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F. GRAY

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SWITCH OR COMMUTATING MEANS

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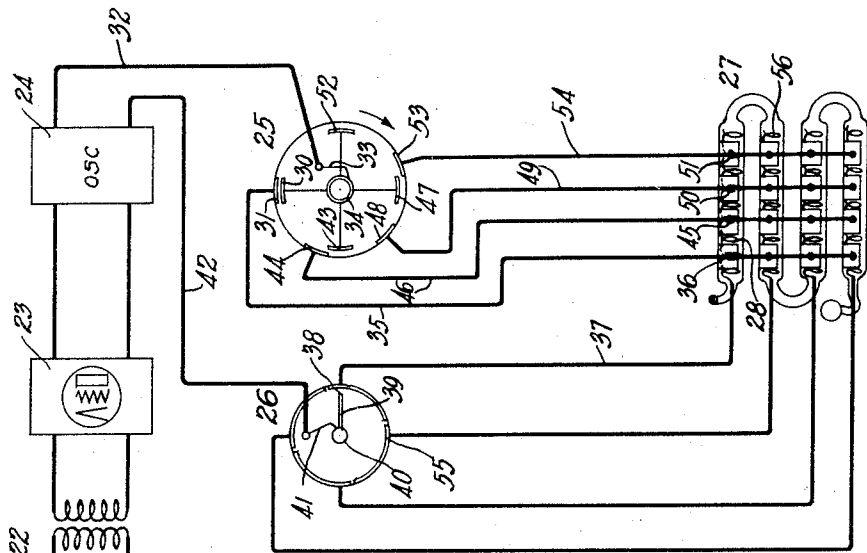
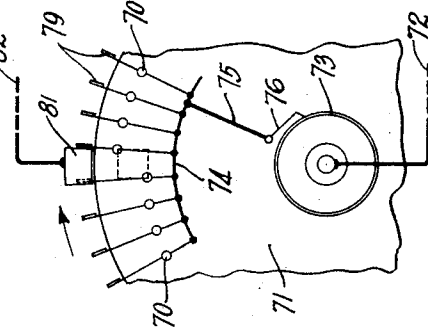
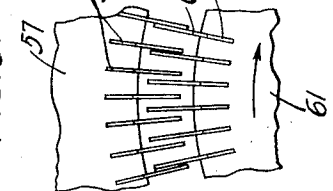
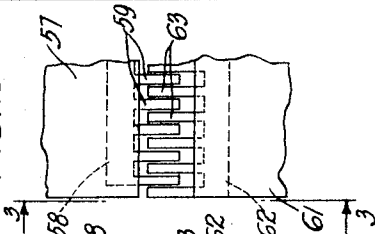


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.



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SWITCH OR COMMUTATING MEANS

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This invention relates to methods and means for switching alternating image currents and is adapted particularly for use in television systems.

5 An object of the invention is to improve efficiency and fidelity of the image in television or picture transmission systems.

Other objects and advantages will appear from consideration of the specification and
10 accompanying drawings.

In one form of television apparatus, a rotary commutator or distributor has been used for supplying high frequency, image modulated current to successive chosen points
15 in a grid lamp of the type shown in Patent No. 1,759,504, Frank Gray. In that patent, contact connections or segments and moving brushes form the circuit closing means for lighting the selected points in the grid.

20 In this invention capacitive connections are employed to select the circuits to be successively energized for selectively illuminating chosen points in the field of view.

In the specific form of the invention hereinafter described in detail, by way of example, a lamp bank is controlled by two commutators in place of the single distributor in the case above referred to. One commutator selects successively the horizontal row of
25 lamps and the other commutator successively selects and lights the lamps in any selected row. A coordinate arrangement of the lamps and the connections therefor is used.

In the illustrative embodiment of this invention hereinafter described;

Fig. 1 is a diagrammatic representation of the apparatus at a transmitting and at a receiving station with the apparatus operative-
30 ly connecting the two stations;

40 Fig. 2 is a fragmentary view of modified switching means for use in a receiver such as that of Fig. 1;

Fig. 3 is a view taken on the line 3—3 of Fig. 2; and

45 Fig. 4 is a fragmentary view of a portion of a modified television receiving apparatus.

At the transmitting station an object 10, the image of which is to be transmitted, is scanned by a pencil of rays 11 proceeding
50 from a source of light 12 of high intensity.

