July 8, 1958 E. P. FISCHER-COLBRIE 2,842,696

COLOR CATHODE RAY IMAGE REPRODUCING TUBE AND METHOD

Filed Oct. 6, 1955 2 Sheets-Sheet 1

FIG.1.

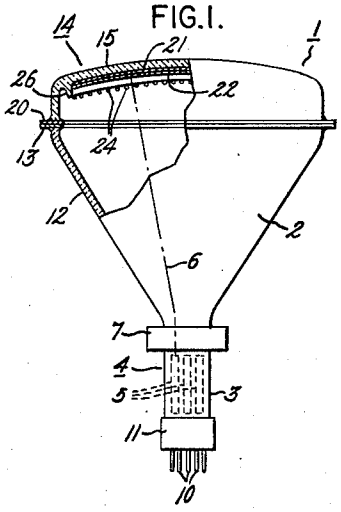


FIG.2.

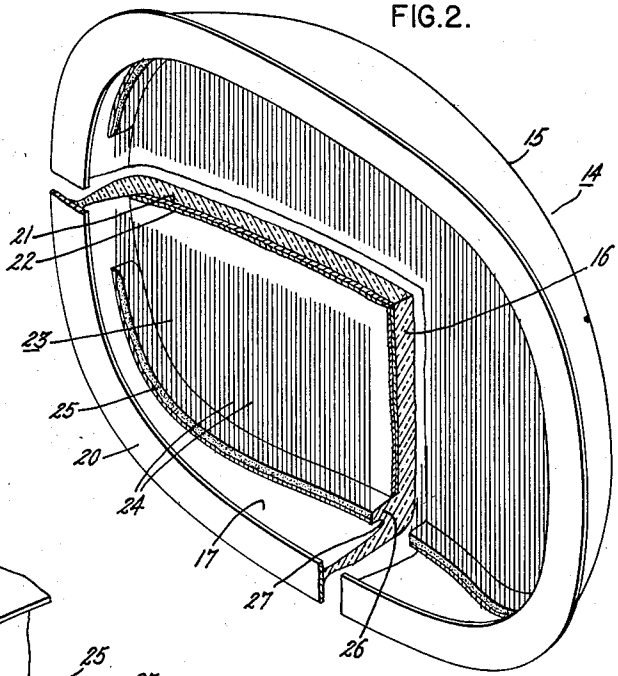


FIG.3.

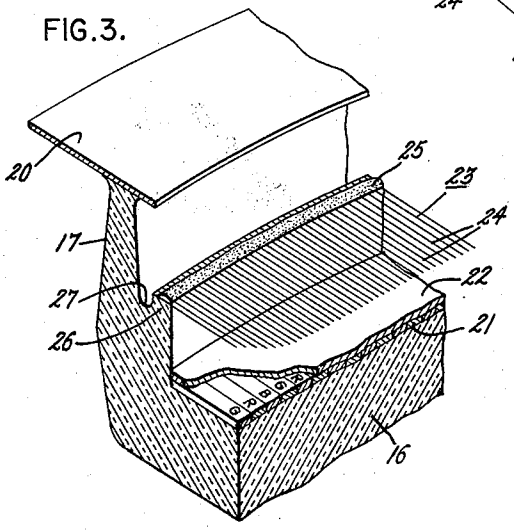


FIG.7.

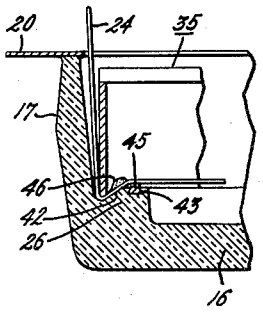
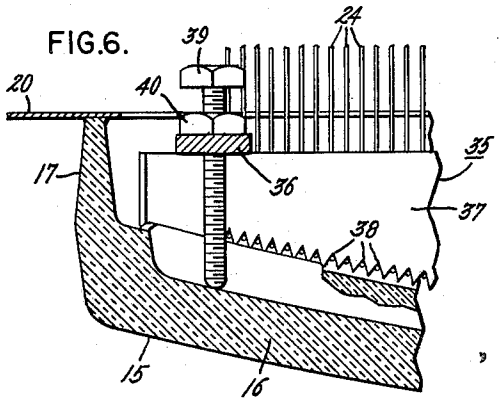


FIG.6.



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COLOR CATHODE RAY IMAGE REPRODUCING TUBE AND METHOD

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FIG.4.

