April 29, 1941. M. GEIGER 2,240,136

SIGNALING APPARATUS

Filed July 7, 1937

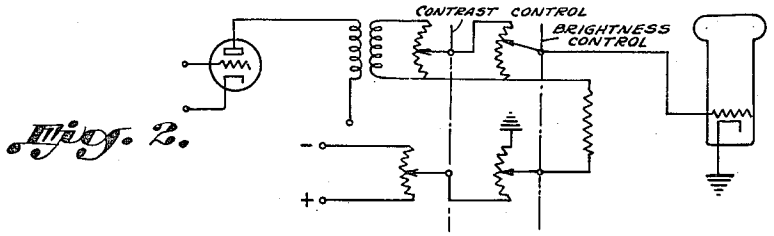


Fig. 2.

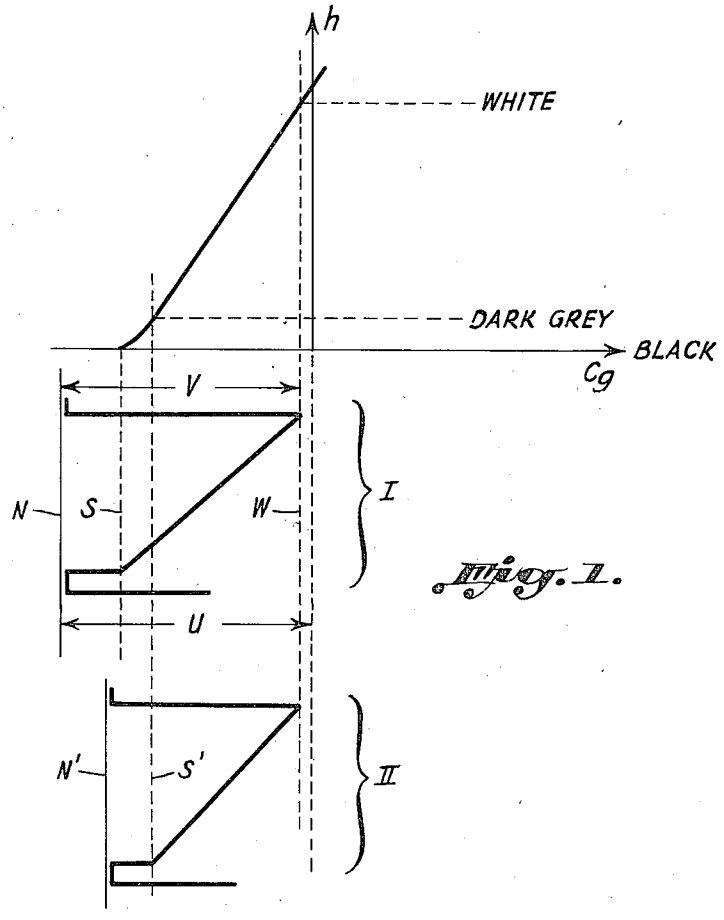


Fig. 1.

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SIGNALING APPARATUS

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Application July 7, 1937, Serial No. 152,288
In Germany July 9, 1936
2 Claims. (Cl. 178—7.3)

This invention relates to signaling apparatus, and in particular, to cathode ray reproducing devices, such as used in television, and the method and means for controlling light values of the reproduced image.

This application is a continuation in part of United States application Serial No. 113,027, filed November 27, 1936, entitled "Signaling apparatus" of Hans O. Roosenstein and Max Geiger which issued March 19, 1940 as United States Patent No. 2,194,456.