Light from the source 12 is concentrated by means of lenses 14 on a spirally perforated scanning disc 15 driven by a motor 16. An aperture in screen 17 passes a single moving beam of light and intercepts rays of light
55 from other apertures in disc 15 than that forming a single pencil of rays used, at the instant. A lens 18 bends the moving pencil of rays to progressively sweep all elementary areas on the object 10 as the scanning apertures of disc 15 successively pass the opening in screen 17, all substantially as disclosed in an application by Frank Gray Serial No. 227,649, filed Oct. 21, 1927.

A photosensitive cell 20 receives some of the reflected light and varies an electrical current in a manner corresponding to the light values of the successive elemental areas on the object 10. These varying electrical currents are generated and amplified, in a
60 device diagrammatically indicated at 21, and transmitted over any suitable transmission line 22 to an amplifier 23 at a receiving station.

An oscillator 24 at the receiving station
65 generates a carrier current of a high frequency which, modified by the incoming picture current, is impressed upon the distributing or switching apparatus, diagrammatically illustrated as individual, rotating devices
70 or distributors 25 and 26. Electrical impulses, passing from the oscillator 24 through paths to be determined by distributors 25 and 26 illuminate successively a selected series of points on the viewing grid 27 diagrammatically illustrated as being of the type disclosed in patent to Frank Gray 1,759,504, supra.

This grid consists of a folded neon-filled tube having spiral metallic electrodes such
75 as 28 centrally disposed within each horizontally arranged bar thereof. Closely arranged patches of sheet metal of metallic foil contact externally along the side of a bar or tube away from the observer. A flash of light
80 consisting of a glow discharge in the neon gas is produced between a selected patch and the adjacent portion of the spiral electrode 28 by the operation of communicating means switching the carrier current and its super-
85

imposed picture current to produce a difference in potential between the selected patch and the internal spiral conductor 28. The brilliance or intensity of luminosity of this flash is controlled by the value of the picture current that is added to the high frequency carrier current.

The distributor system at the receiving station of Fig. 1 comprises as noted the co-
 10 operating rotary distributors 25 and 26 of which the distributor 26 forms successive metallic paths for the conduction of the current to different bars in the grid, and the distributor 25 forms successive paths each through
 15 complementary portions of a condenser, to a selected lamp or spot in a bar or row. The diagram shows a rotatably mounted condenser plate 30 situated in operable relationship with a fixed plate 31 on a stator frame. The
 20 speed of rotation of the moving parts of distributors 25 and 26 is to be synchronized with the speed of rotation of the motor 16 and scanning disc 15 at the transmitter by any suitable means to provide that the point illuminated on the grid 27 will correspond in
 25 position exactly to the point illuminated on the object 10 by the pencil of rays 11. Suitable synchronizing means are well known, an example of which may be seen in Patent No. 1,763,909, issued June 17, 1930 to H. M. Stoller and E. R. Morton.

Movement of the distributors to the position shown closes a connection from the oscillator 24 over the lead 32 to the brush 33
 35 moving on the slip ring 34 of the distributor 26, through the cooperating condenser plates 30 and 31, operably associated with one another, and over the line 35 to the spot 36 on the grid that is luminous for this particular setting of the distributors. The high frequency alternating current returns to the oscillator from the spiral coil 28 over lead 37,
 40 contact plate 38, brush 39 and slip ring 40 of the distributor 26, through the brush 41 traveling upon the slip ring 40, to the lead 42, and to the oscillator 24. The plate 38 is of sufficient size to energize the coil 28 during the period of scanning of that entire horizontal row.

50 In further operation a condenser plate 43 next rotates into operative relationship with a complementary condenser plate 44 to furnish an electrical path to the point 45 over lead 46 and over leads otherwise as already
 55 described on the grid 28. The next succeeding lighting circuit is later closed through complementary condenser plates 47 and 48 over lead 49 to illuminate the point 50 of the grid 28. The next succeeding connection, being that for illuminating a selected point 51,
 60 will be found through condenser plates 52 and 53 on the rotor and stator, respectively, of the distributor 25 and over lead 54 to the spot 51 on the grid. The distributor 25 has
 65 the same number of condenser plates in its

stator as it has in its rotor but the angular displacement is different. An arrangement is used in angularly positioning the condenser plates on the stator in relation to those on the rotor so as to produce a vernier relationship therebetween. The vernier arrangement permits the rotor to be operated at a much slower speed than would otherwise be required. Where the number of plates on both the stator and the rotor are the same
 70 one revolution of the stator causes as many connections between each stator plate as there are plates on the rotor while if there were only one plate on the rotor its speed would be proportionately and greatly increased. In the arrangement shown for making coordinate connections, the rotors in both distributors 25 and 26 rotate the same number of revolutions in a given period and they may, therefore, be placed on the same
 75 shaft.

