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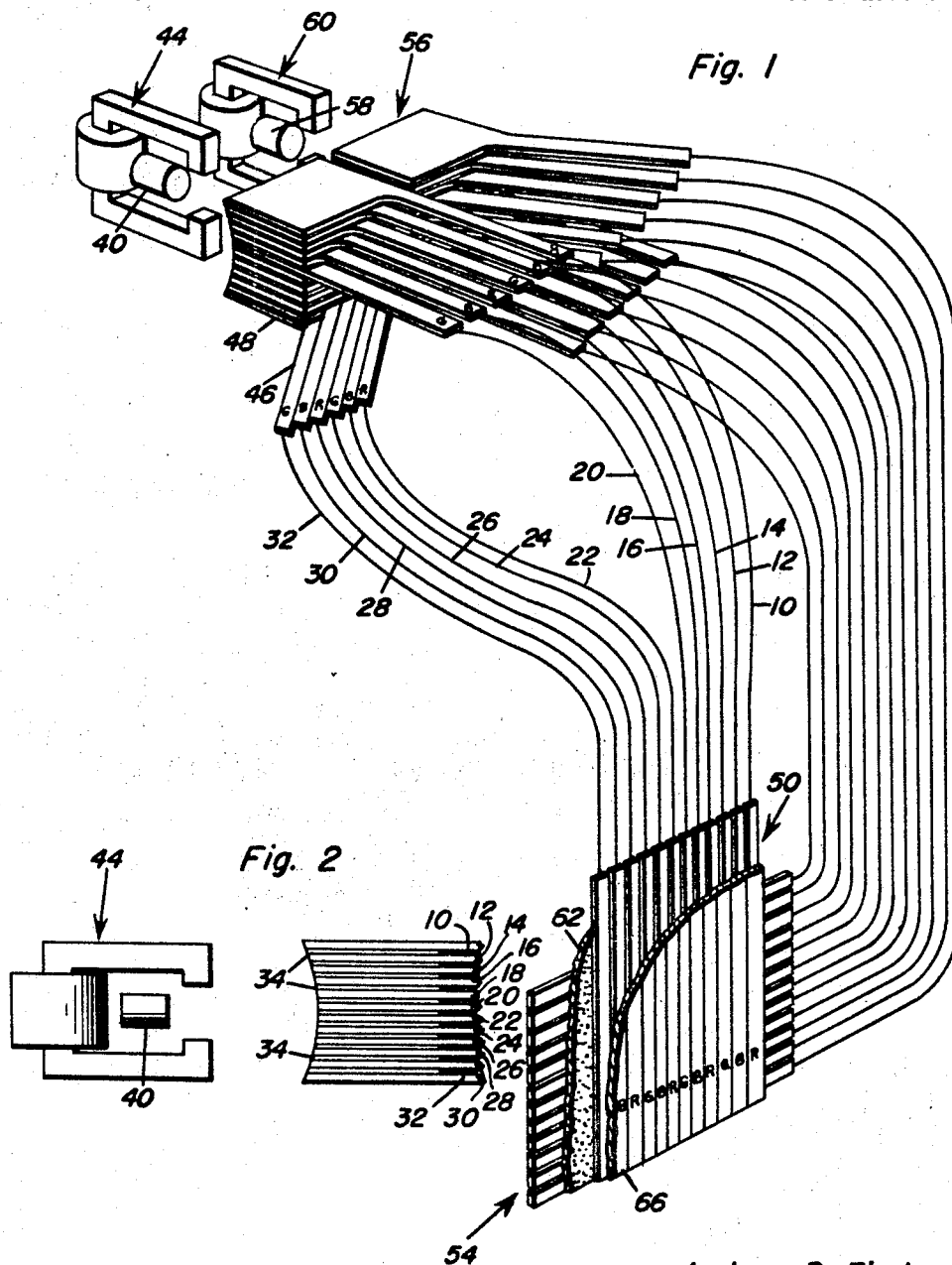
A. P. FISCHER

