April 17, 1962 J. W. HACKETT ET AL 3,030,536

FACE PLATE FOR SUPPORTING COLOR-CONTROL ELEMENTS IN CATHODE-RAY TUBES

Filed April 20, 1956

2 Sheets-Sheet 1

FIG 1

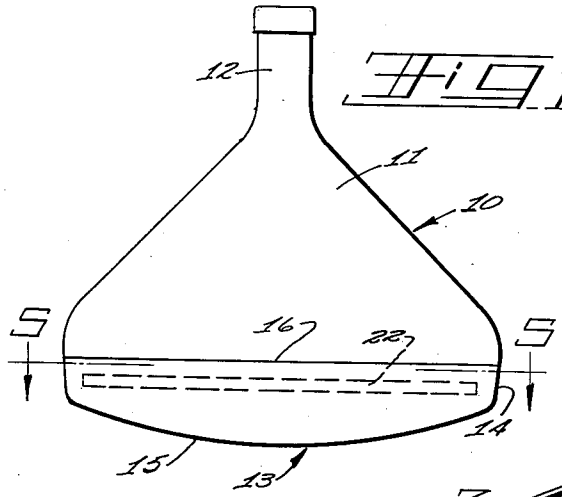


FIG 4

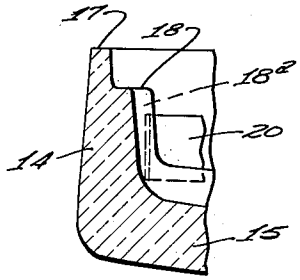


FIG 2

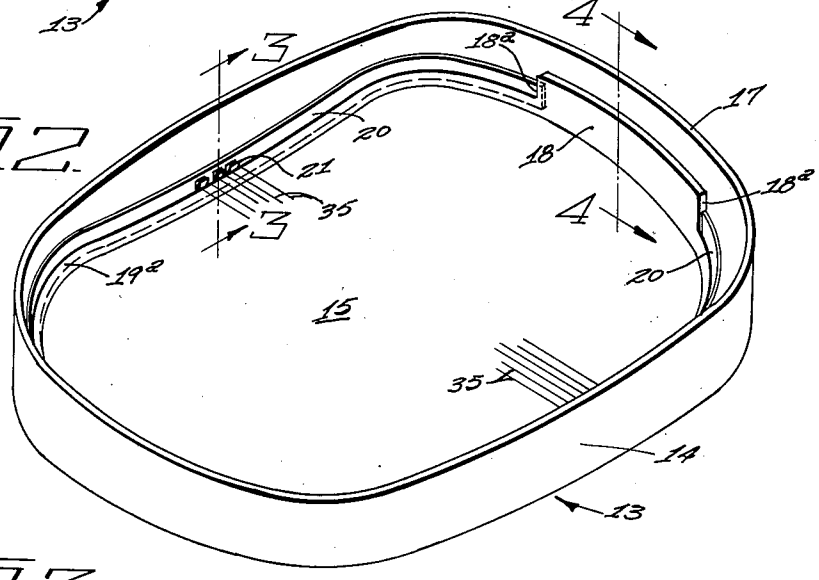


FIG 3

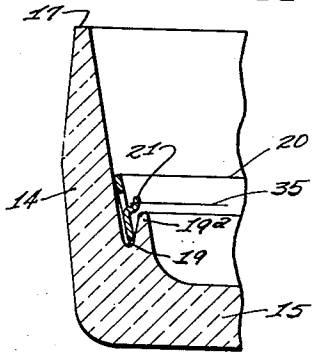
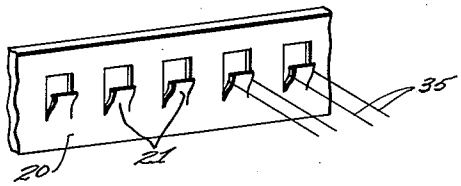


