

June 21, 1960

L. T. MAY

2,942,129

CATHODE-RAY TUBE STRUCTURE

Filed Aug. 27, 1954

2 Sheets-Sheet 1

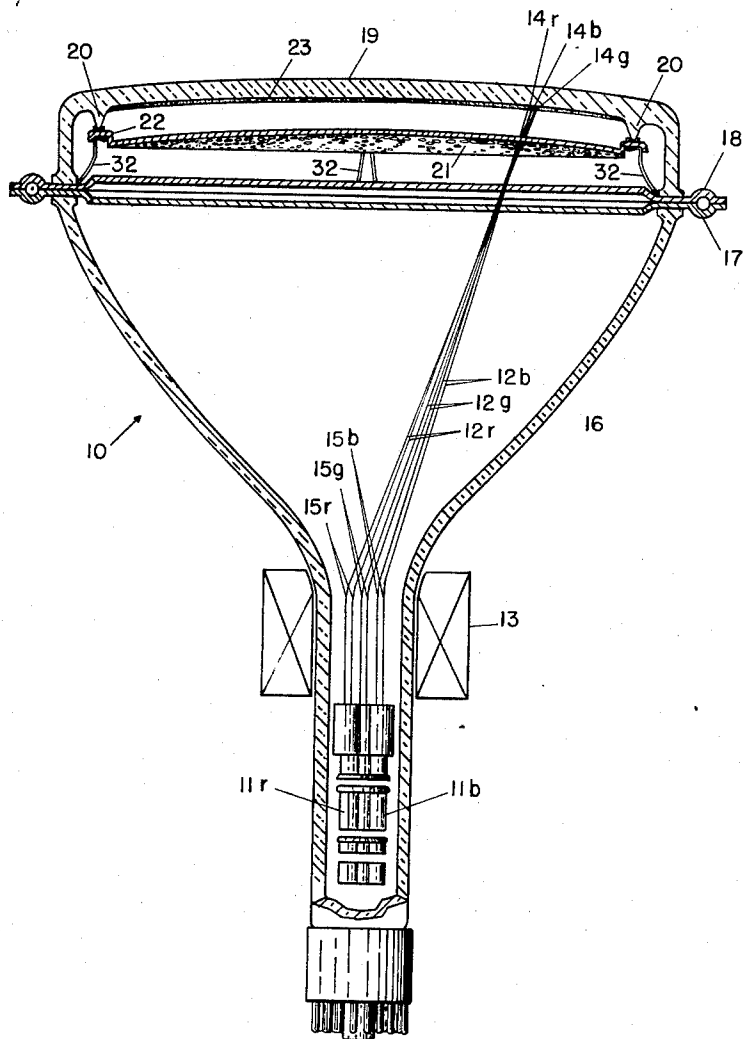


Fig. 1

INVENTOR.
LAWRENCE T. MAY

BY *Darby & Darby*
ATTORNEYS

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2 Sheets-Sheet 2

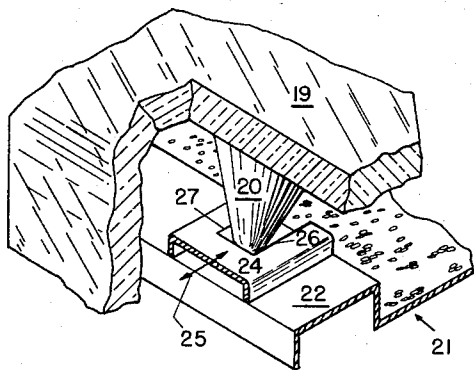


Fig. 2

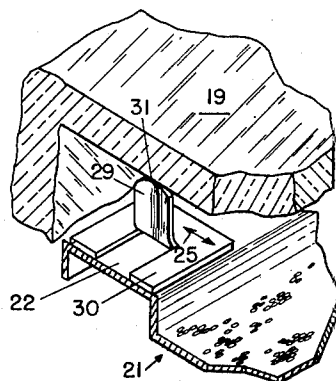


Fig. 3

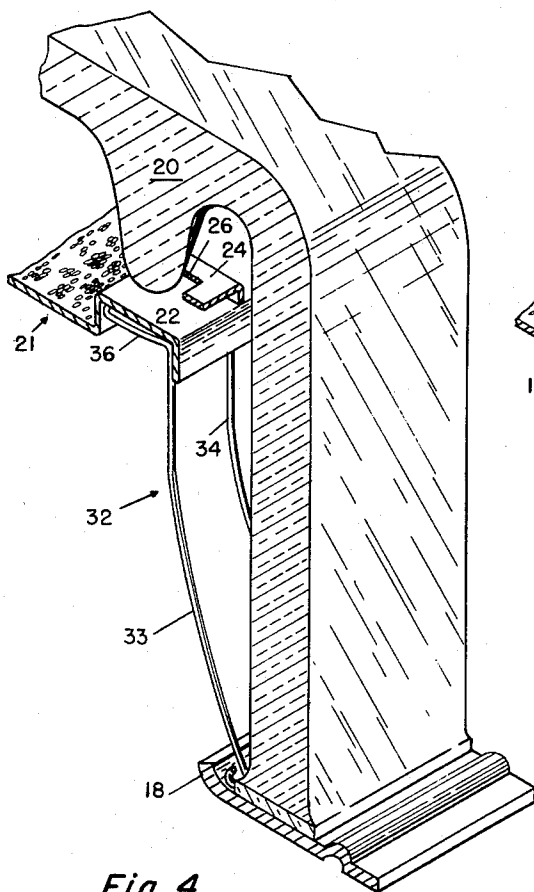


Fig. 4

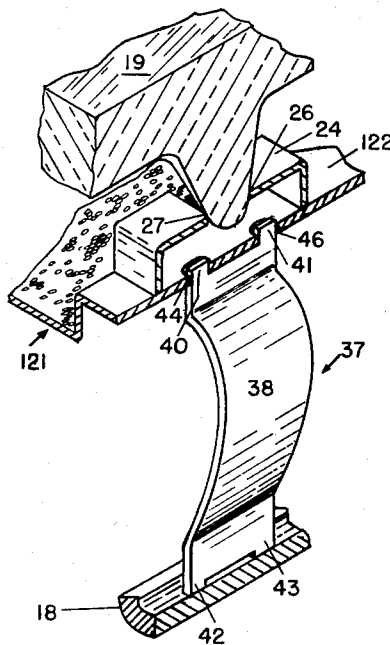


Fig. 5

INVENTOR.
LAWRENCE T. MAY

BY

Parley & Parley
ATTORNEYS

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2,942,129

CATHODE-RAY TUBE STRUCTURE

Lawrence T. May, Cedar Grove, N.J., assignor to Allen B. Du Mont Laboratories, Inc., Clifton, N.J., a corporation of Delaware

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9 Claims. (Cl. 313—85)

This invention comprises improvements in cathode-ray picture tubes of the type characterized by fluorescent screens divided into a large number of dot-like elements. Fluorescent tubes having screens of this type are especially adapted to color picture reproduction. As is known in this art tubes of this kind usually employ foraminous masks between the electron guns and the fluorescent screens. The invention herein particularly relates to novel means for mounting these masks within the tubes. The name "dot type cathode-ray tube" is frequently applied to tubes of this nature.

An important object of this invention is to provide novel and improved means for mounting the foraminous mask in dot-type cathode-ray tubes.

Another object of the invention is to provide a structure which is self-cleaning at the contact surfaces of the mounting elements for the mask.

Still another object is to provide supports by means of which the mask can be rapidly repositioned with precision.

Still another object of the invention is to provide an indexing structure against which the mask is seated and spring loading means for effecting firm and relatively rigid positioning of the mask against the indexing means.

Other and more detailed objects of this invention will be apparent from the following description of the embodiments thereof herein disclosed.

