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2,611,100

TEMPERATURE-COMPENSATED TARGET ASSEMBLY FOR COLOR-KINESCOPIES, ETC

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Fig-1

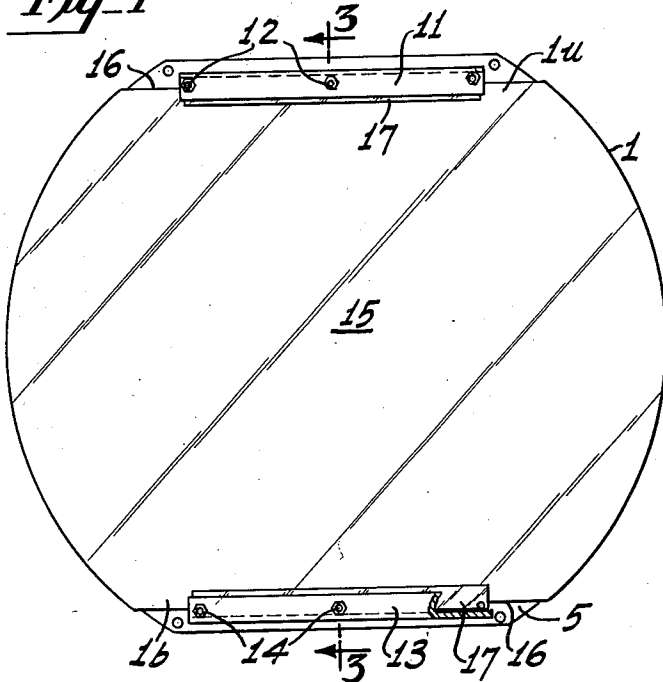


Fig-2

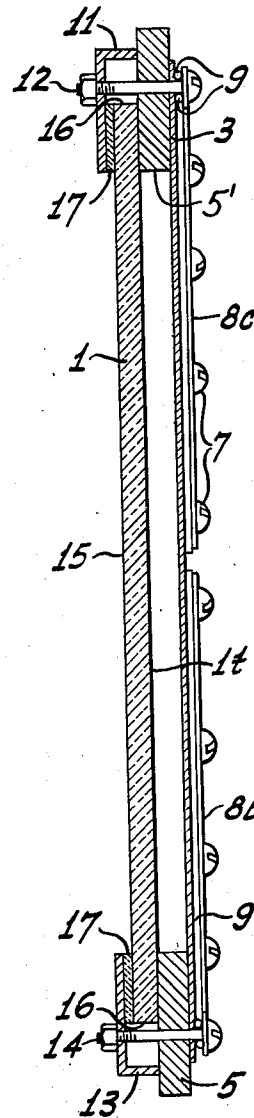
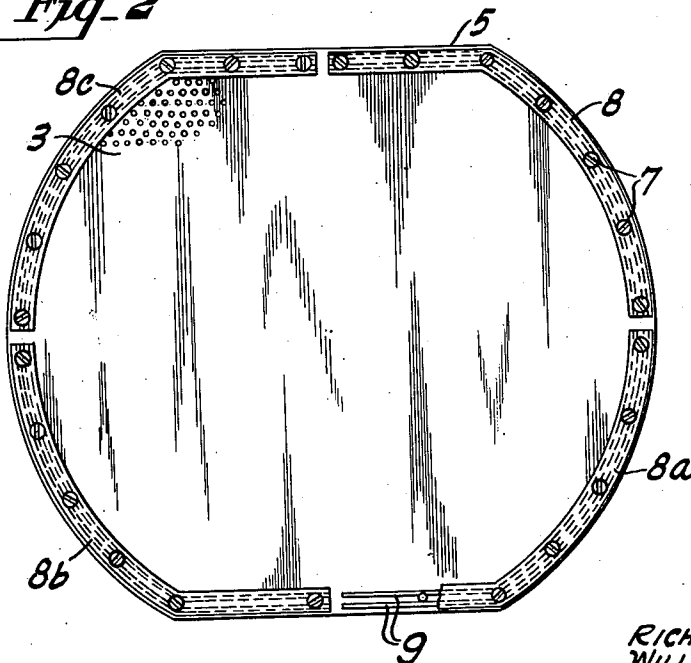


Fig-3

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TEMPERATURE-COMPENSATED TARGET
ASSEMBLY FOR COLOR-KINESCOPES,
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Application December 5, 1950, Serial No. 199,252

7 Claims. (Cl. 313—92)

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This invention relates to cathode-ray tubes and particularly to improvements in target assemblies for color-kinescopes of the so-called "masked-target" variety.

