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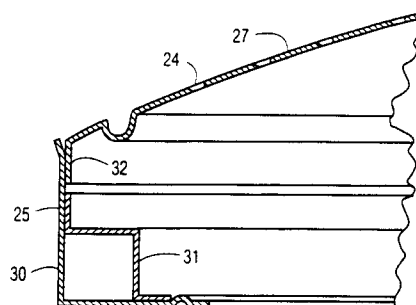
(11) Publication number:

**0 654 811 A1**

(12)

**EUROPEAN PATENT APPLICATION**(21) Application number: **94117908.7**(51) Int. Cl.<sup>6</sup>: **H01J 29/07**(22) Date of filing: **12.11.94**(30) Priority: **19.11.93 IT MI932460**(43) Date of publication of application:  
**24.05.95 Bulletin 95/21**(84) Designated Contracting States:  
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**D-30453 Hannover (DE)**(54) **Color picture tube having a box-like mask-frame assembly.**

(57) An improved color picture tube (8) includes an evacuated envelope (10) having a rectangular faceplate panel (12). The panel includes a viewing screen (22) on an inner surface thereof and a mask-frame assembly (24, 25) mounted therein. The mask-frame assembly includes a shadow mask (24) attached to a peripheral frame (25). The improvement comprises the frame comprising a box-like enclosure that extends around the periphery of the mask. The frame material has approximately the same thickness as does the shadow mask material.

**FIG. 4****EP 0 654 811 A1**

This invention relates to color picture tubes of the type having shadow masks attached to frames that are suspended in relation to cathodoluminescent screens, and particularly to an improved, lighter-weight mask-frame assembly.

As the sizes of color picture tubes have increased, there has been a corresponding increase in the sizes and weights of tube components. One of these components is the mask-frame assembly. Present color picture tubes use steel frames to support shadow masks within faceplate panels of the tubes. One type of frame is made from a continuous piece of L-shaped steel, that is bent and welded to itself at its ends. Another type of frame is formed by pressing a flat steel sheet into the shape of the frame. Typically, tubes have frames that are made from materials that are from about 1.00 mm (0.039 inch) thick to about 1.51 mm (0.062 inch) thick. The frames are usually rectangularly shaped and supported within faceplate panels by three or four springs that are attached to the sides of the frames; alternatively, the frames may be supported at their four corners. Embodiments for achieving such corner support are shown in U.S. Patent 4,723,088, issued to Sone et al. on February 2, 1988, and in U.S. Patent 4,728,853, issued to Sone et al. on March 1, 1988.

Because of the considerable weight of a conventional mask-frame assembly, there is an opportunity to reduce the overall weight of the tube, if the need for a support frame can be eliminated. The present invention provides a shadow mask assembly that utilizes a very lightweight frame.

An improved color picture tube in accordance with the present invention includes an evacuated envelope having a rectangular faceplate panel. The panel includes a viewing screen on an inner surface thereof and a mask-frame assembly mounted therein. The mask-frame assembly includes a shadow mask attached to a peripheral frame. The improvement comprises the frame including a box-like enclosure that extends around the periphery of the mask. The frame material has approximately the same thickness as does the shadow mask material.

In the drawings:

FIGURE 1 is an axially sectioned side view of a color picture tube embodying the present invention.

FIGURE 2 is a top view of a corner section of a lightweight box-frame in the tube of FIGURE 1.

FIGURE 3 is a cross-sectional view of the box-frame taken at line 3-3 of FIGURE 2.

FIGURE 4 is a cross-sectional partial side view of a shadow mask and box-frame assembly.

FIGURE 5 is a cross-sectional partial side view of a second shadow mask and box-frame assembly.

FIGURE 6 cross-sectional partial side view of a third shadow mask and box-frame assembly.

