May 18, 1937. R. M. SMITH 2,080,581

VOLUME CONTROL SYSTEM

Filed Sept. 29, 1934 4 Sheets-Sheet 1

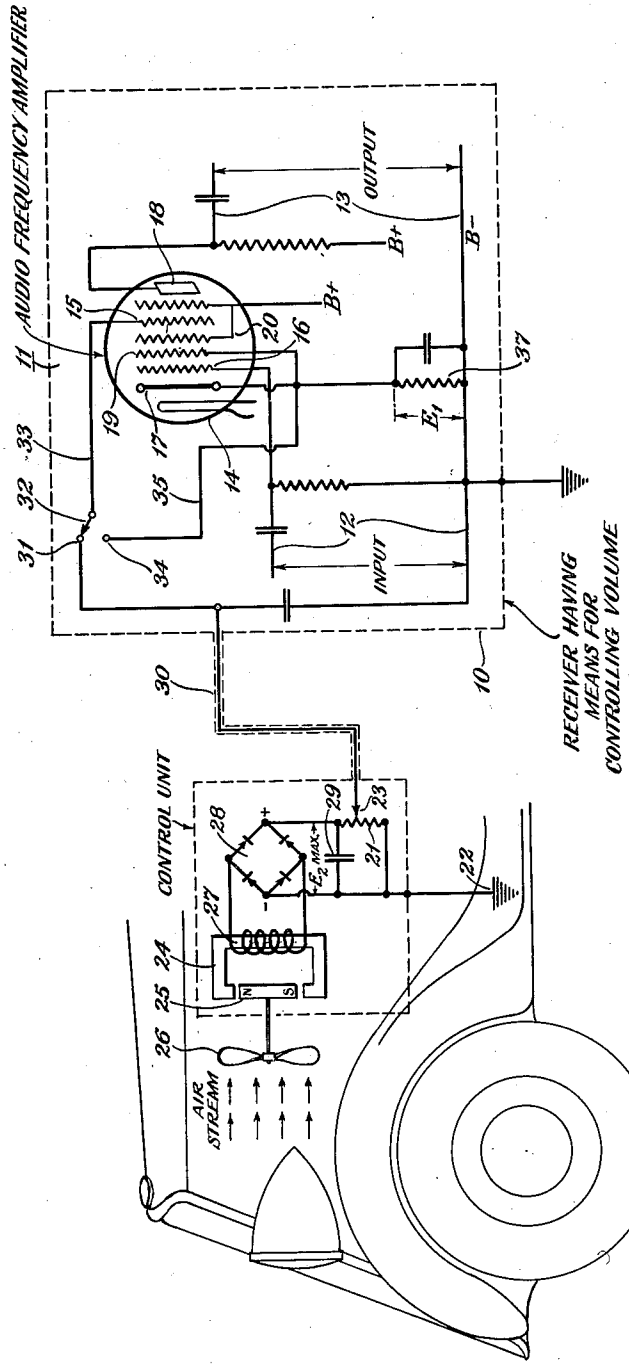


Fig. 1.

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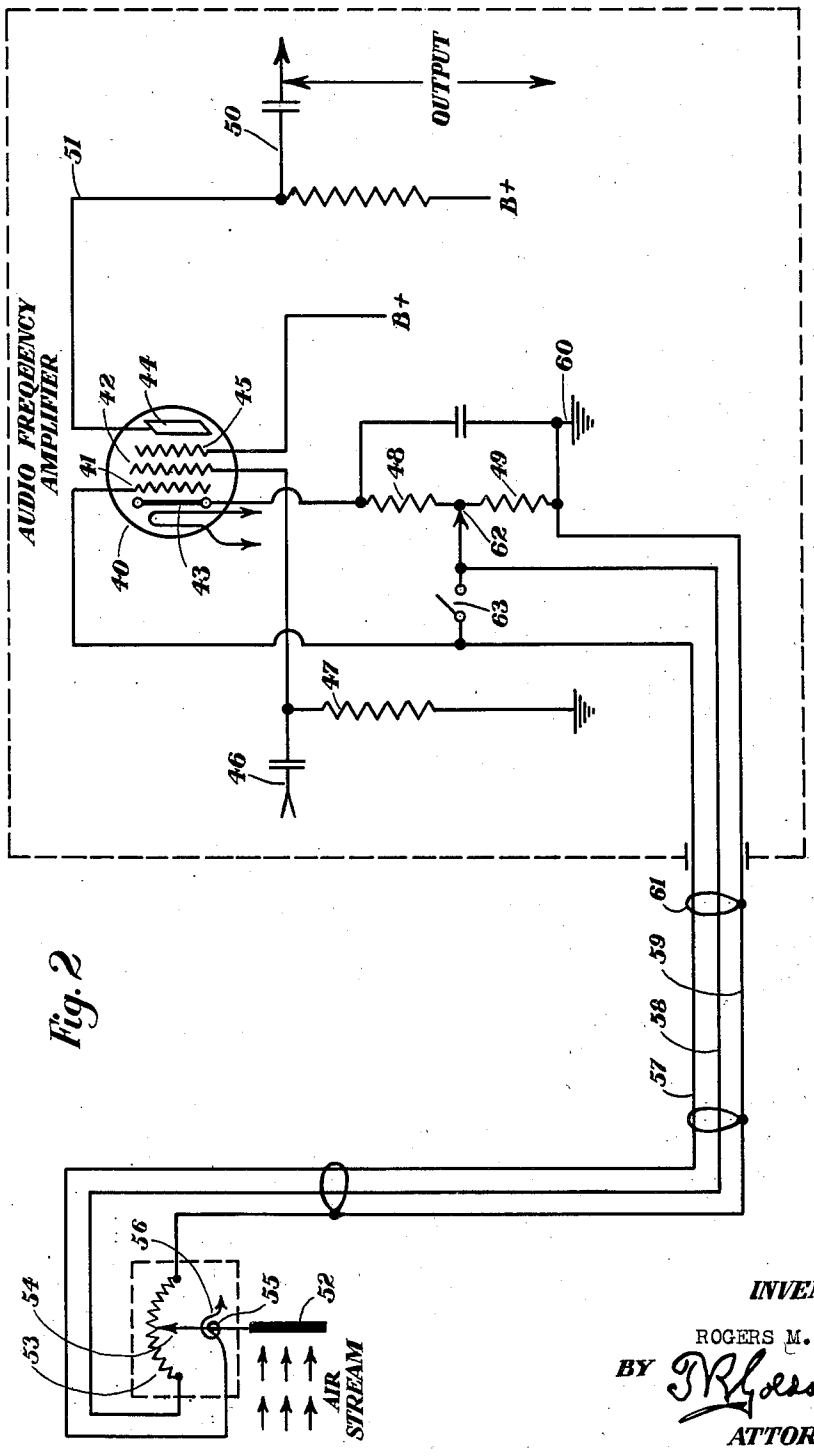


