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(54) CATHODE-RAY TUBE WITH IMPLOSION SAFETY BAND

(71) We, PHILIPS ELECTRONIC AND ASSOCIATED INDUSTRIES LIMITED of Abacus House, 33 Gutter Lane, London, E.C.2, a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a cathode-ray tube for picture display of the kind having an implosion safety band provided around a peripheral portion of the tube, said implosion safety band consisting of a fabric-reinforced adhesive tape which comprises a layer of adhesive, and at least one clamping band arranged over said adhesive tape.

A cathode-ray tube having such an implosion safety band is disclosed in Patent Application 508/72 (Serial No. 1,359,413). The adhesive tape which is reinforced by means of a fabric, for example a glass fibre fabric, *inter alia* has the advantage of a large friction between the fabric and the glass envelope on the one hand and the fabric and the clamping band on the other hand. As stated in the said patent application, said friction is sufficiently large to prevent the sliding off of the clamping band from the slightly conical surface of the tube.

According to the invention, in a cathode-ray tube of the kind referred to at least one of the surfaces enclosing the adhesive tape on either side has a surface unevenness in which the adhesive forced out of the adhesive tape upon fitting the clamping band is received entirely or at least substantially entirely.

The invention is based on the recognition resulting from investigations that at the area where the clamping band exerts a large pressure on the adhesive tape the fabric present in said adhesive tape is compressed and the adhesive may be forced out of the adhesive tape so that at that area an excess of adhesive may be formed. Due to the presence of the fabric, it would be difficult for said excess of adhesive to find an outlet in the lateral direction. A good contact of the fabric with the surfaces present on either side thereof would thus be prevented, as a

result of which the clamping band aided by the adhesive which would then serve as a lubricant, might slide off the envelope.

It is irrelevant for the invention as such whether the surface unevenness is present on the inside of the clamping band or on the outside of the envelope, or on both. The choice of the surface to be roughened is determined by the way in which said surface unevenness can be realized with the minimum cost. This appears to be the case when simultaneously with the moulding of the display screen the required surface unevenness is also moulded in the outer surface of the upright edge of the display screen. This requires only a simple processing of the mould by giving the surface thereof the required surface unevenness by slightly hammering in those places where this is desired.

In the case of a substantially rectangular display screen, the largest pressure forces are exerted by the clamping band on the corners of the upright edge of the display screen. Therefore, according to the invention a surface unevenness is preferably provided on the corners of the said upright edge.

The extent of surface unevenness depends upon the quantity of adhesive present in the adhesive tape per surface unit. When an average thickness is considered of the layer of adhesive present in the adhesive tape, the extent of the surface unevenness must be such that the adhesive forced out of said adhesive tape during providing the clamping band around the envelope is entirely or substantially entirely received by said surface unevenness. According to the invention this can be realized if the surface unevenness corresponds to an average roughness value which is equal to at least half the thickness of the layer of adhesive.

The maximum extent of the surface unevenness is determined by the way in which it is provided in the upright edge of the display screen. When the said unevenness is moulded in the upright edge, a certain value thereof should not be exceeded since otherwise the display screen can no longer be detached from the mould. The conditions with respect to minimum and maximum surface

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unevenness can be satisfied, if the surface unevenness corresponds to an average roughness value of 50 μm to 500 μm .

The adhesive in the fabric-reinforced adhesive tape may consist of a synthetic material which softens at low temperature, for example, a rubber-containing synthetic material or a synthetic material which softens at high temperatures, for example, an acrylate-containing synthetic material. In a cathode-ray tube according to the invention the clamping band may be tightened around the envelope both in the cold condition and by means of a shrinkage process. In this latter method the clamping band is first heated to a temperature of 400 to 450°C and then slid around the upright edge of the display screen. Upon cooling of the clamping band, shrinkage forces arise which, after cooling, provide the required stress in the clamping band.

Because in a cathode-ray tube according to the invention, the choice with respect to the viscosity of the adhesive present in the adhesive tape hardly plays a part, an economic advantage may be obtained with respect to the cost-price of such an adhesive tape in addition to the advantages already mentioned.

The invention will be described in greater detail with reference to a drawing, in which Figure 1 is a cross-sectional view of a surface unevenness on a considerably exaggerated scale.

Figure 2 is a cross-sectional view of a fabric-reinforced adhesive tape, and

Figure 3 is a cross-sectional view of a part of a cathode-ray tube according to the invention.

In the cross-sectional view of the surface shown in Figure 1, the centre line 1 having the roughness profile 2 encloses surfaces 3 the overall area of which on one side of the line 1 is equal to the overall area of the other side of the line 1. The value of the average roughness R_a is equal to the average distance a of the roughness profile 2 to the centre line 1 related on the base length L between the points A and B. So

$$R_a = \frac{a_1 + a_2 + a_3 \dots + a_n}{n} = \frac{1}{L} \int_{x=0}^{x=L} |a_1| dx.$$

In the spaces present between the effective profile 2 and the reference profile 4 the excessive adhesive 5 forced out of the adhesive tape by the clamping band is fully received (clamping band and adhesive tape are not shown for clarity).

In Figure 2, the adhesive tape consists of a non-hardened adhesive 10 and a glass fibre fabric 11. As shown in Figure 3, this tape is provided around the edge 12 of the

display screen 14 which is covered on the inside with a phosphor screen 13. At the corners of the upright edge 12 the surface has a surface unevenness 15 in which the adhesive 17 forced out of the adhesive tape 9 by the clamping band 16 is accommodated. The average roughness value of the surface unevenness 15 is 100 μm and is equal to half the thickness of the adhesive tape 9 which has a width of 19 mm. Since the excess of adhesive which mainly consists of acrylate resin is fully received by the surface unevenness 15, the glass fibre fabric 11 readily contacts both the clamping band 16 and the glass surface 18. The large friction between the clamping band and the glass fibre now fully prevents the clamping band from sliding off the tube.

WHAT WE CLAIM IS:—

1. A cathode-ray tube for picture display having an implosion safety band provided around a peripheral portion of the tube, said implosion safety band consisting of a fabric-reinforced adhesive tape which comprises a layer of adhesive and at least one clamping band arranged over said adhesive tape, characterized in that at least one of the surfaces enclosing the adhesive tape on either side has a surface unevenness in which the adhesive forced out of the adhesive tape upon fitting the clamping band is received entirely or at least substantially entirely.
2. A cathode-ray tube as claimed in Claim 1, characterized in that the surface unevenness is present on the outer surface of the upright edge of the display screen.
3. A cathode-ray tube as claimed in Claim 2 comprising a mainly rectangular display screen, characterized in that the surface unevenness is present at the corners of the upright edge of the display screen.
4. A cathode-ray tube as claimed in Claim 1, 2 or 3, characterized in that a surface unevenness is present corresponding to an average roughness value which is equal to at least half the thickness of the layer of adhesive.
5. A cathode-ray tube as claimed in Claim 4, characterized in that a surface unevenness is present corresponding to an average roughness value of 50 μm to 500 μm .
6. A cathode-ray tube of the kind referred to, substantially as herein described with reference to the accompanying drawing.

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3. A cathode-ray tube as claimed in Claim 2 comprising a mainly rectangular display screen, characterized in that the surface unevenness is present at the corners of the upright edge of the display screen.

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