Feb. 20, 1968 J. W. SCHWARTZ ETAL 3,370,192

COLOR TELEVISION TUBE CONSTRUCTION INCLUDING MEANS FOR MINIMIZING TEMPERATURE DIFFERENTIAL BETWEEN SHADOW MASK FRAME AND TUBE ENVELOPE

Filed Oct. 7, 1966

Fig. 1.

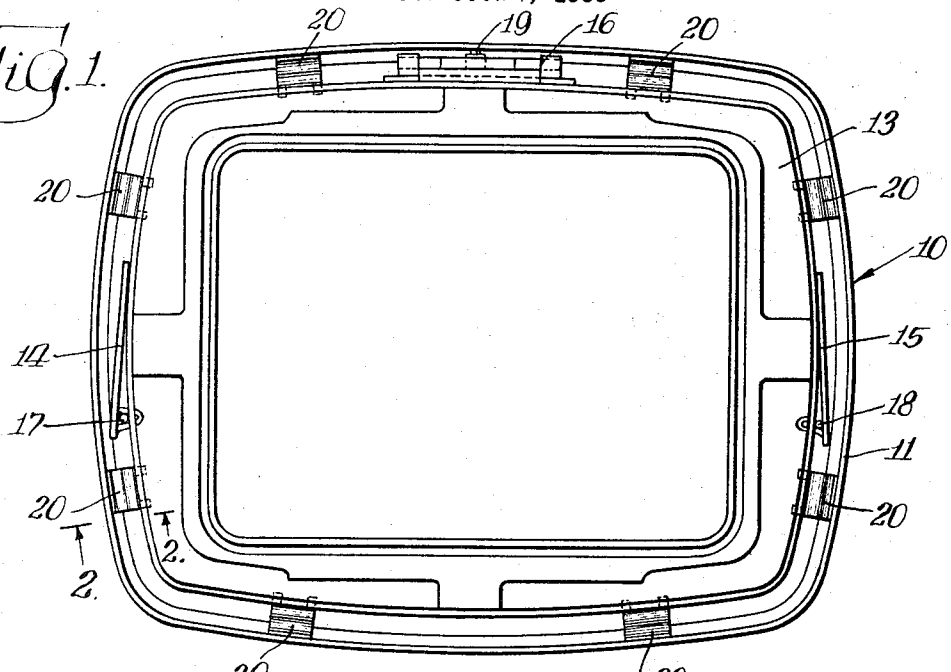


Fig. 2.

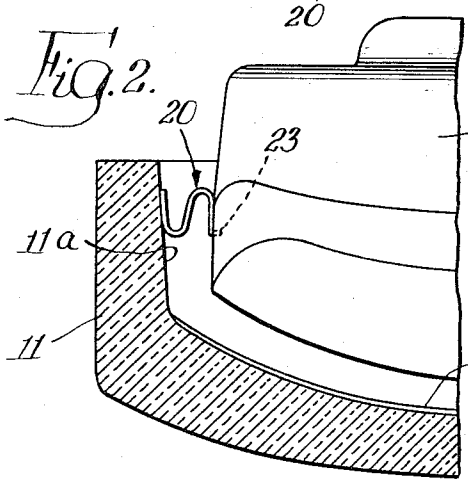


Fig. 4.

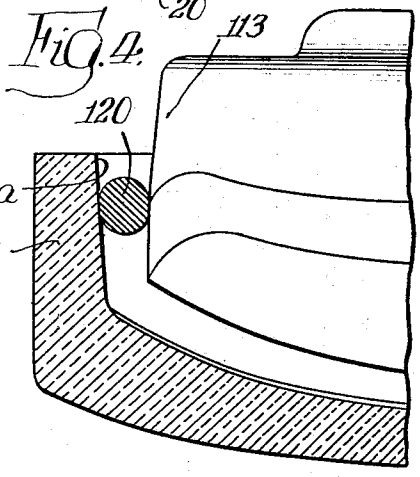
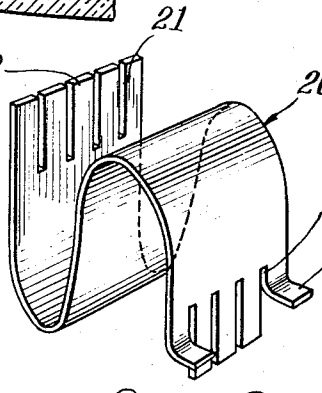


Fig. 3.



Inventors:-
James W. Schwartz,
Laszlo Javorik,
Joseph W. Cooper.
By Dawson, Tilton, Fallon, Lungmus & Alexander
Attys.

United States Patent Office 3,370,192
Patented Feb. 20, 1968

3,370,192

COLOR TELEVISION TUBE CONSTRUCTION INCLUDING MEANS FOR MINIMIZING TEMPERATURE DIFFERENTIAL BETWEEN SHADOW MASK FRAME AND TUBE ENVELOPE

James W. Schwartz, Western Springs, Laszlo Javorik, Chicago, and Joseph W. Cooper, Hinsdale, Ill., assignors to National Video Corporation, Chicago, Ill., a corporation of Illinois

Filed Oct. 7, 1966, Ser. No. 585,168
5 Claims. (Cl. 313—46)

ABSTRACT OF THE DISCLOSURE

A shadow mask is mounted within a color television envelope adjacent the viewing screen with a three-point suspension system of mounting springs. Heat-conductive elements are interposed between the envelope and the shadow mask frame having a substantial area contacting the frame on one side and the envelope on the other for conducting heat from the mask to the envelope on all four sides of the mask. This arrangement minimizes the temperature differential between the mask and the envelope thereby obviating the need for correcting for misregistration of the apertures of the mask relative to the phosphor pattern on the screen during normal operation wherein the shadow mask of a conventional tube rises to a temperature 20–30° C. above that of its envelope.

