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D. A. GRISWOLD ET AL

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IMPLOSION PROTECTION FOR CATHODE RAY TUBES

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FIG. 1.

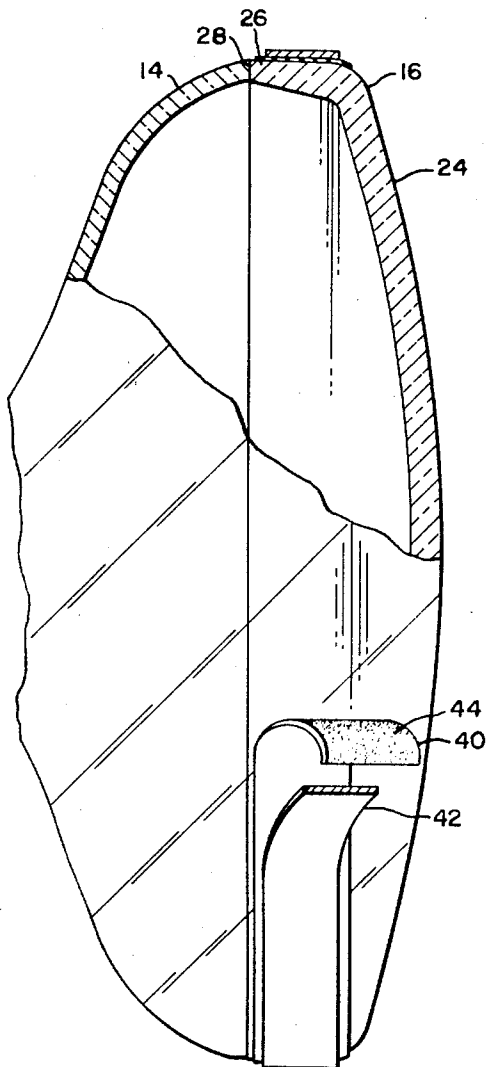
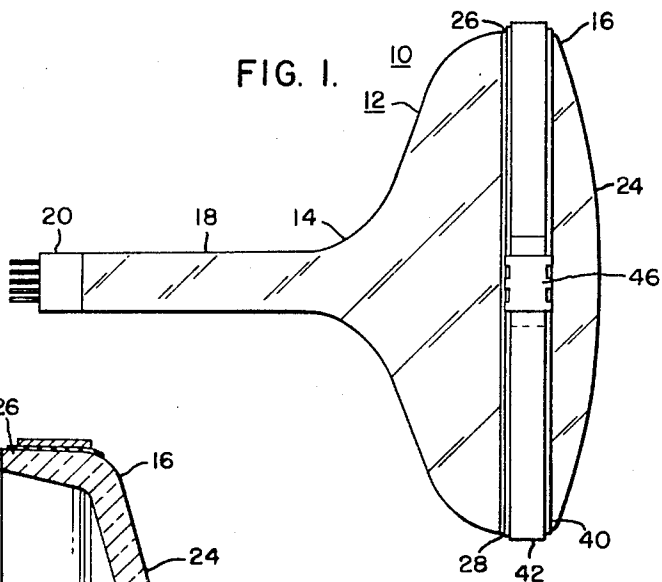
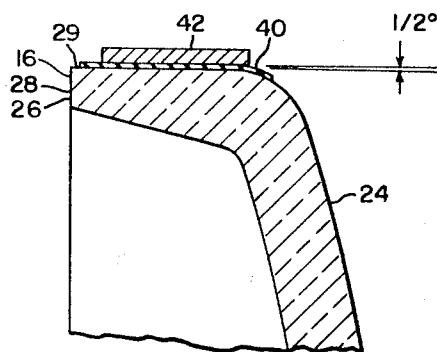


FIG. 2.

FIG. 3.



INVENTORS
Douglas A. Griswold, Edward F. Dick,
and Charles M. Kesser

BY
Charles F. Renz
ATTORNEY

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IMPLOSION PROTECTION FOR CATHODE RAY TUBES

Douglas A. Griswold, Blossburg, Pa., and Edward F. Dick
and Charles M. Kesser, Elmira, N.Y., assignors to
Westinghouse Electric Corporation, Pittsburgh, Pa., a
corporation of Pennsylvania

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4 Claims

ABSTRACT OF THE DISCLOSURE

A rectangular picture tube having a face plate panel including a viewing window and an annular flange, said flange extending from said viewing window at an angle of less than one degree of being parallel to the tube axis. A flexible adhesive tape is secured to the flange and a metallic band is positioned on said tape to provide implosion protection.

This invention relates to cathode ray tubes and more particularly to methods and structure for controlling an implosion within cathode ray tubes.

