

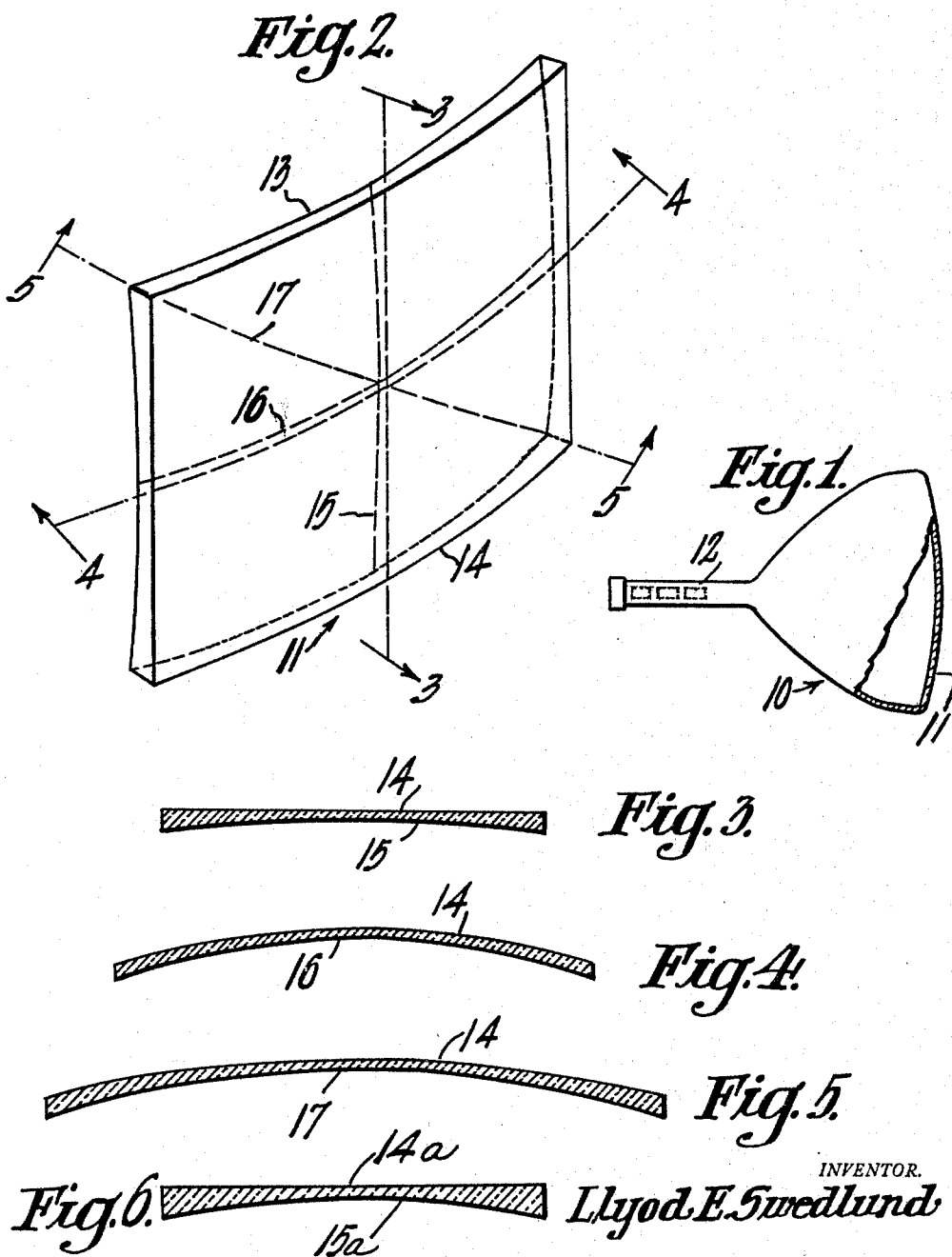
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CATHODE RAY TUBE

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CATHODE RAY TUBE

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My present invention relates to cathode ray tubes of the type suitable for television receivers and having a relatively large face plate. More specifically my invention relates to the shape of the surfaces of the face plate.

As is well known, in direct view television receivers, a picture is created on the inner surface of the cathode ray tube which carries a coating responsive to a beam of electrons. The beam of electrons is caused to scan the coating in one way or another, thereby creating a picture which is viewed from the opposite side of the face plate. Up to the present time, reflections toward the viewer of lights or bright objects by the face plate has marred substantially the quality of the picture produced. A face plate which conforms substantially to the shape of a section of a surface of a sphere is most advantageous from the standpoint of good focus in all portions of the picture area. However, a face plate in the shape of a section of a sphere or a spherical face plate tends to accentuate reflections of lights or bright objects toward the viewer. Attempts to eliminate such undesirable reflections have, insofar as I am aware thereof, proven unsuccessful.