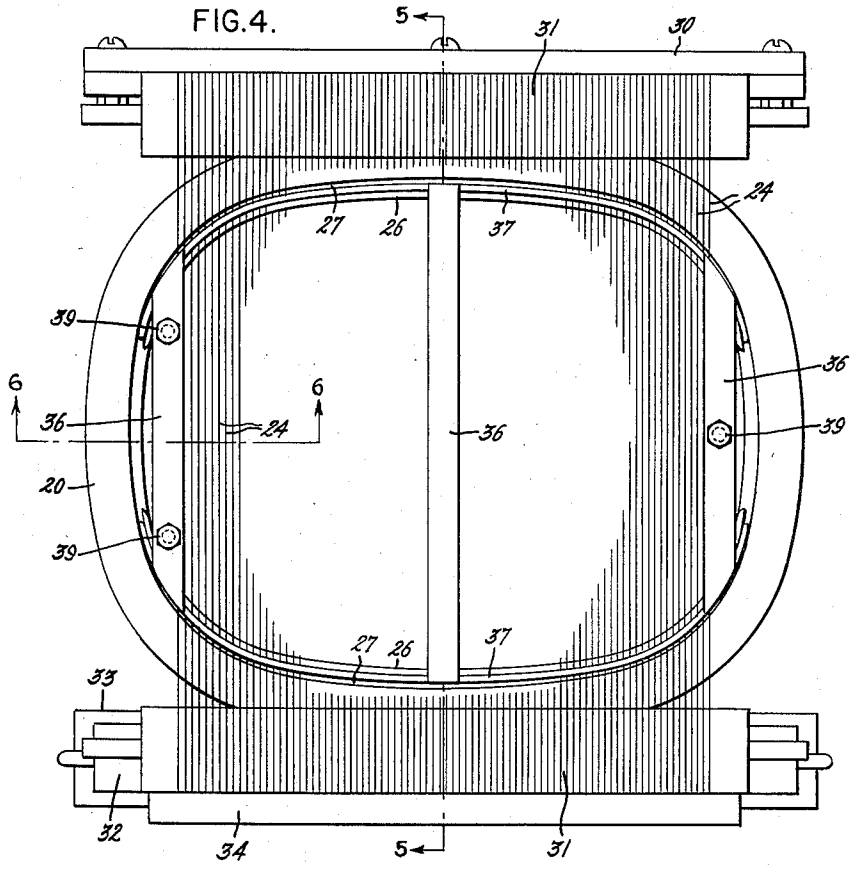
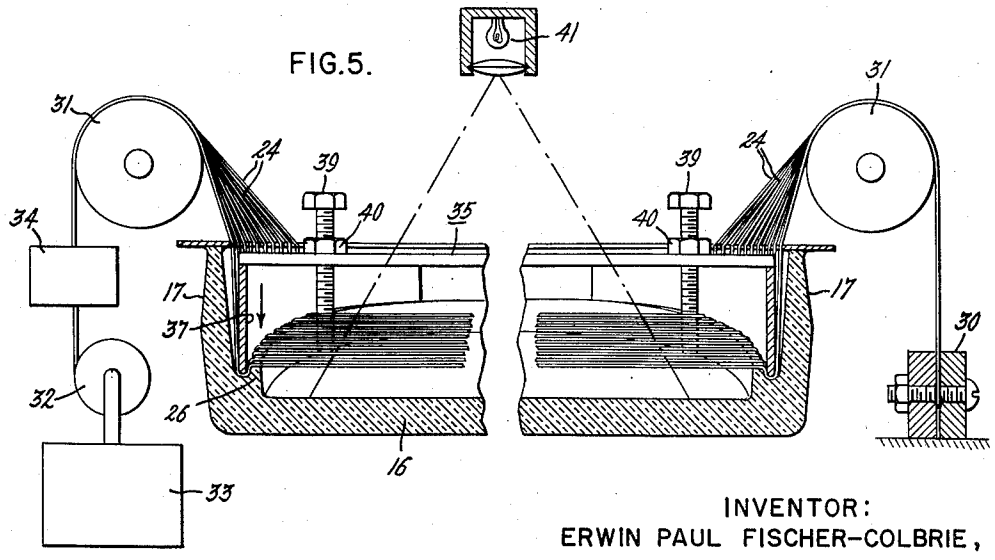


FIG.5.



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2,842,696

COLOR CATHODE RAY IMAGE REPRODUCING TUBE AND METHOD

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Application October 6, 1955, Serial No. 538,940

16 Claims. (Cl. 313—78)

My invention relates to cathode ray tubes and pertains more particularly to a new and improved color cathode ray tube structure and methods of producing same.

Some color cathode ray tubes, such as those generally referred to in the industry as post-acceleration type tubes, comprise an image reproducing structure including a pair of electrodes adapted for being maintained at different potentials and arranged in adjacent relation to the phosphorescent screen of the tube and in parallel spaced relation to each other, thereby to define an inter-electrode region for determining the trajectory and forces of impact of charged particles or electrons directed toward the screen for impinging upon and lighting up the screen. Generally, the image reproducing structure comprises a "sandwich" arrangement including a transparent or otherwise light-permeable face plate supporting a screen made up of a plurality of triads of different color phosphorescent materials and bearing a conductive coating, a frame suitably mounted in spaced relation to the plate and an apertured mask or grill extending across the screen and secured to the frame. This structure is customarily separately fabricated and then mounted and sealed in an envelope behind a transparent face plate or viewing panel thereof.

