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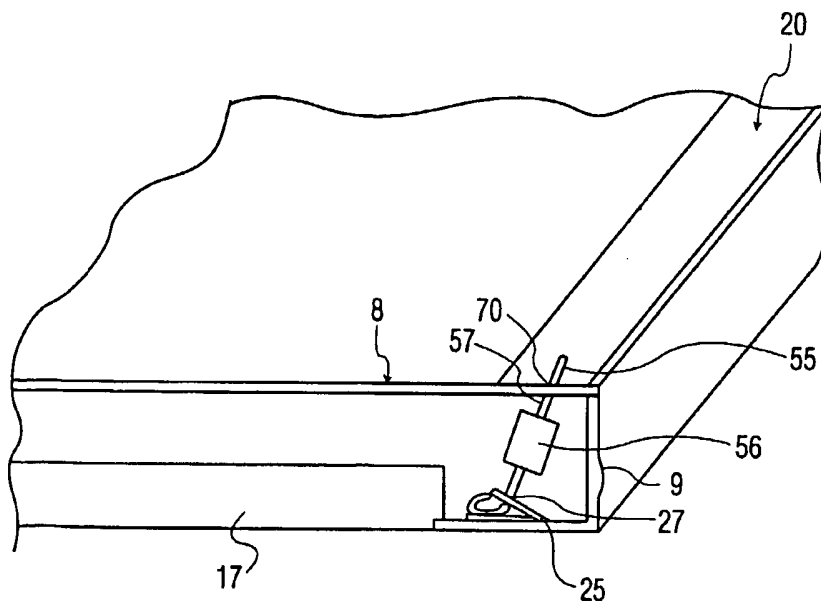
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(54) Title: DAMPER FOR A CATHODE-RAY TUBE (CRT) TENSION MASK



(57) Abstract: A tension mask/frame assembly for a cathode-ray tube (CRT) is disclosed. The tension mask/frame assembly includes at least one vibration damper disposed between and contacting both the mask and the frame. The at least one vibration damper includes a member with one or more mass attached thereto.

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DAMPER FOR A CATHODE-RAY TUBE (CRT) TENSION MASK

CROSS-REFERENCE TO RELATED APPLICATIONS

5 This application claims the benefit of U. S. Provisional Patent Application Serial No. 60/619,194 (Atty Docket PU040283), entitled "VIBRATION DAMPING SYSTEM FOR UNIAXIAL TENSION MASKS" and filed October 15, 2004, and U. S. Provisional Patent Application Serial No. 60/640,951 (Atty Docket PU040363), entitled "ASYMMETRIC DAMPER FOR A CATHODE RAY TUBE (CRT) TENSION
10 MASK" and filed December 31, 2004, which are incorporated by reference herein in their entirety.

BACKGROUND OF THE INVENTION

1. Field of the Invention

15 The present invention relates to a color selection mask structure for color cathode-ray tubes (CRTs). The invention finds its application in any type of tube comprising a color selection mask and is more particularly adapted to a tube having a
20 mask therein held under tension by a frame to which it is secured.

2. Description of the Background Art

25 Conventional cathode-ray tubes include a color selection mask situated a precise distance from the inside of the glass front face of the tube, on which front face are deposited grids of red, green and blue luminophores so as to form a screen. An electron gun disposed inside the tube, in its rear part, generates three electron beams directed toward the front face. An electromagnetic deflection device, generally
30 disposed outside the tube and close to the electron gun, has the function of deviating the electron beams so as to make them scan the surface of the panel on which the grids of luminophores are disposed. Under the influence of three electron beams each corresponding to a specified primary color, the grids of luminophores allow the reproduction of images on the screen, the mask enabling each specified beam to illuminate only the luminophore of the corresponding color.

The color selection mask must be disposed and held during the operation of the tube in a precise position inside the tube. The mask holding functions are carried out by virtue of a generally rectangular metal frame to which the mask may be conventionally welded. The frame/mask assembly is mounted in the front face of the tube by virtue of suspension means which are typically welded to the frame and cooperate with pegs inserted into the glass constituting the front face of the tube.