In the accompanying drawings,

Figure 1 is a view of a cathode-ray tube in accordance with this invention showing a portion of the envelope broken away and some of the structure in cross-section and illustrating one form of this invention;

Figure 2 is an enlarged detail broken view of a mounting assembly unit for the foraminous mask including an indexing and positioning element;

Figure 3 is a similar view of a modified form of structure;

Figure 4 is a similar view of a still further modified form of structure; and

Figure 5 is a similar view of a still further modification.

Generally speaking, the cathode-ray structure illustrated is of a type well known in the art of color television. As illustrated, it includes an envelope 10 having a plurality of electron gun structures mounted in the neck portion thereof. For a three color system three such guns are employed and two of them, namely 11r and 11b provide electron beams 12r and 12b for the red and blue colors respectively. The green electron gun is hidden behind those illustrated, but the beam therefor is illustrated at 12g. As is well understood in the art, the three elemental color electron beams are sharply deflected at the points 15r, 15b and 15g which are known in the art as the apparent electron beam sources. These sources are relatively fixed throughout all movements of the outer ends of the beams across the screen. These deflections are produced by a magnetic deflector of which the magnetic deflection coil 13 is diagrammatically illustrated as an example. The glass envelope flares into a bulbous portion 16 which terminates in a rim to which is welded with a vacuum-tight seal a metallic annulus 17. A dish or dome shaped faceplate 19 completes the bulbous portion of the envelope and is provided on its rim with a similar metallic annulus 18 which is welded thereto with a vacuum-tight seal. In the completed envelope the faceplate 19 is secured to the bulbous portion 16 by welding

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the flanges of the annuli 17 and 18 together with a vacuum-tight seal. It is of course understood that the completed envelope 10 for the tube is highly evacuated when ready for use.