FIG 3-A



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2 Sheets-Sheet 2

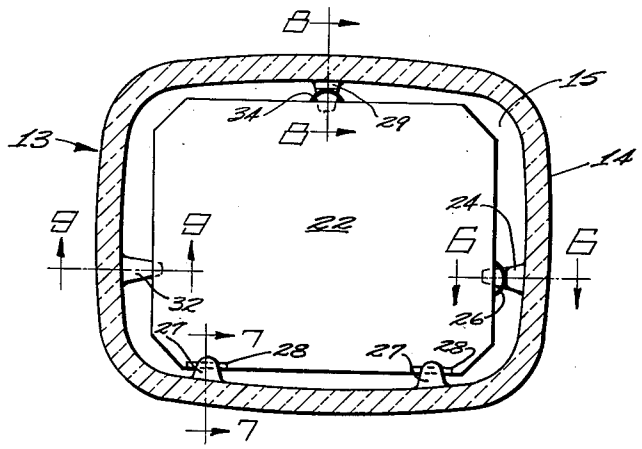


Fig. 5

Fig. 6

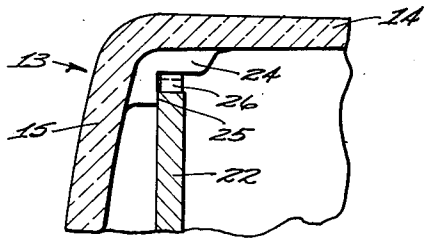


Fig. 8

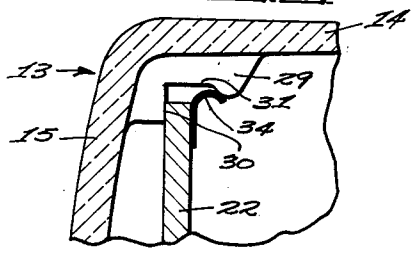


Fig. 7

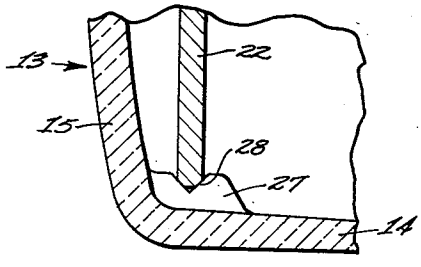
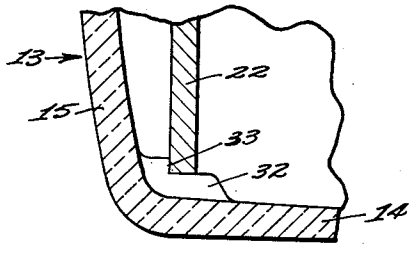


Fig. 9



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3,030,536

FACE PLATE FOR SUPPORTING COLOR-CONTROL ELEMENTS IN CATHODE-RAY TUBES

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4 Claims. (Cl. 313—80)

The present invention relates to cathode-ray tubes and more specifically to cathode-ray picture tubes for color television transmission and reception.

The development of color television picture tubes has been hindered by the stringent requirements of precise alignment of internal components, particularly the color-producing elements mounted within the face plate portion of the tube. An apertured electrode structure such as a shadow mask or line grid is usually disposed adjacent to the screen to control electron impingement upon phosphors of three primary colors. The electrode structure frequently consists of a heavy frame and bulky clamping mechanism, both of which add to the difficulty of tube assembly and exhaust. The location of the apertured electrode must be carefully controled with respect to the phosphor screen in each individual tube for proper color registry.

An object of this invention is to provide an improved supporting structure for an electron beam deflecting element of a cathode-ray tube for directing and accelerating the electrons of the beam onto respective color areas of the tube screen.

Another object of this invention is to provide an improved face plate containing support means for an electrode element within a cathode-ray tube which support means are radially disposed about the inner periphery of the face plate and formed therein during its fabrication.

Another object of this invention is to provide an especially shaped glass face plate for retaining a color-control electrode element in a cathode-ray tube in readily detachable, aligned position.

Another object of this invention is to provide an improved grid support structure formed on the interior surfaces of a glass face plate of a cathode-ray tube, which structure is of simple construction with a design applicable to existing and proposed types of picture tubes.

The specific nature of this invention, as well as other objects and advantages thereof, will become apparent to those skilled in the art from the following detailed description taken in conjunction with the annexed sheets of drawing, on which by way of preferred example only, are shown two embodiments of this invention.

On the drawings:

FIG. 1 is an elevational view of a tri-color cathode-ray tube envelope.

FIG. 2 is a perspective view of a glass face plate of a cathode-ray tube envelope.

FIG. 3 is an enlarged vertical sectional view taken along the line 3—3 of FIG. 2.

FIG. 3A is an enlarged perspective view of one portion of the grid support member only which is shown fitted within the glass face plate in FIGS. 2 and 3.

FIG. 4 is an enlarged vertical sectional view taken along the line 4—4 of FIG. 2.

FIG. 5 is a horizontal sectional view of a modification of the present invention taken along the line 5—5 of FIG. 1.

FIG. 6 is an enlarged sectional view taken along the line 6—6 of FIG. 5.

FIG. 7 is a view similar to FIG. 6 taken along the line 7—7 of FIG. 5.

FIG. 8 is another view similar to FIG. 6 taken along the line 8—8 of FIG. 5.