Now, the above-described type of tube construction has been found costly and to result in considerable shrinkage in production owing to the number of elements involved, the necessity of accurately forming each element to provide the required accurate relative positioning of the electrodes and different phosphorescent materials and the sensitivity of the frame construction to temperature changes with resultant electrode inaccuracies.

Additionally, the described tube construction requires the location of a considerable amount of material in the tube envelope. This material tends to release occluded gases during tube life and thereby adversely affect the tube vacuum and shorten tube life. Further, this material is generally massive relative to the tube envelope and thus tends to increase tube susceptibility to damage resulting from shock. This makes it necessary to provide reinforced envelope constructions and to provide special means for mounting the electrode structure in the tube envelope, all of which results in increased effort and cost of production.

Still further, in tubes including the described separately fabricated "sandwich" electrode structure the viewing area obtained is necessarily less than that which would be available if the screen was supported by the face plate of the tube envelope, as in monochrome tubes.

Accordingly, a primary object of my invention is to provide a new and improved color cathode ray tube.

Another object of my invention is to provide a new and improved image reproducing electrode structure for use in color cathode ray tubes.

Another object of my invention is to provide a new and improved image reproducing electrode including a minimum of separate parts and affording a high degree of accuracy in the relative positioning and alignment of parts.

Another object of my invention is to provide a new and improved electrode structure adapted for increasing tube life and for minimizing tube susceptibility to shock-caused damage.

Another object of my invention is to provide a new and improved image reproducing electrode structure adapted for constituting the viewing end of a color cathode ray tube.

Another object of my invention is to provide a new and improved image reproducing electrode structure adapted for being an integral part of a color cathode ray tube envelope and for increasing the available viewing area of color cathode ray tubes.

Still another object of my invention is to provide new and improved methods for producing color cathode ray tubes and minimizing the cost of production thereof.

Further objects and advantages of my invention will become apparent as the following description proceeds and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming part of this specification.

In carrying out the objects of my invention, I provide a cathode ray tube including a separately formed viewing-end cap sealed to the transitional portion of the tube envelope. The cap includes a viewing area supporting a phosphorescent screen adapted for being impinged by charged particles directed toward the screen, beam producing means in the envelope, and a first electrode extending over the screen. Also included in the cap are inwardly extending ledges disposed on opposite margins of the screen. Extending across the ledges in spaced relation to the screen and having opposite edges thereof bonded to the ledges is a second electrode permeable to charged particles. The second electrode may be secured in predeterminedly spaced relation to the screen by holding it in a desired spaced relation thereto and to the ledges and bonding it to the ledges. Alternatively, the upper surfaces of the ledges may be adapted for being accurately predeterminedly spaced from the screen and the second electrode may be placed thereon and secured thereto.

For a better understanding of my invention, reference may be had to the accompanying drawing in which:

Fig. 1 is a partially broken-away elevational view of a color cathode ray tube constructed in accordance with my invention;

Fig. 2 is an enlarged perspective partially broken-away view of a color cathode ray image reproducing electrode structure constructed in accordance with one aspect of my invention;

Fig. 3 is an enlarged fragmentary perspective view illustrating a manner in which the second electrode may be secured in accordance with my invention;

Fig. 4 is a plan view illustrating the method of positioning grill wires in accordance with an aspect of my invention;

Fig. 5 is a sectional view taken along the line 5—5 in Fig. 4 and looking in the direction of the arrows;

Fig. 6 is an enlarged fragmentary sectional view taken along the line 6—6 in Fig. 4 and looking in the direction of the arrows;

Fig. 7 is a fragmentary sectional view illustrating a modified method of positioning and securing the grill wires.

Referring to Fig. 1, I have shown a tri-color cathode ray image reproducing or picture tube 1 of the post-acceleration type embodying my invention. It is to be understood from the outset, however, that I have shown my invention in a post-acceleration type structure only for purposes of illustration and that my invention is

equally applicable to other color image reproducing tube constructions. It is to be understood further, that my invention is not limited to color cathode ray tubes but is applicable to any image reproducing electrode structure wherein electrode elements are arranged in adjacent relation to a screen and in spaced relation to each other whether the electrode elements are maintained at relatively different potentials or not.