FIGURE 1 shows a rectangular color picture tube 8 having a glass envelope 10, comprising a rectangular faceplate panel 12 and a tubular neck 14 connected by a rectangular funnel 16. The panel 12 comprises a viewing faceplate 18 and a peripheral flange or sidewall 20, which is sealed to the funnel 16. A mosaic three-color phosphor screen 22 is located on the inner surface of the faceplate 18. The screen preferably is a line screen, with vertically extending parallel phosphor lines. Alternatively, the screen may be a dot screen. A multiapertured color selection electrode or shadow mask 24 is attached to a peripheral frame 25, which is removably mounted in predetermined spaced relation to the screen 22. An electron gun 26 is centrally mounted within the neck 14, to generate and direct three electron beams along convergent paths through the mask 24 to the screen 22.

The tube of FIGURE 1 is designed to be used with an external magnetic deflection yoke 28 located in the vicinity of the funnel-to-neck junction. When activated, the yoke 28 subjects the three electron beams to magnetic fields which cause the beams to scan horizontally and vertically in a rectangular raster over the screen 22.

FIGURES 2 and 3 show the frame 25 in greater detail. The frame 25 is made out of two pieces 30 and 31 that are L-shaped in cross-section and are welded together to form a box-shaped structure. The material of the two pieces 30 and 31 is approximately the same thickness as the mask material, e.g., 0.229 mm (0.009 inch). This is considerably thinner than a prior art frame which can be about 1.51 mm (0.062 inch) thick. Therefore, the frame 25 weighs considerably less than a conventional prior art frame.

The shadow mask 24, shown in greater detail in FIGURE 4, comprises an apertured contoured portion 27 surrounded by a peripheral skirt 32. The shadow mask is attached to the frame 25, which, in turn, is mounted within the faceplate panel 12 by support means located either at the four corners of the mask or along the sides thereof.

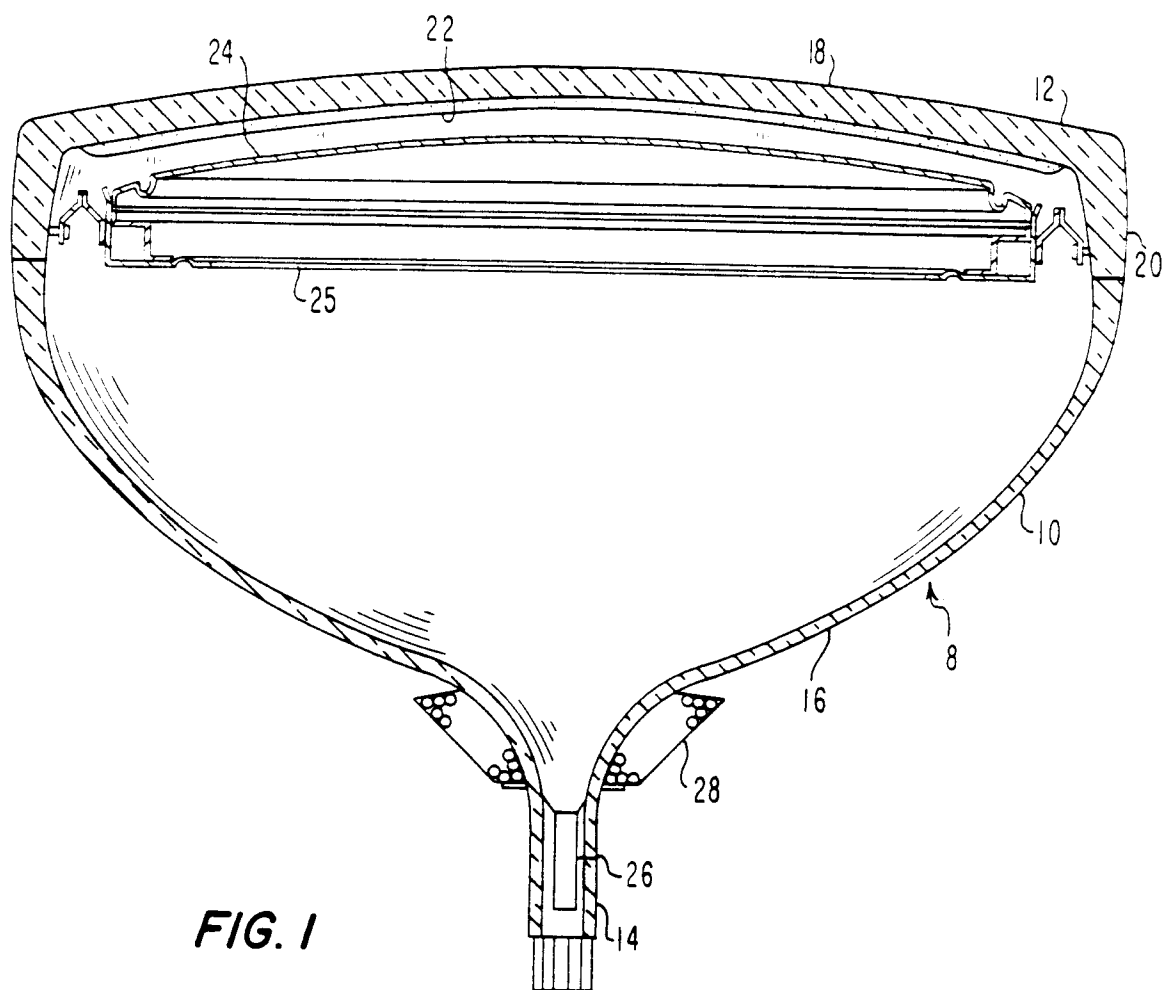
Although the first preferred embodiment of the present invention is shown with a frame formed from two L-shaped pieces, the peripheral box-like structure of the frame need not be rectangular and can be formed from differently shaped parts. For example, FIGURE 5 shows a mask-frame assembly 36 that includes a frame 38 constructed of two pieces 40 and 42 that form a triangular-shaped box-like structure. In this case, a flange 44, outwardly extending from a mask 46, is attached to a corresponding flange 47 on the frame 38. In another embodiment, shown in FIGURE 6, a mask-