Fig. 2

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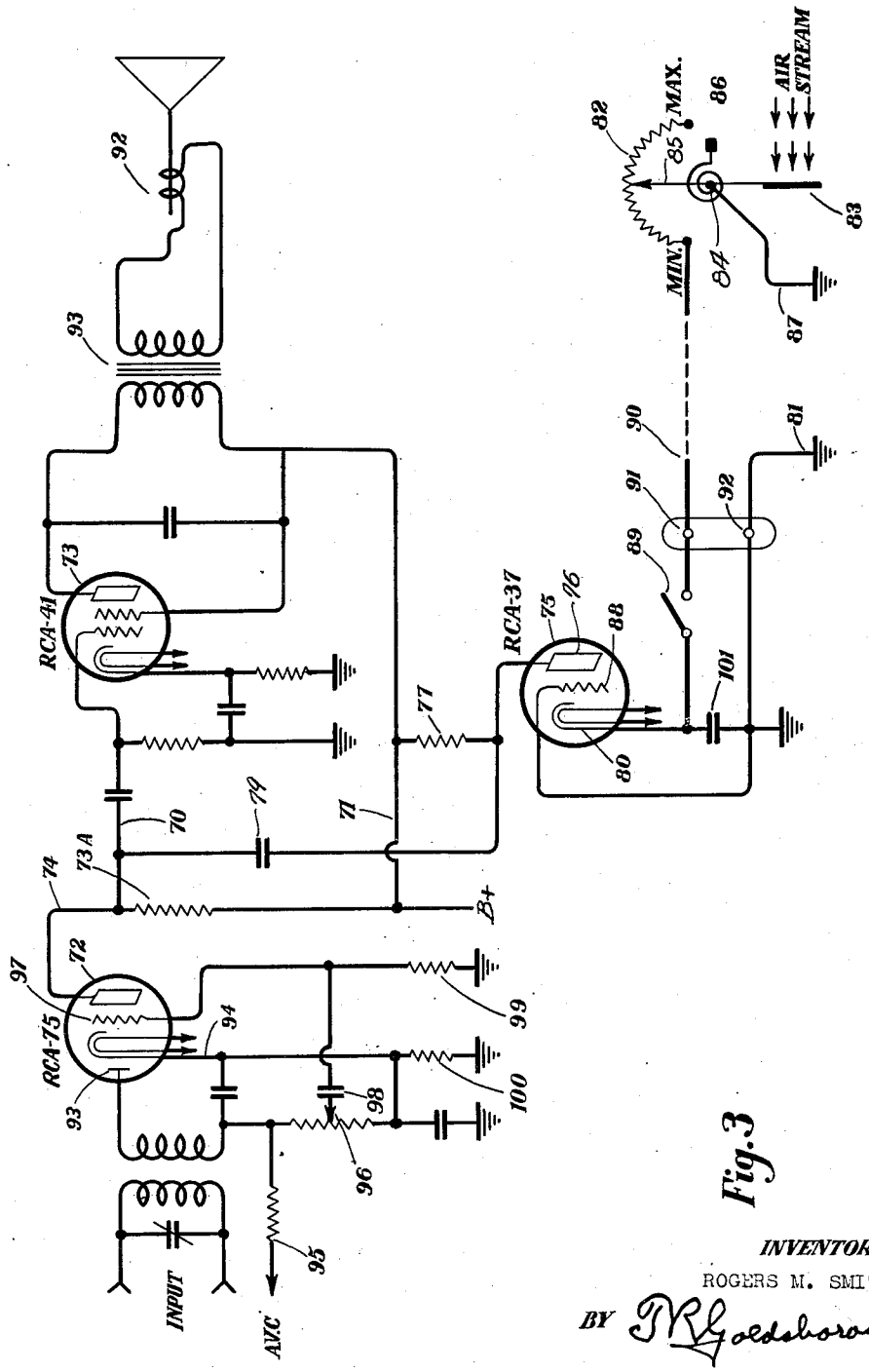


