

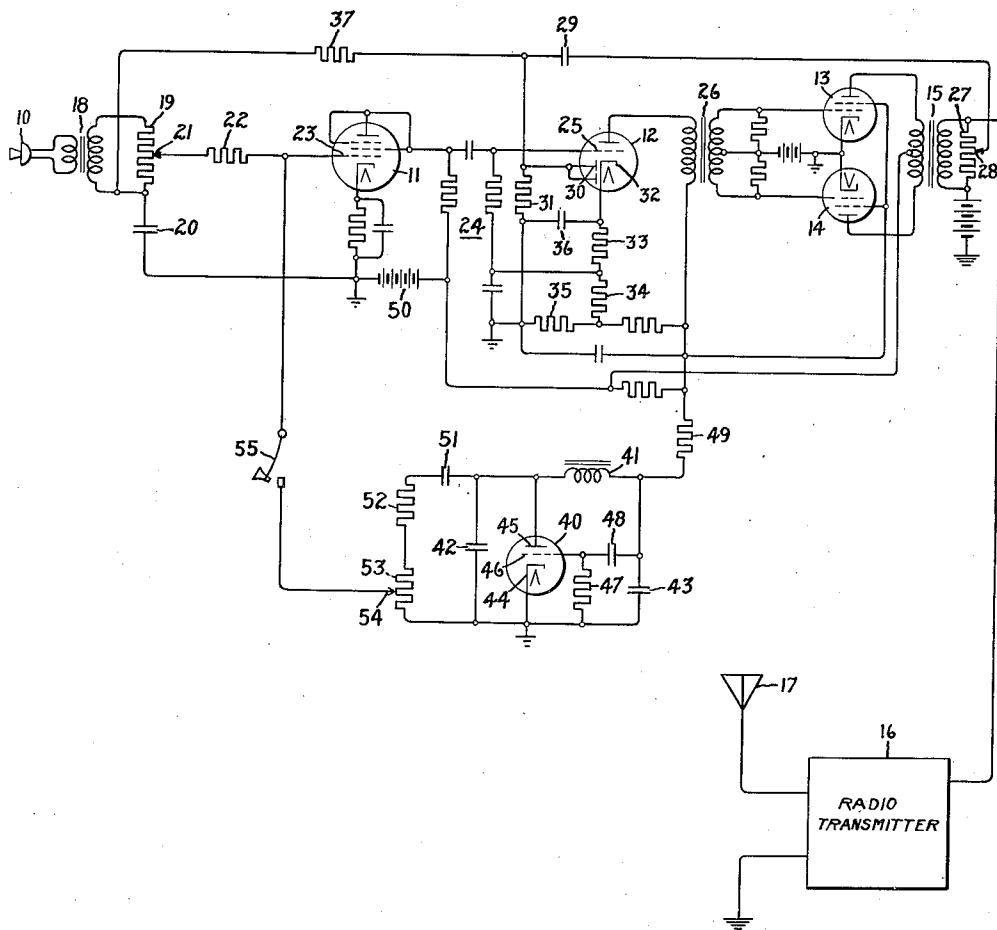
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AUTOMATIC LEVEL CONTROL DECOUPLER

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AUTOMATIC LEVEL CONTROL DECOUPLER

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My invention relates to amplifiers, and more particularly to amplifiers arranged for amplification of waves from different sources, one of which may be a source of variable intensity and another a source of substantially constant intensity. In such amplifiers it is often necessary to provide volume control means operable to prevent excessive variation in the output of said amplifier when amplifying waves from a source whose output varies, while such means are unnecessary, and may be undesirable, when amplifying waves from a source whose output is constant.

Accordingly, an object of my invention is to provide an amplifier having such volume control means together with means for rendering the volume control means ineffective when the amplifier is connected to a source whose output is constant.

A further object of my invention is to provide means whereby this result is secured without the necessity for providing any additional switching means other than that required to connect the constant output source to the amplifier, such, for example, as an ordinary telegraph key used to effect the desired connection in ordinary signaling.

The features of my invention which I believe to be novel are set forth with particularity in the appended claims. My invention itself, however, both as to its organization and method of operation, together with further objects and advantages thereof may best be understood by reference to the following description taken in connection with the accompanying drawing in which the single figure illustrates one embodiment of my invention.

