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(54) Filter glass for cathode ray tubes.

(57) A filter glass for filtering out harful ultraviolet rays from the pictures or figures displayed by cathode ray tubes. The filter glass comprises a laminate of two transparent, arcuate sheet glasses provided with an ultraviolet ray absorbent therebetween. The arcuate sheet glasses are formed to have a curvature conforming to the curvature of the screen face of the cathode ray tube for which the filter glass is to be used. The surface of the laminate facing the viewer is treated to provide a matted surface that does not reflect an image.

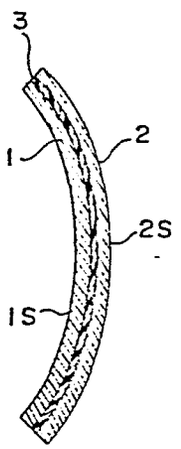

FIG.2

EP 0 125 356 A1

TITLE OF THE INVENTION

Filter Glass for Cathode Ray Tubes

BACKGROUND OF THE INVENTION

All visual display devices using a cathode ray tube, or CRT, including televisions, TV games and monitors for business machines, generate ultraviolet rays which are harmful to human eyes.

Since ultraviolet rays are invisible, people tend to ignore or disregard their harmful effects when watching TV, playing TV games or working with CRT monitors in business machines.

This invention provides a new filter glass to be placed in front of a CRT screen for filtering out the ultraviolet rays generated by the visual display device without at the same time changing the shape and color of the picture.

DESCRIPTION OF PRIOR ART

A conventionally known filter glass for CRTs (shown in Fig. 1) comprises a laminate of two transparent planar sheet glass 10 having a layer of heat-reflective, translucent metallic oxide formed therebetween. Such a filter glass for CRTs, when placed in front of a CRT screen 11, filters out

infrared rays and glare from the picture, but does not filter out ultraviolet rays. Furthermore, the planar sheet glass construction tends to distort the peripheral part of the picture. The glass surfce also tends to reflect objects in the viewing room which interfere with the viewing of the picture.

BRIEF DESCRIPTION OF THE INVENTION

In view of the afore-mentioned problems with conventional filter glasses for CRTs, this invention offers a new filter glass for CRTs, capable of filtering out harmful ultraviolet rays without distorting the displayed picture and without reflection. The filter glass of this invention is composed of a laminate of two transparent, arcuate glass sheets having an ultraviolet ray absorbent disposed therebetween, the arcuate glass sheets having a curvature conforming to the curvature of the face of the CRT screen. The surface of the laminate facing the viewer is treated to provide a matted surface that does not reflect.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic, cross sectional view of a prior art filter glass for CRTs, showing its construction and relationship to the TV screen.

Fig. 2 is a cross sectional view of a first embodiment of the CRT filter glass of this invention.

Fig. 3 is a fragmental, enlarged cross sectional view of the filter glass of this invention, showing the detail of the matted surface.

Fig. 4 is a schematic corss sectional view of the first embodiment of this invention as shown in Fig. 2, showing its relationship to the CRT screen.

Fig. 5 is a schematic, cross sectional view of a second embodiment of the first glass of this invention.

DETAILED DESCRIPTION OF THE INVENTION

This invention relates to a filter glass to be placed in front of a visual display device, or CRT, having an arcuate screen surface.

As shown in Fig. 2, a first embodiment of the filter glass of this invention compirses a first glass sheet 1, second glass sheet 2, both of which are transparent, arcuate, sheet glass having a curvature conforming to the curvature of the CRT screen for which the filter glass is to be used. The glass sheets are bonded by an adhesive layer 3 to form a laminate, adhesive layer 3 comprising an adhesive compound and an ultraviolet ray absorbent.

Each of first glass sheet 1 and second glass sheet 2 has a thickness of 2 to 3 mm. They are transparent, rectangular sheet glass which have been hot-pressed into an arcuate shape. The curvature of the laminate conforms to the curvature of the CRT screen so that when placed 1-5 mm in front of the CRT, a uniform gap G is maintained between the screen surface of the CRT and the concaved, inner surface 1S of the filter glass, as shown in Fig. 4.

