

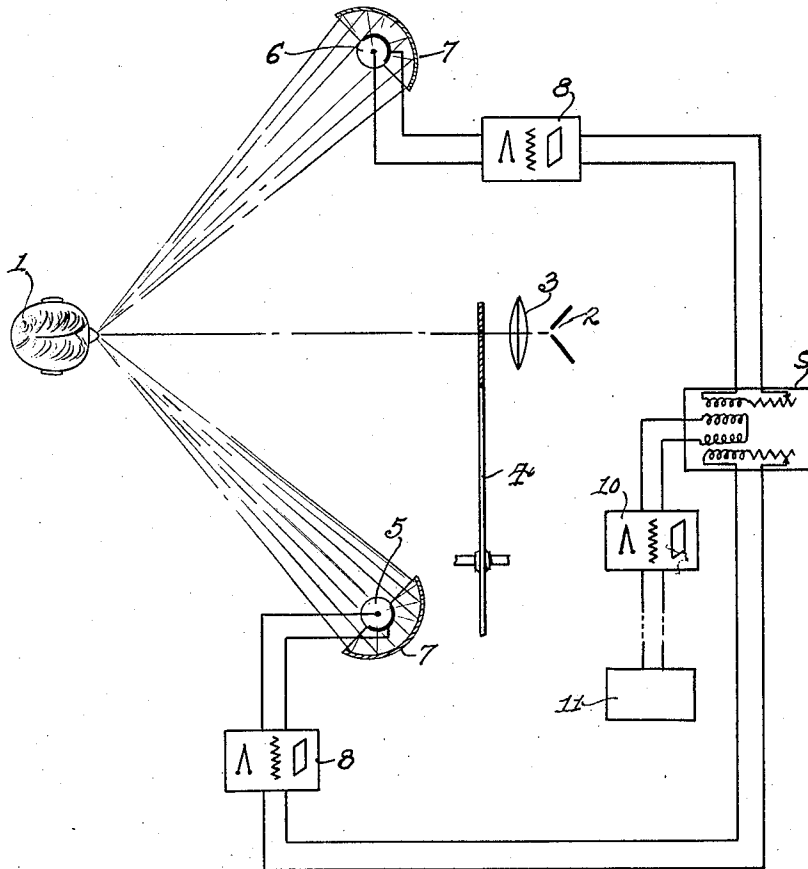
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ELECTRICAL IMAGE TRANSMISSION

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# UNITED STATES PATENT OFFICE

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## ELECTRICAL IMAGE TRANSMISSION

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This invention relates to electrical image transmission systems, and with particularity to improved methods of technique for such systems.

5 The invention has for one of its principal objects to provide an improved method of controlling the transmission of image currents in accordance with the shadow effects desired in reproduction.

10 It has been found that in television systems employing the so-called movable spot scanning method, that the image as reproduced will have different shadow effects, depending upon the disposition of the scanning  
15 beam at the sending station relatively to the object being scanned. Accordingly it is one of the principal objects of the invention to provide methods and means for adjusting the television pick-up and amplifying apparatus so that unusual or undesired shadow effects may be eliminated in reproducing the image.

Another object of the invention is to provide methods and means for controlling the  
25 distribution of the shadows in an electro-optically reproduced image.

Another object of the invention is to provide an improved method of transmitting colored visual representations.

30 Other features and advantages not specifically enumerated will be apparent after a consideration of the following detail descriptions and the appended claims.

While the invention will be described in  
35 connection with one disposition and structure of elements known in television systems, it will be understood that the invention is not limited thereto and furthermore, only sufficient portions of a television system will  
40 be described to enable a clear understanding to be attained of one preferred manner of practicing the invention.

Accordingly in the drawing the numeral 1 represents an object or subject whose image  
45 is to be electro-optically transmitted. In the case of flat objects it is obvious that very little if any shadows are produced by the flood light or scanning light. On the other hand, in the case of objects having irregular sur-  
50 faces, such as a person's face, the distribution

of the shadows will depend entirely upon the angle at which the light reaches the object.

Thus, as shown in the drawing, there is provided a source of scanning light in the form of an arc lamp 2, the light from which is projected by a suitable optical system 3 upon the scanning field of the rotatable scanning device 4. The device 4 may take the form of a spirally perforated disc or lens disc of the type disclosed in Jenkins' Patent 1,679,086.