Recently, the trend is to produce tubes having flatter front faces, with a tendency towards totally flat front faces. To make tubes including a flat front face requires the use of a flat mask held under tension in at least one direction.

Since the color selection mask consists of a metal foil of very small thickness, its tensioning can give rise to unwanted phenomenon of setting the mask into vibration while the tube is operating. Under the influence of shock or outside mechanical vibrations, for example acoustic vibrations due to the loudspeakers of the television set into which the tube is inserted, the mask can start to vibrate at its natural resonant frequency. The vibrations of the mask consequently modify the zone of landing of the electron beams on the screen of the tube. The points of impact of each beam are then shifted with respect to the associated luminophore grid, thus creating a decoloration of the image reproduced on the screen.

The color selection mask typically has either of two structures. In one mask structure, the vertical strands are connected together in many places with "tiebars", which are part of an etched metallic mask. For such a structure, strand vibrations are connected together from strand to strand. To extract vibrations from the mask, vibration dampers are typically placed on the mask in the vertical direction near the 3 and 9 o'clock positions where the strand motion for the fundamental frequency is large.

For the other mask structure, the vertical strands are connected to a border without "tiebars", so the mask elements vibrate individually. To extract vibrations from this mask, one or more wires are positioned perpendicular to the vertical strands. The wires rub against the strands when they vibrate, removing vibrational energy from the mask.

Thus, a need exists for a vibration damper for that works effectively for mask structures including "tiebars" as well as those in which the vertical strands are connected to a border without "tiebars".

SUMMARY OF THE INVENTION

The present invention relates to a tension mask/frame assembly for a cathode-ray tube (CRT). The tension mask/frame assembly includes at least one vibration damper disposed between and contacting both the mask and the frame. The at least one vibration damper includes a member with one or more mass attached thereto.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in greater detail, with relation to the accompanying drawings, in which

FIG. 1 represents a cathode ray tube according to the invention, seen partially cut away;

FIG. 2 illustrates one embodiment of the at least one vibration damper of the present invention; and

FIGS. 3A-D illustrate other embodiments of the at least one vibration damper of the present invention.

DETAILED DESCRIPTION

As illustrated by FIG. 1, a cathode-ray tube 1 according to the invention comprises a substantially flat faceplate 2 and a peripheral skirt 3. The faceplate 2 is connected to the rear part of the tube 1, having a shape of a funnel 4, by virtue of a sintered glass seal (not shown). The end part 5 of the tube 1 surrounds an electron gun 6 which emits electron beams that illuminate a luminescent screen 13 through a color selection mask 8. The color selection mask 8 is flat, for example, stretched between long sides 9 of a frame 19. Metal supports of the mask/frame assembly hold this assembly inside the tube 1. The supports include a part 10 attached to the frame 19 and a part forming a spring 11, having an aperture for cooperating with a connector 12 incorporated within the glass skirt 3.

Cathode-ray tubes using tensioned color selection masks 8 have to cope with the problem of the vibration of such mask, in modes which are natural thereto, when the mask is excited by outside vibrations, such as, for example, mechanical shocks on the tube or sound vibrations originating from loudspeakers disposed in proximity to

the tube. Since these vibrations are manifested by movements of the mask in a direction perpendicular to its surface, the distance between the apertures of the mask and the screen varies locally as a function of the amplitude of the vibration of the mask. The purity of the colors reproduced on the screen is then no longer
5 guaranteed, the points of touchdown of the beams on the screen being shifted as a function of the amplitude of the vibration.

Moreover, since the mask is disposed inside the tube within which a high vacuum prevails, the vibrations of the mask are very slowly damped, the energy communicated to the mask having few means of dissipation, thus increasing the
10 visibility of the visibility of the color purity degradation on the screen when the tube is operating.

Fig. 2 illustrates one embodiment of the present invention for damping the vibrations of a tensioned mask 8 of a color cathode-ray tube. On a peripheral part 20 of the tensioned mask 8, for example, along the horizontal long sides, is disposed at
15 least one damping device 55 of the present invention. The damping device 55 includes a stiff member 57 with one or more mass 56 attached thereto.