Masked-target kinescopes are described in the RCA publication (April 1950) entitled: "General Description of Receivers for the RCA Color Television Employing the RCA Direct-View Tri-Color Kinescope." The bi-part target assemblies therein described include: (i) A viewing screen comprising a transparent foundation surface containing a multiplicity of groups of picture areas of sub-elemental image dimensions. The different areas of each group are coated with different phosphor materials. Each phosphor material, when struck by electrons, emits light of a color peculiar to its position in the group. The phosphor-covered areas usually take the form of circular or hexagonal "dots," though, as described in French Patent 866,665 (1941), they may comprise a multiplicity of parallel arranged phosphor lines. The second element of the bi-part target assembly comprises (ii) an apertured mask. The mask is mounted near the phosphor covered face of the viewing screen. The number of apertures in the mask is less than the number of phosphor covered areas on the screen. If a three-color screen is employed, the mask usually contains one-third as many apertures as there are phosphor areas on the target. The mask is scanned by one or more electron-beams.

When the color-kinescope is of the three-gun variety, the electron-guns are individual to the separate color-components of the phosphor covered areas of the target. The beams approach the mask at different angles. At the mask, the beam-paths cross and diverge to impinge upon separate ones of the sub-elemental areas in each phosphor group. If the kinescope is of the one-gun variety, the beam is deviated and rotated to points corresponding to the points of origin of the three-gun beams, so that it too approaches the mask and target at angles individual to the different colors.

Color-kinescopes using a 9" x 12" receiving screen containing approximately 600,000 color-phosphor dots have been successfully constructed and operated. The masks for these screens comprise taut thin-metal sheets containing approximately 200,000 apertures.

Certain methods employed in plotting the relative location of the grouped phosphor dots with respect to the mask holes, and in making and mounting the screen and mask assembly, are described and claimed by Harold B. Law in co-

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pending application Serial No. 158,901, filed April 28, 1950. In Law's assembly the thin-metal mask is stretched (by the application of heat) on a metal frame and affixed thereto (prior to cooling) by means of screws or the like. The glass screen is secured to the opposite side of the frame, with its phosphor covered surface of the screen facing the mask, by two pins or bolts. Law recognized that the different coefficients of expansion of the glass screen and the metal mask and frame could cause damage to the assembly when it is subjected to heat during the "degassing" cycle and during normal operating cycles. In order to minimize this hazard, Law provides his frame with one or more oversize holes or slots for receiving the pins or bolts which hold the glass screen on the metal plate. Thus, the stresses which might be applied to the glass, when the metal expands, are relieved by the relative movement permitted by the "oversize" mounting holes or slots.

While the Law temperature-compensated screen-assembly operates quite satisfactorily, it may be said, generally, that it is not strong enough to render it immune to physical shocks such as may be encountered during shipping and installation of the tube within which it is installed. Nor is the solution of this problem found in the use of more mounting screws, since each additional screw requires the boring of an additional hole in the screen and its supporting frame.

Accordingly, the principal object of the present invention is to provide an improved temperature-compensated screen-assembly of the general character described and one which shall be substantially immune to shocks and strains of any ordinary intensity.

Another and related object of the invention is to provide a "cushioned" support for the screen of a color-kinescope and other high-vacuum cathode-ray tube, and one wherein the cushion or cushioning material may be thoroughly degassed without unduly prolonging the time that the tube is "on the pump."

The foregoing and other objects are achieved, in accordance with the invention, in a simple and facile manner by the provision of a pair of oppositely located clamps, which are secured to the mask-supporting frame, and within which the glass screen is supported to permit of a limited degree of movement on cushions constituted of a spun glass or equivalent (i. e. easily de-gassed) resilient material.

The invention is described in greater detail in

connection with the accompanying single sheet of drawings, wherein:

Fig. 1 is a front elevational view showing the obverse or viewing side of the glass screen of a masked-target kinescope, the glass being supported, in accordance with the principle of the invention on "cushions" in a pair of oppositely located clamping elements;

Fig. 2 is a rear elevation of the masked-target assembly of Fig. 1, showing the manner in which the punctiform mask is affixed to the frame or support of the assembly; and

Fig. 3 is a vertical section of the masked-target assembly of Figs. 1 and 2, taken on the line 3—3 of Fig. 1.