This invention relates to a color television tube construction and, more particularly, to a construction which is adapted to minimize misregister of the openings in the shadow mask provided in the color television tube adjacent the scintillation screen thereof. As such, it is related to the co-owned, co-pending application of James W. Schwartz et al., Ser. No. 554,106, filed May 31, 1966.

During the course of operation of a color television tube, the cathodo-luminescent phosphor-equipped screen is the target for electron beams which pass through relatively small openings in the shadow mask. Incident to this operation, the shadow mask becomes heated and, being metal, such as cold-rolled steel, expands. This causes the openings to be displaced from their original position and in some instances the displacement is such as to result in electron beams failing to impinge upon the intended phosphor dots. This results in a poor picture and the avoidance of this undesirable end result is an important object of the invention.

Another object of the invention is to provide a construction which couples the shadow mask and tube interior so as to minimize temperature differentials and thereby maintain the openings of the shadow mask in register with the phosphor dots associated with those openings.

Other objects and advantages may be seen in the details of construction and operation set down in this specification.

The invention is explained in conjunction with the accompanying drawing, in which

FIG. 1 is an elevational view of a face-plate portion of a rectangular color television tube showing the shadow mask mounted in place;

FIG. 2 is an enlarged fragmentary sectional view taken along the sight line 2—2 applied to FIG. 1;

FIG. 3 is an enlarged perspective view of an S-shaped spring seen in FIGS. 1 and 2 and which is employed to conduct heat from the shadow mask to the glass envelope of the tube; and

FIG. 4 is a fragmentary sectional view similar generally to FIG. 2 but in which a different form of heat-transferring means is employed.

In the illustration given, numeral **10** designates generally a color television picture tube having the usual enlarged end—the restricted end carrying the electron gun being omitted for the ease of presentation. The tube **10** includes a face-plate portion (seen in fragmentary form in FIG. 2) designated **11** and the face plate **11** in its enlarged end is equipped with the usual phosphor screen **12**.

The tube **10** is equipped with a shadow mask **13** suitably supported within the face plate **11** by means of springs **14**, **15** and **16** which extend between the frame of the mask **13** and posts **17**, **18** and **19** provided respectively on the left and right sides and top of the tube **10**.

The invention is concerned with transferring heat from the shadow mask to the (conventionally glass) envelope which if retained in the shadow mask would cause the mask to expand and develop the hereinabove-described undesirable expansion and misregister of the beam openings. For this purpose, a plurality of elements **20** (see particularly FIG. 3) are installed between the mask **13** and the inner wall **11***a* of the face plate **11**. The elements **20** are seen to be S-shaped and, as such, maintain substantial surface contact with the mask **13** and inner wall **11***a* irrespective of the distance therebetween. The elements **20** are constructed of high-heat conduction metal such as steel and are advantageously slotted as at **21** adjacent the ends thereof, i.e., the slots extending generally longitudinally of the length of the member **20** so as to define fingers **22**. The finger-like projections **22** may be crimped or bent as at **23** to enter openings suitably placed within the mask **13** so as to immobilize the elements **20** in a given position.

In FIG. 4 another version of the invention is seen wherein a metal rope of high-heat conduction character **120** is interposed between the shadow mask **113** and the interior face **111***a* of the face plate **111**. The metal rope **120** extends perimetrically about the mask so as to develop excellent heat transfer between the two members.

Additionally the FIG. 4 embodiment performs another advantageous function in acting as a shield to prevent the electron beam from being reflected from the inside of the envelope through the space now occupied by the rope **120**. It will be appreciated that the beam in tracing out the raster normally is of greater extent than the screen dimensions, hence the desirability of shielding with either embodiment. The instant invention insures that heat transfer is substantial from all sides of the mask and this can be of advantage in augmenting whatever heat is transferred in a system such as that illustrated with three mounting springs. By virtue of employing the heat-transfer means of the invention, a three-point mounting can be employed—overcoming the difficulty of an indeterminate system when four-point mounting is utilized.

In certain instances, there may be substantial heat transfer from the mask to the envelope through the three mounting springs—but that there is a differential expansion developed because of absence of heat transfer (via conduction) along the fourth side of the mask (here, the bottom). In such a case, the invention contemplates usage of a heat-conducting element along the fourth side.

While in the foregoing specification a detailed description of the invention has been set down for the purpose of illustration, many variations in the details herein given may be made by those skilled in the art without departing from the spirit and scope of the invention.

We claim:

1. In a color televison tube having a generally rectangular shadow mask and first and second side and top spring means for mounting said mask within an envelope adjacent the scintillation screen thereof, the improvement comprising heat-conduction means interposed between said envelope and mask, said heat-conduction means

having substantial inner suface contact area with the periphery of said mask and substantial external surface contact area with the interior of said envelope for conducting heat from said mask to said envelope, the inner and outer contact areas of said heat-conduction means being sufficient to substantially equalize a temperature differential between said mask and said envelope during normal operation of said tube, and thereby minimize mask expansion.

2. The structure of claim 1 in which said means includes at least one metal springlike member interposed between said mask and tube at the mask top, sides and bottom.

3. The structure of claim 2 in which said member is generally S-shaped whereby substantial contact area is maintained irrespective of expansion of the contacted parts.

4. The structure of claim 3 in which the terminal portions of said member are longitudinally slotted to provide a plurality of finger-like projections for gripping said contact areas.

5. The structure of claim 1 in which said means includes a rope-like element perimetrically disposed about said mask.

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DAVID J. GALVIN, *Primary Examiner.*

V. LAFRANCHI, *Assistant Examiner.*