July 14, 1931. R. B. DOME 1,814,832

FADING CONTROL SYSTEM FOR RADIO RECEPTION

Filed May 18, 1929

Fig. 1.

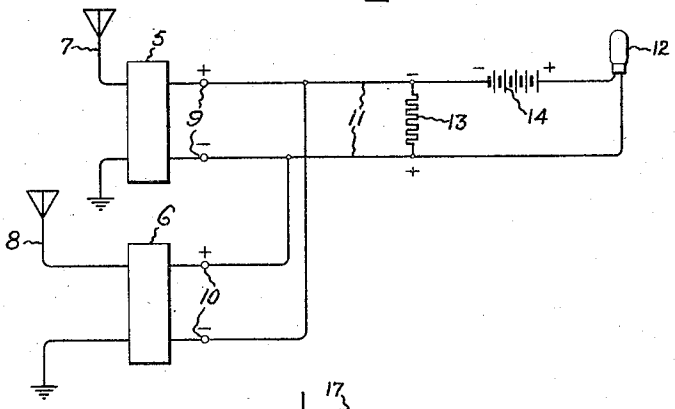


Fig. 2.

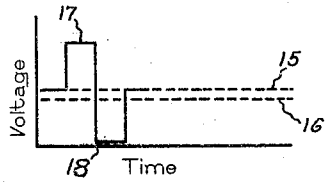


Fig. 3.

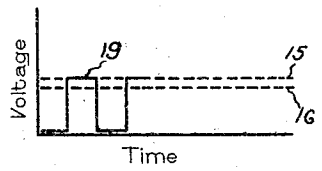
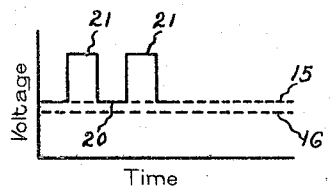


Fig. 4.



Inventor:
Robert B. Dome,
by Charles R. Fuller
His Attorney.

Patented July 14, 1931 1,814,832

UNITED STATES PATENT OFFICE

ROBERT B. DOME, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK

FADING CONTROL SYSTEM FOR RADIO RECEPTION

Application filed May 18, 1929. Serial No. 364,282.

The present invention relates to a fading control system for radio reception, and more particularly it relates to a fading control system for use in connection with a double channel receiving system wherein advantage is taken of possible diversity in fading on different receiving channels or frequencies.

The object of the invention is to provide an improved system for maintaining reception of signals through a double channel system, while fading occurs on either one of the channels. The system of the present invention finds particular application in the reception of facsimile signals, the intelligence or characters of which are transmitted at one frequency while the spaces or intervals are transmitted at another frequency. In the reception of such signals due to the diversity in fading between the two frequency channels, reception rarely fades out simultaneously on both channels.

My 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, Fig. 1 is a wiring diagram of a double channel receiving system, particularly adapted for facsimile reception, and provided with a fading control system embodying my invention, and Figs. 2, 3 and 4 are curve diagrams illustrating various phases of the operation of the circuit shown in Fig. 1.

Referring to Fig. 1, 5 and 6 are signal devices such as radio receivers tuned to receive signals at different frequencies. Each receiver is provided with a collecting circuit represented by antenna circuits 7 and 8 respectively, and provided with output terminals 9 and 10 respectively, for the rectified signals from each channel. In the present example, this may be considered to represent a facsimile receiving system in which receiver 5 is tuned to receive the intelligence or characters, the modulated and rectified indications from which are received at terminals 9, while receiver 6 is tuned to receive the spaces, the modulated and rectified indications from which are received at terminals 10. The output from both channels is combined in an output circuit 11 in opposition to each other; that is, the positive and negative output leads from terminals 11 are connected in opposition with circuit 11 as indicated.

Circuit 11 is connected with the usual light-emitting receiving device, such as a glow lamp 12 for reproducing signals, which may be of the usual neon type. In shunt with output circuit 11 is connected an impedance device such as a resistor 13, and interposed in circuit 11 between the lamp and the resistor 13 is a source of potential or voltage 14. This is represented in the present example by a battery.

