

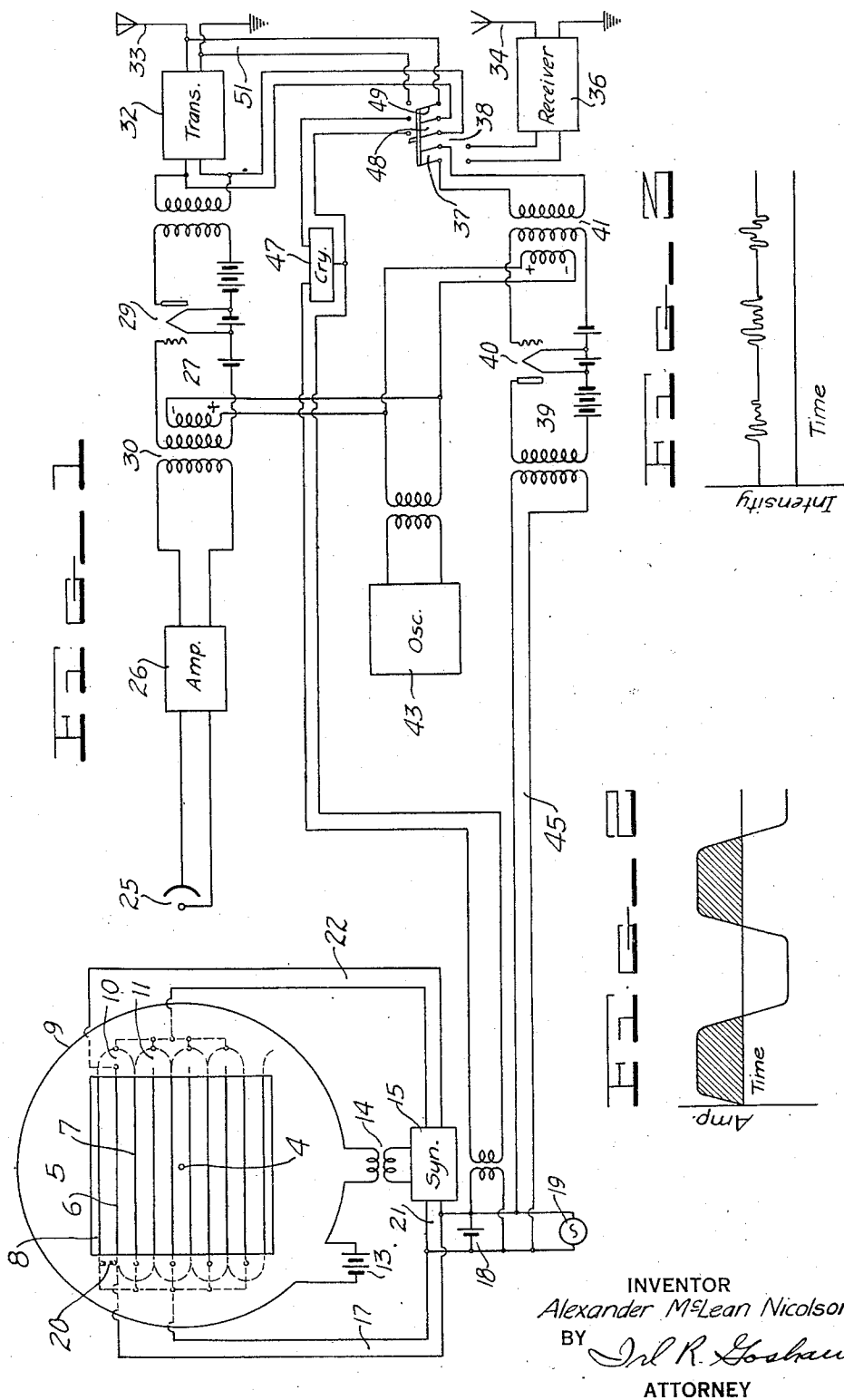
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TELEVISION MIRROR SYSTEM

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TELEVISION MIRROR SYSTEM

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This invention relates to the transmission of images of objects in the form of electrical impulses and particularly to a two-way television system in which the transmission from either the transmitter or receiver may be obtained on one screen.

An object of the invention is to electrically transmit pictures of objects or images thereof to distant points.

Another object of the invention is to simultaneously transmit images in two directions employing the same screen for transmitting and receiving.

