

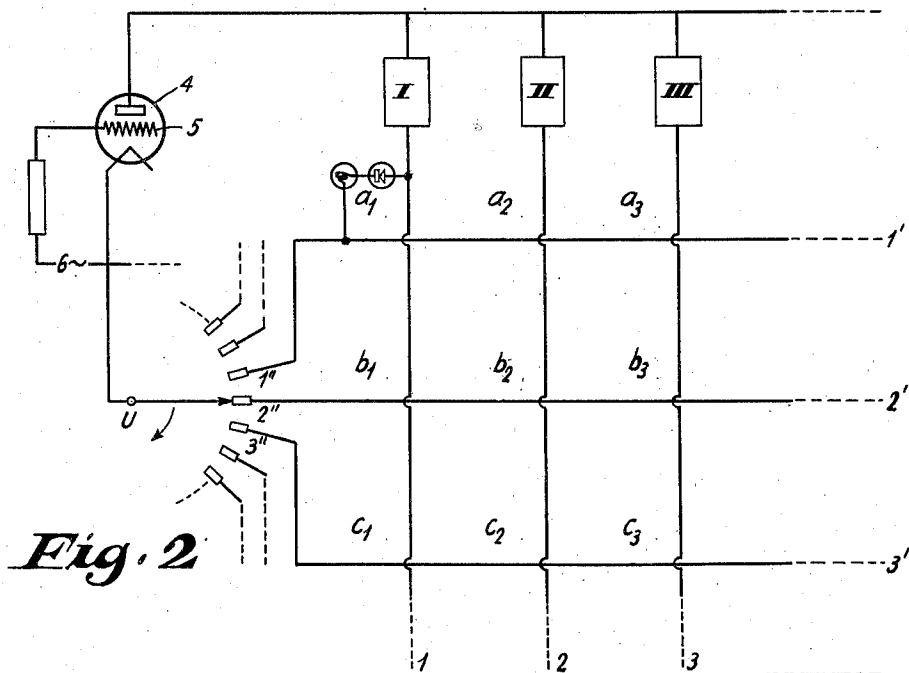
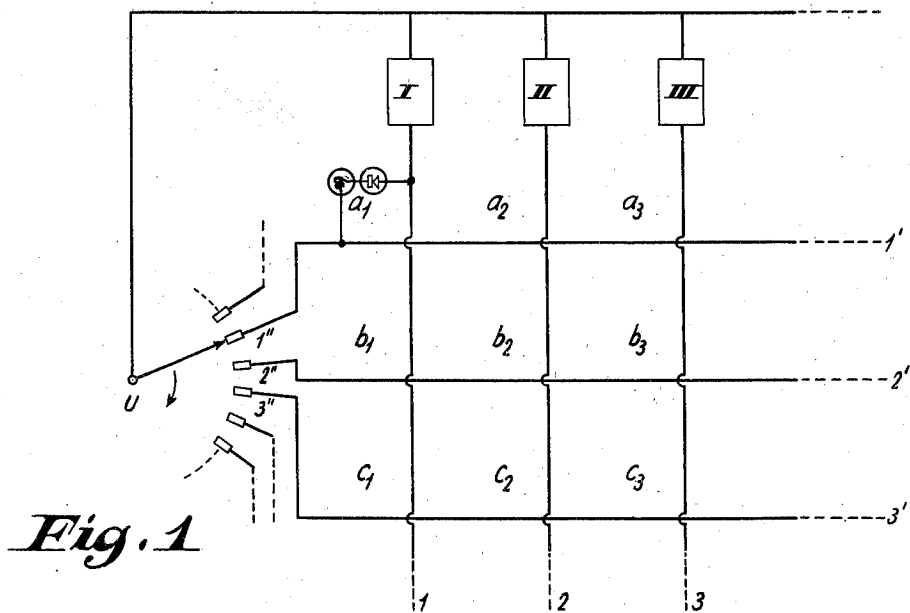
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TELEVISION SYSTEM

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TELEVISION SYSTEM

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The present invention relates to television systems and particularly to apparatus for use at the receiver end of such systems.

More specifically, the invention covers a system and circuit arrangement for operating panels or mosaics of luminous cells upon which an electro-optical image is to be produced.

Still further, the invention is concerned with a circuit scheme adapted to operate a picture recreating surface used in picture telegraphy, television systems, advertising devices and the like by making use of the so-called cell-screen principle.

Still other aims and objects of the invention will become apparent and suggest themselves to those skilled in this art by reading the following specification in connection with the accompanying drawing wherein Fig. 1 shows schematically one form of receiver panel or mosaic for reconstructing the electro-optical image and Fig. 2 shows a modification of the mosaic or panel arrangement of Fig. 1.