In the parent application, above identified, an arrangement has been disclosed which is designed to be used in connection with a television receiver comprising a cathode ray tube and which serves to regulate the nature or characteristics of the picture. To the said end in view, the regulator means for the biasing potential impressed upon the brightness or intensity control or modulating electrode of the cathode ray tube and for the gain of the picture amplifier are so inter-coupled and locked that the aggregate luminous flux from the incoming and recreated image may be regulated independently of the contrast properties of the picture, and vice versa. The measure of the total luminous flux (which, of course, will vary in the course of a long sequence of television pictures because of variations in picture content) is here to be regarded the sum total of the intrinsic brightness or brilliancy values which correspond to the brightest and the darkest picture portions inside a relatively long sequence of television pictures. The measure of the contrast properties of the picture is the difference between the intrinsic brilliancy values which correspond to the brightest and the darkest picture points throughout a comparatively great sequence of television pictures divided by the sum total of these intrinsic brilliancy or brightness values.

The invention essentially resides in the discovery that a regulation of the characteristics or contrast properties of the picture that will be satisfactory for a great many practical purposes will be obtainable by varying the brightness with which the black portions of the picture are recreated independently of the brightness which corresponds to the white portions of the picture. This is obtainable by convenient coupling or inter-locking of the regulator means for the biasing voltage of the intensity modulator electrode and for the gain control or volume control of the picture or video signal amplifier.

One exemplified embodiment of the invention shall be explained in what follows by reference to the accompanying drawing, in which K Fig. 1 shows graphical relationship between the image brilliancy and control potentials, while Fig. 2 shows in circuit form an embodiment of the invention. In Fig. 1, the curve representing the inter-dependence between the brightness h of the fluorescent spot and the voltage e_g prevailing at the intensity control or modulator electrode of the cathode ray tube. I shows a simple form of the modulation potential inside a picture line, it being here assumed that the so-called "black level" S just coincides with the origin of characteristic K. To regulate the characteristics of the picture, recourse may be had, fundamentally, in the operation of a television receiver comprising a cathode ray tube, to the biasing voltage U of the brightness modulation electrode and the gain of the picture signal amplifier, in other words, the voltage V which corresponds to the white elements of the picture. If merely potential U or potential V is varied, then not only the contrast properties of the picture are altered, but also the overall picture brightness or luminosity to an appreciable degree and in accordance with a rather complex law.

According to the invention, therefore, with a view to influencing the contrast properties, the brightness value corresponding to the white picture elements is to be retained, in other words, the vertical broken line W is always to remain stable. But the vertical broken line S, in other words, the line representing what is known as the black element level, is to be shifted to the right-hand side so as to diminish the contrast properties, with the consequence that a voltage characteristic as shown at II results from I. Thus, the zero line N for the voltage represented at I will also be shifted to the right so that it will assume a position as indicated by N'. Line S' which indicates the new position of the black level intersects with curve K at a finite value of h with the result that the black picture portions will now be recreated dark grey, and this means an incidental change in the contrast properties or the characteristics of the image.

It will be obvious from a study of the drawing that a change in such contrast properties, in the presence of unchanged brightness of the white picture portion, will be producible only by a simultaneous regulation or change of both U and V. The adjusting or setting means which will invariably consist of potentiometers of some suitable sort or inter-coupled or inter-locked,

while the gauge of their wires is so graduated that, with W staying unchanged, the black level may be shifted from the bottom knee of curve K in upward direction.

Fig. 2 shows the circuit arrangement similar to that of Patent No. 2,194,456 except that auxiliary bias control coupled to the brightness control has its leads reversed so that the black level can be shifted without, however, changing the white level.

Having described my invention, what I claim is:

1. In an electro-optical device for producing an image composed of elemental areas of varying light intensity, the method of improving the operation of the device which comprises the steps of maintaining the maximum brightness of one of the tones other than black of the produced image constant and simultaneously varying the contrast ratio of the entire image.

2. In an electro-optical device for producing an image composed of elemental areas of varying light intensity, the method of operation which includes the steps of supplying signals for producing an image composed of elemental areas, supplying a potential for controlling the brightness of the elemental areas of the image, and varying the amplitude of said signals and said potential simultaneously according to a predetermined relation between them to vary the contrast of the entire image while maintaining the maximum brightness of one of the tones other than black of the image independent of the variation of said contrast ratio.

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