A further object of the invention is to monitor or mirror the transmitted image upon the transmitter screen for purposes of adjustment and regulation.

It is now known in the art how to transmit pictures of objects or images thereof to distant points by a series of electrical impulses characterized by the varying light and shade intensities of the pictures and images. It is also known that two identical systems working simultaneously in opposite directions will provide a two-way television system. The present invention is an improvement upon the systems now known in the art by employing the same screen or scanning light source as the receiving screen for receiving the messages from a transmitting station, and for monitoring the transmission from the local transmitter itself.

A feature of the invention is the method of rapidly changing the function of the television screen at a sufficiently high frequency to permit the screen to both scan an object and receive an image thereon without flickering and discontinuity.

The screen is in the form of an electrodynamic arc propagated along electric rails at a high velocity and which has a constant intensity for scanning purposes and is modulated by incoming waves for receiving an image being transmitted from a distant point. Such a screen is disclosed in my co-pending applications, S. N. 397,826, filed October 7, 1929, and S. N. 450,025, filed May 5, 1930. These screens are provided with synchronizing apparatus to maintain synchronism between the transmitting and receiving screens and to maintain a uniform propagation of the arc at both screens.

The television system disclosed below permits a person to observe the operation of the transmitting apparatus upon the transmitter-receiver screen and make any necessary adjustments to apparatus before the impulses are impressed upon

the transmission medium. Any change or arrangement of the persons or objects being televised may also be made. In other words the transmitter screen serves as a mirror in which a person may observe how he will appear on the screen at the distance point.

The invention will be more fully understood from the following description taken in conjunction with the accompanying drawing in which:

Fig. 1 shows a schematic arrangement of one terminal of a two-way television system,

Fig. 2 is a diagram showing the alternate functions of the screen and,

Fig. 3 is a graphical illustration of the arc currents in the screen.

Referring particularly to Figure 1, a television transmitter receiver screen 5 is shown, comprising electrode rails 6 and 7, translucent camera and viewing screen 8 with pinhole 4, field winding 9, representing a plurality of turns, and synchronizing shunts 10 and 11. This screen, of course, will include many more rails and shunts, the number shown being merely for clearness of explanation. The field winding 9 is supplied from a constant direct current source 13 which may be alternating if desired, with a super-imposed alternating current component impressed thereon through a transformer 14. The transformer 14 is supplied from a synchronizer 15, which is preferably the same as the synchronizers disclosed in my copending applications mentioned above.

The electrode rails are supplied over conductors 17 from a constant D. C. source 18. Superimposed upon the electrode rails from a source 19 are framing or synchronizing A. C. impulses which are sufficient to initiate the arc at a foreshortened gap 20 of the electrode rails 6 and 7. After the spark has been initiated at the gap 20, the D. C. potential from the source 18 maintains it to the end of the rails, where it is blown out by separation of the electrode rails. The rails may also be of the continuous type such as disclosed in my above mentioned copending applications.

The impulses from the source 19 are fed into the synchronizer 15 over conductors 21, while the impulses from the shunts 10 and 11 are impressed upon the synchronizer over conductors 22. When the arc arrives at the shunts at the proper time instants with respect to the impulses being generated, no current is fed through the transformer 14 into the field. However, if there is retardation or advance of the arc in its propagation over the screen, current of the proper sign will be impressed upon the field weakening or strengthen-

ing it in accordance with the lag or lead of the arc along the rails.

Associated with the television screen 5 is a photo-electric cell 25 which receives varying intensities of light in accordance with the light and shade of an object scanned through the pinhole 4 of the camera 8. This cell may represent a plurality of cells in parallel, disposed around the screen. The output of the cell is amplified by an amplifier 26 and fed into a control circuit 27. This control circuit comprises a vacuum tube 29 having a three winding input transformer 30. The output of circuit 29 is fed into a transmitter 32, where it may be modulated with a carrier broadcasting wave for transmission over antenna 33 or transmitted over a wire circuit in the manner well known in the art.

Received television signals are picked up by antenna system 34 impressed on a receiver 36 which is connected through two blades 37 of a triple pole double throw switch 38 to a receiver control circuit 39. This control circuit is comprised of a vacuum tube 40 and three winding input transformer 41. The output of the receiver control circuit 39 is impressed over conductors 45 upon conductors 17 feeding the screen electrode rails 6 and 7.