As is well understood in the art, a dot-type fluorescent screen 23 is formed on the inner face of the faceplate 19 in any convenient manner, such as that described by Joseph G. Koosman in his copending application Serial No. 446,015, now Patent No. 2,833,954, filed July 27, 1954.

The entire assemblage of dots can be divided into several sets according to the color of the light to be emitted thereby. In present practice there are three such sets with all of the dots of one set emitting red light, all of the dots of the second set blue light, and all of the dots of the third set green light. The dots of these three sets are preferably interspersed, usually in a regular array. The dots of each set comprise elemental deposits of different phosphors which emit light of the three colors mentioned upon excitation by electrons. As is well understood in place of this type of screen a homogeneous phosphor layer could be employed by filtering white light through dot-like colored filter elements.

A foraminous mask 21, preferably domed, has a rim 22 which rests on the protuberances or indexing elements 20 which are formed accurately and are accurately positioned on the inner face of the faceplate 19. The mask 21 is positioned so that its rim 22 rests on these protuberances 20.

When the electron guns are energized they emit the electron beams 12r, 12b and 12g respectively, which are caused to converge on a small area of the foraminous mask 21 and pass through the apertures shown therein. When the parts are properly positioned, electron beam 12r from the gun 11r strikes an elemental phosphor area 14r, which emits red light only. Similarly the electron beams 12b and 12g from the guns 11b and 11g strike phosphor dots 14b and 14g respectively and thereby respectively cause the emission of blue and green light. As is known, the function of the mask 21 is to shade the dots in such a way that the respective electron beams will strike the right dots, as explained above.

In order to assure optimum brightness, color purity, and the necessary resolution the mask 21 must be precisely positioned relative to the dots which make up the screen 23. Furthermore, as is clear from the above mentioned Koosman application, the mask 21 must be removed and precisely relocated in its original position several times in the process of forming a dot-type screen 23.

The importance of maintaining the original mask position is further stressed by the fact that these tubes must be baked at high temperatures during processing. At these temperatures the mask expands radially and this must be accomplished without warping. The further condition must be met that when the tube is cooled the mask must be free to contract to its original dimensions and position, else by assuming some other position color purity and quality be adversely affected.

In order to provide a structure which will meet these conditions the foraminous disc 21 is provided with a rim 22 which is preferably given a shaped section like or similar to that shown, thereby insuring greater overall rigidity in the disc. Around the periphery on the face of the section 22 are mounted the fixtures 24, one for each of the indexing elements 20, as suggested in Figure 2. The fixture 24 is of U-shaped formation with the free side edges thereof welded to the face of the rim 22 so as to lie substantially radially of the mask 21. The base of this channel fixture 24 has a slot formed therein to provide a pair of parallel sharp cutting edges 26 and 27 which are also parallel to radii of the mask 21. The ends of the protuberances 20 are preferably rounded or semi-spherical

so as to form point contacts with these edges and to interlock therewith in order to index the mask 21 into position.

It is obvious that the fixture 24 can take other physical forms so long as the type of supporting contact described above is provided. For example, it is not necessary to use channel stock for the fixture 24; flat stock may be used instead, provided it is sufficiently thick to allow the tip of the protuberance to clear the surface of the rim 22, or provided slots or indentations are formed in the surface of the rim 22 to prevent the tip of the protuberances from resting thereon. Since the mask expands and contracts radially in the direction of the double ended arrow 25 this movement will cause the sharp edges 26 and 27 to slide on the protuberances 20 cutting through any foreign matter which might be deposited thereon and allowing freedom of such radial movement while assuring precise repositioning.

Since, as a matter of stable geometry, three points of support for the mask 21 will accurately determine the position plane thereof, and the same number of slotted fixture 24 will be sufficient to index the mask 21 so that it may be placed in only one position with respect to the faceplate 19, there will normally be three protuberances 20 and three fixtures 24. However, in the interest of greater mechanical strength more than three mask supports can be employed.

An additional support structure for the mask 21 is shown in Fig. 3 in which the fixture 30 is in the form of a flat plate welded or otherwise secured to the rim 22 and having an integral out-turned tab 31 which can be longitudinally creased, if desired, to strengthen it. These fixtures 30 are preferably spaced around the rim 22 intermediate the indexing fixtures 24 and serve to provide additional spacing support for the mask 21. The tab 31 is preferably provided with a rounded end which will seat on the inner face of the faceplate 19.