Fig. 3

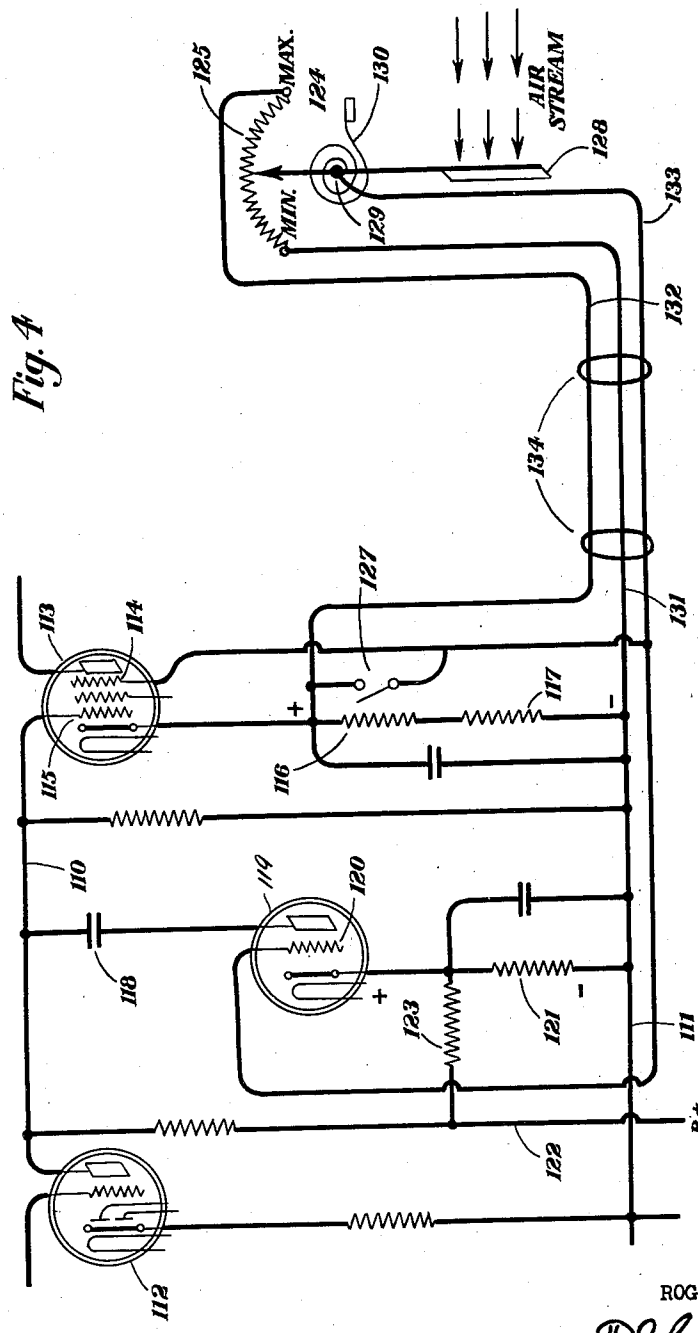
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Fig. 4



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Patented May 18, 1937

2,080,581

UNITED STATES PATENT OFFICE

2,080,581

VOLUME CONTROL SYSTEM

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Application September 29, 1934, Serial No. 746,078

13 Claims. (Cl. 250—20)

The present invention relates to volume control systems for automobile radio receivers and the like of the type disclosed in the copending application of Irving Wolff, for Volume control system, Serial No. 750,792, filed October 31, 1934, and assigned to the same assignee as this application.

In the application above referred to, means are provided for independently controlling the sound output or volume of radio receiving apparatus and the like for vehicles, in accordance with variations in speed, thereby to compensate for variation in windage and other noises normally tending to interfere with reception of signals.

It is an object of the present invention to provide an improved speed responsive volume control system for automobile radio receiving apparatus and the like which is readily adapted to any receiving circuit and which is of simple design throughout for installation at low cost.

It is a further object of the present invention to provide a simplified volume control system for radio receiving apparatus and the like which is adapted for remote control and for operation by means responsive to variations in speed of a vehicle in motion.

It is a further object of the present invention to provide an automatic speed responsive volume control system for automobile radio receiving apparatus and the like which is responsive to variations in speed to control the volume or sound output level of the apparatus at speeds above a predetermined low speed range, whereby a delayed volume control action is obtained.

It is also a further object of the present invention to provide a speed responsive tone and volume control means for radio receiving apparatus and the like which not only tends to maintain substantially constant volume effect but also provides a variable audio frequency tone balance for further improving the response characteristic with variations in speed and the attendant windage and operating noises incidental to the operation of a vehicle.

