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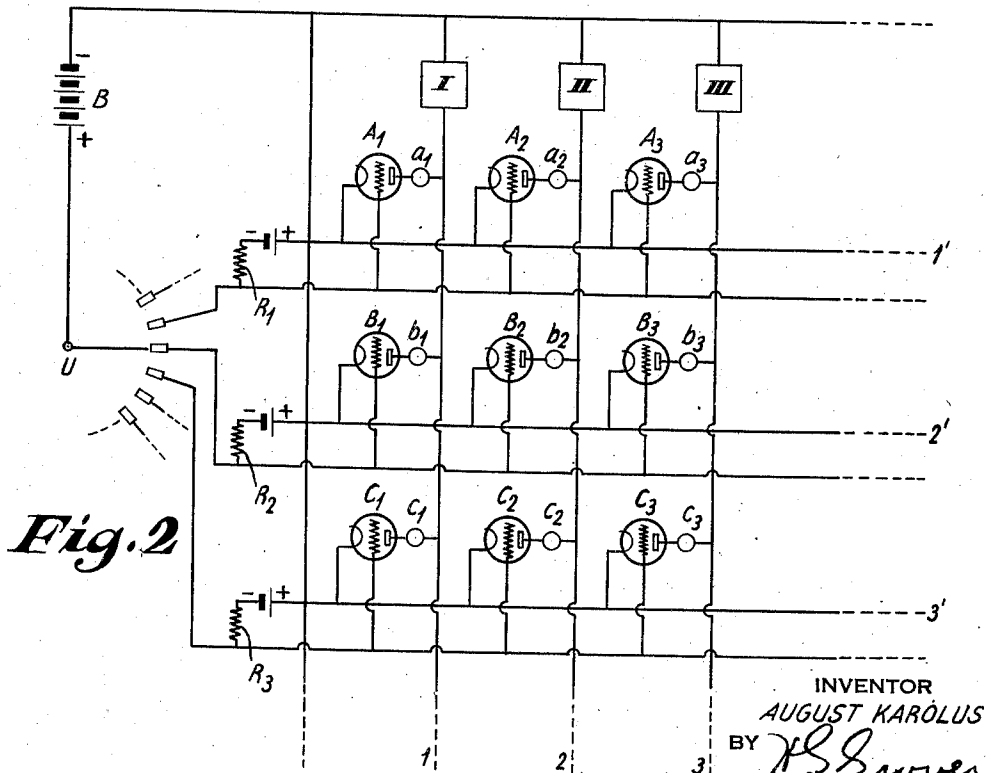
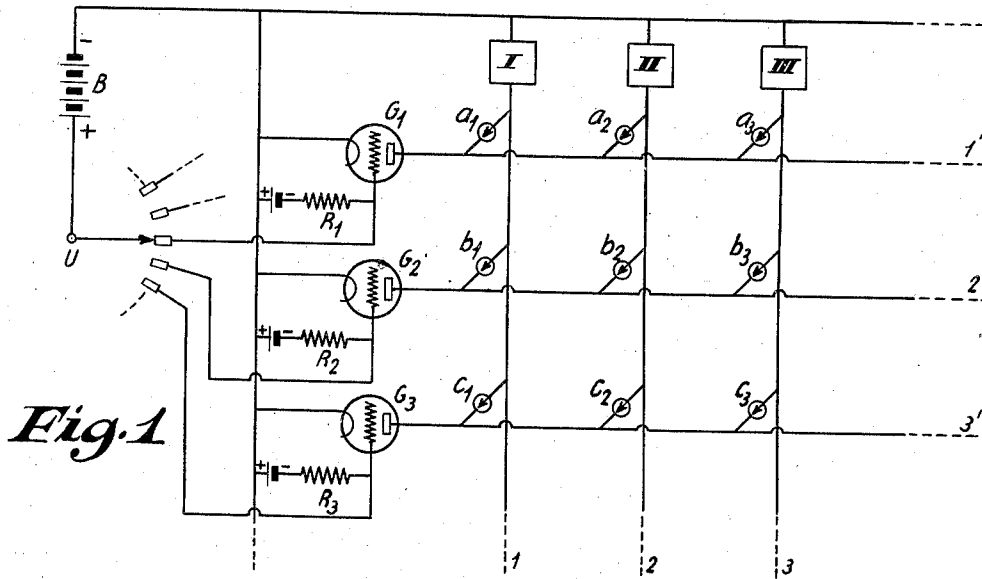
A. KAROLUS