In order to hold the mask 21 positioned against the indexing means of either type above described, spring setting devices are provided. Referring to Figure 4 there is illustrated one type employing a wire spring 32 which is generally shaped like a hairpin to provide a pair of parallel legs 33 and 34 which terminate with looped ends as shown. The bent over or looped portion 36 of these springs is shaped to seat within the rim formation 22 at the closed end of the spring. The looped ends are arranged to seat on a radial inwardly projecting rim portion of the annulus 18. One of these springs is provided at each of the indexing positions and shaped so that under stress they will fit snugly on their seats at each end and hold the disc 21 firmly in index position. These springs strengthen the whole assembly and will permit easy removal during processing.

Alternative spring structure is shown in Figure 5. In this embodiment the springs 37 are formed of suitable flat stock and are given a slightly bowed shape longitudinally, as indicated at 38 in the figure. The upper end of the spring is provided with a pair of tabs 40 and 41 and positioned to seat in apertures 44 and 46 respectively formed in the rim 122 of the foraminous mask 121. The fixture 24 is the same as that shown in Figure 2 and rests on the protuberance 20, as previously explained. The other end of the spring is provided with end tabs 42 and 43 which find a seat on the inner radial rim of the annulus 18. The parts are positioned and the spring 37 is shaped so as to be stressed in use, causing the mask 121 to be firmly indexed.

From the above description it will be apparent that the subject matter of this invention can take a number of different forms. It is preferable, therefore, that the scope of this invention be limited by the claims rather than the disclosure.

What is claimed is:

1. A cathode-ray tube comprising a glass faceplate, a plurality of protuberances on the inner surface of said faceplate near the periphery thereof, a foraminous mask

located within said tube substantially parallel to said faceplate, a reinforced rim on said mask, a plurality of U-shaped members corresponding in number to the number of said protuberances and affixed to the side of said rim proximal to said faceplate, said U-shaped members pointing substantially in the radial direction of said mask, said U-shaped members being spaced around said rim to rest on said protuberances with the ends of said protuberances lying within the open portion of said U-shaped members and bearing against both branches thereof.

2. The device of claim 1 in which said U-shaped members are formed from channeled material with the outer edges of both branches extending in the same direction from the main portion of said U-shaped members.

3. The device of claim 2 in which said U-shaped members are affixed to said rim by means of said outer edges.

4. A cathode-ray tube comprising a glass faceplate, a plurality of protuberances on the inner surface of said faceplate near the periphery thereof, a foraminous mask located within said tube substantially parallel to said faceplate, a plurality of U-shaped members corresponding in number to the number of said protuberances and affixed to the side of said rim proximal to said faceplate, said U-shaped members being spaced around said rim to rest on said protuberances with the ends of said protuberances lying within the open portion of said U-shaped members and bearing against both branches thereof, and a plurality of support legs affixed to said side of said rim between said U-shaped members, said legs extending down to make contact with said inner surface of said faceplate.

5. The device of claim 4 in which said legs comprise flat plate bases affixed to said rim with rounded end tabs extending substantially perpendicular thereto.

6. A cathode-ray tube comprising a glass faceplate, a cylindrical wall attached to the periphery of said faceplate and extending upwardly therefrom, an inwardly extending rim at the upper end of said cylindrical wall, a plurality of protuberances on the inner surface of said faceplate near said periphery, a foraminous mask located within said tube substantially parallel to said faceplate, a reinforced rim on said mask, a plurality of U-shaped members corresponding in number to the number of said protuberances and affixed to the side of said rim proximal to said faceplate, said U-shaped members pointing substantially in the radial direction of said mask and being spaced around said rim to rest on said protuberances with the ends of said protuberances lying within the open portion of said U-shaped members and bearing against both branches thereof, a plurality of spring members bearing against the lower surface of said inwardly extending rim and against the upper surface of said rim on said mask.

7. The device of claim 6 in which one of said spring members makes contact with the rim of said mask in the region of each of said U-shaped members.

8. The device of claim 7 in which said spring members are hairpin shaped and comprise two upwardly extending ends joined by a flat portion fitting within the reinforced rim of said mask.

9. The device of claim 7 in which said spring members comprise flat spring stock having a bowed shape with each end having longitudinally extending tabs at the outer corners thereof.

References Cited in the file of this patent UNITED STATES PATENTS

1,074,449	Myers	Sept. 30, 1913
2,477,705	Sweet	Aug. 2, 1949
2,625,734	Law	Jan. 20, 1953
2,682,620	Sanford	June 29, 1954
2,690,518	Fyler	Sept. 28, 1954
2,727,172	Mark	Dec. 13, 1955
2,733,366	Grimm	Jan. 13, 1956