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FACSIMILE SYSTEM

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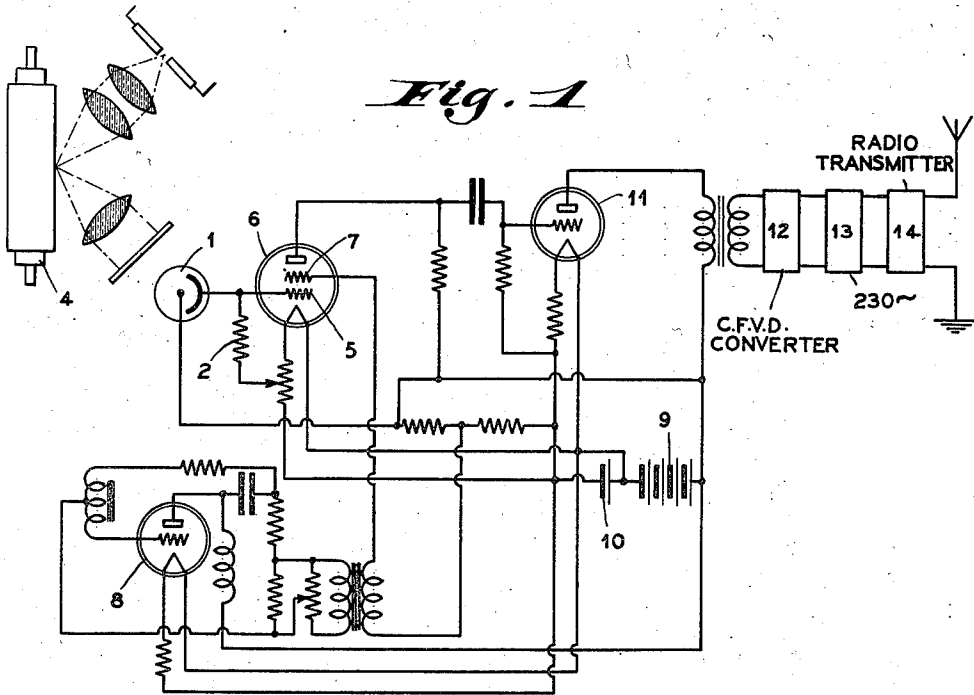
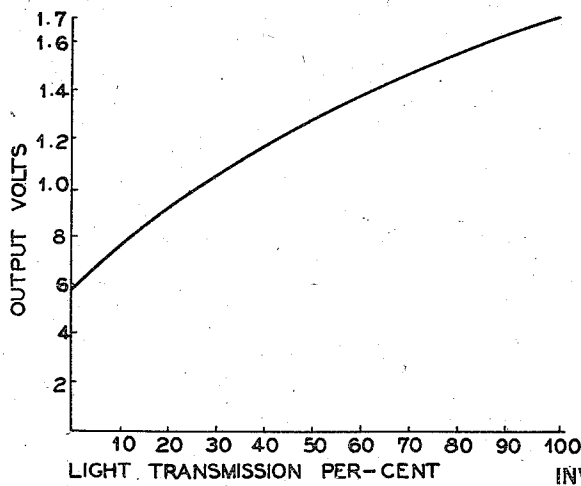


Fig. 2



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FACSIMILE SYSTEM

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Application March 24, 1932, Serial No. 600,874

3 Claims. (Cl. 178—5)

This invention relates to signal transmission systems of the type wherein the transmitted signals are representative of light impinging upon a light sensitive cell.

5 It is well known that photo-electric cells may be used in facsimile transmission systems to control the development of signals in accordance with conditions of light and shade to which such cells are exposed, the modulation of the carrier wave being effected by means of a light chopper and associated current amplifiers and modulators. In such systems, however, wherein a light chopper is employed, it has been found that the wave shape developed is not entirely satisfactory to provide for advantageous conditions of operation. This disadvantage is attributed to the light chopper.

Furthermore, in many of the facsimile scanners proposed heretofore it has been awkward and difficult to place the photo-cell in the mechanical system without sacrificing certain desirable features. In the various systems utilizing direct current amplifiers, difficulties have been encountered due to a pronounced tendency of the amplifier to drift, that is, to depart from its adjustments to such an extent as to materially interfere with the fidelity of the reproduced picture.

One method of overcoming the aforementioned disadvantage is disclosed in a copending application, Serial No. 576,266, filed November 20, 1931, by Maurice Artzt. The foregoing application provides an improved apparatus for modulating an electrical wave, which is relatively stable and capable of holding its setting over long period of time. The present invention is an improvement thereon and provides a highly efficient, simplified circuit arrangement.

An advantage of the present invention is that a minimum number of tubes is employed with a consequent reduction in the complexity of the circuit and in the cost of construction. This arrangement permits easier maintenance requirements.

From one aspect, the present invention comprises a double-modulated circuit arrangement employing a single screen grid tube whose control grid is varied in potential in accordance with the light variations and whose screen grid is coupled to the source of carrier current.