2,136,441

TELEVISION SYSTEM

Filed April 8, 1935

2 Sheets-Sheet 1



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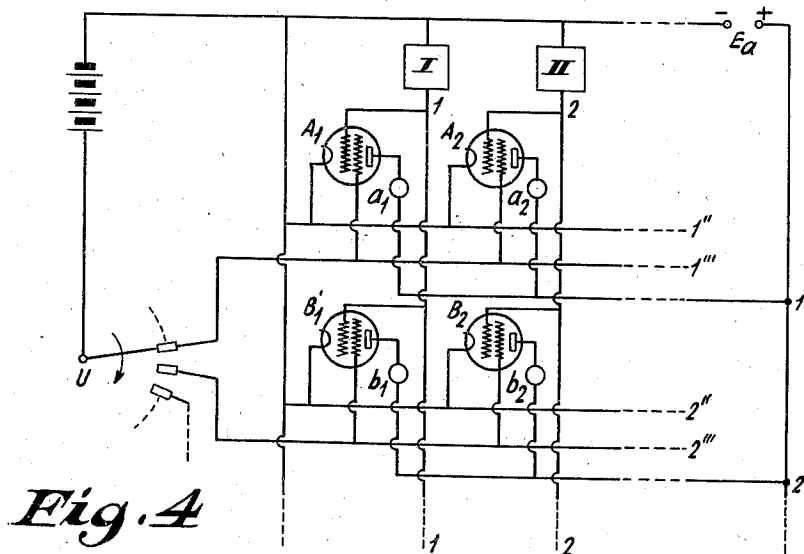
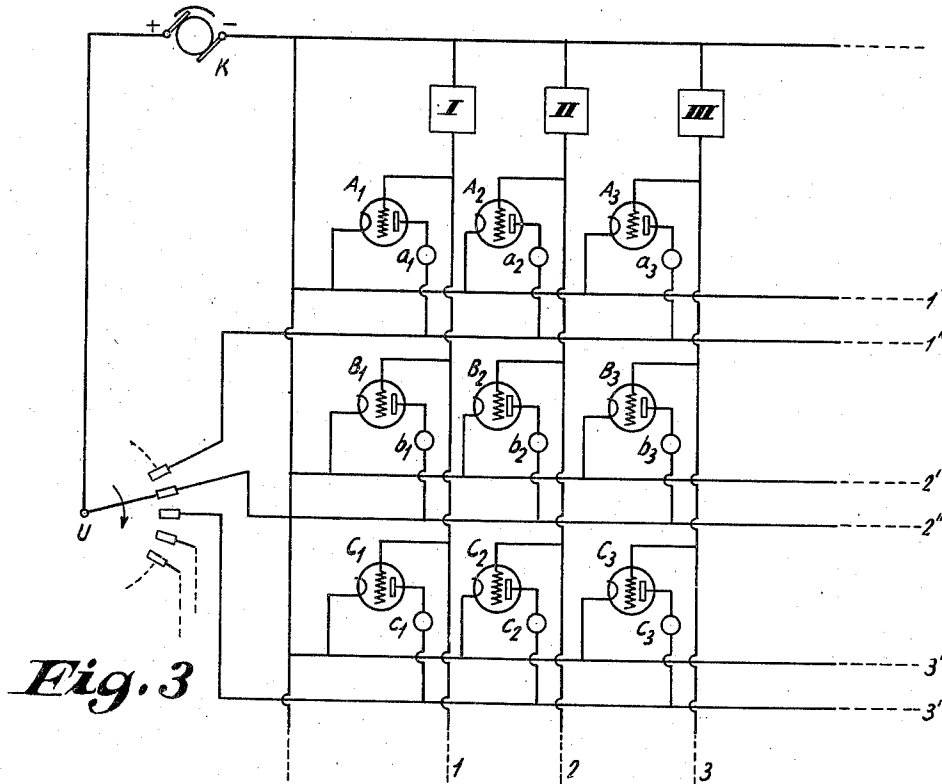
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2,136,441

TELEVISION SYSTEM

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2 Sheets-Sheet 2



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TELEVISION SYSTEM

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In Germany April 21, 1934

4 Claims. (Cl. 178—7.3)

This invention relates to picture reproduction, and in particular, is directed toward large scale television reproductions. The invention also may have wide application to use in connection with advertising signs where a large display panel is to be positioned so as to be viewed from either a near or remote point and the advertising material is to be the equivalent of a motion picture. Its operation is based on a large cellular type of screen associated with commutator and signalling means so that the picture may be reproduced by point by point excitation of the individual lamps making up the cellular structure of this screen.