FIG. 9 is still another view similar to FIG. 6 taken along the line 9—9 of FIG. 5.

The present invention pertains to a vathode-ray tube envelope **10** comprised of three parts, namely, a frusto-conical shaped funnel **11**, neck tubulation **12**, and face plate **13**. The face plate **13** as illustrated in FIG. 2 consists of a bowl-shaped closure member having a uniformly curved viewing window **15** located in its central area. The viewing window **15** is bounded by an annular flange **14** extending from its concave surface and may be either round or rectangular in shape, being shown as the latter in FIGS. 2 and 5. The flange **14** terminates at a planar sealing edge **17** which has a contour and dimensions matching those of the large end of the funnel **11** to which it is sealed along the line **16**. A screen or target area (not shown), which is composed of phosphorescent materials well-known in the art, is usually located on the inner surface of the viewing window **15**. A color-control structure **22** which consists of either a shadow mask or line grid is positioned within the flange **14** adjacent to the tube viewing window **15** in proper alignment with the tube axis "A."

Two recessed grooves **19** are formed on inner opposing surfaces of the flange **14** adjacent and parallel to the viewing window **15** extending throughout the lengthwise inner dimension of rectangular flange **14** as shown in FIG. 2. The recessed grooves **19** consist of V-shaped depressions or notches formed within an internal rib **19***a* and terminate at two ledge portions **18** located within the shorter sides of the flange **14**. The grooves **19** have depth axes which are generally parallel to the tube axis. Elongated strip members **20** are inserted into each of the V-shaped grooves **19** extending throughout their lengths with the ends of strip members **20** abutted against the ends **18***a* of the ledge portions **18** to prevent their lateral movement. Thus having all four ends butted against the ledge ends **18***a*, the two strip members **20** are firmly held in place.

A row of inwardly facing hooks **21** is located in the central area of each strip member **20** extending throughout their length traversing the longitudinal inner dimension of the flange **14**. The hooks **21** are thus arranged substantially parallel to the viewing window **15**. A continuous series of conductive strands **35** are strung back and forth between the two strip members **20** looped around the hooks **21** to form a grid-type electrode parallel to viewing window **15**. The strip members **20** may be simply sprung into place or, if desired, more permanently attached in proper alignment by a cementitious material (not shown) placed within the depths of the grooves **19**.

Another modification of this invention consists of a number of lugs **24**, **27**, **29** and **32** located at spaced-apart intervals around the interior surface of the face plate **13** as shown in FIG. 5. The lugs **24**, **27**, **29** and **32** are of varied indented design to form locating points for firm frictional retention of the color-control structure **22**. The structure **22** may be formed of any known type of color-control element, and is illustrated as a rigid solid much larger in two dimensions than in the third. The only

requirement of structure 22 consists of two spring-like elements 26 and 34 attached to its perimeter.

The five lugs, which are shown in FIG. 5, are located on four sides of the face plate 13 and may be conveniently molded in the glass at the juncture of viewing window 15 and flange 14 during its formation. Two lugs 27 in the lower corner of the face plate 13, such as shown in FIG. 5, are internally shaped to receive a longitudinal edge of the structure 22 at two points. Both of the lugs 27 have V-shaped notched portions 28 which are equally spaced a prescribed distance from the viewing window 15, such as shown in FIG. 7, and into which the edge of the structure 22 is fitted. The notched portions 28 of the lugs 27 are also dimensionally located with respect to the central axis of the face plate 13 and thus the tube axis "A."

Another lug 32, such as shown in FIG. 9, consists of a single support along one of the shorter sides of the face plate 13. Lug 32 has a right-angled interior surface 33 into which a similarly shaped edge of the structure 22 is inserted. Thus both the two notched portions 28 and right-angled surface 33 are individually able to restrain movement of the structure 22 in at least two directions.

Another lug 24 which is located along the other shorter side of the face plate 13 also has a right-angled interior surface 25 as shown in FIG. 6 similar to lug 32. A resilient element 26 consisting of a spring loading device is attached to the edge of the structure 22 opposite lug 24 to be depressed in compression when the structure 22 is properly installed.

Still another lug 29 is positioned along the remaining longitudinal side of the face plate 13 having a recessed inner surface 31 and an abutting surface 30 perpendicular to the tube axis. Another spring-like element 34 of slightly different shape is attached to the longitudinal edge of the structure 22 as shown in FIGS. 5 and 8 for its firm retention within the lug 29 when held in compression. Both lugs 24 and 29 are adaptable to elastic loading to retain the structure 22 against lugs 27 and 32.