Referring to FIG. 2, in one embodiment, the damping device 55 may be formed of rod 57 having a single mass 56, made for example, from metal, attached thereto. The mass 56 may be attached to the rod 57 by for example, welding. The
20 mass 56 and the rod 57 may be formed of any material compatible with the temperatures used to manufacture the color cathode-ray tube. In addition, although a rod is shown, the member may have any other suitable shape, or form. The mass 56 may also have any shape, such as for example conical, round, or square, among others.

The at least one vibration damper 55 is disposed between and contacts both the mask 8 and the frame 9. Each of the at least one vibration dampers 55 contacts the mask 8 through holes 70 formed in the peripheral portion 20 of the mask 8 along the horizontal long sides thereof. One side of the member 57 is inserted through the hole 70 thereby contacting at least in part the mask 8. The other end of the member
30 57 contacts the mask frame via a v-shaped plate 25. The v-shaped plate has a hole 27 therethrough through which the member is inserted and then bent in such a manner that it can not fall out easily or move in the z-direction.

The friction with which the vibration damper 55 contacts the mask 8 for removing vibrations therefrom depends on the weight of the mass 56, and may be

easily increased or decreased by increasing or decreasing the weight of the mass 56 attached to the member 57. The frictional force required to remove the vibrations from the mask are dependent upon the stiffness of the mask and the weight required should preferably be modeled.

5 The vibration damper 55 should preferably be inserted through the mask 8 at an angle with respect to the mask plane, which provides the optimal vibration damping on the vertically tensioned mask. For example, orienting the vibration damper 55 at an angle of 45 degrees with respect to the mask plane would equally dampen x and z motion on a vertically tensioned mask.

10 The one or more vibration dampers 55 may be equally spaced along the horizontal long sides of the mask 8. Alternatively, the distance between adjacent vibration dampers 55 along the horizontal long sides of the mask 8 may be different.

FIGS. 3A-3D depict several illustrative embodiments for the one or more vibration dampers 55 of the present invention. FIGS. 3A-3D show the mass including
15 two or more portions 56A, 56B, 56C. The portions shown in FIGS. 3A-3D may have any shape such as for example, conical round, or square, among others may be used. Additionally, the two or more portions may be formed of the same material or different materials.

Although an exemplary mask/frame assembly for a color cathode-ray tube
20 (CRT) which incorporates the teachings of the present invention has been shown and described in detail herein, those skilled in the art can readily devise many other varied embodiments that still incorporate these teachings.

CLAIMS:

1. A cathode-ray tube, comprising:

5 a mask fixed under tension to a support frame and mounted inside the front face of the cathode-ray tube, the mask having a central region with strands therein and a peripheral region disposed between the central region and edges of the mask, the mask being able to vibrate independently of the support frame; and

10 at least one damper in contact with the mask along the peripheral region of the mask, the damper comprising a member having one or more masses attached thereto.

2. The cathode-ray tube of claim 1 wherein the member is a rod.

3. The cathode-ray tube of claim 1 wherein a first end of the at least one damper
15 is inserted through an orifice in the peripheral region of the mask.

4. The cathode-ray tube of claim 1 wherein a second end of the at least one damper is coupled to the support frame.

20 5. The cathode-ray tube of claim 4 wherein the second end of the at least one damper is coupled to the support frame with a bracket.

6. The cathode-ray tube of claim 1 wherein the first portion contacts the peripheral region of the mask when the mask vibrates.

25 7. The cathode-ray tube of claim 3 wherein the first end of the at least one damper is inserted through the orifice at an angle with respect to the plane of the mask.

30 8. The cathode-ray tube of claim 1 wherein the one or more masses are formed of the same material.

9. The cathode-ray tube of claim 1 wherein the one or more masses are formed of different materials.

10. A mask-frame assembly for a cathode-ray tube, comprising:

a mask fixed under tension to a support frame and mounted inside the front face of the cathode-ray tube, the mask having a central region with strands therein and a peripheral region disposed between the central region and edges of the mask, the mask being able to vibrate independently of the support frame; and

at least one damper in contact with the mask along the peripheral region of the mask, the damper comprising a member having one or more masses attached thereto.

