Sept. 20, 1971 W. F. NIENHUIS ET AL 3,605,227

METHOD OF MANUFACTURING AN IMPLOSION-FREE DISPLAY TUBE

Original Filed Sept. 15, 1967

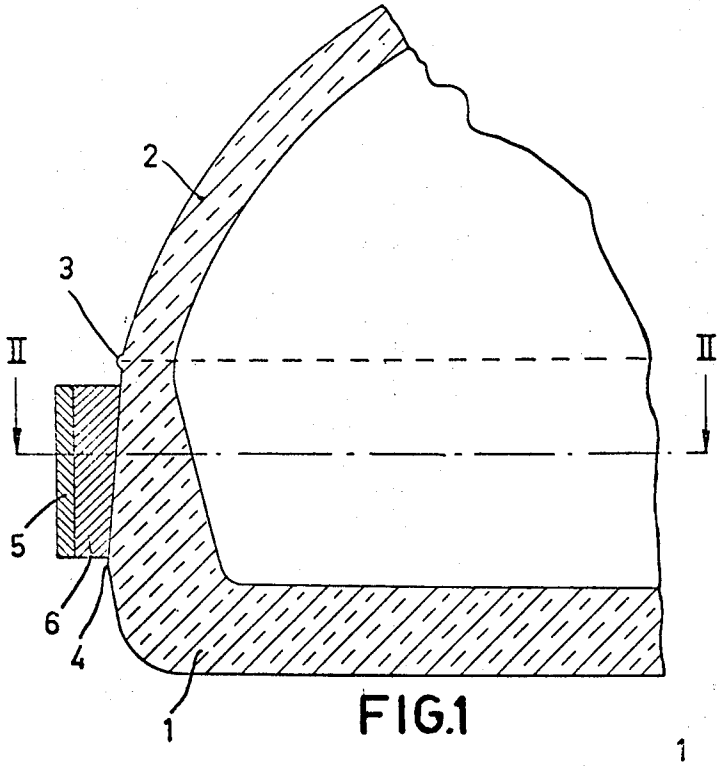


FIG.1

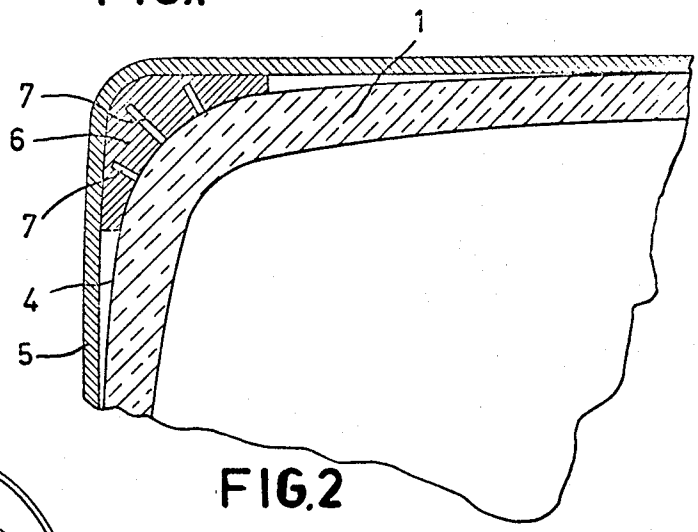


FIG.2

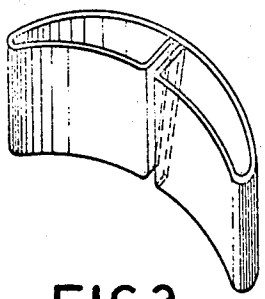


FIG.3

INVENTORS
WILLEM F. NIENHUIS
GEORG A.W.J. SPANHOFF
KLAUS BOKE
BY Frank R. Trifari
AGENT

United States Patent Office 3,605,227
Patented Sept. 20, 1971

3,605,227

METHOD OF MANUFACTURING AN IMPLOSION-FREE DISPLAY TUBE

Willem Fokko Nienhuis, Georg Arnold Spanhoff, and Jacob Willem, Emmasingel, Eindhoven, Netherlands, and Klaus Böke, Brand am Haag, Germany, assignors to U.S. Philips Corporation, New York, N.Y.