In the drawing, a microphone 10 produces an audio wave which is amplified through electron discharge devices 11, 12, 13 and 14. The devices 13 and 14 are arranged in balanced or push-pull relation and transmit the amplified audio wave through a modulation transformer 15 to a radio transmitter 16, in which a carrier wave is modulated in accordance with the amplified audio wave. The modulated carrier wave is radiated from an antenna 17.

The microphone 10 impresses the audio wave through a transformer 18 across a volume control resistor 19. One terminal of the resistor 19 is connected to ground through a condenser 20, which is sufficiently large to transmit low frequency audio current. An adjustable tap 21 of the resistor 19 is connected through a resistor 22 to the control electrode 23 of the device 11.

The device 11 is of the type whose gain is changed upon adjustment of the average, or bias, potential of electrode 23. Automatic output limiting is accomplished by a bias voltage applied to the electrode 23, the voltage being effective upon increases in intensity of the amplified signal above a predetermined intensity to reduce the gain of device 11 so as to maintain the output substantially constant near such predetermined intensity.

The output of the device 11 is transmitted through a conventional resistance coupled circuit 24 to the control electrode 25 of the device 12. The output of the device 12 is transmitted through a suitable transformer 26 to the devices 13 and 14 arranged in balanced relation. The secondary of the modulation transformer 15 is connected in shunt to a voltage dividing resistance 27, an adjustable tap 28 of which is coupled through a condenser 29 to an anode 30 of the device 12, which is conveniently of the duplex diode-triode type. The anode 30 of the device 12 is connected to ground through a load resistor 31 across which a gain control potential is developed when the signal transmitted through the condenser 29 rises above a predetermined intensity.

The cathode 32 of the device 12 is connected through resistors 33, 34 and 35, serially to ground, so that space current flowing through the device 12 and through the resistors 33, 34 and 35 maintains the cathode 32 at a positive potential with respect to ground. The cathode 32 is also connected to ground through a condenser 36 which bypasses audio frequency current around the resistors 33, 34 and 35. The diode including anode 30 cannot conduct current until the peak intensity of audio voltage applied to the anode 30 through the condenser 29 has reached the intensity of the potential produced in the resistors 33, 34 and 35 by space current flowing therethrough. No potential is therefore produced across the resistor 31 until the audio wave transmitted to the anode 30 exceeds a predetermined intensity. The intensity of signal at which a control potential is developed across the resistor 31 may be adjusted by means of the adjustable tap 28 of the resistor 27.

To impress the control potential developed across the resistor 31 on the control electrode 23 of the discharge device 11, the anode 30 is connected through a resistance 37 to a point between the resistor 19 and the condenser 20.

In the operation of the amplifier for modulating a carrier wave in the transmitter 16, as the

audio wave from the microphone increases in intensity to a predetermined value, the anode 30 begins to conduct thereby producing a potential on resistance 31 increasing with further increase in signal intensity. This potential is supplied through the resistors 37, 19 and 22 to the control electrode 23 with negative polarity. The negative potential on the electrode 23 tends to limit the output of the amplifier 11, 12, 13 and 14. It is desirable that the amplified audio wave transmitted through the modulation transformer 15 to the radio transmitter 16 be maintained below a predetermined intensity in order that the carrier wave generated in the transmitter 16 may not be modulated improperly.

It is frequently desirable that such an amplifier be used not only to amplify an audio voice wave, but also to amplify a keyed, constant intensity, audio frequency wave, or tone, to provide modulated continuous wave transmission of telegraph signals. If such a keyed, constant intensity, audible frequency wave be impressed on the control electrode 23 in such a way that the above described automatic gain control means is effective, each impulse of the constant frequency wave is not amplified throughout its duration in constant intensity because it requires a definite time for the automatic limiting means to operate. Since an audio frequency oscillator is easily constructed to generate an audio frequency wave of constant intensity, it is desirable to disable the limiting means of the modulating amplifier, when the constant frequency wave is amplified there-through.

To supply the constant frequency wave, there is provided an audio frequency oscillator including an electron discharge device 40 having a tuned circuit comprising an inductance 41 in shunt to two series condensers 42 and 43. The cathode 44 of the device 40 is connected to ground and to a point between the condensers 42 and 43. The anode 45 of the device 40 is connected through a resistor 47 to the cathode 44 and is coupled through a condenser 48 to a point between the condenser 43 and the inductance 41. The anode 45 of device 40 is supplied through the inductance 41 and through a decoupling resistor 49 from a suitable source 50 of potential.