11. The mask-frame assembly of claim 10 wherein the member is a rod.

12. The mask-frame assembly of claim 10 wherein a first end of the at least one damper is inserted through an orifice in the peripheral region of the mask.

13. The mask-frame assembly of claim 10 wherein a second end of the at least one damper is coupled to the support frame.

14. The mask-frame assembly of claim 13 wherein the second end of the at least one damper is coupled to the support frame with a bracket.

15. The mask-frame assembly of claim 10 wherein the first portion contacts the peripheral region of the mask when the mask vibrates.

16. The mask-frame assembly of claim 12 wherein the first end of the at least one damper is inserted through the orifice at an angle with respect to the plane of the mask.

17. The mask-frame assembly of claim 10 wherein the one or more masses are formed of the same material.

18. The mask-frame assembly of claim 10 wherein the one or more masses are formed of different materials.

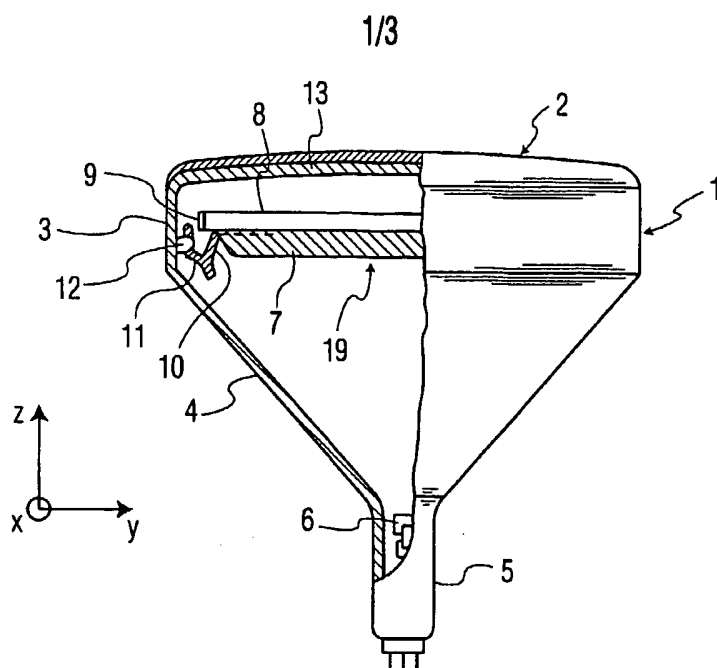


FIG. 1

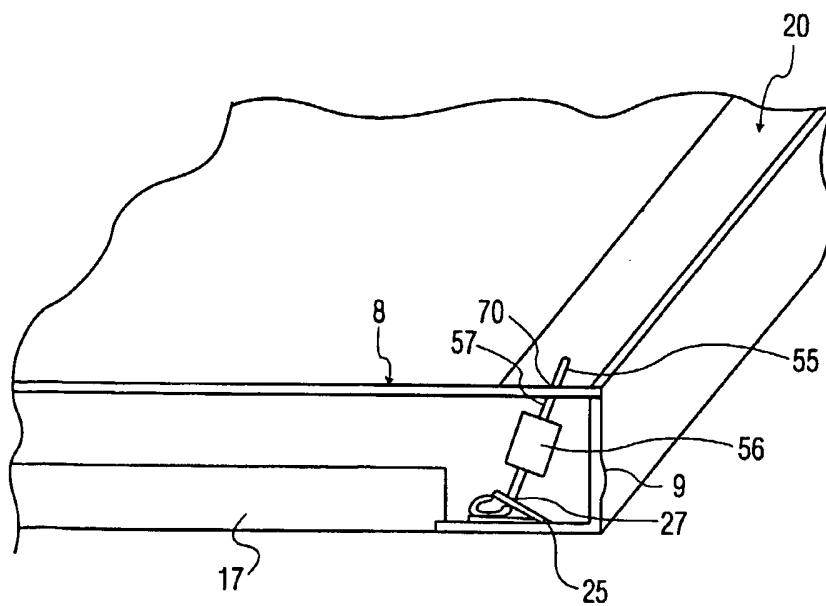