Referring to the drawing, the re-created picture as produced by the devices of Figs. 1 and 2 comprises a large number of similar intensity-controlled luminous cells designated for convenience as $a_1, a_2, a_3 \dots, b_1, b_2, b_3 \dots, c_1, c_2, c_3 \dots$, which in vertical direction are in single-pole connection with the collecting leads 1, 2, 3 $\dots$ and in horizontal direction also in single-pole connection with the collecting wires 1', 2', 3' $\dots$ etc.

As shown by the drawing, each one of the vertical collector wires is united with the terminals of an exciting voltage source I, II, III $\dots$, subjected to control by the transmitter. The various sources I, II, III, etc., may be considered, for example, as embodying a resistance element traversed by a variable current, the secondary winding of an anode transformer of a controlled or regulated thermionic tube amplifier, or the like.

The signals for operating a receiver device of the nature herein described are assumed to originate from a transmitter arrangement of the general form and type shown and described by my copending application Serial No. 12,536, filed March 23, 1935, now Patent No. 2,109,196, granted Feb. 22, 1938 (corresponding to German application Serial No. K. 133,651, dated March 26, 1934, Docket 9598) although other suitable forms of transmitter devices such as are known and used may be substituted. Such modified forms of transmitters may be of the cathode ray type as disclosed by Zworykin, for example, or mechanical types commonly used for demonstrations.

For the purpose of considering the description following it will be assumed that the transmitter is of the form suggested in my above named copending application and, so considered, a number of paralleled photoelectrically controlled picture transmission channels equal to the number N of such voltage sources I, II, III $\dots$, is provided, each of the said channels being called upon to transmit sequentially the brightness values of the picture elements or elementary areas contained in a vertical line or strip of the frame. For this purpose, at the sending end, the picture to be transmitted is caused to move, e. g., as disclosed by my above named copending application, by the agency of a mirror wheel over a row of N many photoelectric cells which are coordinated to the N many voltage sources I, II, III. There are, therefore, interposed N many amplifiers. The distribution of the excitation occurring in synchronism with the picture scanning in the transmitter over the N many luminous cells contained in each vertical strip or line is insured by the aid of a change-over switch U. The switch U is caused to sweep over M many contacts 1'', 2'', 3'' $\dots$ with which the horizontal collector leads 1', 2', 3' $\dots$ are connected. Hence, the number of elementary areas of the picture amounts to M times N, where M—the number of picture lines or elemental strips and N—the number of picture elements per line or elemental strip or in the special instance where M=N, the number of elemental areas equals N^2 .

Since the circuit organization illustrated in Figs. 1 and 2 which will be readily understandable makes it possible to utilize only a single switch comprising M contacts, it will be seen that for a picture comprising 10,000 elementary areas, only 100 segments will be required over which a single distributor arm or wiper is made to move.

However, according to the present invention an essential simplification of the kind hereinbefore outlined in the circuit organization and in operation of a multi-cell panel will be practically possible only when the following precautionary measures are adopted: If the constituent luminous cells $a_1, a_2, a_3 \dots, b_1, b_2, b_3 \dots, c_1, c_2, c_3 \dots$, etc., as before described, are united with the horizontal and vertical collector wires, it will be seen that a number of other groups will be connected in parallel to the particular luminous cell, for example, cell a_1 which at a given instant is assumed to be energized or excited. One of these shunt paths, for instance, is brought from the collector wire 1 by way of lamps b_1, b_2 , and a_2 ; another path leads by way

of lamps c_1, c_2, a_2 ; and, obviously, still other paths may be traced without difficulty. Another danger arises in the case where alternating voltages of the various voltage sources I, II, III . . . are not in phase, but in phase opposition, i. e., act in series in reference of certain luminous cells. For instance, voltages in phase opposition which arise at the terminals I and II resulting in an integrated voltage would tend to become equalized by way of lamps or light sources a_1 and a_2 .

The two risks hereinbefore mentioned are obviated according to this invention by providing for each individual luminous cell a series connection with a rectifier or else by imparting a rectifier characteristic to each of the cells proper. This latter situation will be present, for instance, in the case of glow tubes which, as a result of dissimilar shape or surface size of the electrodes allow of the passage in one direction of a far stronger discharge current than in the opposite sense. If incandescent lamps are employed as the various luminous cells forming the complete panel, then small-sized dry rectifiers such as cuprous-oxide rectifiers are preferably connected in series with each lamp. These individual rectifiers must be proportioned so as to suit the average working current of the associated incandescent lamp. The effect intended by the series connection of a uni-directionally transmitting or conducting element or the rectifier action in gaseous discharges is indicated in the drawing schematically by the use of an arrow-head in connection with each of the various luminous cells.

