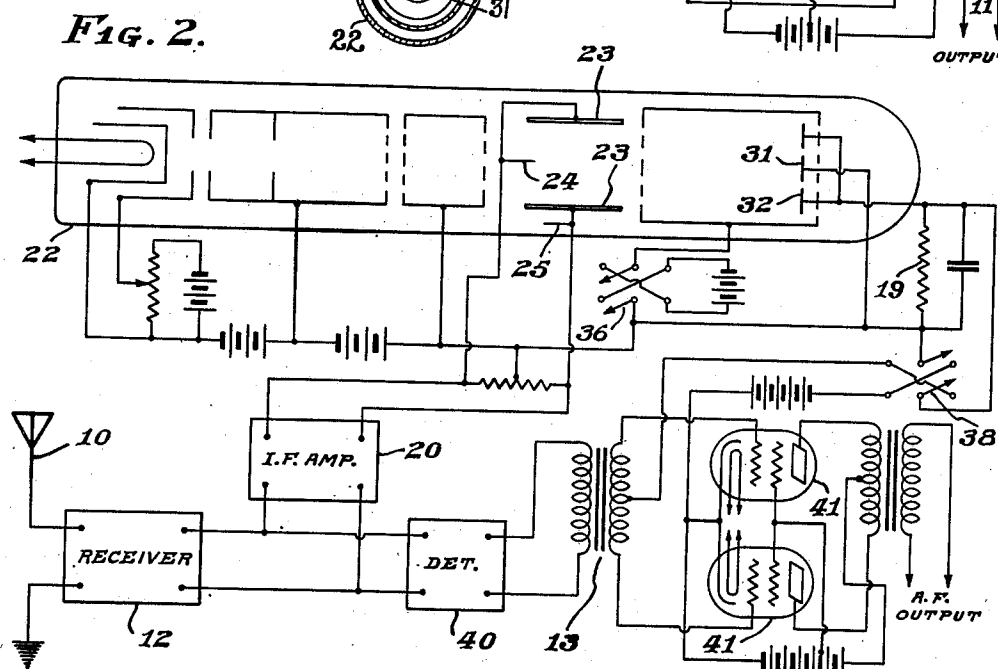
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NOISE REDUCING SYSTEM

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NOISE REDUCING SYSTEM

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8 Claims. (Cl. 250—20)

This invention relates to the reduction of the noise likely to be produced in radio receivers and similar apparatus by electrical impulses extraneous to the signal impulses. It has for its principal object the provision of an improved apparatus and method of operation whereby the signal channel transmitting efficiency is controlled in a manner to preclude the passage of impulses likely to produce noise. In particular, the invention involves the use of an electron gun or similar device which functions in response to impulses of relatively high amplitude to change the conductivity of the signal channel for the duration of such impulses.

The invention will be better understood from the following description when considered in connection with the accompanying drawing and its scope is indicated by the appended claims.

Referring to the drawing:

Fig. 1 illustrates the application of the invention to an intermediate stage of a radio receiver,

Fig. 1A shows a detail of a portion of a tube of Fig. 1, and

Fig. 2 illustrates the invention as applied to an audio stage of such a receiver.

The system of Fig. 1 and Fig. 1A includes an antenna 10, or other suitable signal pick-up device, from which signal impulses are supplied to an output circuit 11 through a signal channel including a radio receiver 12, a transformer 13, an intermediate frequency stage 14 and a transformer 15. Connected between the cathode 16 and the control grid 17 is a capacitor 18 which is shunted by a resistor 19 provided for the purpose of controlling the grid bias potential of the amplifier 14 in response to impulses of relatively high amplitude.

Control of the amplifier grid bias potential in this manner is effected through a control channel including an amplifier 20 shunted by a resistor 21 and an electron gun or cathode ray device 22 provided with deflecting electrodes 23 connected to the output terminals of the amplifier 20. In order to produce a circularly shaped electron beam, the gun 22 is preferably provided with another pair of deflecting electrodes (not shown) which are connected substantially perpendicular to those illustrated and are connected respectively to the leads 24 and 25. The gun 22 includes a cathode 26, a grid 27, anodes 28 and 29, an electrode auxiliary 30, a target electrode 31 which is preferably of circular shape and an outlet electrode target 32 which is preferably of annular shape and surrounds but is spaced from the circular target 31, as shown more fully in Fig. 1A.

It will be noted that (1) batteries 33 and 34 are connected between the cathode 26 and the target 31, (2) the resistor 19 is connected be-

tween the target 32 and the high voltage terminal of the battery 34, (3) the electrode 30 is connected through a battery 35 and a reversing switch 36 to the high voltage terminal of the battery 34 and (4) the resistor 19 is shunted by a capacitor 37 and is connected through a reversing switch 38 to the input circuit of the amplifier 14.

Operation of the system of Fig. 1 and Fig. 1A is based on the fact that the deflecting electrodes 23 are subjected to a signal potential of such amplitude that the circularly shaped electron beam of the gun 22 extends to the periphery of the target 31 when the signal carrier present in the output of the amplifier 20 is about one hundred per cent modulated. Under this condition, no current is supplied from the gun 22 through the resistor 19 to bias the input circuit of the amplifier 14 and this amplifier is unaffected by the output current of the gun. When the level of the signal, at one hundred percent modulation, is exceeded by impulses of relatively high amplitude, however, the periphery of the electron beam extends to the surface of the annularly shaped electrode 32, current flows through the resistor 19 and the amplifier input circuit is subjected to a noise suppressing negative bias potential which prevents the passage of the relatively high amplitude impulses to the output terminals 11.