The tube **1** includes an envelope **2** formed of a material which is sufficiently insulative to avoid electrical short circuits between elements of different potentials separated by portions of the envelope; however, preferably the inside surface, at least, of this material is adapted for being conductive with a very high resistivity thereby to provide for dissipation of static charges and avoid adverse effects on the desired electrical field patterns in the tube. Some types of glass, such as lead glass, have been found suitable for forming the envelope **2** and hereinafter the material used for the envelope will be referred to as being "insulative." The envelope **2** includes a cylindrical neck portion **3**. Located in the neck portion **3** is charged-particle or electron beam producing means generally designated **4** and which may comprise three electron guns **5** arranged horizontally or in any desired array with each adapted for emitting an electron beam intended to impinge and light up particular color phosphorescent materials, i. e. red, green and blue.

By means not shown, the beams emitted by the electron guns **5** are focused into relatively sharp beams, one of which is indicated at **6**. The focused beams are deflected vertically and horizontally by suitable deflecting means generally designated **7**. Thus, the beams are caused to scan over the opposite or viewing end of the envelope **2** which comprises a screen made up of different color phosphorescent materials and will be described in more detail hereinafter.

Provided for making suitable electrical connections with the electron guns **5** and other electrode elements in the tube is a plurality of conductive pins **10** carried in an insulative base member **11** fitted on the end of the neck **3**.

The tube envelope **2** further includes a transitional portion **12** having a metal flange **13** suitably sealed thereto. The flange **13** is adapted for use in vacuum sealing to the transitional portion **12** a color cathode ray image reproducing electrode structure generally designated **14** and adapted for completing the envelope **2** and constituting the viewing end of the tube **1** wherein the above-referred-to phosphorescent screen is located.

As better seen in Fig. 2, the color cathode ray image reproducing electrode structure **14**, which hereinafter shall simply be referred to as the electrode structure **14**, comprises a tube envelope viewing-end cap or dish-like member **15** formed of the same type of material as that described above in reference to the envelope **2** as a whole. Additionally, the material of the member **15** is transparent or otherwise suitably permeable to light. The member **15** includes a face plate or viewing panel **16** which is suitably formed so as to have a predetermined radii of curvature, and in some cases the radius may be such as to provide a perceptibly arcuate cross-sectional configuration while, if preferred, the radius of curvature may be substantially infinite so that the viewing panel **16** will be substantially planar. Additionally, it is to be understood that the curvature of the face plate may be such as to define a cylindrical segment, a spherical segment or a segment of any irregular configuration.

Additionally, the member **15** as illustrated includes substantially high side walls **17** to the edge of which is suitably secured a metal flange **20**. The metal flange **20** is substantially identical to the flange **13** on the transitional portion of the tube envelope and these flanges are adapted for being sealed together, as by welding, for making the member **15** an integral portion of and completing the tube envelope **2**. As will be seen hereinafter the side walls **17** may in different constructions have different heights, and in some, together with the flanges **13** and **20**, may be eliminated completely in order to enable direct sealing between portions of the member **15** and the transitional portion **12** of the envelope.

Provided on the inner surface of the viewing panel **16** is a coating or screen **21** comprising phosphors capable of producing light of different colors in response to impingement thereon by charged particles. The screen **21** preferably comprises red, green, and blue light-producing phosphors deposited or arranged on the panel in repeated triads of vertical red, green and blue phosphor stripes in the manner illustrated exaggeratedly in Fig. 3. In other types of color image reproducing tubes, the phosphors may be formed as dots, squares or other geometrical shapes and arranged symmetrically in triangular arrays, or the phosphors may be arrayed as horizontal stripes or some other pattern. Formed over the screen **21** is an electron-permeable conductive layer **22** which may be of aluminum or other suitable metal and constitutes the first electrode in the structure **14**. The layer **22** hereinafter shall be referred to simply as the first electrode **22**.

Provided for cooperating with the first electrode **22** is a second electrode generally designated **23** comprising a plurality of closely spaced wires **24** extending substantially parallel to each other and to the stripes of phosphorescent material comprising the screen **21**. The wires **24** are maintained in desired spaced relation to the electrode **22** by having the opposite end portions thereof directly secured as by glass-to-metal bonds **25** to ledges **26** integrally formed in the member **15** marginally on opposite sides of the phosphorescent screen **21** and so as to extend transverse the ends of the color phosphor stripes. If desired the ledges may be suitably metallized in a well-known manner in which case the bonds **25** can be metallic or metal-to-metal. For a purpose which will be seen hereinafter, the ledges **26** are separated from the side walls **17** by an elongated channel or groove **27**. Additionally, the surfaces of the ledges **26** to which the wires **24** are bonded may be ground or otherwise suitably formed to conform substantially to the curvature of the pannel **16** so as to provide substantially uniform spacing between the first and second electrodes **22** and **23**, respectively, across the member **15**. It will be seen, however, that the surfaces of the ledges may be formed in any desired manner and to any desired degree of accuracy for obtaining any desired predetermined spacing between the various corresponding portions of the first and second electrodes.