3,179,846

FLAT KINESCOPE

Filed Sept. 13, 1960

2 Sheets-Sheet 1

Andrew P. Fischer
INVENTOR.BY *Oliver A. Orin*
and *Harvey R. Jackson*
Attorneys

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Fig. 3

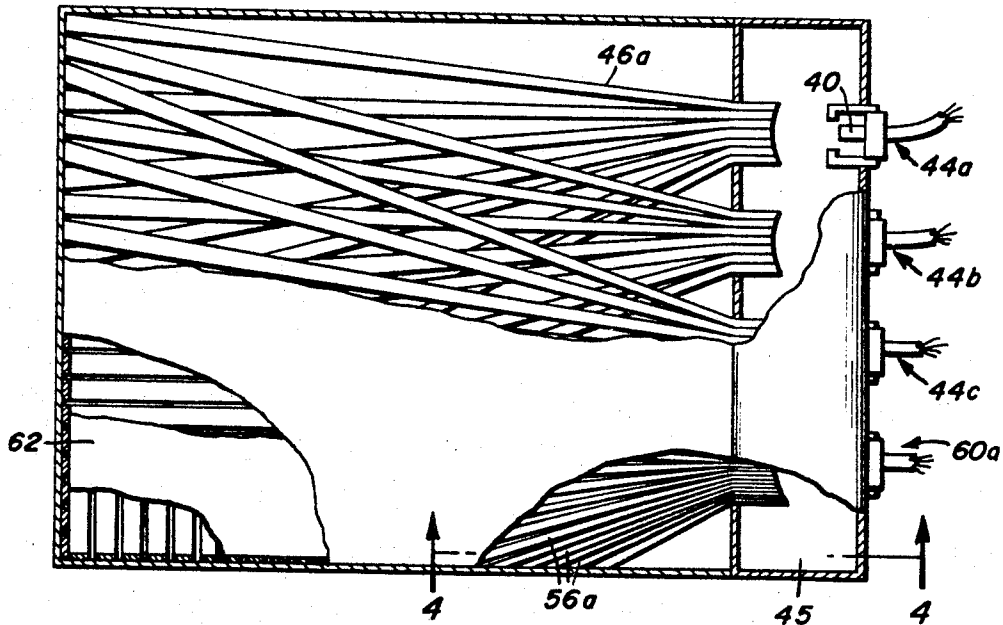


Fig. 4

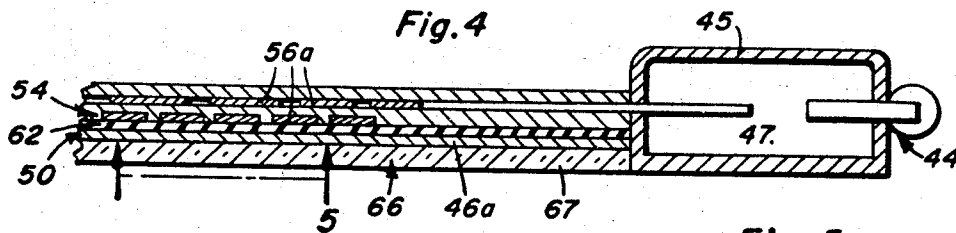


Fig. 5

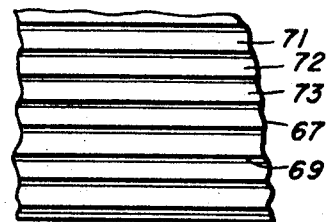
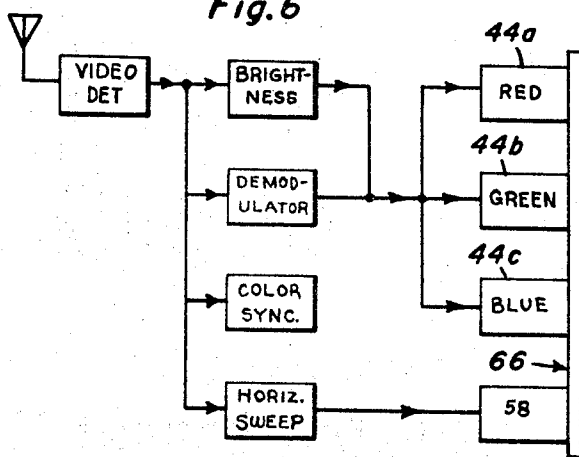


Fig. 6



Andrew P. Fischer
INVENTOR.

BY *Alvin A. O'Brien*
and *Harvey B. Jackson*
Attorneys

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FLAT KINESCOPE

Andrew P. Fischer, 1310 9th St., Modesto, Calif.

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8 Claims. (Cl. 315-169)

This invention relates to a method of and apparatus for displaying pictures or other information in either black and white or color, and is particularly adapted to color television systems.