The brush 39 of distributor 27 now passes to contact plate 55 through which a coil or electrode 56 in the next lower horizontal row is energized for illumination of successive
 80 points in that row. The points in this row are energized in the same order and by correspondingly arranged capacitive connections of the distributor 25, as was noted for the horizontal row just above, the cycle of capacitive connections being repeated for that
 85 horizontal row.

The grid 27 obviously may be of any size, and of any suitable number of sources of light, optionally having approximately 2500
 90 as in the grid of the patent to Frank Gray, 1,759,504, supra. A large field of view would necessitate an increase in the number of horizontal bars and therefore in the number of contact points of distributor 26. A greater
 95 number of points to be made luminous in each horizontal row, would necessitate an increase in the number of capacitive connections to be made by the distributor 25. This latter increase could be accommodated by
 100 an increase in the number of condenser plates on both the rotor and the stator of the distributor 26, with a suitable rearrangement of the fixed and moving condenser plates.

105 Figs. 2 and 3 illustrate a possible modification of distributor 25 showing a manner in which an increased number of movable condenser plates are provided around the periphery of the rotor with a possible increase
 110 in the number of condenser plates complementary thereto on the stator frame. A stator frame 57 is indicated in fragmentary manner with inserted members 58 notched to form a plurality of narrow condenser
 115 plates or sections 59 extending inwardly at properly spaced intervals. The rotary member 61 has similar condenser members 62 inserted at uniform intervals about its periphery. Each member 62 is notched out in
 120 a manner complementary to members 58 to
 125
 130

provide individual condenser plate members 63 to mesh between the narrow closely spaced inwardly extending condenser plate sections 59. As already noted with distributor 25, only one set of condenser plates 63, around the entire periphery of the rotor, will be at any one time in operative association or alignment with the complementary set of condenser plates 59.

Such a capacitive distributor as shown in Figs. 2 and 3 could be constructed with fifty condenser plates on the rotor and fifty correspondingly staggered therewith on the stator frame to successively select a large number of points upon a field of view or to select the fifty points in each row of a large grid. A connection could be extended from each condenser plate or member on the stator to one of fifty horizontally disposed positions in each horizontal element of the grid 27. A suitable condenser or brush distributor could be connected to the fifty horizontal rows of the grid and by suitable choice of speeds, the elemental points of the entire grid could be successively illuminated once in a single revolution of the contact distributors and fifty times in one revolution of the capacitive distributor.

In the modification illustrated in Fig. 4, individual lamps 70 are mounted spirally upon a rotating disc 71 in a pattern similar to that of the apertures in the scanning disc 15 at the transmitter. A lead line 72 extending from the oscillator 24 is electrically connected with a slip ring 73 in any suitable manner. The slip ring 73 feeds a conductor 74, connecting one terminal of all of the lamps, through a lead line 75 and a brush 76 moving on the ring 73. Each lamp 70 is electrically connected to a condenser plate member 79, individual to itself. This condenser connection may be a single plate or a group of narrow plates similar in construction to members 58 having plates 59. These condenser connections are rigidly mounted on or adjacent the periphery of the rotor 71. Complementary, cooperating condenser plates 81 connected to lead 82 provide a return path to the current and picture source. A suitable screen may be provided in front of the observer to limit the field of view to include but one lamp 70 at any single instant of time whereby more than one lamp may be luminous, or partly luminous, at any instant and yet only one lamp will be visible.

The operation of the modification illustrated in Fig. 4 is as follows. When any condenser plate or plates 79 associated with the terminals of a single lamp is or are in a position to be operatively associated with complementary condenser plate or plates 81, a circuit is closed through that lamp from the source 24 through the lead line 72, slip ring 73, brush 76, lead lines 75 and 74, through the lamp, through complementary

condenser sections 79 and 81, and lead line 82, back to the oscillator 24. A lamp 70 in the field of view is thus variably illuminated while crossing the field of view with a current which is varying according to the successive instantaneous aspects of the line, across the object 10, that is, being scanned at the instant that the particular lamp 70 is crossing the viewing field. Disc 71 may be rotated in synchronism with disc 15 in any well-known manner.

It will be understood that other modifications comprising this invention may be employed. A suggested structure comprises a single capacitive commutator having 2500 fixed condenser plates, each connected to a point in a 2500 point grid.

Capacitive switching is obviously not limited to the structure disclosed or suggested in this specification nor to television in general, but may have many other useful applications.