As the device rotates, the subject 1 is scanned in successive elemental areas by a moving spot of light. This light spot is diffusely reflected in all directions and for the purpose of translating the light into corresponding  
65 electric currents there are provided two or more photo-electric cells 5, 6, etc. Each cell is provided with a concave light collecting mirror 7 which collects the diffusely reflected light and focuses it or projects it upon the associated photo-electric cell. This arrangement permits the use of comparatively small  
70 photo-electric cells and at the same time enables a very large quantity of the reflected light to be picked up and projected into each  
75 cell. Associated with each of the cells 5, 6 is a suitable amplifier 8. The output of the amplifier 8 is connected to a mixer device 9 such as is ordinarily employed in radio  
80 boardcast systems for proportioning the currents from the amplifiers 8 and feeding them into a common output amplifier 10. The amplified output may be transmitted to a television receiving station schematically represented by the numeral 11. This station  
85 may be of the type disclosed in Jenkins Patent 1,683,137, or any other well known form of television receiving station. It has been found that either by changing the positions of the cells 5 and 6 relatively to the subject  
90 1, or by varying the gains of the amplifiers 8, or by adjusting the mixer device 9 that different shadow effects are produced in the reproduced image. For the purpose of explanation it will be assumed that the cells 5 and  
95 6 are symmetrically positioned with respect to the subject 1 and that the amplifiers 8 are adjusted for equal gain and the mixer device 9 is adjusted to feed carrier currents from the amplifiers 8 into the common ampli-  
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fier 10. Assuming further that the scanning light 2 is also symmetrically disposed with relation to the subject 1, then it will be clear that the reproduced image will have a minimum of shadow effects. Should it be desired, for example, to increase the shadow effects on one side of the subject, then all that is necessary is to either move one of the light sensitive cells or vary the gains of the amplifiers 8 or of the mixer device 9.

It will be understood that the term "shadow effects" as employed herein refers to the shadows produced by the object itself or portions thereof relatively to the scanning beam. This term does not include the normal shade effects of an object which is uniformly illuminated. For example, it is the customary practice in present day television systems to position the object to be scanned in front of a background or screen which is ordinarily visible in the reproduced picture. If a single light cell is positioned in front of the object, particularly if it is positioned symmetrically with relation to the object, the scanning beam will produce a shadow on the background or screen which in many cases is objectionable. By means of the present invention the shadow effects in the reproduced image itself, as well as the shadow effects on the background, resulting from the object as a whole can be varied and controlled as desired.

The above described arrangement also possesses advantages when a colored representation is to be transmitted. For example, the cell 5 may be sensitive to red light, while the cell 6 may be sensitive to green light. By means of the independent amplifiers for the cells and the common mixer device 9, the proportionate effects of each of the cells may be adjusted to give the proper degree of contrast in the reproduced image. It will be understood of course that in this use a suitable colored filter will be used in conjunction with the disc 4 to cause the subject 1 to be successively illuminated by the colored scanning beams. Thus, during one rotation of the disc 4 a red scanning beam will be projected on the subject 1, and during the next rotation a green scanning beam will be projected on the subject. Of course more than two-colored scanning beams may be employed. Further application of the method will be obvious. It has also been found that when a colored subject is scanned by a panchromatic scanning spot that the different colorations give rise to different responses. For example, assuming that half of the subject is red and the other half is green, obviously then when ordinary photoelectric cells are employed the response from the red portion of the subject will be different from the green portion of the subject. This would ordinarily give rise to undesirable contrast in the reproduced image. To obviate this the cells 5 and 6 may be made selectively responsive

either inherently or by suitable color filters to the red and green rays, and the relative responses adjusted by the mixer 9, so as to preserve the proper relation between the relative light intensities from the different colored portion of the subject.

In this case also it will be obvious that if the subject is in variegated colors, a corresponding plurality of selectively responsive pick-up channels similar to those shown may be employed and connected to a common mixer for adjusting the relative levels in the several channels.

Other adaptations and use not specifically enumerated will be apparent to those familiar with the art.

What is claimed is:

1. In an electro-optical system the method which comprise simultaneously energizing a plurality of light sensitive devices in accordance with the characteristics of an elemental area of said object, connecting said devices to a common mixer device, and adjusting said mixer device in accordance with the shadow effects desired in reproducing the image of the object.

2. In an electro-optical system the method which comprises positioning a plurality of light sensitive devices around an object whose image is to be transmitted, simultaneously energizing said light sensitive devices in accordance with the characteristics of an elemental area of said object being scanned, independently amplifying the responses of said devices, and feeding said amplified responses into a common adjustable mixer device, and adjusting said mixer to vary the shadow effects in the reproduced image.

3. In an electro-optical system the method which comprises projecting a moving light spot over the surface of an object whose image is to be transmitted, collecting the reflected light from said object at a plurality of separated points, energizing the light sensitive device at said separated points in accordance with the light reflected thereto, connecting said light sensitive device to a common mixer device, and adjusting said mixer device to control the shadow characteristics desired in the reproduced image.

4. In an electro-optical system the combination of means for projecting a moving scanning spot over the surface of an object whose image is to be transmitted, a plurality of light sensitive cells grouped around said object, means for independently amplifying the responses from said cells, a common mixer device connected to said amplifier means for controlling the shadow effects desired in the reproduced image.

5. In an electro-optical system the combination of a colored visual representation whose image is to be transmitted, means for projecting a multi-colored light upon said representations, a plurality of light sensitive

devices, means for independently amplifying the responses of said devices, and a common adjustable mixer device to which said amplifying means is connected for controlling the shadow effects in the reproduced image.

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6. In an electro-optical system the method which comprises scanning a visual representation with light of one color to produce simultaneous and separate currents each corresponding to the elemental areas of the representation, common mixer means for independently varying the magnitude of said currents to control the shadow effects in reproduction, and a common transmission channel to which said independently varied currents are applied.

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In testimony whereof I have hereunto set my hand on this 3rd day of November, A. D. 1930.

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D. E. REPLOGLE.

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