One difficulty encountered in attempting to eliminate or reduce such undesirable reflections lay in that changes in the shape of the face plate adversely affected the shape of the area scanned by the electron beam. Thus, when a face plate having the shape of a section of a cylinder with its axis vertical as viewed by the viewer is utilized, reflections toward the viewer are minimized. However, the shape of the picture raster, the area scanned by the electron beam, deviates substantially from the desired rectangular shape and has sides which are substantially bowed-in when the conventional magnetic electron beam deflection yoke, corrected for spherical face plates, is used. Redistribution of the windings of the magnetic yoke or utilization of external correcting magnets can be used to straighten the bowed-in sides of the picture area but causes undesirable increase of focus spot size at the sides and corners.

It is therefore a principal object of my present invention to provide a face plate for cathode ray tubes which minimizes reflections.

Another object of my invention is to provide a face plate which minimizes reflections and at the same time permits the use of conventional electron beam deflection means corrected for spherical face plates without introducing additional focus distortion or undesirably thick areas in the face plate.

A more specific feature of my invention is the provision of a face plate having outer and inner surfaces substantially different in shape and at the same time preserving sharp focus and relatively thin face plate thickness.

These and other objects will be apparent as the nature of my invention is more fully understood from the following description taken in conjunction with the accompanying drawing.

In carrying out my invention I provide a face plate having an exterior surface which is similar in shape to a

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section of a cylinder while the interior surface thereof is similar in shape to a section of a sphere or spheroid.

In the drawing, Figure 1 is an elevational view partly broken away of a cathode ray tube embodying a face plate in accordance with my invention;

Figure 2 is a perspective view on an enlarged scale of the face plate;

Figures 3 through 5 are sectional views along the lines 3—3, 4—4, and 5—5 respectively of Figure 2; and

Figure 6 is a sectional view corresponding to Figure 3.

Referring now to the drawing in detail wherein the curvatures are to a small extent uniformly exaggerated to better illustrate my invention. Cathode ray tube 10 has an envelope which comprises a face plate 11. The usual electron gun structure may be mounted in neck 12 while a fluorescent coating or screen (not shown) is provided on interior surface 13 of face plate 11. A conventional magnetic electron beam deflection yoke (not shown) corrected for spherical face plates is usually mounted on neck 11 adjacent tube 10.

In order to minimize reflections toward the viewer I provide face plate 11 with an exterior surface 14 of such configuration as to minimize reflections. Thus, face plate 11 may have an exterior surface 14 similar in shape to a section of a cylinder having its axis extending vertically as viewed in Figure 2. Such an exterior surface reduces reflections thereon to substantially narrow vertical lines or bands and, with the tube tilted, these reflections can be thrown downward out of the viewer's vision.

In order to eliminate bowing-in of the sides of the picture area, the face plate is formed with its inner surface 13 shaped like a section of a sphere. The center of inner surface 13 lies on an axis of the inscribed sphere. Such a plate is shown in section in Figure 6 and is a similar sectional view to that shown in Figure 3. Axis 14a is the vertical axis of the exterior surface while line 15a is the vertical contour or profile of the inner surface of the plate along a vertical plane. This form of face plate has the advantage of avoiding reflections toward the viewer.

I also form inner surface 13 like a section of a prolate or oblate spheroid with its center on a minor axis of the spheroid. This has the advantage over the face plate having a cylindrical outer surface and a spherical inner surface shown in Figure 6 in that a face plate substantially thinner particularly adjacent the periphery thereof is provided. For example such a face plate of reduced thickness may be more readily fabricated and joined into tube 10 and is substantially lighter in weight. Referring now to the inner surface 13, perpendicular vertical and horizontal contour lines or axes 15 and 16 respectively are maintained as straight as possible and thus have radii of curvature as long as possible while intermediate contour lines or axes such as diagonal axis 17 has a radius of curvature short enough to correct raster shape. Vertical or short contour line or axis 15 lies in a plane normal to external surface 14 and, because of its long radius of curvature, deviates only to a small extent from a surface parallel to the outer surface 14. Horizontal or long contour line or axis 16 has a radius of curvature substantially the same as that of external surface 14 and lies in a plane normal to external surface 14. The thickness of the face plate at the periphery thereof adjacent the ends of perpendicular contour lines or axes 15 and 16 is increased a relatively small amount over the thickness at the center of the face plate where the contour lines or axes intersect.