The invention is described more in detail in the following specification which is accompanied by drawing in which Figure 1 illustrates, diagrammatically, a system embodying the principles of the present invention, and Figure 2 shows, graphically, the operation of the system of Figure 1.

Referring to Figure 1, there is shown an improved circuit arrangement for controlling the development of picture signals in a facsimile

transmission system wherein a photo-cell 1 is connected to the control grid 5 of a four-electrode electron discharge device 6 whose screen grid 7 is coupled to a source of carrier current 8. As is well known, the photo-cell 1 draws more or less current depending upon conditions of light and shade to which it is subjected. In the system shown, variations in these conditions are determined by the amount of light reflected from the surface of a picture wrapped about the usual drum 4 forming part of the transmitter. The anode of the four-electrode electron discharge device is shown connected to a source of positive potential supplied by battery 9 and the cathode thereof connected to another suitable source of potential shown as battery 10. In the preferred arrangement, the voltage applied to the anode is about 135 volts while that applied to the cathode by battery 10 is 6 volts.

The carrier current is shown supplied by a suitable thermionic oscillator designated, generally, by the reference numeral 8. This oscillator, as shown, functions in a manner well known to those skilled in the art and will not be described herein. If desired, this oscillator may be of the type described in my copending application Serial No. 599,946, filed March 19, 1932.

In operation, when light is reflected on the photo-cell 1 the cell will draw a corresponding amount of current to cause variation in the voltage across the resistor 2. The potential of the control grid 5 of the tube 6 will thereby be changed, affecting the mutual conductance of the tube and producing amplitude variations of the carrier. The modulated carrier is applied to the grid circuit of a suitable amplifier 11 from which it passes through a constant frequency-variable dot convertor arrangement of the type described in copending application Serial No. 558,750, filed by H. Shore and J. N. Whitaker, August 22, 1931, where it is combined with a screening tone of the desired frequency, 230 cycles for instance, which is supplied by a suitable generator designated as 13. This combination converts the amplitude modulated carrier of the scanning head to characters resembling telegraph signals of varying length or duration (depending on the weight or tone value of the scanned picture) which are supplied to the radio transmitter 14, or to a wire line service. If desired, the output of amplifier 11 may be applied directly to a wire service or radio transmitter as an amplitude modulated signal.

Figure 2 shows the light response characteristic of the circuit arrangement of Figure 1. It will be noted that there is a slight departure from linearity. This departure, however, is an advantage inasmuch as a slight curvature at the dark end of the characteristic can render somewhat greater detail when using this particular system

of transmission. In this system the density of a given area is the average of discreet black dots and white spaces. The averaging is done by the eye and when the percentage of black area becomes about 85% or more of the total area it becomes exceedingly difficult for the eye to detect changes in density. Consequently, departure from linearity in this region by increasing the actual percentage change enables the eye to detect these changes and, in effect, increase the amount of detail that can be seen.

What is claimed is:

1. A facsimile system employing a rotating drum, a scanning light and means for converting reflected light variations therefrom into electrical waves of varying amplitude comprising a single electron discharge device having a cathode, anode, control electrode, and an auxiliary electrode, a photo-cell directly connected to the control electrode and to the cathode of said device, a resistor between said control electrode and said cathode for supplying variable bias to said control electrode, another resistor connected to said anode, a source of uni-directional potential, and a source of low frequency sinusoidal carrier current coupled to the auxiliary electrode of said device, whereby the amplitude of said carrier current across said anode resistor is always proportional to the intensity of the reflected light impinging upon said photocell.

2. A facsimile system comprising, in combination, a rotating drum, scanning means, a single electron discharge device including a cathode, a control electrode, a screen electrode, and an output circuit for said device, a photoelectric cell responsive to varying light values of elemental areas of the subject supported on the drum for scanning, a direct connection between the cath-

ode of the discharge device and the photoelectric cell, a direct connection between the control electrode of the discharge device and the photoelectric cell, a resistor connected between said cathode and said control electrode, means for supplying sinusoidal carrier voltage to the screen electrode of said device, means for supplying uni-directional voltage to the screen electrode of said device, and an output circuit connected with the output of said single discharge device wherein there appears an amplitude modulated carrier wave whose extent of modulation is always proportional to the response of the photoelectric cell to said varying light values.

3. A facsimile system comprising, in combination, a rotating drum, scanning means, a single electron discharge device including a cathode, a control electrode, a screen electrode, and an output electrode, a photoelectric cell responsive to the varying light values of elemental areas of the subject supported on the drum for scanning, resistor means for biasing said control electrode, a source of low frequency sinusoidal carrier current coupled to the screen electrode of said device, a source of D. C. voltage directly connected to the screen electrode of said device, a direct connection between the cathode of the discharge device and the photoelectric cell, a direct connection between the control electrode of the discharge device and the photoelectric cell, said connections giving accurate amplitude control of said carrier, and a resistor connected to the output electrode wherein a modulated wave appears whose amplitude is always proportional to the response of the photoelectric cell to said varying light values.

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