In recent years several attempts have been made to reduce the depth of television apparatus. Conventional television systems must have a significant depth because of the electron gun assembly and deflection yokes therefor. Where deflection of the electron beam produced by the electron gun must be in two planes, there must be sufficient travel distance between the gun and the screen to permit the deflection. Attempts to reduce the depth of the television assembly have resulted in highly improved conventional equipment designs and also some novel approaches at flat unconventional type screens. The prior art shows that most of the unconventional methods for pictorially displaying information employed transverse sets of conductors between which potentials are created to in turn create localized illumination in gases carried between the transverse conductors. By applying scanning frequencies to the sets of conductors and modulating at least one of the frequencies, information may be displayed by the localized illumination. The several systems devised along these lines have not been successful for television inasmuch as it has not been possible to scan the conductors at a sufficiently high frequency compatible with conventional television systems. The information displayed by the systems utilize conventional commutator apparatus, often of a mechanical nature.

Herein, applicant discloses a form of commutation or high speed switching systems employing an electron beam produced by an electron gun which is deflected in one plane only. The plane of deflection may be parallel to the viewing surface. Moreover, inasmuch as only single plane deflection is required for the apparatus herein, the deflection and electron gun assemblies need be only a few thousands of an inch thick, and therefore a flat screen of minimum depth may be provided utilizing the transverse conductor principle mentioned above.

It is contemplated that the transverse conductors create glows visible through a transparent screen. The conductors may be energized by permitting the electron beam from an electron gun to be successively deflected upon free ends of the conductors which are stacked, insulated from one another, and disposed opposite to the gun. Moreover, by arranging the stacked conductor free ends so that they are equally spaced from the electron gun, high speed, efficient, and reliable displays may be effected.

It is accordingly the principal object of this invention to provide apparatus for permitting the pictorial display of information which is extremely thinner than heretofore known devices.

More particularly, it is an object of this invention to provide a novel commutation or high speed switching system utilizing an electron beam to deposit charges upon stacked conductors. The beam may be deflected in one plane only by a deflection yoke so as to enable the beam to successively pass to the stacked conductors. By so applying a field frequency on one set of transverse conductors and a horizontal line frequency on a second set of transverse conductors, conventional television information may be displayed.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully here-

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inafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

5 FIGURE 1 is a perspective representative view partially broken away illustrating the relationship between the various portions of the invention including the electron gun, deflection yoke, stacked conductors, and transverse conductors;

10 FIGURE 2 is a side elevational view illustrating the manner in which the electron gun is associated with the stacked conductors;

15 FIGURE 3 is a plan view of one side of a screen assembly with parts broken away and shown in section, representing another installation embodiment of the invention;

FIGURE 4 is an enlarged sectional view taken upon a plane indicated by section line 4-4 in FIGURE 3;

20 FIGURE 5 is a greatly enlarged partial sectional view of the screen assembly as viewed from a plane indicated by section line 5-5 in FIGURE 4;

FIGURE 6 is a schematic diagram of a portion of a television receiver system with which the screen assembly may be associated.

25 With continuing reference to the drawings, initial attention is called to FIGURE 2 wherein the apparatus for effecting the high speed commutation or switching is disclosed. The numerals 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30 and 32 represent free conductor ends to which it is desired to successively apply a voltage at a frequency as, for instance, the field or horizontal line frequency in a television system. The frequency applied may be modulated or unmodulated as desired. The ends of the conductors 10-32 are stacked with insulators 34 disposed therebetween so as to insulate adjacent conductors from one another. In order to successively apply a potential to the conductors, an electron gun 40 capable of creating an electron beam, is disposed in opposed relationship to the conductor ends. A conventional deflection yoke 44 40 is provided for deflecting the beam in one plane only. That plane would of course be the plane of the sheet of drawing upon which FIGURE 2 is illustrated. The ends of the conductors 10-32, besides being stacked, terminate along an arc having a radius equal to the distance from the gun 40 to the free conductor ends. Accordingly, as 45 the beam is deflected from conductor 10 to conductor 32, the distance of travel from the gun to the conductor ends remains constant. In the exemplary installation as shown in FIGURE 4, the stacked conductor ends and gun assembly are mounted in the same envelope 45 with a conductive gas 47 therein for improving conduction. The spacing between the gun and the conductors is determined by the deflection capabilities of the yoke and the fineness of the ends of the conductors. With proper design, the spacing may be in the order of only a fraction of an inch.