In the specific embodiment of my invention illustrated cathode ray tube 10 is a so-called seventeen inch picture tube, this dimension being an approximation of the diagonal length of the face plate in the case of rec-

tangular tubes. External surface 14 which, as was pointed out, has the shape of a section of a cylindrical surface, the generatrix or major axis of which extends vertically as shown in Figure 2, and which surface has a radius of curvature of twenty-seven inches. It was found that a face plate thickness of approximately .7 inch adjacent the periphery was the maximum tolerable. This thickness together with the original face plate thickness, at the center of approximately .250 inch determined the minimum radius of curvature for diagonal axes 17. At present I utilize a radius of curvature of sixty inches for the minor or short axis 15 and a radius of curvature of 26.75 inches for major or long axis 16. However, I may also make contour lines or axes 15 and 16 less curved than indicated. As for example axis 15 may have substantially zero curvature and be parallel with the vertical generatrix or axis of surface 14. This will in turn permit lengthening the radius of axis 16; resulting in reduction of the bowing-in of the edges of the picture area. I may also form surface 13 with axis 16 having less a smaller radius of curvature than that of the outer surface which makes possible or further reduction in edge thickness.

The radius of curvature of contour line or axis 17 lies between the 26.75 inch radius of axis 16 and the 60 inch radius of curvature of axis 15. In practice, the radius of curvature of axis 17 is found to be relatively small amount longer than that of axis 16 and is short as compared to that of axis 15.

From the foregoing it is apparent that surface 13 lies between that of the cylinder of which surface 14 is a portion and the surface of a sphere constructed within the cylinder with the radius of and from the same center as axis 16. It is further apparent that the periphery of surface 13 approaches the closest to the surface of the inscribed sphere, described above, at the ends of diagonal axis 17 and is most remote from the surface of the sphere at the ends of minor or short axis 15. Furthermore, it may be noted that if the radius of curvature of the face plate is measured along lines determined by the intersection of parallel planes with the face plate, which planes extend parallel to the common plane of axis 16 and the axis of tube 10 it is seen that the radius of curvature decreases as the measurements are made more distant from the center of the face plate in the direction of axis 15. Thus, the periphery of inner surface 13 parallel to axis 16 has a substantially smaller radius of curvature than axis 16 and approximately the same as the corresponding portion of the inscribed sphere.

A face plate constructed in accordance with my invention not only reduces reflections but also, for all practical purposes, eliminates bowing in of the picture area without requiring deviation from the commonly used deflection yoke designed for spherical face tubes.

I also provide a face plate which in addition to reducing reflections without introducing bowing-in of the picture area as pointed out has the greatly desired advantage of minimizing the thickness of the face plate.

It is to be understood that though I have set forth the

foregoing embodiments of my invention and described it in detail with respect thereto, I do not wish to be limited to the exact construction set forth but desire to claim all modifications thereof that come within the scope of the appended claims.

What I claim is:

1. A cathode ray tube, comprising a vacuum tight envelope including a face plate having opposed surfaces one of which is scanned by an electron beam to generate an image thereon while the other surface forms a viewing surface for said image, an electron gun for producing said electron beam, said beam being adapted to be swept over said scanned surface, said viewing surface of said face plate being substantially a section of the curved surface of a cylinder and having substantially zero curvature in the direction of its vertical axis as normally viewed to minimize reflection of light of external origin toward a viewer, the scanned surface of said face plate having a radius of curvature in the direction of its normally horizontal axis substantially equal to the radius of curvature of said cylinder surface and a radius of curvature in the direction of its diagonal axis ranging in length from that in the direction of said horizontal axis to a length close to and a small amount longer than said horizontal radius of curvature so that a rectangular raster may be readily formed on said scanned surface.

2. A cathode ray tube, comprising a vacuum tight envelope including a face plate having opposed surfaces one of which is scanned by an electron beam to generate an image thereon while the other surface forms a viewing surface for said image, an electron gun for producing said electron beam, said beam being adapted to be swept over said scanned surface, said viewing surface of said face plate being substantially a section of the curved surface of a cylinder and having substantially zero curvature in the direction of its vertical axis as normally viewed to minimize reflection of light of external origin toward a viewer, the scanned surface of said face plate having a radius of curvature in the direction of its normally horizontal axis substantially equal to that of said cylinder surface, a radius of curvature in the direction of its normally vertical axis substantially longer than the radius of curvature of said horizontal axis and a radius of curvature in the direction of its diagonal axis intermediate that of the horizontal and vertical axes and only a relatively small amount longer than the radius of curvature of said horizontal axis as compared to the radius of curvature of said vertical axis to minimize bowing of the sides of the raster swept out by said electron beam and thereby facilitate formation of a rectangular raster.

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