

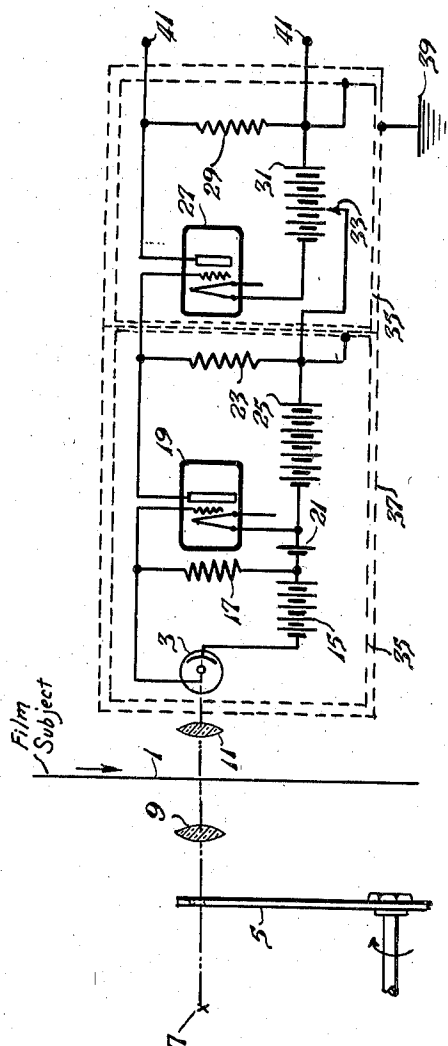
Nov. 22, 1938.

R. H. GEORGE ET AL.

2,137,278

AMPLIFIER SYSTEM

Filed Sept. 30, 1935



INVENTORS
Roscoe H. George
and
Howard L. Heath
BY
H. S. Grover,
ATTORNEY

UNITED STATES PATENT OFFICE

2,137,278

AMPLIFIER SYSTEM.

Roscoe H. George and Howard J. Heim, West
Lafayette, Ind., assignors to Radio Corporation
of America, a corporation of Delaware.

Application September 30, 1935, Serial No. 42,817

4 Claims. (Cl. 250—41.5)

The present invention relates to amplifiers and particularly to amplifiers which are useful in connection with television and picture transmission systems, although the use is in no sense limited specifically to such types of systems.

In television systems it has been found frequently to be desirable to resort to the so-called D. C. amplifier type of system where it is desired to hold the picture level or background at any particular point. When using a D. C. amplifier in such systems it is possible to transmit in correct relationship to the entire picture continued along dark or light portions of the subject, whereas in the so-called A. C. amplifier type of system it is necessary to provide special ways and means whereby the D. C. component of the picture or subject may be added to the picture. This is preferably accomplished at the receiving end of the system and the compensation may be under the control of the synchronizing impulses or some other portion of the signal.

Another advantage to be obtained through the use of a direct current amplifier system is that a small change in the direct current or voltage at the input terminals of the amplifier may be represented by a large change in direct current or voltage at the output terminals without distortion.

The above and other objects are those sought to be attained by the present invention, although we do not in any way limit ourselves to any or all of the foregoing objects or advantages of such a system as is disclosed herein.

For the purpose of illustrating our invention, we have shown by diagrammatic sketch embodying the single figure of the drawing one form which the said invention may assume and have confined the illustration only to the first two stages of an amplifier of the character above described.

If reference is now made to the drawing, it will be seen that light representing different successive elemental areas of the subject 1 is caused to fall upon a photoelectric cell or other suitable light translating element 3 by scanning the illuminated subject, for example, by means of a rotary scanning disk or other equivalent element 5 such as a cathode ray tube, oscillating mirror or the like. The subject 1, for example, may be illuminated from a source 7 by way of an optical system 9 and the light from the subject, in turn, is directed by way of a second optical system 13, the light passing beyond the scanning element is caused to fall upon the light sensitive photoelectric cell 3. The photoelectric cell 3 is con-

nected in series with a battery 15 and resistor 17 so that due to varying conditions of light falling upon the photocell, varying voltage drops take place in the resistor 17. Connected across the terminals of the resistor element 17 is the first stage of the amplifier system. This first stage of the amplifier is so connected that the input circuit comprising the grid-cathode circuit of the tube 19 connects to opposite terminals of the resistor 17 and the control grid is appropriately biased by way of a biasing battery 21. The output circuit of the tube 19 includes the anode electrode of the tube, the resistor 23 and the plate supply source 25. Across opposite terminals of the resistor 23 through which varying voltage drops take place in accordance with the current flowing through the tube 19 (as determined by the potential of that terminal of the resistor 17 connected adjacent the control grid of the tube 19) is connected the input circuit of the second stage of the amplifier which comprises the tube 27. The tube 27, for example, may consist, like the tube 19, of three or more electrodes of which one is an electron emitter and another is an anode.