This oscillator generates a wave of constant intensity and of audible frequency, which wave is impressed through a coupling condenser 51 across a pair of series connected resistances 52 and 53. An adjustable tap 54 of the resistance 53 is connected through a suitable switch, or key, 55 directly to the control electrode 23 of the device 11. That portion of the resistance 53 between the tap 54 and ground is thus between the control electrode 23 and cathode of the device 11 and hence it is connected in shunt to resistors 31, 37, 19 and 22.

The resistance 53 is adjusted to apply a voltage to the control electrode 23, which voltage is of such magnitude that, when amplified through the modulating amplifier, it can modulate the carrier waves in the transmitter 16 to a high degree. The resistances 37, 19 and 22 are large in relation to the resistor 53. For example, in one case the resistor 22 was made about 50,000 ohms, the resistor 53 about 1000 ohms, the resistor 19 about 1500 ohms, and the resistor 37 about 200,000 ohms. With such proportioning of the resistors less than one percent of the control voltage developed across the resistor 31 is impressed on the control electrode 23 when the

switch, or key, 55 is closed. Such a small control voltage applied to the control electrode 23 cannot produce a noticeable variation in the intensity of keyed impulses, and the shape of each impulse is therefore satisfactory.

The condenser 20 is large enough with respect to resistances 19, 22, and 53 to maintain a charge for an appreciable portion of the duration of a pulse produced by key 55. However, the potential across the condenser 20 cannot appreciably affect the control electrode 23 when the key 55 is closed because of the large potential drop through resistor 22. In the example given above the resistor 22 is sufficiently large so that less than two per cent of the voltage across condenser 20 appears between the control electrode 23 and the cathode of device 11 when the key 55 is closed.

The microphone 10 is also entirely ineffective to impress an audio voltage on the control electrode 23 when the key 55 is closed. This result is obtained because of the voltage drop produced in resistor 22 when the key 55 is closed.

The scope of this invention is not limited to use in a radio transmitter but may also be used in equipment such as carrier current apparatus where the keying means 55 may provide ringing impulses. The amplifier may also be found useful for other modulating purposes as for example, public address systems where it may be desired to produce a constant intensity audible frequency sound controlled by the switch, or key, 55.

While I have shown and described a particular embodiment of my invention, it will be obvious to those skilled in the art that changes and modifications may be made without departing from my invention in its broader aspects, and I, therefore, aim in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. In combination, an amplifier having a pair of input terminals, a source of signal voltage to be amplified connected between said terminals, a second source of signal voltage, a switch and connections between said terminals including said switch and said second source, the impedance of said second source being so low relative to the impedance of said first source that signals from said first source are not impressed in substantial intensity on said amplifier when said switch is closed.

2. In combination, an amplifier comprising an electron discharge device having a cathode, a control electrode, and an anode, a source of operating potential connected between said cathode and anode, a source of signal voltage to be amplified connected between said cathode and control electrode, means responsive to the amplified signal voltage above a predetermined intensity for biasing said control electrode to a negative potential with respect to said cathode, a second source of signal voltage, a switch and connections between said cathode and control electrode including said switch and said second source, the impedance of said second source being so low relative to the impedance of said biasing means that said biasing means is rendered inoperative when said switch is closed.

3. In combination, an amplifier having a pair of input terminals, a resistance, a source of signal voltage to be amplified connected between said terminals through said resistance, a second source of signal voltage, a switch and connec-

tions between said terminals including said switch and said second source, the impedance of said second source being so low relative to said resistance that signals from first source are not impressed in substantial intensity on said amplifier when said switch is closed. 5

4. In combination, an amplifier comprising an electron discharge device having a cathode, a control electrode, and an anode, a source of operating potential connected between said cathode and anode, a resistance, a source of signal voltage to be amplified connected between said control electrode and cathode through said resistance, means responsive to the amplified sig- 10

nal voltage above a predetermined intensity to impress a control potential through said resistance upon said control electrode said control potential being negative with respect to said cathode, a second source of signal voltage, a switch, and connections between said cathode and control electrode including said switch and said second source, the impedance of said second source being so low relative to said resistance that said control potential and signals from said first source are not impressed in substantial intensity on said amplifier when said switch is closed.

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