It is also an object of the present invention to provide a volume control system for an audio frequency amplifier in an automobile sound producing system which is responsive to variations in speed of travel.

It is an object of the present invention to provide an improved volume control circuit for an audio frequency amplifier embodying a multi-element electric discharge amplifier device which may function to amplify and transmit signals and which at the same time may control the amplitude of the signals transmitted without distortion.

The invention will be better understood from the following description when considered in connection with the accompanying drawings and its scope will be pointed out in the appended claims.

In the drawings

Figure 1 is a schematic circuit diagram of a volume control system embodying the invention,

Fig. 2 is a similar circuit diagram showing a modification, and

Figs. 3 and 4 are also schematic circuit diagrams of combined volume and tone control systems embodying the invention.

Referring to Fig. 1, a radio receiver **10** having an audio frequency amplifier stage **11** is provided with signal input and output circuits **12** and **13**, respectively, and arranged to be controlled in gain without variation in frequency characteristic through the medium of an electric discharge amplifier device **14** having two control grids **15** and **16**, a cathode **17**, a signal output anode **18** and suitable suppressor and screen grids **19** and **20**, respectively.

The amplifier device **14** is arranged to receive signals on one of the control grids, such as the grid **16**, as shown, from the input circuit **12** and for the purpose of transmitting the amplified signals to the output circuit **13** and the latter is coupled to the anode **18**, as indicated. The grid **19** is connected to the cathode as a suppressor and the screen grid **20** about the second control grid **15** is provided with a suitable positive biasing potential, as indicated.

The second control grid is arranged to receive a controlling potential from a variable source responsive to speed variations. In the present example this comprises a tapped potentiometer resistor **21**, one end of which is connected to ground, as indicated at **22**, having a variable output contact **23**.

The potentiometer resistor receives a potential from a wind-driven alternating current generator **24** comprising an armature **25** connected with a propeller **26** and having a field winding **27** as a voltage output winding.

Any suitable generator may be employed for supplying current in response to wind flow. In the present example the generator and propeller are mounted to receive the windage flow air stream about the vehicle and are shown in association with the front of an automobile, the preferred location being indicated as inside or outside of the hood.

The generator output is rectified in a contact rectifier system, indicated at 28, and is suitably filtered by a shunt by-pass condenser 29 in being applied to the terminals of the potentiometer resistor 21.

The voltage selected by adjusting the position of the contact 23 is applied to the grid 15 through shielded supply lead 30 leading from the control unit to the receiver and the lead is connected with a contact 31 of a suitable transfer switch 32 for disconnecting the remote speed control unit. In the position shown the switch 32 provides a connection from the contact 31 to a grid lead 33 leading to the grid 15. An alternate position in connection with a contact 34 provides connection for the lead 33 with the cathode 17 through the lead indicated at 35.

From the foregoing description it will be seen that the volume control system includes a variable source of potential remotely located from but connected with the receiver through a single wire lead which is preferably shielded and which may be extended any distance. The variable source of potential is responsive to speed variations or the velocity of the automobile or other vehicle through wind or air pressure operated means. In the present example this comprises a simple alternating current generator and propeller. The variable alternating current derived from the generator in response to motion of the vehicle is applied to a simple oxide or other similar type of rectifier wherein the voltage is rectified to provide direct current in a series resistor tapped for potential adjustment, as hereinafter pointed out.

A filtering means including the condenser 29 is further supplemented by a second condenser 36 preferably in the receiver and connected to the ground, as indicated, between the supply lead 30 and the return circuit of the receiver.

The operation of the system shown and described is as follows:

Variations in the potential applied to one of the control grids, such as the grid 15 in the present example, causes the amplification factor of the tube 14 to vary and thereby to change the audio frequency gain. The controlling potential applied through the lead 30 from the remote control unit may be adjusted by the contact 23 to effect a desired volume level for a predetermined speed. The automatic control of volume in response to speed may be provided by other speed responsive control means and the controlling potential may be applied to either of the control grids of a tube of the type shown.

A tube of the type shown is provided commercially by an RCA–6A7 tube. A higher degree of audio frequency gain is obtained by using the inner grid 16 as the signal input grid while the other grid 15 is used as the gain control grid. It will be noted that the receiver is grounded to provide a return circuit for the control potential means and that the controlling potential provided by the control unit is positive for connection to the control lead 30 whereby the grid 15 receives an increasing positive potential with increase in speed. The increased potential serves to increase the gain of the amplifier stage without introducing distortion in the signal amplifier portion. As the rotational speed of the alternator 24 is increased coincident with the speed of the vehicle, the generated voltage is increased so that after having been converted into direct current it is applied to the audio frequency amplifier tube 14 to cause the gain controlling grid 15 to become more positive with increase of speed.

It will be noted that the cathode circuit includes a self-bias resistor 37 for applying a bias to the signal grid 16. This bias potential, indicated at E_1, is also applied to the grid 15 through the auxiliary speed control unit and the polarity of the variable speed control unit is such that the bias potential is opposed thereto. Accordingly, the grid 15 will approach the same potential as the cathode of the tube and a higher degree of amplification is obtained from the audio frequency amplifier stage 11 between the input circuit 12 and the output circuit 13.