The third winding of the transformer 30 in the transmitter control circuit 27, and the third winding of the transformer 41 in the receiver control circuit 39 are connected in parallel to an oscillator 43 which may be of any type well known in the art generating a pure wave form, but, preferably, one whose frequency is controlled by a crystal producing a wave having a flattened top. The output winding of this oscillator is so connected that control circuit 27 is made operative when the control circuit 39 is biased to an inoperative point. As the circuit 43 oscillates, therefore, the transmitting and receiving circuits will be made alternately operative and inoperative at a rate depending upon the frequency of the oscillator.

Referring now to Figs. 2 and 3, in Fig. 2 a wave form is shown which represents the output of the oscillator 43. The shaded half cycles are those which operate the receiving line, while the unshaded portions of the wave are those which operate the transmitter. The receiving circuit will, therefore, operate during one-half the cycle and the transmitting circuit will operate during the other one-half cycle. Now what occurs in the light source or to the arc on its travel along electrode rails 6 and 7 is depicted in Fig. 3. The straight portion of the curve shown represents the arc having a steady light intensity when it is supplied only from the source of potential 18. During the same length of time and alternating with the constant intensity periods are the variations in intensity, due to the superimposing on the conductors 17 of the output of the receiving system 36 over conductors 45 for the same period of travel of the arc. Therefore, the arc will be modulated by the incoming signal waves being transmitted from a similar television system for one-half its travel and during the other portions it will produce a constant light intensity for the purpose of scanning an object in front of the screen, the screen alternating in function in accordance with the frequency of the oscillator 43. The variations in light intensity caused by the received currents will not be transmitted from the photoelectric cell 25, since during this period the oscillator 43 has made the transmitting circuit inoperative, and this circuit will only be

operative during the constant light periods of the arc. The rapidity with which the receiving arc alternates as a scanning source and a receiving screen, is sufficient to produce continuity of the received message as well as that of the transmitted image.

The medium or screen 8 placed in front of the arc may be of quartz or of any translucent material which permits the arc being viewed there-through but reduces the light transmitted there-through to an extremely small fraction of that which is projected through the pinhole 4 and which scans objects in front of the screen.

The system shown in Fig. 1 has another important feature and that is it permits monitoring or mirroring the transmitted picture on the transmitter screen at any time during operation. In a pair of conductors connected between the rails supply conductors 17 and the output of the control circuit 27 is a crystal delay circuit 47. This crystal circuit may be replaced by any type of delay circuit, the period of which is made equal to one-half cycle of the frequency produced by the oscillator 43. This delay circuit is connected to the output of the control circuit 27 through the blades 48 of the switch 38. The switch 48 also comprises a blade 49 which short circuits the output of the transmitter 32 over conductors 51.

The operation of this portion of the circuit is as follows: When the switch 38 is thrown to its upper position, the receiver 36 is disconnected from the receiver-transmitter screen, while the output of the transmitter 32 is short circuited and the output of the control circuit 27 is connected to the supply conductors 17 of the screen. When the arc, therefore, traveling over the screen scans an object, the varying light intensities are detected by the photoelectric cell 25 which are transmitted through the control circuit 27 and to the screen over conductors 17. These signal variations are, however, transmitted back to the screen at the times when the transmitting circuit is inoperative since the delay in the circuit 47 is equal to one-half the frequency of the oscillator 43. This permits a person or object to be viewed on the screen which is transmitting the person or object, permitting adjustment and regulation of the circuit or of the objects being televised. When the complete adjustments have been made, and it is desired to transmit images, the switch 38 is thrown to its lower position, breaking the short circuit across the transmitter 32 and connecting the receiver 36 to the screen 5. The switch 38 may be in the form of push buttons placed in a convenient position where, at any time that the mirroring effect is desired, the switch may be quickly operated.

The above invention is particularly adaptable to two-way television transmission utilizing an electrodynamic arc such as disclosed in my co-pending application above mentioned. The mirroring effect produced may be utilized for other purposes besides monitoring, while the delay circuit 47 comprising the crystal may be adapted to other uses.

What is claimed is:

1. In an electrical system for the transmission of electrical impulses characterized by the varying light intensities of an object, a moving light source for scanning said object, means for translating light reflected from said object into electrical currents, means for rendering the translating means inoperative during the time the

moving light beam travels over alternate unit areas of said object, and means including a delay circuit for utilizing alternate unit areas for producing an image of said object being scanned.