In this invention the recreated picture or image to be formed on the screen consists of a large number of similar luminous cells which are subject to intensity control. The cellular screen has its cells arranged to form a pattern consisting of rows and columns of individual cells. Each row of cells is connected to a single connector. For convenience the column connection will be referred to as the "vertical collector", while the row connection will be called the "horizontal collector". Each vertical collector is connected with the terminals of an exciting voltage source controlled from the sending end, said source consisting of an output stage of an amplifier which may be either of resistance or transformer coupling. The assumption is made in this connection that a number of picture transmission channels working in parallel relation and subject to photo-electric control equalling in number the individual voltage sources referred to is provided. Each of said picture transmission channels sequentially transmits the brightness values of picture elements or elemental areas of a vertical column.

For this purpose at the sending end the picture to be transmitted, as for example, by the agency of a mirror wheel, is caused to move over a line of N photo-cells where N is the number of individual exciting voltage sources referred to above, which in turn control the N voltage sources. Interposed therefor are N amplifiers. The distribution of the excitation occurring in synchronism with the vertical scanning at the sending end over M luminous cells in each vertical column is accomplished by the aid of a distributor. This distributor contacts M segments to which the horizontal collector leads are connected. The number of elemental areas, therefore, is the product of the vertical columns and the horizontal rows, or $M \times N$. While in the special case where there are as many rows as columns, $M=N$ and the number of elemental areas amount to N^2 .

Thus, if $M=N=100$, there will be 10,000 elemental areas, but since only one commutator is supplied for the horizontal rows, this commutator need only consist of a single distributing arm and 100 segments.

In order that the essential simplification of the circuit arrangement and operation of the multi-cellular screen outlined above may be practically realized, it is the purpose of this invention to end the disturbing shunt series and/or short circuits by connecting a rectifier in series with each individual luminous cell or to build the luminous cells to have uni-directional current flow of characteristics. Cells of this last named kind comprise glow tubes containing electrodes dissimilar in shape or in size. Furthermore, tubes in which pencil or electron rays issuing from a heated cathode, i. e., so-called "electron-gun" are controlled by an auxiliary grid, can be used to cause fluorescence by bombardment similar to the conventional cathode ray tube. If luminous cells of the incandescent lamp type are used, then tiny dry rectifiers are preferably connected in series with them and thus rectifiers must have a current carrying capacity equivalent to the mean value of the working current of the incandescent lamp.

One of the objects of this invention is to provide an improved type of commutation operation whereby certain defects existing in the prior art will be eliminated.

Another object is to provide means for supplying relatively large power output to the individual cells of the screen without excessive sparking at the commutator which existed in the prior art.

Another object of this invention is to overcome the usual plurality of shunt or series paths which are inherent in existing commutator arrangements.

Other objects of this invention will become apparent upon reading the following detailed explanation of the invention in conjunction with the attached drawings.

Fig. 1 illustrates an embodiment of the invention using uni-directional conducting luminous tubes;

Fig. 2 shows another embodiment of the invention using a series connection between a luminous tube and a gaseous discharge tube provided with a controlled grid.

Fig. 3 shows another embodiment of the invention with a modified form of connections between the luminous tubes and the gaseous grid controlled discharge tubes; and

Fig. 4 shows another embodiment of the in-

vention utilizing gaseous discharge tubes with two control grids.

Referring now to Fig. 1, the effect obtained by the series connection of the uni-lateral conducting element or rectifying resistance in gaseous discharge tubes or cathode ray tubes is schematically shown by an arrowhead indicated in the various luminous cells A_1, A_2, A_3 . An examination of Fig. 1 clearly shows that the undesirable shunt paths to the luminous cell, as well as the undesired short circuit paths, are eliminated inasmuch as these spurious paths contain a rectifying or valve means which would have to be transversely by currents flowing in a non-conducting direction. Inasmuch as this is impossible, only the tube under desired excitation has a complete return path for the exciting current. For instance, if the luminous cell A_1 were to be energized, shunt paths are present by the way of B_1, B_2, A_2 . However, inasmuch as B_2 acts as a block for this path, no current can flow through it. Identical situations hold for all the other shunts as well as for the case wherein the voltage sources I, II, III. . . produce potentials in phase opposition should happen to arise which in the form of an aggregate voltage would be enabled to become equalized across the luminous cells connected in series with them in each horizontal row.