In order that the wires constituting the second electrode **23** may all be maintained at the same predetermined electric potential, the wires can be secured or bonded to the ledges **26** by means of a conductive cement such as the cement consisting of a mixture of powdered aluminum silicate and aluminum phosphate in a paste-forming medium of a dilute water solution of phosphoric acid described and claimed in copending U. S. application Serial No. 538,872 of Ralph J. Bondley and Marvin E. Knoll entitled "Cement and Cemented Structures" and assigned to the same assignee as the present application; and the bond effected may extend between and electrically interconnect the adjacent ends of the wires. Alternatively, the wires can be secured to the ledges **26** by insulative means such as a cement which can be obtained by admixing two parts of powdered glass frit, two parts of ferro-silicon alloy powder and three parts flint with a suitable amount of sodium silicate diluted 1:1 in water for obtaining a mixture of any desired consistency. If such an insulative cement or bonding material is employed, the ends of the wires **24** must be somehow suitable electrically connected. This may be accomplished by bunching groups of wire ends extending outwardly of the bonds and electrically interconnecting such bunches by means of an interconnecting wire. Alternatively, the wire ends may be electri-

cally interconnected by painting them down on the ledge with a conductive lacquer or the like. A suitable conductive lacquer can be obtained by mixing suitable amounts of silver powder with sodium silicate in water to obtain a consistency suitable for painting or applying with a brush. Subsequent to application the lacquer should be baked to drive off volatile constituents.

As brought out above, the just-described electrode structure **14** is adapted for being sealed in place to constitute the viewing end of the tube **1** in the manner illustrated in Fig. 1. When so assembled in a tube structure the first electrode **22** is adapted for being maintained at a potential higher than that of the second electrode **23**, thereby to set up and maintain an electric field in the inter-electrode region defined by the electrodes. By virtue of its construction, the second electrode **23** is permeable to charged particles or electrons and during the operation of the tube **1**, the electrons comprising the beams emitted from the guns **5**, including the beam **6**, are admitted into the inter-electrode region through the spaces between the wires **24** and travel through this region for striking or impinging upon the phosphor material or screen **21**. In the inter-electrode region the higher potential of the conductive layer or first electrode **22** is effective for attracting and thereby accelerating the movement of the electrons comprising the beams toward the screen thereby to increase the striking force of the electrons on the phosphorescent screen **21** whereby the color brightness is increased. Additionally, the second electrode **23** serves properly to focus the electron beams entering the inter-electrode region and to direct them onto the stripes of different color phosphorescent material. It is this last aspect of the electrode structure which requires the above-referred-to accurate predetemined relative positioning of the wires **24** and the diffeent color phosphor stripes. And, it will be clear that in my electrode structure this accurate dimensioning is obtained relatively simply and without the necessity of accurately dimensioning a plurality of individual electrode support elements or of providing a grill frame construction.

In Figs. 4–6 I have schematically illustrated equipment and a method whereby the wires **24** constituting the second electrode **23** may be suitably accurately positioned and secured in place on the ledges **26** of the member **15**. As seen, the wires **24** may be secured in place before the phosphorescent material or screen **21** and the conductive layer **22** are formed on the face plate of the member **15**.

In securing the wires **24** in place by means of the equipment illustrated in Figs. 4–6, the member **15** is positioned with the open or flanged side up beneath an array of substantially parallel coplanar wires. This array may be obtained by securing the ends of the wires in a station-any anchoring device **30** and running them over a pair of spaced pulleys **31**. The wires may be fed over the pulleys from a suitable reel structure **32** to which a suitable tensioning force may be applied, as by a weight designated **33**, thereby to provide a predetermined tensioning of all of the wires **24**. Additionally, from the reel **32** the wires may pass through any desired cleaning or surface processing equipment indicated generally at **34**.

Provided for cooperating with the wires **24** is a frame construction **35** comprising a plurality of cross pieces **36** provided for securing a pair of comb members **37** in desired spaced relation. The comb members **37** are shaped and spaced to be received in the above-mentioned channels **27** formed between the ledges **26** and the side walls **17**. Additionally, and as perhaps best seen in Fig. 6, the lower edges of the comb members **37** are suitably serrated or formed with accurately predeterminedly spaced teeth **38** for receiving and determining the spacing between the wire **24**. Additionally, the teeth are set to define lines conforming substantially to the curvature of the ledges. The teeth **38** are illustrated exaggeratedly and in actual practice are such as to insure against cutting or breaking of the wires **24**. Thus, it will be seen that when the frame member **35** is moved into engagement with the described array of wires **24** the wires will each become positioned or seated in corresponding teeth or serrations in the oppositely positioned comb members **37** and thereby will be held in a desired predetermined spaced relation to each other. Thereafter, the frame **35** may be moved downwardly into the member **17** for moving the comb members **37** into channels **27** in the manner illustrated in Fig. 5, thereby to position the wires **24** for being secured to the upper surfaces of the ledges **25**.