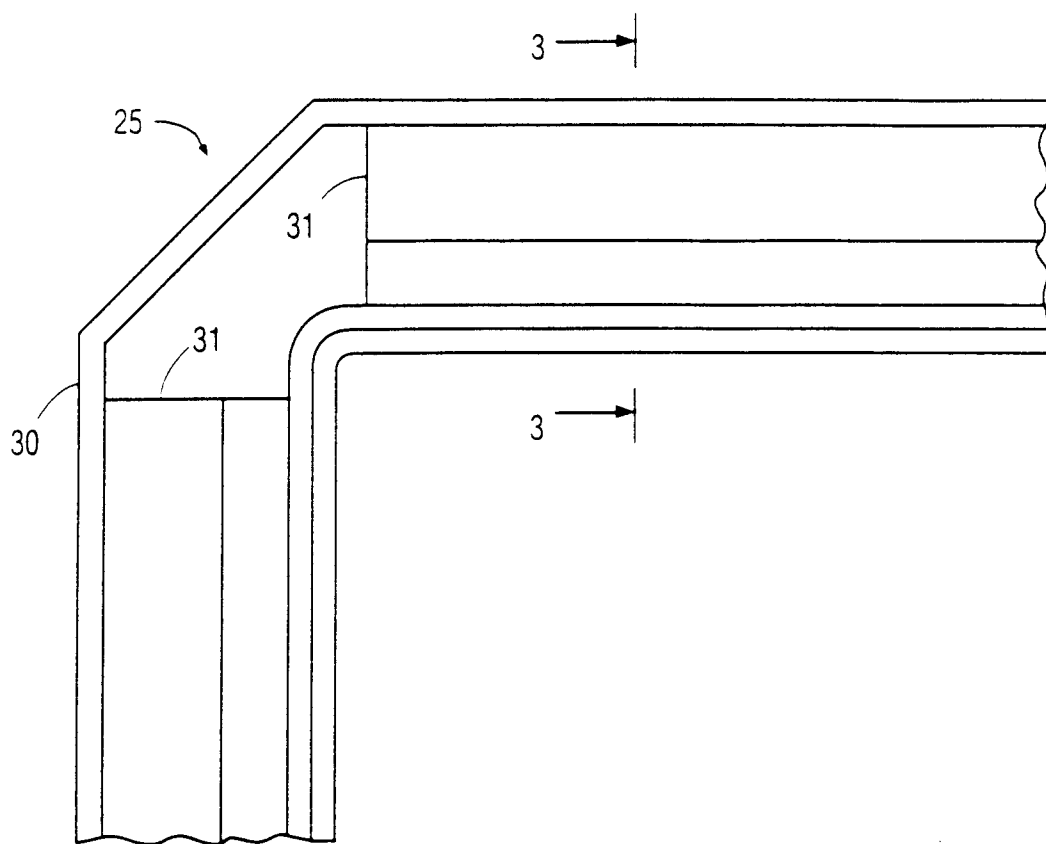
frame assembly 48 includes a frame 50 constructed out of a single piece that is formed into a rectangular cross-section.