In Figs. 2, 3 and 4, circuits are shown in which the luminous cells are disposed in series with a grid controlled gaseous discharge tube which are, of course, uni-directional conducting. These gaseous discharge tubes A_1, A_2, A_3 . . . could themselves be employed to act as sources of light so that it would be possible to dispense with separate luminous sources a_1, a_2, a_3 . . . which would otherwise be arranged in series with them.

For example, if they were cathode ray tubes so designed that the beam of electrons controlled by the grid cause excitation of a fluorescent screen. It is evident that this invention which discloses the introduction of a rectifier characteristic in the closing path of each individual luminous cell, makes possible a simplification of the changeover mechanism or distributor so that in the presence of N^2 cells, it is only necessary to utilize a change-over switch or distributor with only N contacts in order to achieve reliable and satisfactory operation.

It is evident from a study of the drawings that the distributor is no longer called upon to carry the working currents of the luminous cell which are relatively great. In fact, all it has to carry is the grid energy required to initiate the flow of current through the various cells. An inspection of Fig. 3 and Fig. 4 shows that the voltage sources I, II, III. . . do not have to supply the lamp energy but only the grid energy for the tubes A_1, A_2, A_3 . . . , while the working energy of the luminous cells is derived from a constant local source.

Referring to Fig. 1, the distributor U operates so that during its rotation over the contacts connected to the horizontal luminous cell, rows 1', 2', 3'. . . the grids G_1, G_2, G_3 . . . of the grid control gaseous tubes are charged positively from the voltage source B. As a result, the tubes blocked by the way of resistance R_1, R_2, R_3 . . . in cyclic sequence are momentarily rendered transmissive or conducting, so that all of the N voltage sources I, II, III. . . controlled from the picture transmitter will be closed by way of the luminous cells of horizontal rows and by way of the switch tubes common to these.

Referring to Fig. 2 each individual luminous

cell a_1, a_2, a_3 . . . is connected in series with a grid control gaseous discharge tube A_1, A_2, A_3 . . . All of these latter tubes are blocked by aid of the grid biasing voltage sources through the resistances R_1, R_2, R_3 . . . and in the sense of a horizontal row, they will be unlocked or rendered conducting simultaneously as soon as the corresponding segment is contacted by the wiper of the distributor U, with the result that a positive charge is imparted to the grids from the battery B. This step means a reduction or division of the high load of the M tubes G_1, G_2, G_3 in Fig. 1 over the $M \times N$ individual tubes $A_1, A_2, A_3, B_1, B_2, B_3$, and C_1, C_2, C_3 , each of which is in series with a luminous cell.

Another improvement of the circuit connections is shown in Fig. 3. In this figure the voltage sources, I, II, III. . . controlled from the picture transmitter no longer furnish themselves the working energy of the various luminous cells, but they merely supply the grid energy of the gaseous discharge tubes A_1, A_2, A_3 . . . As a consequence, the amplification in the N channels need no longer be as great as in the two methods described above for Figs. 1 and 2.

In other words, the voltage sources, I, II, III. . . now merely fulfill the function of supplying to the various switching tubes A_1, A_2, A_3 . . . a variable grid voltage designed to regulate in volume the current that is to flow through the various luminous cells. The working current is furnished to these from a common direct current voltage source K by way of the distributor U whose contacts are connected to the horizontal collecting wires 1'', 2'', 3''. . .

This means a progress in the art inasmuch as the aggregate amount of energy required for the operation of the luminous cells may be taken from a constant local source of energy, while the voltage sources I, II, III. . . merely supply control energy.

Fig. 4 represents a further development of the arrangement shown in Fig. 3. The distributor U no longer carries the total working current of a horizontal row of luminous cells but only minute control currents. The anodes of the electronic tubes A_1, A_2, B_1, B_2 . . . by way of the associated luminous cells a_1, a_2, b_1, b_2 are permanently connected with the collector system 1', 2'. . . which is connected with the positive pole of the common working energy source E_a . The electronic tubes, as will be noted, are now equipped with two grids. All of the grids adjacent to the cathode are connected with the sources I, II, III. . . of the control potentials, whereas the grids closest to the anodes are brought to the horizontal collective leads 1'', 2'' which terminate at the segment of the distributor U and are positively charged, thereby at the proper instant from the source of voltage E_g ; as a result at a given instant and in cyclic rotation an entire row of control tubes is rendered conducting, whereas the control tubes of the other rows remain in a blocked or non-conducting condition. So far as the horizontal row which is connected in the circuit is concerned, the modulating grids adjacent to the cathode insure the accurate control of the strength of the current flowing through the series luminous cell in question. In this manner both the voltage sources I, II, III. . . controlled from the picture transmitter and the distributor U will be relieved of carrying the full luminous cell current.