The bias control arrangement is preferably such that the additional controlling potential derived from the speed variable source such as the rectifier 28 and the generator 24 in the present example and indicated in the drawing as E_2 is for maximum speed at least equal to the self-bias or other biasing potential normally applied to the grid 15 and in opposition thereto, whereby the gain controlling grid is caused to approach or equal the cathode potential when the speed is maximum.

The switch 32 for rendering the auxiliary speed control of volume inoperative to control the receiver is arranged to connect the control grid 15 directly to the cathode when it is desired to operate the receiver or amplifier without automatic compensation of volume through different speeds of the vehicle.

For the foregoing reasons the circuit shown in Fig. 1 having an audio frequency amplifier stage provided with an amplifier tube with two control grids in the same electric stream, one for receiving a signal potential to be amplified, and the other for receiving a gain controlling potential variable in accordance with changes in speed or velocity of the vehicle, is at present preferred. The selective switching means for the gain controlling grid whereby said grid is connected through a single extension lead to a grounded source of controlling potential and a self-bias resistor in the cathode return lead providing a potential in opposition to the controlling potential is adopted for a simplified control circuit arrangement.

For speed control of volume an audio frequency amplifier stage may be provided with an electric discharge amplifier device in which the normal suppressor grid may be eliminated with a main signal control grid as the outer grid with shielding and the gain controlling grid adjacent to the cathode. However, either grid may be used interchangeably as the signal control grid. An audio frequency amplifier stage similar to that shown in Fig. 1 is shown in Fig. 2 as provided with a tube of the character above referred to, to which attention is now directed.

The amplifier stage comprising an electric discharge amplifier device 40 is provided with a control grid 41, a second control grid 42, a cathode 43, an output anode 44 and a screen electrode 45 between the control grid 42 and the control grid 41 and the anode 44.

Audio frequency signals are applied to the outer control grid 42 to a suitable signal input circuit, indicated at 46, and comprising a coupling impedance or resistor 47 through which biasing potentials are supplied to the grid 42 from a suitable self-bias resistor comprising two sections 48 and 49.

Signals amplified by the device 40 are applied to an output circuit, indicated at 50, through a suitable output connection 51 with the anode

44. Audio frequency signals supplied by the input circuit are amplified and delivered to the output circuit under control of the second control grid 41 which is connected with control means responsive to speed variations. In the present example, the speed responsive means comprise a pivotally mounted vane arranged to receive windage currents or other air stream caused by passage of a vehicle through the air. The vane is arranged to control a potentiometer device comprising a resistance 53 and a movable contact 54 connected with the vane through the pivot point 55. A spring 56 or other suitable means connected with the contact 54 and the vane serves to provide a biasing force for moving the vane and the contact 54 in a windwise direction about the pivot point 55. The contact, therefore, is moved by the spring to the position marked "Min." while the windage flow tends to overcome the spring action and move the contact in the direction of the end of the potentiometer marked "Max.".

The potentiometer resistor 53 is connected with a suitable potential source for controlling the grid 41 and in the present example is connected across the self-bias resistor section 49 in parallel therewith while the contact 54 is connected with the grid 41, connections being made through a cable comprising three wire connections 57, 58 and 59. It will be noted that the lead 59 is connected to ground 60 in the receiver and is connected with the shielding for the cable indicated at 61. In order to prevent interference and undesired pickup of signals for application to the grid 41, it is preferable that the cable be shielded. The arrangement is such that as the vane 52 receives increasing pressure resulting from increasing speed the contact 54 is moved in a direction to decrease the negative bias on the grid 41 as derived from the resistor section 49. With the vehicle at rest and the contact 54 in the "Min." position the lead 57 is in effect connected with the lead 59 to provide a maximum negative bias which is reduced as the speed is increased until contact 54 is in the "Max." position whereby the lead 57 is connected with the lead 58. The grid connection is then at the junction point indicated at 62 between the sections 48 and 49. A reduced negative bias derived only from the resistor 49 causes an increased gain in the amplifier stage. If desired the gain may further be increased by connecting the point 62 for the lead 58 nearer to the cathode in the circuit shown. However, in other circuits different potential supply means may be provided.

In order to increase the gain to maximum and to render the speed control means ineffective, a switch 63 is provided for connecting the leads 57 and 58 together thereby connecting the grid 41 with the point 62 of minimum negative bias for providing full gain through the amplifier stage.

In the circuit arrangement shown the controlling potential is derived from the self-bias resistance means in the cathode lead of the double grid amplifier tube and is controlled by a variable resistor or potentiometer so connected with the potential source as to cause the biasing potential on the control grid to vary in response to variations in air pressure on a movable vane. It will be noted that in this embodiment the connection with the speed control unit is made through three conductors as distinguished from a single lead required for the system shown and described in connection with Fig. 1. This system, however, has the advantage that no additional means is required for providing the controlling potential and only a simple variable resistor or potentiometer is required in the remote or auxiliary volume control circuit.