In order to insure predetermined uniform spacing between the individual wires and the inner surface of the viewing panel or face plate **16**, which is adapted for supporting the above-referred-to phosphorescent screen **21**, I have provided three adjustment screws or legs **39** suitably threadedly fitted in the outer ones of the cross-pieces **36**. As perhaps best seen in Fig. 6, these screws may be turned down into positions wherein they engage the inner surface of the face plate **16** and position the frame **35** so that the wires **24** are all predeterminedly spaced from the face plate or viewing panel **16**. Alternatively, the frame **35** may be constructed so that the adjustment screws **39** engage a reference surface other than the face plate. For example, the upper surface of the flange **20** may be formed as to be located a predetermined distance from the face plate and in which case the flange **20** may serve satisfactorily as a reference surface to be engaged by the adjustment screws. The predetermined spacing of the wires from the face plate also depends upon the degree of conformance of the serrated edges of the combs **37** to the curvature of the face plate and, thus, the spacing may be uniform across the face plate or may vary in any desired manner depending upon the configurations of the ledges and the toothed edges of the combs. Additionally, the wires **24** are disposed immediately above but do not rest upon the upper surface of the ledges **26**. This adjusted positioning of the frame and wires may be retained by turning lock nuts **40** carried on the adjustment screws **39** down into engagement with the cross pieces **36**. Thereafter, the above-referred-to cement **25** may be applied in the manner indicated in Fig. 3 and so as to extend between the adjacent ends of the wires. Following application of the cement **25** and with the wires retained in their predetermined adjusted position by the frame **35**, the cement is cured or dried. By this method I obtain a permanent accurate positioning of the wires relative to the face plate without resorting to accurate grinding of the upper surface of the ledges **26**. That is, the cement **25**, in addition to bonding the wires directly to the glass ledges acts as filler material or shimming material between the wires and the upper surfaces of the ledges **26**. Thus, the amount of cement filling the spaces between different wires and the ledges may vary in accordance with any irregularities of the upper surfaces of the ledges but the arrangement of the wire array will be predeterminedly highly accurate.

After the wires are secured in place in the just-described manner the frame **35** may be moved out of the wire-securing position of Fig. 5 and the wires may be trimmed adjacent the outer edges of the ledges **26**. If the cement **25** is conductive it will be effective for electrically interconnecting the individual wires constituting the second electrode **23** whereby all portions thereof will be adapted for being maintained at the same potential. If, however, the cement used is not conductive means must be provided for electrically connecting the wires; for example, groups of the extending ends of the wires may be twisted into bunches and these bunches may be suitably electrically connected or the wire ends may be interconnected by a conductive lacquer or the like. After the wires are secured to the ledges in the manner just-described the different color phosphorescent screen **21** may be applied to the face plate or panel portion **16** of the member **15** in any suitable manner; and, if desired, the

wires 24 of the second electrode may be utilized in conjunction with a light source 41 in any conventional photochemical process for printing the different color phosphor stripes on the face plate in predetermined location and parallel relation to the wires. Alternatively, the light source may be replaced by a charged-particle beam producing means and in a suitably rarified atmosphere any conventional phosphor stripe-printing process utilizing electron exposure may be carried out. Inasmuch as the particular methods or techniques that may be used to deposit such different color phosphor stripes, per se, form no part of this invention, fuller disclosure of such methods and techniques are not here deemed necessary.

If desired the screen 21 comprising the different color phosphor stripes and the conductive layer 22 may be laid down on the inner surface of the face plate 16 in any desired manner before the wires 24 are bonded to the ledges 26. When this sequence of assembly is followed the frame 35 is effective for obtaining predetermined spacing between the wires and the screen, and before the wires are bonded to the ledges the light source 41 may be utilized in throwing shadows of the wires on the screen and thus obtaining a desired parallel relation between the wires and the color stripes.

In Fig. 7 is illustrated a modified form of my invention wherein the ledge 26 is formed with an inclined surface 42 between the upper surface thereof and the groove 27. Additionally, in this form of my invention an elongated dove tail groove or channel 43 is formed in the upper surface of each of the ledges 26. Fitted and secured in the grooves 43 are elongated member 45 formed of some etchable material which may be metal or some desired form of glass. The upper surfaces of the members 45 are formed as by grinding in a predetermined accurate spaced relation with respect to the inner surface of the viewing panel 16 upon which the phosphorescent screen is to be supported. Additionally, the upper surfaces of the members 45 are etched or otherwise suitably provided with predeterminedly spaced grooves for receiving the wires 24. The frame 35 is adapted for moving a coplanar array of the wires 24 into position with predetermined ones in the grooves provided in the members 45, and to hold the wires in contact with the inclined surface 42 on the sides of the ledges 25. Thereafter, the wires may be cemented as at 46 in the same manner as that described above with regard to the first embodiment. The cement 46 may be conductive and provide an electrical connection between the different wires or it may be insulative and the required electrical interconnection of the wires 24 may be afforded in the manner described above or by the member 45 if the latter is formed of conductive material.