Cathode ray tubes, of which television picture tubes are of major importance, are large evacuated glass envelopes subject to implosion problems. The implosion of one of these large glass envelopes usually results in the scattering of chunks and splinters of glass. The television industry has utilized several schemes to reduce the danger of flying glass from an implosion of a cathode ray tube incorporated in a television set. One particular method that has been used for several years is the provision of a safety plate shield positioned in front of the viewing surface of the cathode ray tube and secured to the television cabinet. A safety plate had several disadvantages including reducing the light output of the cathode ray tube and producing unwanted reflection and glare. In recent years, the industry has attempted to dispense with the safety glass by providing fracture restraining means in the form of bands provided about certain critical portions of the envelope and relying on this type of assembly to provide the necessary implosion protection. It is to this latter type of system that this invention is directed and particularly to the smaller size television display tubes whose diagonal is less than 16 inches.

It is accordingly an object of this invention to provide an improved implosion system for a cathode ray tube.

It is another object to provide an improved economical implosion protection system for small size cathode ray tubes.

It is still a further object to provide an improved method for implosion protection of small size cathode ray tubes.

Briefly, the present invention provides an implosion protection system in which a tension band is provided about the skirt or flange portion of the face plate panel of a cathode ray tube. The skirt portion of the face plate panel is provided with band bearing surfaces which are substantially parallel to the axis of the cathode ray tube. An adhesive tape is provided between the tension band and cathode ray tube. The viewing portion of the face plate is increased in thickness from the standard type of tube to provide, in conjunction with the tension band, adequate implosion protection.

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

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

FIG. 1 is an elevational view of a cathode ray television picture tube with an implosion system and incorporating the teachings of this invention.

FIG. 2 is an enlarged view, partly in section of a portion of the tube shown in FIGURE 1; and

FIG. 3 is an enlarged view, partly in section of a portion of the face panel portion of the tube shown in FIG. 1.

Referring in detail to FIG. 1, there is shown a cathode ray tube 10. The cathode ray tube 10 includes an envelope 12. The envelope 12 is comprised of a funnel portion 14, a face plate panel portion 16 and a neck portion 18. The neck portion 18 is sealed at its extremity and a base 20 is provided thereon for provision of terminals and application of suitable potentials to an electron gun (not shown) positioned within the neck portion 18 of the tube. The funnel portion 14 is frustoconical in shape with the small end thereof sealed at its extremity to the neck portion 18 and with the large end of the funnel portion sealed to the face plate panel portion 16. The face plate panel portion 16 consists of a curved viewing panel 24 bounded by a dependent annular side panel skirt or flange 26. The skirt portion 26 of the face plate panel 16 and the large end of the funnel portion 14 terminate in sealing surfaces of complementary contour which are joined together by suitable means such as fusion of the glass of the face plate portion 16 and the funnel 14. This fusion point or seal 28 is normally referred to as the fuse or panel seal and lies in a plane perpendicular to the longitudinal axis of the cathode ray tube. A fluorescent screen (not shown) is provided on the inner surface of the panel 24.

In the specific device shown, the diagonal dimension of the viewing area 24 is 10.875 inches, minor axis 7.950 inches and major axis 9.750 inches. The outer peripheral surface 29 of the face plate skirt portion 26 tapers inwardly from the panel seal 28 at a $\frac{1}{2}^\circ$ angle as shown in FIG. 3. The outer peripheral surface 29 of the skirt 26 is substantially parallel to the longitudinal axis of the cathode ray tube. The thickness of the viewing portion 24 of the face plate panel 16 is 0.280 inch. The radius of curvature of the viewing area is 15 inches.

The minimum thickness of the face plate panel depends on the radius of curvature and the diagonal dimensions of the face plate panel. For example, face plate panels having diagonal dimensions of 10 to 13 inch should have a minimum thickness of .250 inch with a panel radius of 15 inches. If the radius of curvature is increased to 25 inches, then the thickness of the face plate panel should be increased to about .325 inch.

Now referring in detail to FIG. 2 and FIG 3, there is illustrated the banding provided around the skirt portion 26 of the face panel 16. The assembly of a tape 40 and a tension band 42 to the cathode ray tube is accomplished after the envelope is evacuated. In the specific embodiment shown, the tape 40 is of a suitable material such as polyester material type with a rubber adhesive 44 provided on one surface. The tape 40 is wrapped about the skirt portion 26 one time with the tape 40 positioned adjacent the seal 28. The thickness of the tape 40 is about 0.003 inch and a width of one inch and it is provided about the entire periphery of the face plate panel 16 with the adhesive coating in contact with the exterior surface 29 of the skirt portion 26. The flexible metallic band 42 is provided over the adhesive tape 40 and tensioned thereon by mechanical means to provide a residual tension in the band of about 300 to 500 pounds. The band 42 should be of a high tensile strength material of about 2,600 pounds and of a thickness of about 0.023 inch and a width of 0.625 inch. The band 42 is normally placed

under a tension of about 1650 pounds and the clip 46 mechanically secured to lock the band 42.