With this arrangement the source of potential 14 is connected in series with the lamp and resistor and supplies sufficient voltage to cause the lamp just to glow. The drop in potential across resistor 13 is opposed or assisted by the rectified signal waves applied thereto through terminals 9 and 10. When a signal is supplied through receiver 5 and terminals 9, it produces a drop in potential in resistor 13 which adds to the potential of source 14, thus increasing the glow in lamp 12. When a signal is supplied through receiver 6 and terminals 10, it produces a drop in resistor 13 which opposes the voltage applied through source 14, and if of sufficient magnitude it causes the lamp to stop glowing. Since the voltage of the source 14 is so adjusted that the lamp 12 will barely glow, any slight signal through this last named channel will cause it to stop glowing.

The operation of the above arrangement is shown more fully in the curves of Figs. 2, 3 and 4 to which attention is now directed. In these figures the voltage applied to the glow tube for various operating conditions is plotted with respect to time as indicated and in relation to dotted lines 15 and 16, the former indicating the steady value of voltage of the supply source 14 and the latter indicating the voltage at which the glow lamp will just glow. From these two lines it will be seen that the voltage supplied to the lamp is such that it will glow steadily in the absence of any signal.

With intelligence or character signals applied through channel 5, the voltage rises as shown at 17, Fig. 2, and with a subsequent space signal applied through channel 6 the voltage falls as indicated in 18, Fig. 2, thus causing the glow to increase or decrease in accordance with the reception of signals on each channel. This represents the operation without fading on either channel.

Fig. 3 shows a condition of operation when fading is complete on the intelligence or character channel 5. The space signal channel however is still functioning and it will be seen that the lamp still continues to record with diminished brightness, that is, the spaces are black but the intervals are not fully brilliant as indicated by curve 19 in Fig. 3.

Referring to Fig. 4, a condition of operation is indicated at which complete fading is had on space channel 6. The glow lamp still continues to record however, by changing the brilliancy of the lamp from just on as indicated at 20 to full brilliancy as indicated at 21. Thus under conditions of fading on either channel, recording still continues with this arrangement, although normally the condition of operation will be between the two extremes indicated in Figs. 3 and 4.

Thus by utilizing the diversity factor in fading due to frequency difference in double channel reception, the effects of fading are overcome by combining the rectified outputs from each channel in opposition in an output circuit connected with a glow lamp or similar receiving device and applying to said lamp a voltage which will cause it to operate at a minimum operating value or just to glow without the application of signals, and connected across said circuit a resistor through which a voltage drop is produced from the source and across which the received potentials are added to or subtracted from the voltage of the source thus causing the lamp to increase and decrease in brilliancy.

While the invention has been shown and described in this application to the reception of facsimile signal reception, it should be understood that it is not limited thereto and may be applied to other receiving systems.

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

1. A method of reducing the effects of fading in a double channel receiving system, which comprises applying to a voltage responsive light-emitting receiving device a voltage just sufficient to maintain said device in operation, applying rectified output voltage from one channel to said device in opposition to said first named voltage, and applying the rectified output voltage from the other channel to said device in aiding relation to said first named voltage.

2. The combination with a receiving means having terminals for supplying rectified signals from two separate channels, of an output circuit to which said terminals are connected in opposition, a voltage responsive light-emitting receiving device connected with said output circuit, a resistor connected in shunt to said output circuit, and a source of potential for operating said device connected in said output circuit between said device and said resistor.

3. The combination with a receiving means having terminals for supplying rectified signals from two separate channels, of an output circuit to which said terminals are connected in opposition, a voltage responsive light-emitting receiving device connected with said output circuit, a resistor connected in shunt to said output circuit, and a source of potential for operating said device connected in said output circuit between said device and said resistor, said source of potential being adjusted to subject said device to substantially its minimum operating potential.

4. In a facsimile receiving system, a voltage responsive variable source of light, a resistor and a source of direct current connected in circuit with said light source, terminals for receiving rectified character wave signal voltage, and terminals for receiving rectified space wave signal voltage, said terminals being connected with said resistor to apply said voltages thereto in opposition one to the other.

5. In a signal receiving system, the combination of an electric lamp, a source of electric current, an impedance device connected in series with said lamp and said current source, and a pair of signal receiving means for signals of different frequencies connected with said impedance device electrically in opposition to one another.

In witness whereof, I have hereunto set my hand this 17th day of May, 1929.

ROBERT B. DOME.