What is claimed is:

1. Apparatus for the reception of images in television comprising a grid which is provided with a plurality of points each adapted to be made luminous when energized by a current of high frequency, a distributor for selectively energizing groups of said points and a capacitive distributor for selectively energizing any point in any one of said groups.

2. Apparatus for the reception of images in television comprising a grid having a number of points adapted to be made luminous when energized by a current of high frequency, a lead line associated with each of said points, a condenser member connected to each of said lead lines, a condenser element designed to cooperate with said first condenser members, a source of high frequency current to energize said points, means operatively associating said source with said second condenser element and each of said points, and means to move said second condenser element to distribute said high frequency current in succession to said first mentioned condenser members.

3. A method of television image production with a plurality of light sources energized in succession by alternating television current, which method comprises capacitively distributing the alternating current to said light sources.

4. Image producing apparatus comprising groups of light sources designed to be energized by high frequency voltages and arranged in a bank, a source of high frequency voltage, a distributor, connections from each of said groups of light sources to said distributor, a connection from said voltage source to said distributor, a stator frame, condenser plates spaced thereon, a connection from each of said condenser plates to a group of said light sources containing one light

source of each of said first mentioned groups, a rotor, condenser plates spaced thereon, means for connecting said voltage source to said rotor, and means to operate the rotor to cause each of said rotor plates to register in turn with each of said stator plates.

5. Apparatus for image production comprising a plurality of light sources, a source of high frequency current modulated in accordance with the tone values of elemental areas of a field of view, and means for energizing said light sources in succession, one at a time, from said current source comprising stationary and movable condenser elements and means for causing each movable condenser element to periodically register with a stationary condenser element to form a capacitive path for said high frequency current.

6. Image producing apparatus comprising groups of light sources designed to be energized by high frequency voltage and arranged in a bank, a source of high frequency voltage, a distributor for connecting one group of said light sources at a time to one terminal of said voltage source, and a distributor for capacitively completing a circuit connection from said voltage source through each of said light sources in succession.

7. Television apparatus comprising a plurality of electric elements and distributing means for television current associated therewith, said means comprising a rotary member, a plurality of condenser elements carried by said member, and stationary means cooperating with said elements to form therewith a condenser connection for the capacitive transfer of electric energy.

8. Television image producing apparatus comprising a plurality of light sources and means for distributing alternating television current to said light sources comprising a rotary member, a plurality of condenser elements carried by said member and stationary means cooperating with said elements to form therewith a condenser connection for the capacitive transfer of electric energy.

9. Television apparatus comprising a plurality of electric elements and means associated therewith for distributing television current comprising a rotary member, a plurality of condenser elements carried by said member, stationary means cooperating with said elements to form therewith a condenser connection for the capacitive transfer of electric energy, and means for causing said electric elements to revolve about the same axis of rotation as said rotary member.

10. Television image producing apparatus comprising a rotary member, a plurality of light sources, a plurality of condenser elements carried by said member, stationary means cooperating with said elements to form therewith a condenser connection for the ca-

pacitive transfer of electric energy, means for causing said light sources to revolve about the same axis of rotation as said rotary member, and means for electrically connecting said light sources with said condenser elements respectively.

11. Television apparatus comprising a plurality of electric elements and television current distributing means associated therewith comprising fixed condenser elements electrically connected to said electric elements respectively, movable condenser elements and means to move said movable elements past said fixed elements to form capacitive coupling therewith, said fixed and movable elements having a vernier relationship therebetween whereby a rapid distribution of current is effected by relatively slow movement of said movable elements.

12. Apparatus for producing television images comprising light sources, means for distributing alternating television current to said light sources comprising fixed condenser elements, movable condenser elements, and means to move said movable elements past said fixed elements to form capacitive coupling therewith, said fixed and movable elements having a vernier relationship therebetween whereby a rapid distribution of current is effected by relatively slow movement of said movable elements.

13. Television apparatus comprising a plurality of electric elements arranged in groups in bank formation and television current distributing means associated with said elements comprising fixed condenser elements, movable condenser elements, means to move said movable elements past said fixed elements to form capacitive coupling therewith, said fixed and movable elements having a vernier relationship therebetween, means for electrically associating one of said electric elements of each of said groups with each of said fixed condenser elements, a second group of fixed distributor elements, means for connecting said last mentioned distributor elements with groups of said electric elements respectively, and a conducting rotor cooperating with said last mentioned fixed distributor elements.

In witness whereof, I hereunto subscribe my name this 17th day of October, 1928.

FRANK GRAY.