In order to eliminate the reflective characteristics of the glass surface, the convex outer surface 2S of the laminate is treated to provide a matted surface by such process as dipping in hydrofluoric acid, sand blasting, or by depositing crystals of silicon oxide over the glass surface so as to form a surface having irregularly formed projections or depressions within the range of 3 to 6 um from the surface, as shown in Fig. 3.

In the first embodiment, the adhesive layer 3 is composed of a mixture of an adhesive compound and an ultraviolet ray absorbent. The adhesive compound can be polyvinylbutyral,one part or two part type epoxy resin based adhesive. A particular suitable

adhesive is two part type epoxy resin based adhesive such as Shell Chemical's Epikote 828. Ultraviolet rays have a wavelength of less than 4000 Å. The ultraviolet ray absorbents useful is this invention should have the capability of absorbing light rays having wavelengths within the range of 3000 to 4000 Å, particularly at 3530 Å. Suitable ultraviolet ray absorbents include 2(2'-hydroxy-3' 5' di-tertbutylphenyl) benzotriazole (hydroxyphenyl benzoltriazole), 2-hydroxy-4-methoxybenzophenone, ethyl-2-cyano-3-phenylcinnamate and phenyl salicylate, with hydroxyphenyl benzotriazole and dihydroxybenzophenone being prefered. The mixture comprises about 98.0 to 99.5 parts by weight of the adhesive and about 0.5-2.0 parts by weight of the ultraviolet ray absorbent. If a colored adhesive mixture is desired, 0.5-1.5 parts by weight of a coloring agent may be included therein. The coloring agent may be selected from Ciba-Geigy Microlity-T Colours. The mixture is evenly applied to the surface of either first glass sheet 1 or second glass sheet 2 to bond them together. The best result is obtained when adhesive layer 3 has a thickness of 0.35 to 0.40 mm, preferably 0.38 mm.

The filter glass may be colored by selecting a colored glass or a colored adhesive. Either light brown or light gray is preferable. When a colored glass is used, a clear adhesive compound is used. When a clear glass is used, a colored adhesive compound is used accordingly. Of course, if a clear filter glass is desired, clear glass and clear adhesive have to be used.

As a second embodiment, the adhesive compound and the ultraviolet ray absorbent are applied separately as shown in Fig. 5. In this embodiment, first glass sheet 1 and second glass sheet 2 are prepared in the same way as the first embodiment. Before laminating first glass sheet 1 and second glass sheet 2, a layer of 2000 Å - 3000 Å thick ultraviolet ray abosrbent film 31 is formed on the surface on the concave side of second glass sheet 2. The ultraviolet ray absorbent film 31 is formed by spraying a solution comprising a solvent and an ultraviolet ray absorbent selected from the group of the compounds as previously described with respect to the first embodiment. The solvent may be toluene, benzene, acetone or ethanol and the solution may be a saturated solution of the selected compound.

Then a layer of approximately 0.38 mm thick adhesive compound 32 is despoited on top of the layer of ultraviolet ray absorbent film to bond second glass sheet 2 onto the convex side of first glass sheet 1 to form a laminate. The convex side 2S of second glass sheet 2 is matted as in the case of the first embodiment.

To further assure the non-reflective characteristics of the CRT picture filter glass of this invention, the concave surface 1S of first glass sheet 1 may also be matted in the same way as the convex surface 2S of second glass sheet 2.

The following examples further illustrate the present invention. However, such examples should not be constructed as limiting on the scope of the present invention.

Example 1

A laminate of two arcuate glass sheets was made according to the first embodiment as described above, without either glass surface being matted. First glass sheet 1 and second glass sheet 2 were both transparent, clear glass and the adhesive composition was colored. The adhesive composition comprised 96.6 parts by weight Shell Chemical's Epikote 828 as the adhesive compound, 1.9 parts by weight hydroxyphenyl benezotriazole as the ultraviolet ray absorbent, and 1.5 parts by weight the mixture of CIBA-GEIGY Microlith Yellow and Microlith Red as the coloring agent. The adhesive composition was applied at a thickness of 0.38 mm. The laminate was placed in front of a television set to measure the flow through rate of ultraviolet rays and the reflection. The following results were obtained.

ultraviolet ray (wave length: 360 mm -380 mm):
0.6% of the value obtained without using the filter

reflection: 7.8%

Example 2.