Additionally if desired, the same etching or other groove forming step used in predeterminedly grooving the members 45 may be effectively utilized in marking the inner surface of the face plate for locating the color phosphor stripes and aligning same with the grooves in the members 45 thereby to insure a parallel relation between the wires and stripes.

In the above-described method and embodiment of my invention the accuracy of positioning of the wires relative to the face plate depends solely upon the predetermined accuracy of the upper surfaces of the member 45. The frame 35 need not be relied upon for accurate positioning of the wires in this method, and thus the adjustment screws or legs 39 are not required.

It is to be understood that while I have illustrated and described the second electrode 23 as comprising a plurality of spaced wires, my invention is equally applicable to tube structures incorporating otherwise constructed electrode members. For example, the second electrode 23 may alternatively comprise a perforated mask or disk.

While I have shown and described specific embodiments of my invention, I do not desire my invention to be limited to the particular form shown and described, and I intend by the appended claims to cover all modifications within the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An image reproducing structure for a cathode ray tube comprising; a viewing panel having an outstanding integral peripheral side wall, an integral shoulder on said side wall, disposed about said viewing panel, and an electrode secured to said shoulder and extending across said viewing panel in spaced relation thereto.

2. An image reproducing structure for a cathode ray tube comprising; a transparent viewing panel adapted to form a portion of an evacuated envelope and having an outstanding integral peripheral side wall adapted to be joined to a funnel-shaped transitional portion of said envelope, a pair of spaced electrodes including one supported on said viewing panel, said side wall including integral insulative ledges disposed about said viewing panel, the other of said electrodes being secured to said ledges for extending in spaced relation to said viewing area.

3. A cathode ray tube comprising; an evacuated envelope including a viewing panel of transparent insulative material supporting a screen adapted for being impinged by charged particles, said viewing panel having integral side wall portions including integral elongated insulative ledges disposed on opposite margins of said screen, and an electrode permeable to charged particles having opposite end portions thereof secured to said ledges and adapted for effecting the travel of charged particles toward said screen.

4. An image reproducing structure for a color cathode ray tube comprising; an insulative member adapted to form a portion of an evacuated envelope and including a viewing area supporting a screen comprising a plurality of stripes of different phosphorescent material adapted for being impinged by charged particles, said member further including integral peripheral outstanding side walls at the opposite ends of said stripes, integral ledges in said side walls extending generally transverse to said stripes and an electrode for determining the impingement of said stripes comprising a plurality of electrically connected wires having the opposite end portions thereof secured to said ledges and extending in a predetermined spaced relation to each other and said stripes of phosphorescent material.

5. A cathode ray image reproducing tube comprising; an envelope including an insulative viewing-end cap including a viewing area supporting a phosphorescent screen, electron beam producing means in said envelope for directing a beam of electrons toward said screen, said cap further including integral elongated inwardly extending ledges disposed marginally with respect to said screen and spaced therefrom, and an electrode interposed between said screen and said beam producing means for effecting the travel of said beam to said screen comprising a plurality of electrically connected spaced wires having the opposite ends thereof secured to said ledges.

6. A color cathode ray image reproducing tube comprising; an envelope including an insulative viewing-end cap including a viewing area supporting a phosphorescent screen including a plurality of stripes of different color phosphorescent material, electron beam producing means in said envelope for directing beams of electrons toward said screen, said cap further including integral outstanding peripheral side walls formed with integral elongated inwardly extending ledges extending generally parallel to said viewing area and transverse to the opposite ends of said stripes, and an electrode interposed between said screen and said beam producing means for effecting the travel of said beams to said screen comprising a plurality of electrically connected wires having the opposite ends thereof secured to said ledges and extending in predeter-

mined spaced relation to each other and said stripes of phosphorescent material.

7. A structure adapted for constituting the viewing end of a cathode ray tube comprising; a glass face plate member including side portions adapted for being sealed to the transitional portion of a cathode ray tube envelope and a central portion supporting a screen adapted for being impinged by charged particles, said side portion further including integral elongated ledge portions disposed thereon on opposite margins of said screen and spaced from the edges of said side portions, and an electrode permeable to charged particles extending across said screen and having opposite edge portions thereof secured to said ledges.