In order to mount the structure 22 normal to the tube axis with its edges substantially equidistant from the viewing window 15, one leg of each of the right-angled surfaces 25 and 33 and abutting surface 30 of the three lugs 24, 29 and 32 respectively are all located in a common plane perpendicular to the tube axis. The notched portions 28 of the lugs 27 are also spaced so as to retain the lower edge of structure 22 the same distance from the viewing window 15 as the right-angled surfaces 25, 30 and 33. The depressed areas of the lugs 27 and 29, such as the notched portions 28 and recessed surface 31, may be subsequently shaped by grinding after the face plate 13 is originally formed. The structure 22 is positionable within the face plate 13 in only one positive location. The points of location may be accurately molded into the glass with respect to the center line of the tube. Edge portions of structure 22 are tightly held against the two lugs 27 and lug 32 by its two spring loading devices 26 and 34. The position of structure 22 is thus dimensionally arranged with respect to the electron source of the tube and the target area.

The color-control structure 22 may be quickly removed from the face plate 13 as required by pulling it toward the sealing edge 17. During fabrication of the tube and before face plate 13 and funnel 11 are joined, electrode structure 22 can be repeatedly removed and reinserted to obtain duplicate alignment between the structure 22 and the target area (not shown) on the viewing window 15. The elastic loading of the spring clips 26 and 34 faciltates rapid replacement and realignment of the color-control structure 22 with the target area.

With the supporting lugs 24, 27, 29 and 32 formed in the face plate 13 during its manufacture, a secure and reproducible positioning is attainable without metal flanges or glass-to-metal seals. The particular shapes of the lugs 24, 27, 29 and 32 which are formed in the glass are dependent upon the specific form of the internal structure 22. Where the structure 22 is a rigid mechanical entity, the chief requirement is one of positive location which the especially shaped lugs accomplish with six rigid mechanical restraints acting through the six degrees of freedom of the internal structure 22.

"Dimensionally located" as referred to herein pertains to having the grooves 19 or lugs 24, 27, 29 and 32 so located with respect to the tube axis as to facilitate impingement of electrons on proper areas of the screen after passage through the apertured electrode structure.

Additional modifications may be resorted to within the spirit and scope of the appended claims.

We claim:

1. A hollow glass face plate for a cathode-ray tube comprising a curved glass viewing window and an annular flange extending around the periphery of said viewing window, a plurality of curvilinear spaced-apart notched retaining grooves on the internal surface of said flange substantially parallel and coextensive with the greater dimension of said viewing window, said retaining grooves with their depth axes parallel to the central axis of the face plate and their root plane parallel with said viewing window, and elongated support members positioned in said retaining grooves, said support members each having a lengthwise series of hooks adapted to retain an apertured electrode.

2. A hollow glass face plate for a cathode-ray tube comprising a cylindrically curved glass viewing window and an annular flange extending around the periphery of the concave face of said viewing window, deep recessed grooves on at least two oppositely disposed internal surfaces of said flange with their root plane located substantially parallel and adjacent to said viewing window and coextensive therewith with their depth axes extending essentially parallel to the central axis of the face plate, at least two elongated strip members retained on oppositely disposed sides of said viewing window within the length of said recessed grooves, and a row of protruding hook-like elements located in a lengthwise direction along each of said strip members substantially parallel to said viewing window for support of a grid-type electrode.

3. A hollow glass face plate for a rectangular cathode-ray tube comprising a cylindrically curved glass viewing window and an annular flange extending around the periphery of the concave face of said viewing window and terminating at a planar sealing surface, a recessed groove extending around the major portion of oppositely disposed internal surfaces of said flange having a root plane substantially parallel and adjacent to said viewing window and facing the open side of said face plate, at least two elongated independent metallic strip members retained on oppositely disposed sides of said viewing window within said recessed groove extending essentially through the greater dimension of said viewing window, and retaining supports for said strip members disposed in substantially the same plane as said recessed groove, a row of inwardly protruding hook-like elements located in a lengthwise direction along each of said strip members substantially parallel to said viewing window, and a series of fine wires wound back and forth between said hook-like elements in the form of a grid-type electrode.

4. In a cathode-ray tube for television reception, a hollow glass face plate consisting of a cylindrically curved glass viewing portion and an annular flange portion extending from the periphery of the concave surface of said viewing portion, at least four inwardly protruding lugs having internally exposed indentations radially disposed along opposed inner surfaces of said face plate in spaced relationship at the juncture of said flange and viewing portions, said internally exposed indentations consisting of V-shaped depressions in at least two of said lugs and right-angled shaped depressions in at least two

other lugs with one leg thereof perpendicular to the central axis of the face plate, and an electronic element frictionally retained within said internal surfaces of said lugs.

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