A mask and frame assembly constructed in accordance with the present invention uses a minimum amount of material and is lighter than an assembly of more conventional construction. This results in cost reduction, better thermal performance and reduced warpage during long-term operation. The thinner material of the frame is easier to machine, and the completed mask and support are still sufficiently strong to withstand mechanical shocks and vibrations.

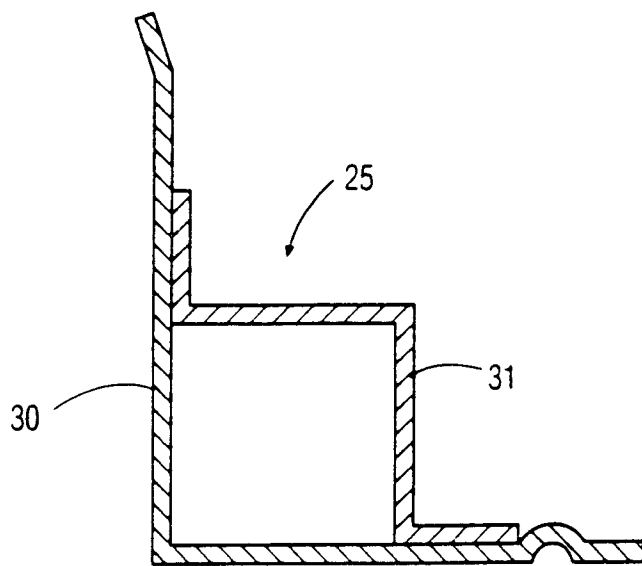
## Claims

1. A color picture tube (8) including an evacuated envelope (10) having a rectangular faceplate panel (12), said panel including a viewing screen (22) on an inner surface thereof and a mask-frame assembly (24, 25; 36; 48) mounted within said panel, said mask-frame assembly including a shadow mask (24; 46) attached to a peripheral frame (25; 38; 50); characterized in that said frame (25; 38; 50) forms a box-like enclosure around the periphery of said mask (24; 46), and said frame has approximately the same thickness as does said mask.
2. The tube as defined in Claim 1, characterized in that said frame (25) is formed from two pieces (30, 31) that are L-shaped in cross-section and are welded together to form said box-like structure.
3. The tube as defined in Claim 1, characterized in that said frame (38) is formed from two pieces (40, 42) which form box-like structure that is triangular-shaped in cross-section.
4. The tube as defined in Claim 1, characterized in that said frame (50) is formed from a single piece which is bent to form a box-like structure that is rectangularly-shaped in cross-section.