8. A structure adapted for constituting the viewing end of a cathode ray tube comprising, a glass dish-like member including outstanding peripheral side walls adapted for being sealed to the transitional portion of a cathode ray tube envelope and a bottom portion having a predetermined radius of curvature and supporting a screen adapted for being impinged by charged particles, said member further including elongated ledge portions disposed therein on opposite margins of said screen and spaced from the edges of said side walls, said ledge portions having substantially the same predetermined radius of curvature as said bottom, and an electrode permeable to charged particles secured to said ledges and conforming substantially to said predetermined curvature of said screen.

9. A structure adapted for constituting the viewing end of a cathode ray tube comprising, a glass dish-like member including integral side walls adapted for being sealed to the transitional portion of the cathode ray tube envelope, a bottom portion supporting a screen comprising a plurality of stripes of different color phosphorescent material adapted for being impinged by charged particles, said side walls further including integral elongated ledge portions disposed therein transverse the opposite ends of said stripes and spaced from the edges of said side walls and said screen, and an electrode comprising a plurality of electrically connected wires having the ends thereof secured to said ledges in a predetermined spaced substantially parallel relation to each other and said stripes of said phosphorescent material.

10. The method of producing a cathode ray image reproducing structure comprising; forming an insulative member including a face plate and ledge portions disposed on opposite margins of said face plate, supporting a first electrode on said face plate, supporting a second electrode on a frame, positioning the frame in a predetermined spaced relation to said face plate, and bonding opposite edges of said second electrodes to said ledges so as to maintain said predetermined spaced relation between said second electrode and said face plate.

11. The method of producing a cathode ray image reproducing structure including spaced electrodes comprising, forming an insulative member including a face plate and ledge portions disposed on opposite margin of said face plate, supporting a first electrode on said face plate, supporting a second electrode on a frame having a profile corresponding generally to the profile of said face plate, positioning said frame in desired spaced relation to said ledges and in predetermined spaced relation to said face plate, and interposing bonds between the opposite edges of said second electrode and said ledges for securing said second electrode to said ledges while maintaining said predetermined spaced relation between said second electrode and said face plate.

12. The method of producing a cathode ray image reproducing structure including spaced electrodes comprising, forming an insulative member including a face plate and ledge portions disposed on opposite margins of one face of said face plate, supporting a first electrode on said one face, positioning an array of spaced wires in spaced relation to said ledges and in predetermined spaced relation to said one face, and building up a bond between the ends of each of said wires and corresponding portions of said ledges for securing said wires to said ledges and maintaining said predetermined spaced relation between said wires and said one face.

13. The method of producing a cathode ray image reproducing structure including spaced electrodes comprising, forming an insulative member including a face plate and ledge portions disposed on opposite margins of said face plate, supporting a first electrode on said face plate, positioning an array of spaced wires in spaced relation to said ledges and in predetermined spaced relation to said face plate, building up conductive bonds between the ends of each of said wires and corresponding portions of said ledges for securing said wires to said ledges and maintaining said predetermined spaced relation between said wires and said face plate, and connecting said bonds between adjacent ends of said wires for electrically interconnecting said wires.

14. The method of producing a cathode ray image reproducing structure including spaced electrodes comprising, forming an insulative member including a face plate and ledges disposed on opposite margins of said face plate, supporting a first electrode on one face of said face plate, forming surfaces on said ledges in predetermined spaced relation to said face plate opposite said one face, forming predeterminedly spaced transversely extending grooves in said surfaces, locating an array of wires in said grooves and bonding the opposite ends of said wires to said ledges.

15. The method of producing a color cathode ray image reproducing structure including spaced electrodes comprising, forming an insulative member including a face plate and ledges disposed on opposite margins of said face plate, supporting a first electrode on said face plate, forming surfaces on said ledges in predetermined spaced relation to said face plate, forming predeterminedly spaced transversely extending grooves in said surfaces and corresponding grooves in said face plate, locating an array of wires in said grooves in said surface, bonding the opposite ends of said wires to said ledges, and depositing different color phosphorescent stripes on said grooves in said face plate.

16. The method of producing a cathode ray image reproducing structure including spaced electrodes comprising, forming an insulative member including a face plate and elongated ledge portions disposed on opposite margins of said face plate, supporting a first electrode on said face plate, forming a groove in each of said ledges securing an elongated member in each of said grooves, forming the upper surfaces of said elongated members in predetermined spaced relation to said face plate, locating a second electrode on said surfaces of said elongated members, and bonding the opposite edges of said second electrode to said ledges at points disposed outwardly of said elongated members.

References Cited in the file of this patent

UNITED STATES PATENTS

485,478	Pollard	Nov. 1, 1892
2,683,833	Zaphiropoulos	July 13, 1954
2,690,518	Fyler et al.	Sept. 28, 1954
2,761,990	Amdursky et al.	Sept. 4, 1956