Original application Sept. 15, 1967, Ser. No. 668,066. Divided and this application May 19, 1969, Ser. No. 850,275

Int. Cl. H01j 9/18

U.S. Cl. 29—25.13 3 Claims

ABSTRACT OF THE DISCLOSURE

A method of making an implosion-free display tube by fitting an annular clamping strap around the outer periphery of the bulb. The strap has an inner periphery equal to or greater than that of the bulb. By pressing wedge-shaped spacing members in the corners between the strap and the bulb to stretch the strap, uniform tensile stresses are provided within the strap. Securing the members and straps to the bulb by means of an adhesive completes the process. Other spacing members may be used to stretch the strap in the flat sections of the tube.

This is a division of application Ser. No. 668,066, filed Sept. 15, 1967 and now abandoned.

The invention relates to a method of providing a clamping strap around a television display tube having a substantially rectangular screen, and more particularly to a method in which the strap can be stretched uniformly in a very simple manner.

Known clamping straps are generally stretched by tightening bolts or clamps. It is then inevitable that the strap, when stretched, slides over the glass with a certain amount of friction especially at the corners. It has been found that this results in a very uneven distribution of the tensile force in the strap along its periphery. In a strap having one welding joint, the tensile force in the part of the strap opposite this joint is found to be considerably lower than the tensile force at the said joint. However, when the ends of the strap are fixed by clamping and bending over, the tensile force in the strap is found to decrease strongly at the joint, so that ultimately the tensile force in the strap, though more uniformly distributed along the periphery, is considerably lower than the tensile force adjusted. Moreover, when steel straps are used, sliding of the strap over the glass may involve the risk of scratching the glass. After some time, such scratches may give rise to the formation of cracks through which air may leak into the tube so that the tube become unserviceable. Such straps of hardened steel or high-grade steel must be used if a comparatively narrow clamping strap is employed, for example, if this strap must be located entirely between the mold match line and the sealing seam of the window.

A simple method of uniformly stretching such a clamping strap, in which the said disadvantages are avoided, is obtained if, according to the invention, an annular strap having an inner periphery approximately equal to or larger than the outer periphery of the bulb around which the strap will be arranged, is provided around the bulb, whereupon wedge-shaped parts and, as the case may be, spacing blocks are pressed between the bulb and the strap so that the required tensile force in the strap is obtained, while steps are taken by which the strap and wedge-shaped parts are fixed to the glass. This may be achieved by roughening the surface of the strap and/or the wedges and/or the glass at the corners, but preferably by fixing the strap and the wedge-shaped parts to the glass by means of an adhesive, such as a cement, a hardening synthetic

resin and the like, which may be cast, for example, into the spaces between the said parts and the glass, for it has been found necessary to ensure that the strap and/or the wedges cannot be detached from the bulb by shocks and the like.

The wedge-shaped parts preferably consist of a metal which is softer than the glass of the bulb so that there is no risk of the glass being scratched. On the other hand, the material of the wedge-shaped parts is not allowed to be deformed strongly by the large tensile force. Very suitable materials are unhardened steel and aluminum alloys. If desired, use may be made of a hard synthetic resin which may be reinforced by a suitable material or even of a hard kind of wood.

The wedge-shaped parts are preferably arranged at the center of the straight sides or are distributed uniformly over these straight sides, since the force required for inserting the wedges to obtain a given tensile force in the strap may be comparatively small. Moreover, an additional pressure is then exerted on the glass along these straight sides, which has a favorable influence on the reinforcement of the glass surface of these flat sides located between mold match line and the front of the window. In order to obtain a satisfactory engagement of the strap at the corners, spacing blocks may be provided at the corners between the strap and the glass surface.

When the wedge-shaped parts are provided at the center of the straight sides, the additional advantage is obtained that at this area the strap is spaced from the glass by a larger distance, which facilitates the casting of adhesive and filler materials. In order to prevent these materials from leaking out on the other side of the strap, a sealing layer, for example, consisting of acryl lacquer, plexigum lacquer or cellulose-acetate lacquer may be applied to this side, which lacquer layer is preferably transparent and shock-proof so that it at the same time protects the glass surface from damage by shocks. For this purpose, the lacquer layer may extend up to the front surface of the window.

The angle between the pressure surfaces of the wedge-shaped parts is chosen to be larger than that between the clamping strap and the glass surface, so that the angle between the wedges and the compressed state corresponds to that between the strap and the glass.

The wedge-shaped parts and spacing blocks may be manufactured by casting or injection-molding, but they may also be folded from sheet material. In the latter case, they may be slightly elastic so that they satisfactorily match the shape of the bulb wall, which is of importance especially for the parts to be located at the corners. The wedge-shaped parts obtained by casting may be provided with incisions. Alternatively, a number of narrow wedges may be arranged closely adjacent each other.