The convex surface of the laminate of Example 1 was matted. Reflection was completely eliminated.

Example 3.

A laminate according to the second embodiment was prepared, with both of first and second glassed being colored and the adhesive compound clear. The adhesive composition comprised 98 parts by weight Shell Chemicals Epikote 828 as the adhesive compound and 2 parts by weight hydroxyphenylbenzotrizole as the ultraviolet ray absorbent. Neither side of the laminate was matted. The test results were as follows:

ultraviolet ray measured: 0.7% of the value obtained without using the filter.

reflection: 6.6%

Example 4.

The convex surface of the laminate of Example 3 was matted as described above. Reflection was completely eliminated.

I claim:

1. A filter glass for use with a cathode ray tube having an arcuated screen surface, comprising a laminate of a first transparent glass sheet, a second transparent glass sheet and disposed between said glass sheets a layer of a composition comprising 98 to 99.5 parts by weight of an adhesive compound and 0.5 to 2.0 parts by weight of an ultraviolet ray absorbent, said laminate being arcuated to conform with the arcuate screen surface of the cathode ray tube.

2. The filter glass of claim 1 wherein the adhesive compound is selected from the group consisting of polyvinylbutyral, one part type exposy based adhesive and two part type exposy based adhesive and the ultraviolet ray absorbent is selected from the group consisting of 2(2'-hydroxy-3', 5'-ditert-butylphenyl) benzotriazole, 2,2'-dihydroxy-4-methoxybenzolphenone 2-hydroxy-4-methoxybenzophenone, ethyl-e-cyano-3-phenylcinnamate and phenyl salidcyicate.

3. The filter glass of claim 1 wherein the composition has a thickness of 0.35 to 0.40 mm and each of the first and second glass sheets has a thickness of 2.0 to 3.0 mm.

4. The filter glass of claim 1 wherein the adhesive compound has a thickness of 0.35 to 0.40 mm and the ultraviolet absorbent has a thickness of 2000 to 3000 Å.

5. The filter glass of claim 1 wherein the first and second glass sheets are colored and the adhesive composition clear.

6. The filter glass of claim 1 wherein the first and second glass sheets are clear and the adhesive composition colored.

7. The filter glass of claim 5 wherein the first and second glass sheets are brown or gray.

8. The filter glass of claim 1 wherein the outer surface of second glass sheet which is furthest from the cathode ray tube screen has a matted finish.

AMENDED CLAIMS

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I claim:

1. A filter glass for use with a cathode ray tube having an arcuated screen surface, comprising a laminate of a first transparent glass sheet, a second transparent glass sheet and disposed between said glass sheets a layer of a composition comprising 98 to 99.5 parts by weight of an adhesive compound and 0.5 to 2.0 parts by weight of an ultraviolet ray absorbent, said laminate being arcuated to conform with the arcuate screen surface of the cathode ray tube.

2. The filter glass of claim 1 wherein the adhesive compound is selected from the group consisting of polyvinylbutyral; one part type exposy based adhesive and two part type exposy based adhesive and the ultraviolet ray absorbent is selected from the group consisting of 2(2'-hydroxy-3', 5'-di-tert-butylphenyl) benzotriazole, 2,2'-dihydroxy-4-methoxybenzolphenone, 2-hydroxy-4-methoxybenzophenone, ethyl-2-cyano-3-phenylcinnamate and phenyl salidcyicate.

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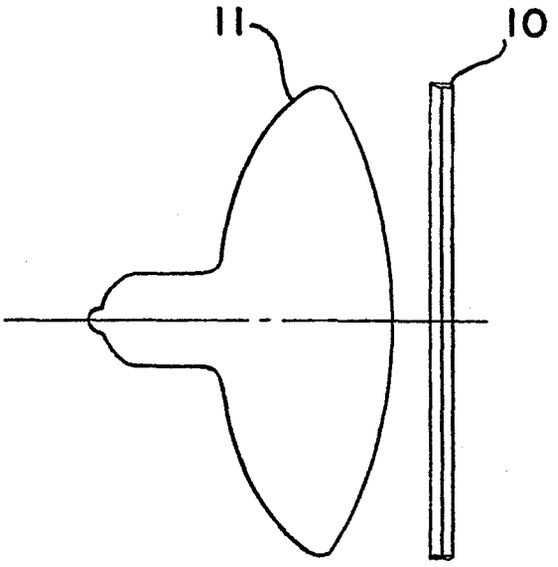