By reference to the diagram indicative of the paths of the current it will be readily understood that in this manner both undesirable shunts as well as short-circuits are avoided seeing that in each instance a rectifying means is contained in each path or chain which would have to be traversed in the blocking or non-conducting sense if this were to happen. The said means, for instance, in the case of the shunt to a_1 by way of b_1, b_2, a_2 , would be the cell or combination b_2 . In fact, it is only by virtue of this object and feature of the invention that the simplification of the switch mechanism is made possible and practicable to an extent as before described, while the undisturbed excitation under proper phase conditions of each luminous cell in relation to the decomposition or scanning of the picture at the sending end will be quantitatively secured.

In arrangements of this kind, as experience has taught, it is difficult to safeguard the segments 1'', 2'', 3'', of the change over switch U from the destructive action of sparking, especially when the constituent luminous cells of the recreating surface require comparatively high working voltages and allow transiently of the flow of strong excess currents which become integrated in the plurality of simultaneously excited cells. According to the invention, therefore, for the object of relieving the contacts of the switch device U, a joint input tube 4 is connected in series with the said switch which will cause interruption at the proper time. This tube 4 which is controlled by the grid 5, by the aid of a synchronous alternating voltage, is always rendered currentless or non-energized a brief instant prior to the point when the rotating contact slides away from the particular segment that has been contacted. Interruption is effected in this case in the absence of sparking inasmuch as it really occurs inside the tube 4. If the volt-

age sources I, II, III . . . constitute the secondary windings of plate transformers of separate amplifier tubes, it will also be recommendable instead of using a common tube 4 (which, in a circuit organization such as illustrated would have to be dimensioned for very considerable currents) to block the various power tubes or input tubes coordinated to the sources I, II, III, at the grid end, and all that is required therefor is an alternating voltage which is synchronous and which operates at the proper phase so that, at the instant when the contact is broken, the potentials prevailing at I, II and III will be off.

It is evident from the foregoing description that this invention provides ways and means for obtaining electro-optical images of extremely great brilliancy. Due to the fact that each lamp is actually excited $1/MN$ of total time to produce each complete image it is possible to increase the power input MN times the normal value without changing the total power consumption. Previously, this could not be done, so far as applicant is aware, because the instantaneous peak power was excessive for successful commutation. Applicant's invention, however, permits successful commutation of this instantaneous high power and thus a picture of high brilliance results. To refer to one specific example, assume, for instance, that each of the lamps $a_1, a_2, a_3 \dots, b_1, b_2, b_3$, etc., is of the 6 volt, 50 m. a. type. Since the time for switching from line to line with the commutating distributor U is only $1/100$ of the time for producing a complete picture (still assuming a 100 line picture) it can be seen that the lamps can each operate during the period of switching at 60 volts and 500 m. a. without increasing the total power. Thus, it is clearly apparent that the mosaic panel when operating as above described is capable of producing controlled intensity electro-optical images of great brilliancy.

Many modifications and changes may be made in the system above described without departing from the spirit and scope of the foregoing disclosure and I believe myself to be entitled to make and use any and all of such modifications as fall fairly within the scope of the claims, wherein I claim as new the following:

1. In image reproducing apparatus wherein there are provided a plurality of light sources arranged in mesh-like manner, a series of ordinate and abscissa conductors connecting said light sources in said mesh-like manner, a plurality of signal controlled energizing means connected individually with one series of said conductors and a distributor connected so as to energize sequentially upon rotation the other series of conductors and thereby cause the illumination of the light source at the intersection point of the energized conductors of each set and means for limiting the flow of signal energy to a single point only in said mesh instantaneously.

2. In a television receiver panel, a plurality of rectifiers, a plurality of independent sets of conductors arranged in intersecting patterns, a plurality of individual means each adapted to produce light when energized each joined in series with one of said rectifiers, each of said series circuits being connected at an intersection of said aforementioned conductors, means for energizing one of said sets of conductors with energy varying in accordance with the image to be reproduced, means for sequentially connecting the other of said sets of conductors, and means for de-energizing said sequential joining means sub-

stantially at the time of disconnection from any conductor.

3. In a television receiver panel, a plurality of rectifiers, a plurality of independent sets of conductors arranged in intersecting patterns, a plurality of individual means each adapted to produce light when energized each joined in series with one of said rectifiers, each of said series circuits being connected at an intersection of said
10 aforementioned conductors, means for energizing

one of said sets of conductors with energy varying in accordance with the image to be reproduced, means for sequentially connecting the other of said sets of conductors comprising a rotating switch arm adapted to sequentially join
5 each of said conductors, and means for de-energizing said sequential joining means substantially at the time of disconnection from any conductor.

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