The target output electrode 32 may or may not be provided with an electron emissive coating. If it is not provided with an emissive coating the operating positions of the switches 36 and 38 are as illustrated, and the electrode 30 is connected to the negative terminal of the battery 35 and the gun functions with primary electrons derived from the cathode 26 to produce a negative grid bias drop in the resistor 19. If it is provided with such a coating, the switches 36 and 38 are moved to their other closed positions, and the electrode 30 is connected to the positive terminal of the battery, secondary electrons flow from the target 32 through the electrode 30 and the battery 35 to the resistor 19, and the input circuit of the amplifier 14 is biased as previously indicated. Operation with secondary emission has the advantage that the output of the gun may be amplified to an extent depending on the character of the emissive coating, a four fold amplification being readily obtainable and an eight fold amplification being possible.

The system of Fig. 2 is similar to that of Fig. 1 in most respects but differs therefrom in that it includes a detector 40 and the noise suppressing bias potential derived from the gun 22 is applied to the input circuit of a push-pull audio frequency stage 41. The operation of this system and the application of an electron

emissive target 32 to it will be readily understood from the previous discussion. In the operation of either system, relatively high level impulses function to reduce the output of the amplifier 14 or 41 for the duration of such impulses, thus suppressing the noise otherwise produced.

I claim as my invention:

1. The combination of a modulated signal channel including an electric discharge device provided with input and output circuits, an impedance device connected in said input circuit, a cathode ray device provided with output electrodes comprising an inner circular target and an outer annular target closely spaced therefrom, said electrodes being connected respectively with the opposite ends of said impedance device, and means responsive to radio frequency impulses in said channel above a predetermined level for shifting said ray from one to the other of said output electrodes, and for maintaining said ray on said one output electrode in response to signals having a normal amplitude level.
2. The combination of a modulated signal channel including an electric discharge device provided with input and output circuits, an impedance device connected in said input circuit, a cathode ray device provided with an auxiliary electrode, a circular target electrode, and an annular output electrode located adjacent to and surrounding the target electrode, said target and output electrodes being connected respectively with the opposite ends of said impedance device, means responsive to impulses in said channel above a predetermined level for shifting the cathode ray of said device from the target electrode to the output electrode, and means connected between said auxiliary electrode and said impedance device for causing current dependent on the primary electrons of said cathode ray device to be transmitted through said impedance device.
3. The combination as defined in claim 2 further characterized by the fact that the connection between the impedance device and the input circuit is provided with switch means for reversing the polarity of the connection, and that the last-named means for causing current dependent on the primary electrons to be transmitted through the said impedance device includes a switch for applying a more positive potential to said auxiliary electrode, and an electron emissive coating on said output electrode.
4. The combination of a modulated signal channel including radio and audio frequency amplifying stages, an electron gun having means for producing a circular electron beam, means responsive to signals from said radio frequency stage for causing said gun to provide a deflection of the beam, substantially coplanar annular target electrodes for receiving said beam, means for adjusting the amplitude of said signals to effect a deflection of said beam into the outer annular target electrode in response to impulses of an amplitude exceeding a predetermined value corresponding substantially to a level of signals at substantially 100% modulation, and means connected with said outer electrode for suppressing the output of said audio frequency amplifier when said beam is so deflected.
5. In a modulated signal amplifying channel, the combination of an electric discharge amplifier device provided with input and output circuits, an impedance device connected in said input circuit,

a cathode ray device provided with a circular target electrode and an outer annular target electrode closely spaced therefrom and having a cathode, means providing a connection between one end of said impedance device and the outer annular target electrode and between the opposite end of said impedance device and both the cathode and the inner circular target electrode, means responsive to signals applied to said input circuit for maintaining the cathode ray of said cathode ray device on the inner circular target electrode in response to signals having a predetermined maximum amplitude, said last means including an additional amplifier interposed between said input circuit and said cathode ray device, and means for adjusting said last named means for causing said cathode ray to shift from the inner circular target electrode to the outer annular target electrode in response to electrical impulses having an amplitude higher than said maximum value.

6. The method of limiting the amplitude of impulses in a signal channel having a thermionic amplifier and an impedance device connected to a control electrode thereof, by means of a vacuum tube device having a cathode, anode, control electrode and a plurality of other electrode elements, which comprises so adjusting exterior circuit values affecting said tube that at least a major portion of the current through said cathode deriving from the electron stream passes through elements in said tube other than said anode when the input signal voltage is greater than a predetermined value, and suppressing the output of said amplifier by causing the electron current passing through said other electrode elements to actuate said impedance device and thereby to set up a bias potential on said control electrode of said amplifier.

7. The method of limiting the amplitude of radio frequency impulses in a signal channel including a radio frequency amplifier by means of a cathode ray tube having a cathode, a target electrode and an output electrode, and deflecting means, which comprises so adjusting exterior circuit values affecting said cathode ray tube that the cathode ray impinges upon said target electrode for effecting normal signal transmission in said channel, and causing at least a major portion of said ray to be deflected from said target electrode to said output electrode in response to radio frequency impulses above a predetermined level, and causing thereby a reduction in the output of said radio frequency amplifier for the duration of said impulses.

8. The combination in a signal channel including a pair of electric discharge devices having grids, anodes and cathodes, connected in push-pull relation, input and output coupling devices connected respectively to said grids and anodes, an impedance element connected between said cathodes and a low potential point on the input coupling device, a cathode ray device having a target electrode and an output electrode connected to said impedance device, and means responsive to electrical impulses in said channel above a predetermined level for shifting said ray from said target electrode to said output electrode in response to impulses above a predetermined signal level for effecting a voltage drop through said impedance device to suppress the output of said push-pull connected discharge devices for the duration of said impulses.

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