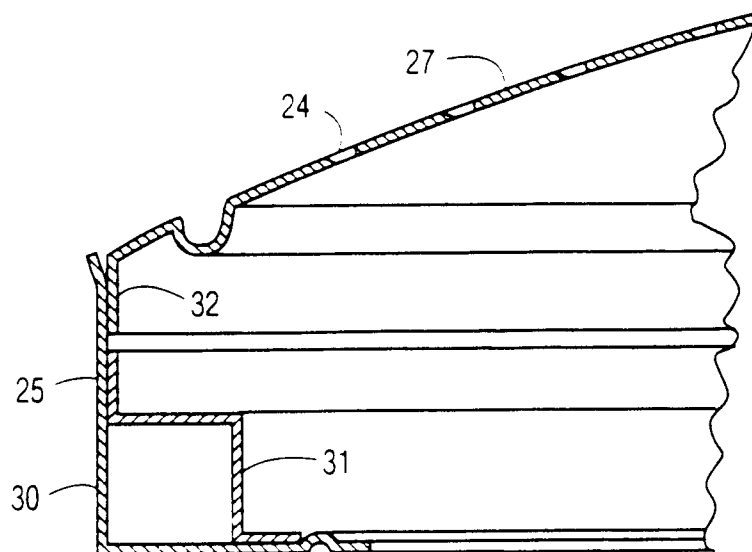




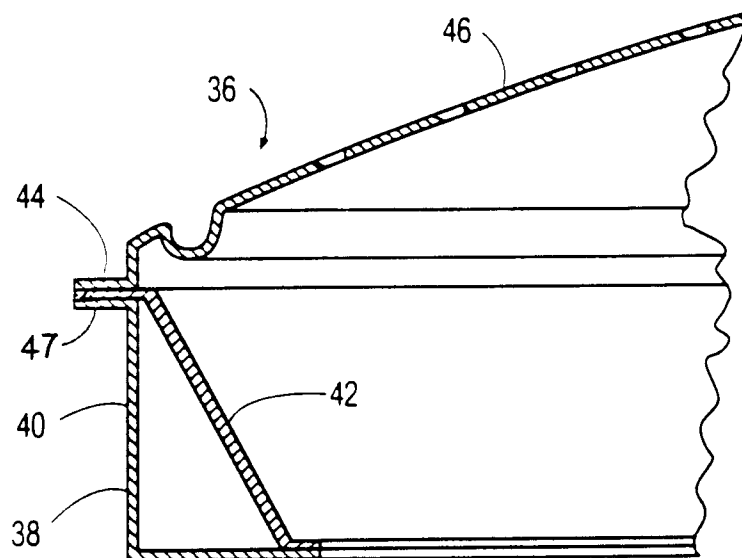
**FIG. 2**



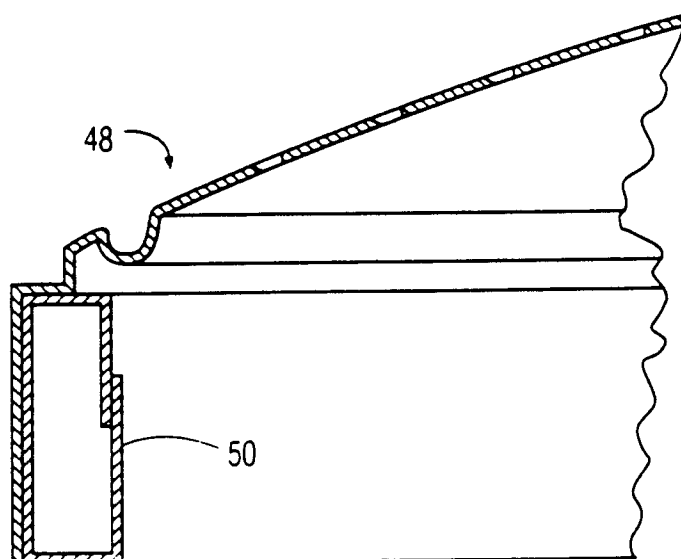
**FIG. 3**



**FIG. 4**



**FIG. 5**



**FIG. 6**



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## EUROPEAN SEARCH REPORT

Application Number  
EP 94 11 7908

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.6)
Y	PATENT ABSTRACTS OF JAPAN vol. 5, no. 159 (E-77) (831) 14 October 1981 & JP-A-56 088 239 (HITACHI SEISAKUSHO K.K.) 17 July 1981 * abstract *	1	H01J29/07
Y	US-A-5 072 151 (P.SPINA) * claims 1,2 *	1	
A	US-A-4 700 105 (HIDEYA ITO) * claims 1-7 *	1	
A	US-A-5 021 707 (R.C.BAUDER)		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			H01J
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 23 February 1995	Examiner Van den Bulcke, E
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