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3,248,480

CATHODE RAY TUBES

Filed March 27, 1963

2 Sheets-Sheet 1

FIG. 1

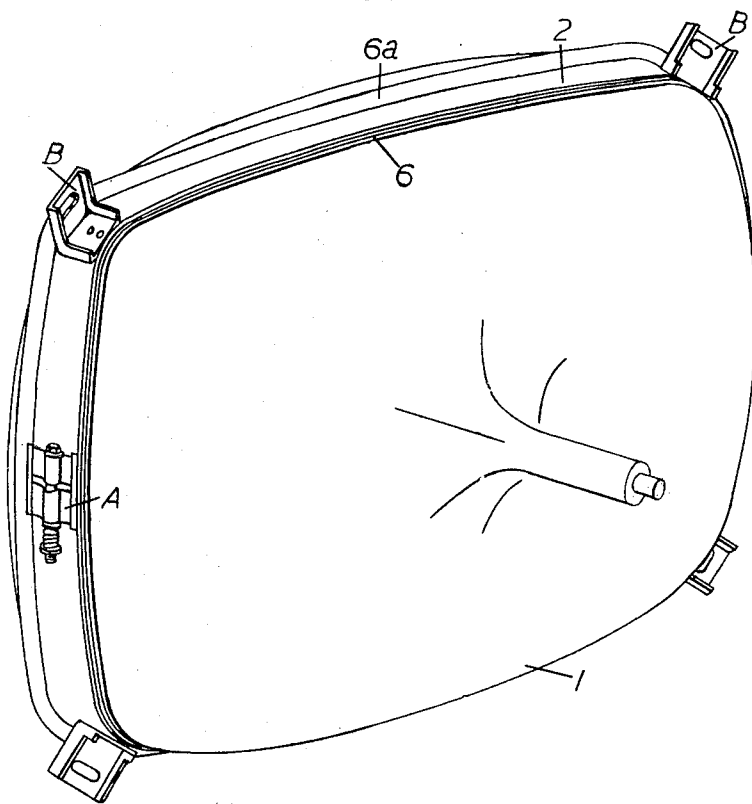
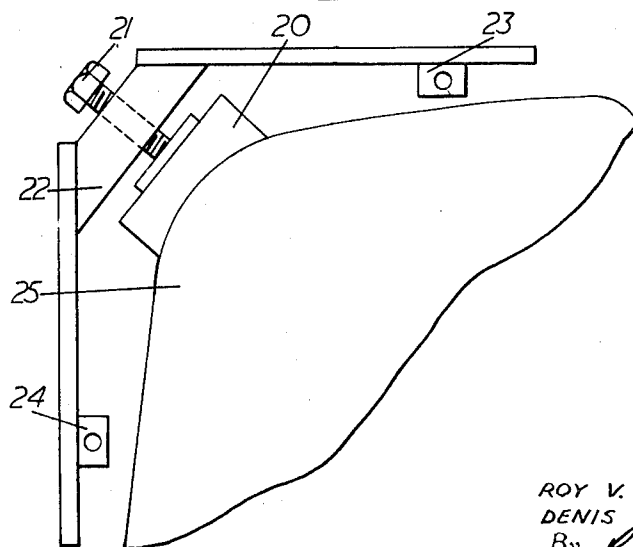


FIG. 4



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FIG. 2.

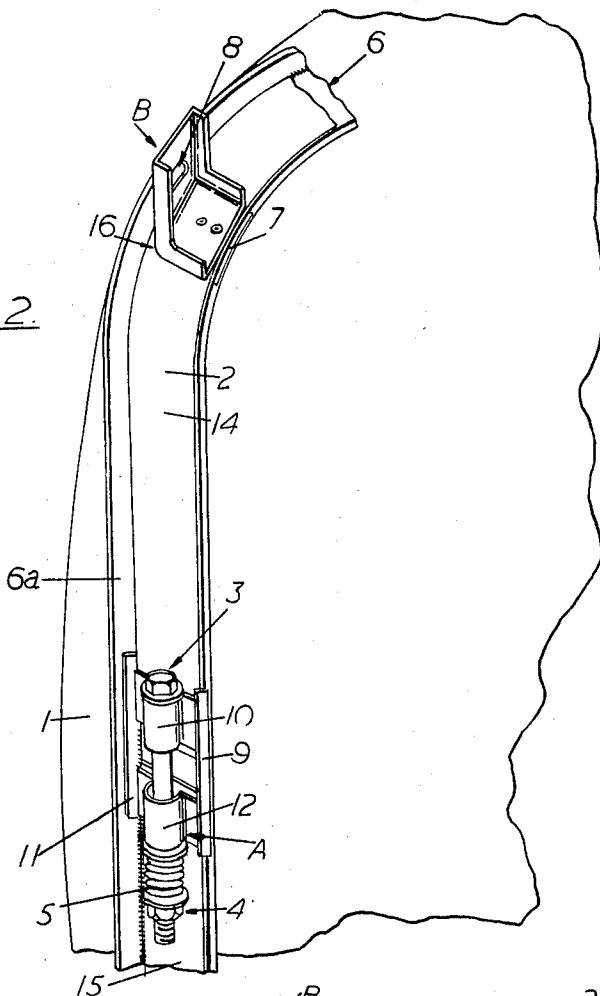
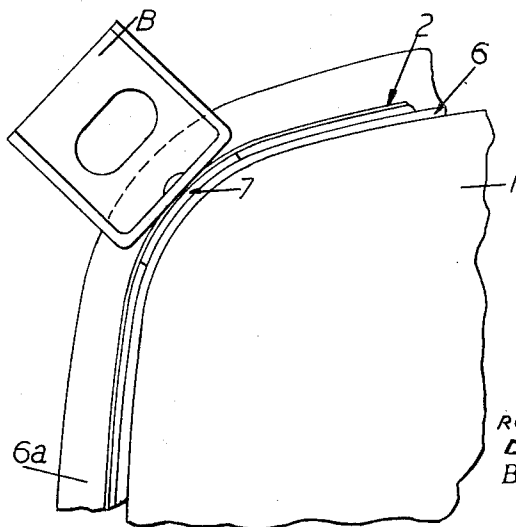