While we have shown in the accompanying illustration tubes of the triode type, it is to be understood that we may also utilize tubes of the so-called screen grid, pentode, hexode, and other types, or we may use any desired multi-purpose tubes provided other characteristics of the invention remain unchanged.

The tube 27 includes in its output circuit the tube anode, the resistor 29 and the source of anode voltage 31 similarly to the tube 19. In contrast to the arrangement by which the control electrode of the tube 19 is biased by the battery 21, we have provided an arrangement wherein the tube 27 is appropriately biased by means of the plate battery of the tube 19 of which the positive terminal is connected to an intermediate point 33 on the source of plate potential 31 for the tube 27. All succeeding stages (not shown) of the amplifier are preferably biased in the same manner as that provided for the second stage.

In order to shield different sections of the amplifier with respect to each other, there are provided separate shielding boxes 35 for each stage and the positive terminal of the plate voltage supply for each of the tubes 19 and 27, as shown, is connected to one of the shielding boxes 35. An outside shield box 37 is also provided for housing each of the initial shield boxes in order to provide full and complete shielding for all

stages of the amplifier. The outer shield box 37 is preferably grounded at 39.

With the arrangement hereinabove shown, there results an amplifier which is of extreme stability in operation. All succeeding stages of the amplifier are connected to the output terminals 41 or the terminals 41 may connect directly to the modulator and thence to the transmitter.

10 Having now described the invention, what is claimed and desired to secure by Letters Patent is the following:

1. A multi-stage amplifier system comprising a plurality of cascaded thermionic tubes, a source of anode voltage for each of said tubes, means for controlling the output current from the first of said tubes in accordance with a variable quantity so as to control thereby the current flowing through subsequent tubes, means for biasing the second tube of the series from the source of anode voltage for said tube, separate electrostatic shielding means surrounding each of said tubes, a connection from the positive terminal of the anode voltage source for each tube to said shielding means, and a second shielding means surrounding all of said tubes and the individual shields therefor and insulated from the first named shielding means.

2. A multi-stage amplifier comprising a plurality of directly connected thermionic tubes, means for controlling the output current from the first thermionic tube in accordance with light modulations, means for controlling the output of the following tubes in the system in accordance with the output of the first tube of the series, means for biasing each tube of the series from the source of anode voltage for the selected tube of the series, separate electrostatic shielding means enclosing each stage of the amplifier and joined to the positive terminal of the anode voltage source for said stage, and a second shielding means surrounding the entire amplifier and insulated from each of the individual shields, said second shielding means being maintained at ground potential.

3. In a multi-stage amplifier comprising a plurality of directly connected thermionic tubes, means for controlling the output current from the first thermionic tube in accordance with light modulations, means for controlling the output of the following tubes in the system in accordance with the output of the first tube of the series, means for biasing each tube of the series from the source of anode voltage for the selected tube of the series, separate electrostatic shielding means enclosing each stage of the amplifier and joined to the positive terminal of the anode voltage source for said stage, thereby placing said shields at a potential relative to the cathode of at least one of the tubes which is progressively higher from the first tube, and a second shielding means surrounding the entire amplifier and insulated from each of the individual shields, said second shielding means being maintained at ground potential.

4. In a multi-stage amplifier comprising a plurality of directly connected thermionic tubes, means for controlling the output current from the first thermionic tube in accordance with light modulations, means for controlling the output of the following tubes in the system in accordance with the output of the first tube of the series, means for biasing each tube of the series from the source of anode voltage for the selected tube of the series, separate electrostatic shielding means enclosing each stage of the amplifier and joined to the positive terminal of the anode voltage source for said stage, thereby placing said shields at a potential relative to the cathode of at least one of the tubes which is progressively higher from the first tube, a second shielding means surrounding the entire amplifier and insulated from each of the individual shields, said second shielding means being maintained at ground potential, and shielding means separating each of the separate electrostatic shielding means enclosing each stage of the amplifier and insulated therefrom.

ROSCOE H. GEORGE.
HOWARD J. HEIM.