Attention is now called to FIGURE 1 wherein the commutating or switching system of FIGURE 2 is shown employed in flat screen assembly. Therein, gun 40 and deflection yoke 44 are again illustrated as opposed to stacked conductor ends. The conductors 10-32 in FIGURE 1 are connected to arms 46 which extend angularly from and are integral with plates as 48. Again, the thickness of the plates or conductor ends may be only a few thousandths of an inch. The conductors 10-32 extend to a first set of conductors 50. The first set or grid formed by a group of conductors 50 include a plurality of parallel flat and flexible conductors which are spaced from one another and which define a first plane. A set or grid formed by a group of conductors 54 are spaced from conductors 50 and define a second plane parallel to the plane defined by conductors 50. The conductors 54

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extend in the same manner as conductors 50 to a stack 56 opposed to electron gun 58 and deflection yoke assembly 60.

If black and white television were desired, it would be necessary only to utilize identical conductors 50 and 54 with a porous material 62 therebetween through which an illuminable gas is diffused. Then, when a voltage existed between crossed conductors, the voltage would create a localized glow in the gas which could be displayed through a screen. The conductors of at least one of the groups 50 and 54 would of course have to be transparent so that light may be transmitted from the luminescent gas through a viewing panel or covering enclosing the screen assembly.

If it is desired to pictorially present colored information, several methods may be employed. Initially, the conductors 10-32 may each correspond to red, blue and green successively, with the conductors of group 50 being colored phosphors excited by the glow of the gas to luminescence. When a voltage then existed between conductors of group 50 and conductors of group 54, the colored phosphors of group 50 which would have to be transparent, would glow appropriately. On the other hand, the conductors of group 56 may merely be transparent conductors with a porous member 62 being disposed therebetween. The porous material 62 may be provided with a gas as white neon which glows when a voltage is impressed thereacross. A viewing panel or screen 66 may be provided upon which is impressed transparent color lines alternately of red, blue and green. This impression may be made by printing techniques, photographic techniques, or any other similar techniques available. Moreover, it is not necessary to employ glass for the construction of screen 66. Plastic may be employed if printing or photographic techniques are utilized and the screen assembly thus formed may then be rolled up for storage or transportation similar to a home movie screen. The localized glows would then appear as color pictures through the screen.

In operation, the electron beam produced by gun 40 may be scanned at the horizontal line frequency and modulated according to the picture information in a television receiver system such as shown diagrammatically in FIGURE 6 using separate deflection yokes 44a, 44b and 44c for each color being scanned. The beam of gun 58 may be scanned at the field frequency and may also be modulated. If the modulations be of opposite polarity, greater potential differences may of course be obtained between the crossed conductors. In view of the various short distances involved between the gun and the conductor ends, low voltages in comparison to present kinescopes may be employed and therefore, transistor circuits may be easily utilized for the illustrated components. The information is presented by the modulations of the beam of the gun 40 which effects the glow intensity between the cross conductors inasmuch as it effects the potential difference between the transverse conductors. It will be appreciated therefore that despite the low voltage utilized, a picture screen of almost unlimited size may be activated by the apparatus herein. It will further be appreciated that inasmuch as the disposition of the gun, deflection yoke, and conductor ends, are not important with respect to the display screen, the display screen may be made flat and extremely thin. Moreover, the technique, as noted, lends itself to the latest printing and photographic techniques for presenting alternate transparent colored lines of red, blue and green upon the screen 66 for displaying localized glows therethrough. Because these techniques are usable with thin plastic 67 as more clearly shown in FIGURE 5, screens constructed in accordance with the suggestions herein may be rolled up in the manner of movie screen. In order to prevent colored diffusion between adjacent areas on the screen, dark color guard lines 69 may be imprinted between the transparent red, blue and green color lines on the screen. Of course, the dark

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lines would be sufficiently small so as not to be noticeable but would serve merely to prevent diffusion between adjacent areas. By employing the apparatus herein, television assemblies may be miniaturized extensively inasmuch as electron guns which need only deflect in one plane may be made very small and moreover inasmuch as the voltages therefor need not be high, many transistor circuit may be employed for controlling the signals thereto.