In the case where a picture recreating surface according to Fig. 4 is to be used in conjunction

with a standard television transmitter which does not operate with N parallel channels but rather with a time sequence of all elemental areas of the picture, then a cathode ray distributing commutator with N contacts must be provided which is synchronized with the line frequency of the transmitters' scanning rate. In other words, during the interval of a picture strip or line the voltage values of all the sources I, II, III . . . are adjusted. This is accomplished, for example, by the cathode ray current being varied in its intensity from one segment to the next in accordance with the brightness of the associated picture unit or elemental area which is closed by the way of N resistances with condensers connected in shunt relation thereto. The charging up of each of these resistor-condenser combinations, which now take the place of the voltage sources I, II, III . . . will in this scheme be properly regulated in volumn from the transmitter end.

While the above description has concerned itself with separate channel transmission, it is of course, appreciated that a single channel transmitter utilizing multiplex transmission could be used. For example, a plurality of modulating frequencies could be used, each frequency being associated with a particular channel. The amplifying voltage sources would then include a band-pass filter to separate its particular frequency from the other modulating frequencies present.

Other modifications and changes may suggest themselves to those skilled in the art and I believe, therefore, I am entitled to make and use any and all such modifications as fall fairly within the spirit and scope of the hereinafter appended claims.

Having now described my invention, what I claim is:

1. A television viewing panel comprising a series of abscissa conductors and a series of ordinate conductors, arranged in mesh-like formation, the said ordinate and abscissa conductors being electrically separated one from the other, a uni-directional conducting element connecting each of the intersection points of the mesh-like formation for conveying electrical energy between intersecting ordinate and abscissa conductors in one direction only, said uni-directional conducting elements each being adapted to produce light during current flow therethrough, means to energize the several conductors of one series, and an electrical discharge tube normally biased to cut-off connected with each abscissa conductor and commutator means to overcome the normal bias of said discharge tubes to render said discharged tubes conducting and to energize associated conductors sequentially.

2. A television viewing panel comprising a

series of abscissa conductors and a series of ordinate conductors, arranged in mesh-like formation, the said ordinate and abscissa conductors being electrically separated one from the other, a uni-directional conducting element connecting each of the intersection points of the mesh-like formation for conveying electrical energy between intersecting ordinate and abscissa conductors in one direction only, said uni-directional conducting elements each being adapted to produce light during current flow therethrough, means to energize the several conductors of one series, and an electrical discharge tube normally biased to cut off connected serially with each uni-directional conducting element, and means to overcome the normal bias of the discharge tube to render said discharge tube conducting and to energize successive abscissa conductors sequentially.

3. A television viewing panel comprising a series of abscissa conductors and a series of ordinate conductors, arranged in mesh-like formation, the said ordinate and abscissa conductors being electrically separated one from the other, a uni-directional conducting element connecting each of the intersection points of the mesh-like formation for conveying electrical energy between intersecting ordinate and abscissa conductors in one direction only, said uni-directional conducting elements each being adapted to produce light during current flow therethrough, means to energize the several conductors of one series, an electrical discharge tube normally biased to cut-off connected serially with each uni-directional conducting element, means to overcome the normal bias of the discharge tubes to render said tubes conducting in ordinate groups, and means for sequentially connecting the successive abscissa conductors.

4. A television viewing panel comprising a series of abscissa conductors and a series of ordinate conductors, arranged in mesh-like formation, the said ordinate and abscissa conductors being electrically separated one from the other, a uni-directional conducting element connecting each of the intersection points of the mesh-like formation for conveying electrical energy between intersecting ordinate and abscissa conductors in one direction only, said uni-directional conducting elements each being adapted to produce light during current flow therethrough, means to energize the several conductors of one series, an electrical discharge tube comprising two control electrodes connected serially with each uni-directional conducting element, means to energize one of the control electrodes from the ordinate conductors, and means to energize the other control electrode from successive abscissa conductors sequentially.

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