FIG. 3.



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CATHODE RAY TUBES

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3 Claims. (Cl. 178-7.8)

This invention relates to a method of, and arrangements for, stressing the glass of a cathode ray tube envelope.

Cathode ray tubes are evacuated to a very low pressure and any fracture of the envelope is normally accompanied by an implosion. This implosion can be very dangerous since the broken glass is liable to be projected by it with considerable velocity, and many attempts have been made over the years to reduce this danger.

In television receivers it has been the common practice to arrange a sheet of toughened glass in front of the face of the cathode ray tube, and to rely upon this, together with the cabinet, to contain the glass.

Other methods which have been used to reduce the danger of this effect have included bonding a sheet of plastics material to the face of the tube, and stretching a sheet of tough plastics material over the face of the tube.

All of these methods have aimed to contain the glass and to reduce the danger from flying splinters once the implosion has taken place.

The present invention aims to reduce the likelihood of an implosion occurring at all.

According to the present invention there is provided a method of stressing the glass of a cathode ray tube having an approximately rectangular image or face portion which includes applying forces entirely or predominantly at the corners of the rectangle in directions towards the longitudinal axis of the tube, and of such values that when the glass of the tube is fractured the possibility of the tube imploding is reduced.

Embodiments of the invention illustrating the use of this method will now be described with reference to the accompanying drawings which show in

FIG. 1 is a perspective rear view of a cathode ray tube with a stress band attached, in

FIG. 2 an enlarged perspective view of part of the stress band and cathode ray tube of FIG. 1, in

FIG. 3 a rear corner view of a stress band assembly shown in FIGS. 1 and 2, and in

FIG. 4 a rear view of part of an alternative assembly.

Referring to FIG. 1 there is shown a cathode ray tube 1 around which a stress band 2 made of steel is placed. The band 2 is tensioned by adjusters such as that shown at A. The stress band 2 is seated on a band 6 of plastics material made with a flange portion 6a standing up at right angles to the main part of the band. Angle brackets B are shown attached to the stress band 2.

Referring to FIG. 2 the enlarged view of one corner of the assembly of FIG. 1 shows more clearly the arrangement of the stress band 2 on the plastics band 6 surrounding the cathode ray tube 1. The stress band is made of two lengths of steel strip 14 and 15, and these are drawn tightly around the tube by means of adjusters such as that shown at A. The adjuster shown at A includes two guide pieces 10 and 12 each attached to one end of one of the lengths of band. A headed bolt 3 passes through the guide pieces 10 and 12, and is secured by a nut 4 which is tightened against a compression spring 5. A channel piece 9 is provided to act as a guide for the ends

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of the lengths of the band. The side 11 of the channel piece 9 may be used as a stop and abut against the flange portion 6a of the band 6 and thus push the flange portion 6a against the cabinet of a television receiver in order to prevent the assembly from being pushed through the aperture provided for the tube in the cabinet.

A similar adjuster assembly to that shown at A is provided in a similar position along the opposite edge of the tube in order to connect together the other two ends of the two lengths of the stress band. The invention can be performed with only one length of stress band and one adjuster A.

At the corner of the tube 1 an angle bracket B, having a hole 8, is shown attached by means of rivets to the stress band. On the opposite side of the stress band from the angle bracket there is a pressure plate 7. The angle bracket is mounted on the stress band so that the bend 16 in the bracket is set back from the edge of the stress band adjacent the flange portion 6a.

Referring to FIG. 3 there is shown more clearly the relationship of the bracket B to the stress band 2, the pressure plate 7, and the plastics band 6. From this view it can be seen that flange portion 6a may provide a seal between the cabinet and the tube and prevent stray light from passing around the edge of the tube.