Any portion or all of the potential available in the self-bias resistor means may be utilized to control the gain of the amplifier stage. In the present example the grid 42 is provided with the biasing potential derived from both sections 48 and 49, whereas the gain controlling grid 41 may receive a biasing potential which varies between that provided by the resistor section 49 and that provided by both sections.

In the control of certain radio receiving apparatus it may be preferable or desirable to utilize a single lead connection, as in the circuit of Fig. 1, in connection with a simple rheostat or variable impedance having a grounded return circuit whereby a further simplified and low cost volume control system may be provided. A control circuit having these features is shown in Fig. 3, to which attention is now directed.

In Fig. 3, an audio frequency transmission circuit comprising the leads 70—71 is provided between a combined detector amplifier tube 72 and a power output amplifier tube 73. The circuit 70—71 is connected across an output impedance device 73*a* in the anode circuit 74 of the device 72 and is arranged to be variably loaded, to control the amplitude of the signals, under control of an auxiliary control tube, indicated at 75.

The control tube 75 operates as a variable impedance device and comprises an anode 76 connected through an anode potential supply resistor 77 with the lead 71 through which anode current is taken and connected through a lead 78 and a loading condenser 79 with the lead 70 through which signals are transmitted between the tubes 72 and 73.

The tube 75 is further provided with a cathode 80 which is connected to ground or other suitable return circuit, indicated at 81, through a variable control resistor 82 adapted to be remotely located with respect to the resistor and arranged to be operated by a suitable wind pressure responsive means, such as a movable vane 83 having a pivot point 84 about which it moves. The variable contact 85 of the resistor 82 is caused to return under action of suitable means, such as a spring 86. The control unit is thus similar to that shown and described in connection with Fig. 2. The arm 85 is connected through a ground connection 87 to the chassis and the common circuit return lead 81.

The tube 75 is provided with a control grid 88 which is connected to ground and to the negative side of the variable resistor 82 which is in effect a variable self-bias resistor.

It will be seen that as the variable resistor 82 is caused to vary in response to changes in air pressure resulting from changes in speed of the vehicle the biasing potential on grid 88 will vary, thereby varying the impedance of the tube, the biasing potential being increased with the increase in speed, thereby increasing the internal impedance of the tube and the loading effect of the condenser or other reactance device 79 across the audio frequency transmission circuit, which results in an increase in volume with increased speed and likewise a reduction in volume with reduced speed.

The volume control resistor 82 is connected with the cathode through a switch 89 and an extension lead 90, which is connected with a ter-

minal 91. The ground connection 81 is also provided with a terminal 92. The terminal board connection permits removal of the remote control circuit or attachment of the remote control circuit to the receiver. The receiver may thus be constructed with the terminal board short-circuited and the remote control circuit may be added at any time after installation of the receiver.

The switch 89 is provided for causing the impedance of the tube 75 to be increased by opening the plate circuit to the cathode. The condenser load then is reduced to a minimum and the gain is increased to maximum.

It will further be noted in connection with Fig. 3 that the amplifier 73 supplies signals to an output device or loudspeaker 92 through an output transformer 93 and that the combined detector amplifier 72 is provided with a diode plate 93 which, in connection with the cathode, indicated at 94, serves as a rectifier and detector of incoming signals, the direct current component of which is supplied through a connection 95 for automatic volume control purposes and the alternating component of which is supplied through a variable volume control contact 96 to the control grid 97 and thence to the output circuit 74, a suitable coupling condenser 98 and a coupling resistor 99 being provided in the grid circuit. The grid 97 is supplied with a biasing potential from a suitable self-biasing resistor 100.

The speed responsive remote control means is provided as a self-bias resistor in the cathode circuit and in the case of a relatively long extension to the remote control unit a suitable bypass condenser 101 is provided across the remote control circuit comprising the lead 90 and the ground connection 81.

This volume control circuit has the advantage of a single lead connection which is not a part of the signal conveying circuit and which does not require shielding. The circuit further permits a ground return through a simple variable resistor which itself is the self-bias resistor and the controlling potential source as well as the controlling means for volume.

The condenser 79 for loading the audio frequency transmission circuit is preferably of such impedance that it forms a relatively low resistance path for signals to be attenuated within the audio frequency range and as a volume control means preferably attenuates signals at all audio frequencies. It is, however, frequency discriminating in that it forms a low impedance to the higher frequency signal and in a relatively large capacity serves also as a tone control means to reduce the signals in the high frequency end of the audio frequency range more rapidly than signals in the low audio frequency range.

The simple potentiometer control of volume thus may include the control of tone simultaneously and in response to variations in speed.

A preferred arrangement for the combined control of volume and tone is shown in Fig. 4, to which attention is now directed.

In Fig. 4, an audio frequency transmission circuit 110 and 111, between a combined detector amplifier 112 and a second amplifier 113, is shown.

The amplifier 113 is of the same type as shown in Fig. 2, having two control grids 114 and 115 and is provided with a self-bias resistor comprising sections 116 and 117 in series.

The audio frequency transmission circuit 110 and 111 is provided with a tone control means comprising a condenser 118 and a variable impedance device provided by a tube 119, the impedance of which is varied by variations in potential on the control grid 120. The tube is provided with a bias resistor 121 through which current flows from an anode potential supply lead 122 under control of a series resistor 123.