Although a single electron gun has been shown in FIGURE 1 for applying potential to the red, green, and blue conductors, it will of course be realized from FIGURES 3 and 4 that the three separate guns associated with deflection yokes 44a, 44b and 44c may be employed with the various conductors 46a and 56a positioned in side-by-side, rather than in the stacked relationship for connection to the conductor groups 50 and 54 on opposite sides of porous sheet 62 against the transparent screen 66 as described with respect to FIG. 1.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A screen assembly comprising, radiation deflecting means operative to deflect energizing radiations in a single plane, a single flat display assembly operatively connected to said radiation deflecting means, continuous conductor means extending through said display assembly and responsive to energization thereof to produce localized illumination of the display assembly, said continuous conductor means including end portions disposed in said single plane within the radiation deflecting means for receiving energizing radiations, said conductor means comprising groups of flat flexible conductors extending in intersecting relation to each other within said display assembly for selectively establishing localized energizing potential between intersections of the conductors, one group of conductors forming a closely spaced assembly of end portions within said deflecting means for scanning by a single beam of said energizing radiations, another group of conductors forming a plurality of separate assemblies of closely spaced end portions for respective scanning by different beams of said energizing radiations, said display assembly comprising a continuous flexible sheet of porous material disposed between intersecting groups of conductors of said continuous conductor means, illuminable gas diffused within said porous material for emitting localized glow through one group of conductors, and light transmitting means enclosing said conductor means and porous material.

2. The combination of claim 1, wherein said light transmitting means includes a transparent plastic viewing panel having transparent color lines printed thereon.

3. A screen assembly comprising, radiation deflecting means operative to deflect energizing radiations in a single plane, a single flat display assembly operatively connected to said radiation deflecting means, continuous conductor means extending through said display assembly and responsive to energization thereof to produce localized illumination of the display assembly, said continuous conductor means including end portions disposed in said single plane within the radiation deflecting means for receiving energizing radiations, said display assembly comprising a continuous flexible sheet of porous material disposed between intersecting groups of conductors of said continuous conductor means, illuminable gas diffused within said porous material for emitting localized glow through one group of conductors, and flexible light transmitting means enclosing said conductor means and porous material.

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4. The combination of claim 3, wherein said light transmitting means includes a transparent plastic viewing panel having transparent color lines printed thereon.

5. A screen assembly comprising, radiation deflecting means operative to deflect energizing radiations in a single plane, a single flat display assembly operatively connected on one side thereof to said radiation deflecting means, continuous conductor means extending through said display assembly and responsive to energization thereof to produce localized illumination of the display assembly, said continuous conductor means including end portions disposed in said single plane within the radiation deflecting means for receiving energizing radiations, said conductor means comprising groups of flat flexible conductors extending in intersecting relation to each other within said display assembly for selectively establishing localized energizing potential between intersections of the conductors, one group of conductors forming a closely spaced assembly of end portions within said deflecting means for scanning by a single beam of said energizing radiations, said display assembly comprising a continuous flexible sheet of porous material disposed between intersecting groups of conductors of said continuous conductor means, illuminable gas diffused within said porous material for emitting localized glow through one group of conductors, and light transmitting means enclosing said conductor means and porous material.

6. A display device comprising, a flexible light transmitting enclosure, a pair of flexible grids disposed within said enclosure, a flexible sheet of porous material non-conductively spacing said grids within the enclosure, illuminable gas diffused within said flexible sheet of porous material for producing illumination in response to local-

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ized potential differences between said grids, one of said grids comprising flat, parallel spaced conductors made of transparent material through which said illumination emitted from the sheet of porous material is transmitted, flexible conductor means disposed in a common plane non-conductively spaced from the other of said grids and connected to both of said grids within the enclosure, said flexible conductor means having end portions projecting from the enclosure in said common plane, and means scanning said end portions by energizing radiations in said common plane to establish said localized potential differences between the grids.

7. The combination of claim 6 wherein said flat, parallel spaced conductors of said one grid contain phosphors excited to luminescence by the illumination emitted by the illuminable gas from the sheet of porous material.

8. The combination of claim 6 wherein said flexible enclosure includes a transparent screen face in contact with said one grid, and spaced lines of colored matter printed thereon through which said illumination is transmitted.

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GEORGE N. WESTBY, *Primary Examiner.*

RALPH G. NILSON, *Examiner.*