The use of plastics band 6 is not essential to the performance of the invention. It has been found advisable, in practice, to use it in order to mitigate against damage from vibration, and the effect of any sharp edges on the stress band coming into contact with the glass of the tube. Materials other than plastics, for example rubber, could be used.

Referring to FIG. 4 there is shown a pressure block 20, supported by a bolt 21 which runs in a threaded portion of a frame 22. The frame 22 is fixed by means of lugs 23 and 24 to the inside of the front panel of a television receiver, and the pressure block is shown resting on the corner of a cathode ray tube 25. Similar arrangements are provided at the other corners of the cathode ray tube face.

The embodiment described with reference to FIGS. 1, 2 and 3 and that described with reference to FIG. 4 provide arrangements for exerting pressure upon the corners of cathode ray tubes.

By tightening the nut 4 in FIG. 2 against the spring 5 it is possible to increase the tension in the stress band and hence the pressure exerted by the pressure plates, such as that shown at 7, upon the corners of the face of the cathode ray tube 1. Similarly by tightening bolt 21 shown in FIG. 4 in the frame 22 it is possible to increase the pressure exerted upon the corner of the cathode ray tube 25. By tightening the other bolts similar to 21 on the other corners it is possible to exert pressure on all of the corners of the tube 25.

Referring again to FIGS. 1, 2 and 3 attention is drawn to brackets B. These brackets have two purposes. They are used to mount the tube assembly in the cabinet and may also be used to exert additional pressure on the corners of the cathode ray tube. A bolt (not shown) projects from the cabinet through hole 8 in the bracket, and the bracket is tightened on to this bolt by means of a nut. It has already been pointed out with reference to FIG. 2 that this bracket is mounted with its bend 16 set back from the front edge of the stress band.

Thus when the nut is tightened on to the bolt passing through hole 8 the bracket tends to pivot about the bend 16, and as well as mounting the assembly it causes additional tension in the stress band 2 and additional pressure on plate 7.

It has been found possible to control the tension in the stress band and the pressure on the corners of the tube by tightening either or both of the nuts 4 and/or the nuts

on the bolts passing through holes 8 to a specific degree of torque.

By controlling this tension in the stress band the effect of a fracture in the cathode ray tube on the resultant damage occurring to the tube may be controlled to a high degree.

The tightness of the nuts can be controlled very accurately by means of a spanner which slips at a given torque.

Some examples of the results obtained from fracturing the glass of a number of cathode ray tubes with various degrees of torque on the nuts and the stress band in varying degrees of tension are shown from the following table where A and B refer respectively to the torque exerted on the nut on each of the two adjusters A, and the torque exerted on the four bolts passing through the hole 8 in each of the brackets B.

Torque in Inch-Pounds		C. R. T. Size in inches	Results
A	B		
40	40	19	O.K.
37	37	19	O.K.
33	37	19	O.K.
37	33	19	O.K.
0	40	19	O.K.
40	0	19	O.K.
37	0	19	O.K.
0	37	19	O.K.
33	33	19	Failed.

From the above table it can be seen that when the value of the torque applied to the nuts on the adjusters A, or to the nuts on the bolts passing through the brackets B was 37 inch-lbs. or more, then no implosion of any of the tubes occurred. With the torque on both the adjuster and the bracket nuts below this value then it was found that the tubes imploded.

It is clear from these results that the two methods of controlling the tension in the stress band may be used independently or together.

It was found that by varying the degree of tension in the band it was possible to exert a considerable degree of control over the time taken, after fracture, for the pressure of the vacuum in the tube to increase to atmospheric pressure.

For example with a 19 inch tube, and a torque on the nuts of 40 inch-lbs. it took three minutes for the pressure to increase to atmospheric.

The time can be increased, for example, to 7-10 minutes, or reduced to a few seconds dependent on whether the torque is increased or decreased relative to 40 inch-lbs.

The stress band used was made of steel. The plastics band 6 serves to protect the stress band and to render it less liable to damage the glass. A similar result may be obtained in this respect by coating the stress band with a layer of tough plastics material, this coating being between the stress band and the cathode-ray tube.

It has been found that whether the fracture occurs in the face of the tube or in the body or neck of the tube, the provision of a stress band of the type described renders the tube less liable to the danger of implosion.

What we claim is:

1. A cathode ray tube protection device comprising a tube having a rectangularly shaped glass faceplate, a metal stress band surrounding the entire periphery of said faceplate, pressure applying brackets mounted on said stress band at the four corners of said faceplate and means attached to said band for adjusting the tension of said band to apply the pressure of said brackets against the glass at said corners with a predetermined force sufficient to inhibit implosion of the tube.

2. The device of claim 1 including a plastic band interposed between said metal band and faceplate, and pressure plates positioned below said brackets at said four corners between said plastic band and metal band.

3. The device of claim 2 wherein said brackets and plastic band have flange portions adapted to be mounted adjacent a cabinet, said brackets being pivotable about the bend of the flange to apply further tension to said metal band and pressure against said plate and glass.

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