The gain controlling grid 114 in the amplifier tube 113 and the tone control grid 120 in the variable impedance device 119 are connected to the variable contact 124 of a combined gain and tone controlling device 125 comprising a potentiometer resistor connected in parallel across the two self-bias resistor sections 116 and 117 as a source of controlling potential for said grids. Movement of the contact 124 along the potentiometer resistor 125 causes a variation in potential on both grids with respect to the cathodes of said device, thereby controlling the gain in the audio frequency amplifier channel and the tone or frequency range of the amplifier.

In the present example the arrangement is such that as the contact 124 is moved clockwise the biasing potential on the grids 114 and 120 are rendered less negative, thereby increasing the gain of the amplifier and decreasing the impedance of the tone control tube 119. This is for the reason that operation of the contact 124 gradually includes in circuit between the grid 120 and the cathode of the tube an increasing portion of the potential available across the self-bias resistors 116 and 117 in series with the potential available across the bias resistor 121 and in opposition thereto. A point may thus be reached to provide a maximum volume. The potentials may be balanced to provide a desired impedance at maximum volume by providing extra current through the resistor 121 from the controlling resistor 123.

A switch for rendering the remote control and tone control devices ineffective is indicated at 127 and serves to connect the grids 120 and 114 to the positive end of the self-bias resistor 116, thereby increasing the gain to maximum in the tube 113 and decreasing the impedance of the tube 119 to minimum, rendering the condenser 118 effective to reduce a certain portion of the high frequency signal range in the channels 110 and 111. This is the same connection as provided by moving the contact 124 to the maximum position.

The contact is controlled by means responsive to windage or air pressure in the form of a movable vane, indicated at 128, pivoted at 129 and movable by a spring 130 to the minimum position.

It will be noted that the connections required for the potentiometer device 124—125 are the same as the circuit shown in Fig. 2 and comprise a ground lead 131 and a second lead 132 for supplying potentials to the terminal of the resistor 125 and a lead 133 from the contact 124 to the grids 114 and 120. The leads are preferably shielded in a cable, as indicated by the cable shield loops 134.

The auxiliary speed control system, described in conjunction with Fig. 4, comprises a single control device arranged to be actuated in accordance with speed changes and preferably by a simple windage actuated vane and electric discharge device in the audio frequency circuit having control grids arranged to receive a variable potential through operation of the control device, thereby to increase the gain of the amplifier and

to reduce the high frequency response as the speed of travel increases. This is desirable, it has been found, for the reason that although the volume or sound level is increased to increase the sound output above the noise level caused by windage and other increasing operating noises with increasing speed, the base or low frequency response is somewhat reduced in its effect upon the ear because of the heavy low frequency noises with the result that there appears to be a preponderance of high frequency response at the higher speeds of travel. Accordingly, it is found to be desirable to reduce the high frequency response, thereby to obtain an acoustic balance for pleasing tone effect, the sounds in the high frequency end of the audio frequency range being reduced to balance the unavoidable reduction or loss of low frequency sounds in the low frequency noises incidental to operation of the vehicle at the higher speeds.

From the foregoing description of several modifications of my invention its advantages should be obvious. Among these may be mentioned the fact that the sound output is always automatically correlated to vehicle speed and, consequently, to wind noise and other noises with the result that such noise does not detract from the enjoyment of musical or other types of radio programs which may be received.

Although I have chosen several modifications of my invention for purposes of explanation, other methods of and means for accomplishing the desired result will be apparent to those skilled in the art. My invention, therefore, is not to be restricted except insofar as is necessitated by the prior art and by the spirit of the appended claims.

I claim as my invention:

1. In a mobile sound producing system, the combination with an audio frequency amplifier, of an electric discharge amplifier device having a signal control grid, a signal input circuit connected therewith, a signal output electrode, a signal output circuit connected therewith, a cathode, means in circuit with said cathode for providing a self-bias potential for said control grid, and a gain control grid for said device, means responsive to speed of travel of a vehicle for controlling a potential on said gain controlling grid, and means for deriving said potential from said self-bias resistor.

2. In a mobile sound producing apparatus, the combination with an audio frequency signal transmission circuit, of means including an electric discharge device having a gain controlling grid and gain controlling connection with said transmission circuit whereby signals transmitted by said circuit are controlled in amplitude by potentials on said grid, means for supplying a controlling potential for said grid, and means responsive to variations in air pressure resulting from variations in rate of speed of travel of said mobile apparatus for varying said potential independently of other operating potentials for said device.

3. In an audio frequency amplifier, the combination of an electric discharge device having a cathode, an anode, a control grid adjacent to the cathode, a second control grid more adjacent to the anode, a screen grid for said second control grid, circuit means for applying audio frequency signals to one of said control grids, an audio frequency output circuit connected with said anode, and means responsive to variations in speed of a vehicle in motion for controlling a biasing potential on the other of said control grids.