5 2. In an electrical transmission system for the transmission of an electrical impulse characterized by the varying light intensities of an object, a movable light beam for scanning an object, means for translating light reflected from
10 said object into electrical currents, means for transmitting said currents intermittently, said means rendering the translating means inoperative during the time the moving light beam travels over alternate unit areas of said object, and means including a delay circuit for utilizing
15 these alternative unit areas for depicting an image of the object being scanned.

3. In an electrical transmission system for the transmission of electrical impulses characterized by the varying light intensities of an object, a light source, means for utilizing said light source for scanning said object for transmission, means for receiving current impulses characterized by the varying light intensities of an object scanned
25 at a distant transmitter, a delay circuit, and means including said delay circuit and utilizing said light source for translating said received image currents from said distant transmitter into an image of the said distant object, said
30 means alternating the functions of receiving and scanning in unit area sections.

4. In a television system, a source of light, means for developing and transmitting picture signals, delay means for said signals, receiving means for applying the picture signals to said
35 light source for monitoring the image, and means for alternately biasing the transmitter and receiver into an inoperative condition so that the function of the light source as a transmitter and receiver scanner occurs on alternate unit areas
40 of the light beam projected by said source.

5. In a television system, an arc screen having electrode rails for determining the path of an arc employed as a source of light for scanning, means
45 for detecting variations in the light and shade of an object for transmission, means for translating said light variations into electrical currents, means for transmitting said currents to a distant point, means for applying currents similarly generated at a distant point to said arc, and means
50 for delaying the received currents and causing said transmitter scanner to be inoperative in alternate unit areas.

6. In a two-way television system, a light source
55 for scanning an object to be transmitted, means for transmitting picture signals, delay means for said signals, receiving means for applying picture signals scanned at a distant point to said light source, and means for alternately biasing
60 the transmitter and receiver into an inoperative condition so that the function of the light source as a transmitter and receiver occurs on alternate unit areas of the beam from the light source.

7. In a television system, an arc screen having
65 electrode rails for determining the path of the

arc employed as the source of light for scanning, a photoelectric cell for detecting light intensities of an object to be transmitted, a transmission circuit for said photoelectric cell currents, means
5 for impressing said currents on said screen, said means including a delay circuit, and means for suppressing said transmission circuit during the delay period of said delay circuit.

8. In a television system an arc screen having electrode rails for determining the path of said
10 arc employed as a source of light for scanning, a local photoelectric cell for detecting light intensities of an object of image scanned, a transmission circuit for said photoelectric current, a receiver of photoelectric cell currents from another transmitter, a transmission line between
15 said receiver and said arc screen, and means in said local photoelectric transmission circuit and said receiver circuit for actuating and suppressing each of said circuits alternately at a high frequency.

9. In a television system, an arc screen having electrode rails for determining the path of said arc employed as a source of light for scanning, a photoelectric cell for detecting varying light
25 and shade intensities of an object or image scanned, a transmission circuit for said photoelectric cell current, output terminals for said transmission circuit connectable to said arc screen, and means in said transmission circuit for
30 delaying the output of said transmission circuit to said screen and alternating the scanning and receiving function of said arc screen.

10. In a television transmitting system in accordance with claim 9, in which said transmission circuit includes means for actuating and
35 suppressing said photoelectric cell currents at one-half the time period of said delay circuit.

11. In a television transmitting system, an arc screen having electrode rails for determining the path of said arc employed as a source of light
40 for scanning, a light sensitive device for translating the light intensities of objects or images thereof into electrical currents, a receiving circuit for receiving electrical impulses characterized by the light intensities of an object being transmitted from another transmitter, and means for altering the function of and impressing
45 said received variations on said arc screen in alternate unit area positions.

12. In a television system, a moving light beam
50 employed as a source of light for scanning, a light sensitive device for translating light variations of an object or image thereof into electrical currents, means for transmitting the currents from said device to receiving apparatus at a distant
55 point, means at the local point for receiving transmitted variations of an image from a distant point, and means comprising an oscillator for controlling the transmission and reception of
60 said images alternately in unit area sections to obtain simultaneous transmission and reception upon said arc screen.

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