The invention will now be described more fully with reference to the drawing, in which:

FIG. 1 is a sectional view of an angular point of the window of a display tube taken on the axis of the tube, and

FIG. 2 is a cross-sectional view taken on the line II—II of FIG. 1.

FIG. 3 is a sectional view of a wedge-shaped body folded out of sheet material and to be placed at a corner.

In the drawing, reference numeral 1 denotes the glass window of a display tube which is sealed at 3 to a glass cone 2.

The area at which the two parts of the mold in which the window 1 has been molded engage one another is referred to as the mold match line 4. An annular steel strap 5, of which the inner periphery is approximately equal to or larger than the outer periphery of the window at the mold match line 4, is arranged around the cone 2

at an area at which the periphery of the cone **2** is so much smaller than the inner periphery of the strap that the wedge-shaped parts **6**, which in this case are provided at the corners, can be slipped between the bulb and the strap without the strap being tautly stretched, if the wedges **6** already occupy the correct positions with respect to the strap **5**. Subsequently, the wedges **6** and hence also the strap **5** are pressed over the bulb surface in the direction of the picture surface until the desired position of the strap on the bulb has been attained, the strap being stretched in the desired manner due to the larger cross-section of the bulb at this area. Thus, the wedges **6** need not slide over the inner surface of the strap. The strap **5** may be made of unhardened steel and the tensile force may be so large that the limit of flow of the material of the strap is exceeded. The tensile force then always has approximately the same value independently of the tolerances of the bulb or the wedge-shaped parts of the periphery of the strap. Only the width of the strap still influences the tensile force, but the tolerances of the width of the strap may be small.

The wedge-shaped parts may taper at one end or at both ends, while gaps **7** may be provided in order to render these wedge-shaped parts slightly elastic so that they more satisfactorily engage the glass wall of the bulb. In order to prevent the strap and/or the wedges from being detached, these parts must be fixed to the glass by means of an adhesive preferably consisting of a suitable hardening substance. For this purpose, the adhesive may be cast into the gap between the strap and the bulb. The strap may have one or more indentures on the straight sides which bear on the glass and space the strap at those areas by a certain distance from the glass, which facilitates the casting process.

The wedge-shaped part of FIG. 3 is folded out of sheet material. The spacing blocks disposed at the corners or the wedge-shaped parts may also be provided with securing lugs (not shown). However, these lugs may also be secured to the strap **5** or be clamped between the strap and the wedges.

The strap **5** and the wedges **6** are preferably not arranged until the tube has otherwise been completely finished so that the strap ought not to be strongly heated.

For this could result in a decrease of the tensile stress. Due to the fact that the strap is not stretched by tightening two ends and need not slide over the glass in its longitudinal direction, the tensile force is uniformly distributed along the periphery of the strap and the strap exerts a pressure on the glass which is substantially symmetrically distributed along the periphery of the bulb.

What is claimed is:

1. A method of providing a clamping strap around the bulb of a television display tube having a substantially rectangular display screen comprising fitting an annular strap over the outer peripheral flat surface part of said bulb between the mold match line and the front window, the inner periphery of said strap being substantially equal to or larger than the outer periphery of said bulb, pressing wedge-shaped spacing members between said bulb and said strap to obtain a predetermined uniform tensile stress within said strap, and fastening said strap and said spacing blocks to said bulb with adhesive material.

2. A method as claimed in claim **1** wherein pressing wedge-shaped spacing blocks comprises disposing spacing blocks on the straight sides of said strap.

3. A method as claimed in claim **1** wherein fitting an annular strap comprises providing said strap around a part of said bulb having a smaller periphery than the area to be covered by said strap and pressing wedge-shaped spacing blocks comprises slipping said spacing blocks between said bulb and said strap and pressing said strap and said spacing blocks thereby stretching said strap.

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JOHN F. CAMPBELL, Primary Examiner

R. B. LAZARUS, Assistant Examiner

US. Cl. X.R.

220—201A

PO-1050
(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,605,227 Dated September 20, 1971

Inventor(s) WILLEM FOKKO NIENHUIS, GEORG ARNOLD WILLEM JACOB SPANHOFF, AND KLAUS BOKE

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, lines 4 and 5, change "Georg Arnold Spanhoff, and Jacob Willem," to --Georg Arnold Willem Jacob Spanhoff--.

Signed and sealed this 18th day of January 1972.

SEAL)
.ttest:

EDWARD M.FLETCHER,JR.
.ttesting Officer

ROBERT GOTTSCHALK
Acting Commissioner of Patents