4. In an audio frequency amplifier, the combination of an electric discharge device having a cathode, an anode, a control grid adjacent to the cathode, a second control grid more adjacent to the anode, a screen grid for said second control grid, circuit means for applying audio frequency signals to one of said control grids, an audio frequency output circuit connected with said anode, means responsive to variations in speed of a vehicle in motion for controlling a biasing potential on the other of said control grids, said last named means including a potentiometer device having a movable contact, said device being connected with said last named grid, and a movable vane connected with said contact to move it and being adapted to be actuated by the flow of an air stream about it resulting from operation of a vehicle carrying said apparatus.

5. In an audio frequency amplifier, the combination of an electric discharge device having a cathode, an anode, a control grid adjacent to the cathode, a second control grid more adjacent to the anode, a screen grid for said second control grid, circuit means for applying audio frequency signals to one of said control grids, an audio frequency output circuit connected with said anode, means responsive to variations in speed of a vehicle in motion for controlling a biasing potential on the other of said control grids, and means jointly controllable with said last named means for simultaneously varying the tone characteristic of said audio frequency amplifier.

6. The combination with a radio receiver adapted for use in vehicles, of means responsive to variations in speed of a vehicle by which the said receiver is carried for simultaneously controlling the volume and tone characteristic of said receiver independently of the normal volume and tone adjustment thereof, said means including a gain controlling tube and a tone controlling tube each having a control grid, means providing a source of biasing potential for said grids, a potentiometer device connected with said potential source and with said grids to vary said potential on said grids, and a vane adapted to be actuated by air currents connected with said potentiometer to control it.

7. The combination with a radio receiver, of an audio frequency amplifier comprising an electric discharge device having a gain controlling grid, an audio frequency transmission circuit connected with said device whereby the signal amplitude therethrough is varied in accordance with variations in potential applied to said grid, and a remote control device for said receiver comprising a variable resistor connected in the cathode circuit of said electric discharge device to provide a variable biasing means for said grid, and means responsive to the speed of a vehicle in motion, connected with said last named volume control device to actuate it in accordance with variations in said speed.

8. In an automobile radio receiver having means for controlling volume the combination with an audio frequency amplifier, of a combined gain controlling electric discharge device therein, means connected therewith providing a source of biasing potential for said device variable in accordance with variations in windage pressure about the automobile in motion to control the gain independently of said volume control means, and means for controlling the application of said potential to said device to control the gain of

said amplifier independently of the first named means for controlling volume.

9. In a mobile sound producing apparatus, the combination with an audio frequency amplifier, of an electric discharge amplifier device therein having a cathode, an anode, a signal control grid and a gain control grid between said cathode and anode in the electronic stream of said device, means for applying audio frequency signals to said first named control grid, a self-bias resistor in circuit with the cathode for supplying a biasing potential to said first named control grid, and means for deriving a variable gain controlling potential from said self-bias resistor for said gain controlling grid comprising a potentiometer connected with said self-bias resistor and having a movable contact connected with said control grid and adapted to be actuated in accordance with variations in speed of a vehicle by which said apparatus is carried.

10. In a mobile sound producing apparatus, the combination with an audio frequency amplifier of an electric discharge amplifier device therein having a cathode, an anode, a signal control grid and a gain control grid between said cathode and anode in the electronic stream of said device, means for applying audio frequency signals to said first named control grid, a self-bias resistor in circuit with the cathode for supplying a biasing potential to said first named control grid, means for deriving a variable gain controlling potential from said self-bias resistor for said gain controlling grid comprising a potentiometer connected with said self-bias resistor and having a movable contact connected with said control grid and adapted to be actuated by variations in speed of a vehicle, craft and the like in motion, an audio frequency signal transmission circuit, a reactance device and a variable impedance device connected in series across said circuit for controlling the tone of signals transmitted through said circuit, said variable impedance device comprising an electric discharge amplifier having a control grid connected with said gain controlling grid for receiving a biasing potential variation simultaneously therewith, thereby to control the tone and volume simultaneously.

11. The combination with an automobile radio receiver, of an audio frequency amplifier having an electric discharge device provided with a gain controlling grid and a remote volume control unit having a circuit connection with said grid, means in said remote control unit responsive to speed variation for controlling a potential in said circuit connection whereby the gain of said amplifier is varied in accordance with variations in speed of the automobile by which the receiver is carried, and means for independently adjusting said potential to provide a predetermined delay in speed control of said amplifier.

12. In a radio system for vehicles, craft and the like, an electrical sound amplifier, means for energizing said amplifier, and gain controlling means for said amplifier responsive to operation of such vehicle, craft and the like in which said system is conveyed, said amplifier including at least one electric discharge amplifier device having a signal grid and a gain controlling grid, and said gain controlling means providing a variable grid biasing potential for said gain controlling grid and having a movable control element positioned to receive and being responsive to variations in windage flow about said vehicle, craft and the like in motion to provide said variable potential in accordance therewith.

13. In an automotive vehicle, the combination with a radio receiver, of means for energizing said receiver, and means independent of said energizing means for varying the sound output level and tone characteristic of the receiver with variations in speed of said vehicle, said last named means including a gain and tone controlling circuit for said receiver, an electrical control device therein having a movable control element, and means connected with said element to move the latter in response to variations in speed.

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