FIG. 2

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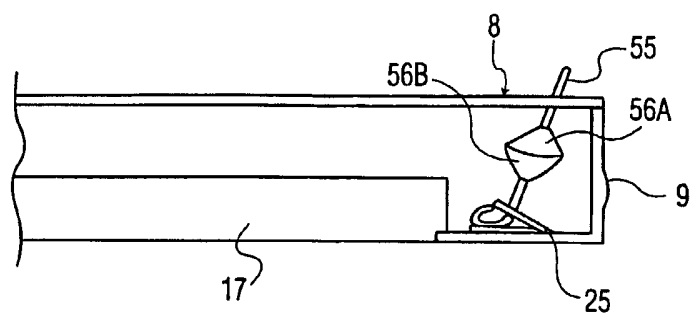


FIG. 3A

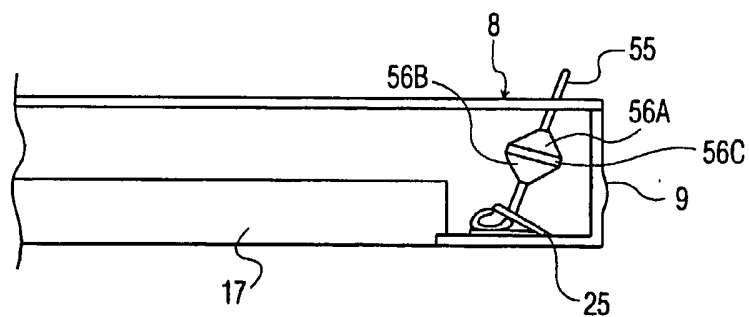


FIG. 3B

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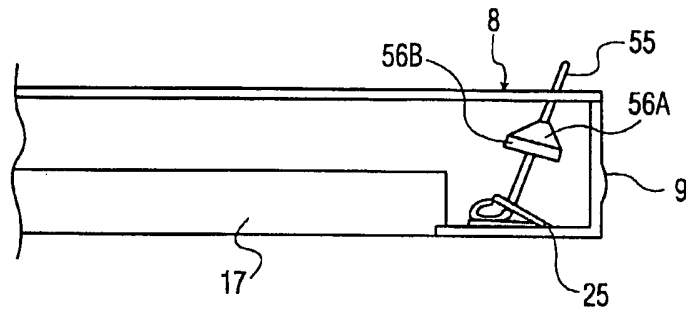


FIG. 3C

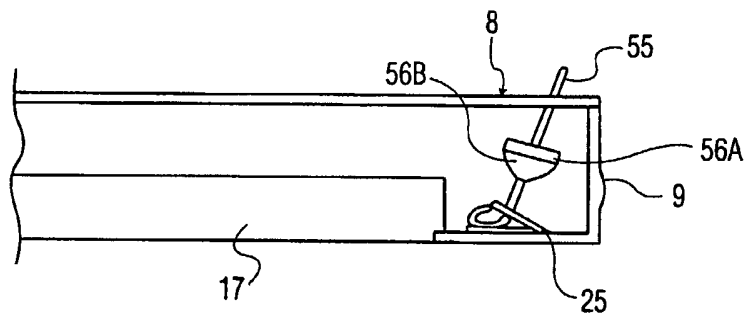


FIG. 3D

INTERNATIONAL SEARCH REPORT

International Application No
JS2005/036250

A. CLASSIFICATION OF SUBJECT MATTER

H01J29/07

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H01J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002/135289 A1 (SUZUKI HIDEO ET AL) 26 September 2002 (2002-09-26) paragraph '0094! - paragraph '0097!; figure 10b	1-18
X	EP 1 308 983 A (MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD) 7 May 2003 (2003-05-07) abstract; figure 2	1-3, 10-12
A		4-9, 13-18
A	US 2002/024283 A1 (ARAI SHINJI) 28 February 2002 (2002-02-28) figure 3	1-18
A	US 4 827 179 A (ADLER ET AL) 2 May 1989 (1989-05-02) figure 10a	1-18

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

JS2005/036250

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