FIG.1 PRIOR ART

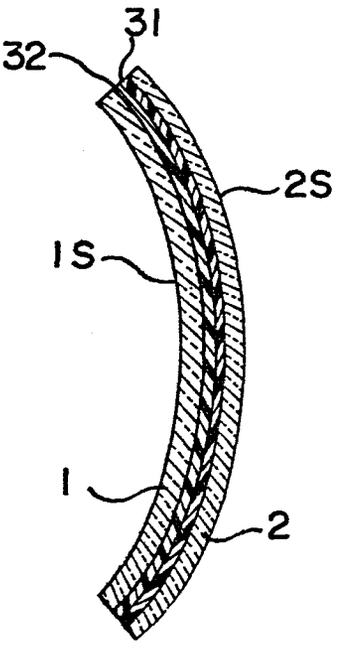

FIG.5

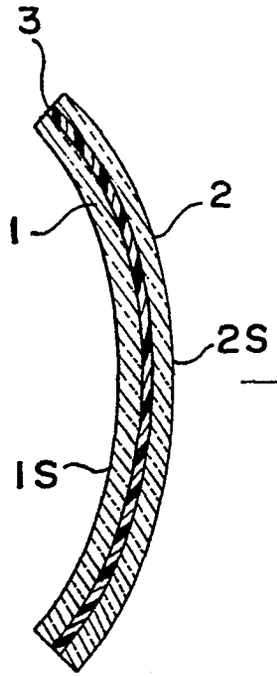

FIG.2

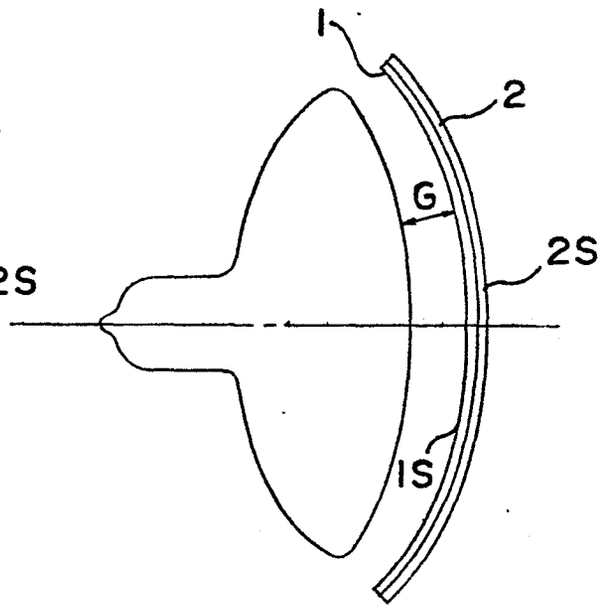

FIG.4

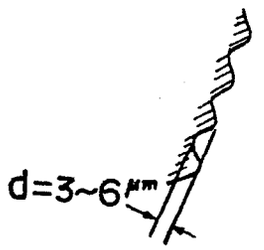

FIG.3

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EUROPEAN SEARCH REPORT

Application number

EP 83 30 2667

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int Cl. ³)
A	US-A-2 734 142 (R.B. BARNES) * Column 2, line 66 - column 3, line 2; column 4, lines 5-18, 45-69; figures 1,2 *	1,2,5,7	H 01 J 29/89
A	US-A-4 354 739 (R.T. SCANLON et al.) * Column 1, lines 9-25, 48-55; column 6, lines 35-61; figures 3,4 *	1,2	
A	US-A-2 943 964 (M. GOLDENBERG) * Column 1, line 46 - column 2, line 34; figure 2 *	1,5	
A	US-A-4 039 719 (T. MATSUDA et al.) * Column 1, lines 8-23; column 5, lines 1-25 *	1,2	TECHNICAL FIELDS SEARCHED (Int. Cl. ³) H 01 J 29/00 G 02 B 5/00 B 32 B 17/00
A	US-A-4 034 895 (S. LOSHAEK) * Column 3, lines 10-32 *	2	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	11-01-1984	DAGLISH B.D.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
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