In the specific embodiment shown the taper is $\frac{1}{2}$ degree about the entire periphery of the skirt portion 26. It is found that this bearing surface on the exterior surface 29 for the band is not necessary about the entire periphery but small corner regions may be provided on the glass envelope having a taper of about $\frac{1}{2}$ degree and a remaining portion of the face panel skirt 26 may have a greater taper. The taper on the face plate panel 16 is required for the molding operation to permit ease of removal of the panel from the mold. By providing the surface of the face panel skirt 26 substantially perpendicular to a plane perpendicular to the longitudinal axis of the tube, the tension band 42 may be provided upon the envelope without the danger of the tension band 42 slipping off the face panel 16. The resultant compressive forces on the face panel 16 are applied normal to the glass surface thereby increasing the strength of the viewing face 24 and its resistance to high energy impact. The increased thickness of the viewing face 24 over conventional cathode ray tubes is found to increase the resistance of the cathode ray tube to low energy impacts.

While there have been shown and described what are presently considered to be the preferred embodiments of the invention, modification thereto will readily occur to those skilled in the art. It is not desired, therefore, that the invention be limited to the specific arrangements shown and described and it is intended to cover in the appended claims all such modifications as fall within the true spirit and scope of the invention.

We claim as our invention:

1. A rectangular television picture tube comprising an evacuated glass envelope having a face plate panel portion including a viewing window and an annular flange extending from said viewing window and sealed to a body portion of said envelope, said annular flange providing exterior surfaces within less than one degree of being parallel to the axis at the corners of said rectangular tube a flexible adhesive tape secured to the said exterior surfaces about said flange and a sole metallic band positioned on said tape and about said flange by which a compressive force is applied to the exterior surfaces of said flange to reduce implosion danger of said tube, said band having a residual tension of greater than 300 pounds.

2. A television picture tube comprising an evacuated glass envelope having a face plate panel portion including a viewing window and an annular flange extending from said viewing window and sealed to a body portion of said envelope, said viewing window having a thickness of greater than .250 inch, said annular flange providing an exterior surface within less than one degree of being parallel to axis of tube and having a flexible tape secured to the exterior surface about said flange and a sole metallic band positioned on said tape and about said flange by which a compressive force is applied to the exterior surface portion of said flange to reduce implosion danger of said tube, said band having a residual tension of greater than 300 pounds.

3. A cathode ray tube comprising an envelope including a funnel member and a face plate panel member, said face plate panel member including a viewing portion and an annular skirt portion fixed to said viewing portion said annular skirt portion hermetically sealed to the enlarged portion of said funnel member to form a seal region, said seal region lying in a plane substantially perpendicular to the axis of said cathode ray tube, the exterior peripheral surface adjoining said seal region of said skirt portion having bearing portions tapering inwardly at an angle less than one degree from said seal region, a flexible nonmetallic tape having an adhesive surface, said tape extending about said annular skirt portion with the adhesive surface in contact with said bearing portions and a sole metallic band having a width less than said flexible non-metallic tape tensioned on said bearing portions of said annular skirt portion, said metallic band having a residual tension greater than 300 pounds by which a continue compressive force is applied to the exterior surface of said cathode ray tube.

4. A cathode ray tube comprising an envelope including a funnel member and a face plate panel member, said face plate panel portion including a planar viewing and an annular skirt portion extending from said viewing portion, said viewing portion having a diagonal dimension, a thickness dimension, and a radius of curvature with said diagonal dimension being less than 14 inches, said thickness dimension greater than .250 inch and said radius of curvature greater than 15 inches, said skirt portion hermetically sealed to the enlarged portion of said funnel member to form a seal region, said seal region lying in a plane substantially perpendicular to the axis of said cathode ray tube, the exterior surface of said skirt portion having bearing surfaces tapering outwardly from said viewing portion to said seal region at an angle less than one degree, a sole metallic tension band banded about said annular skirt portion and having a flexible tape positioned between said bearing surfaces and said band, said band having a residual tension of greater than 300 pounds.

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ROBERT L. GRIFFIN, Primary Examiner

JOSEPH A. ORSINO, Jr., Assistant Examiner

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178—7.8; 220—2.1