The temperature-compensated target-assembly shown in the drawing comprises a translucent viewing-screen 1, an apertured thin-metal mask 3, and a metal frame 5, upon which said screen and mask are supported. The viewing screen comprises a foundation plate constituted of glass or equivalent (i. e. transparent or translucent) insulating material and its rear or "target" surface 1*t* will be understood to be provided with a punctiform or other pattern of electron sensitive areas, not shown. This plate 1, as here shown, is in the form of a truncated circle, having upper and lower horizontally extending edges 1*u* and 1*b*, respectively. The mask 3 for the target surface 1*t* of the glass screen or plate 1 and the central opening 5' in the frame 5 are of the same general shape as the viewing screen 1. The thickness dimension of the frame 5 is indicated by the required spacing between the mask 3 and the electron sensitive surface of the screen.

The thin metal mask 3 is secured to the rear surface of the frame 5 by means of screws 7 which extend through metal clamping strips 8, 8*a*, etc., which are disposed in end-to-end relation, about the marginal edges of the mask. Wires 9, welded to the underside of each strip, may be provided, if desired, to prevent the mask from slipping when the screws are tightened. As described in the Law application (Serial No. 158,901), the thin metal mask is preferably heated before the screws are tightened, so that, upon cooling, the thin metal will contract and be rendered taut on the frame.

Two elongated L-shape clamping elements 11 and 13, which are movably secured to the front of the frame 5 by two sets of screws 12, and 14, respectively, hold the viewing screen or plate 1 in position on the frame 5. This glass plate 1 is fitted in the angle of the L's (11, 13) with the long arm of each L (11, 13) extending over the straight edges of the front major surface of the glass, so that the short arms of the L's (11, 13) are adjacent to the straight minor edges thereof.

If a clamping force were to be applied directly to the glass through the clamping elements 11, 13 and screws 12 and 14, the different coefficients of expansion of the glass and metal might cause the glass to crack when the assembly is subjected to the heat generated either during normal operating periods (by the electron-beam) or during the "sealing-in" (or "de-gassing") manufacturing operations. In accordance with the present invention, this hazard is overcome by applying the clamping force to the glass plate 1 through a suitable cushioning material 17, which permits of a limited degree of relative movement between the glass plate or screen 1 and the frame 5 when the assembly is subjected to changes in temperature. The "cushion" 17

must be constituted of a refractory material and, furthermore, the material must be of a kind capable of being thoroughly out-gassed without unduly prolonging the time the tube is "on the pump." Fibers constituted of glass and assembled either in the form of a bundle, wad or fabric have been found entirely satisfactory. In the instant case, the refractory cushioning material takes the form of a woven glass tape 17 and is disposed between the marginal straight edges of the major surface 15 of the viewing screen 1 and the long arms of the L-shape clamping members 11 and 13.

It will be observed that the construction and arrangement of the clamping elements 11, 13 and screws 12, 14 is such that the glass plate is not weakened by the mounting holes required in the "target assemblies" of the prior art.

It will now be apparent that the present invention provides an improved temperature-compensated screen assembly and one which is substantially immune to shocks and tremors of any ordinary intensity.

What is claimed is:

1. A temperature-compensated target and frame assembly for use in an electron-discharge device, said assembly comprising, a foundation plate having an electron-sensitive target surface, a frame for said plate, said plate and said frame being constituted of materials having different coefficients of expansion, mounting elements carried by said frame in a position to engage discrete edge portions of said plate, a resilient refractory material disposed adjacent to said discrete edge portions of said plate, and means for exerting clamping force upon said plate through said mounting elements and resilient material, whereby to permit of a limited degree of relative movement between said frame and plate when said assembly is subjected to changes in temperature.

2. The invention as set forth in claim 1 and wherein said resilient refractory material is constituted essentially of inorganic fibers.

3. The invention as set forth in claim 1 and wherein said resilient refractory material is in the form of a fabric having a relatively loose weave to facilitate the removal of gas therefrom.

4. The invention as set forth in claim 1 and wherein said resilient refractory material comprises a tape-like structure constituted of glass fibers.

5. The invention as set forth in claim 1 and wherein said mounting elements for said foundation plate comprise a pair of elongated L-shape members disposed with their long arms adjacent to a common major surface of said plate and their short arms adjacent to oppositely located minor surface portions of said plate.

6. The invention as set forth in claim 5 and wherein said elongated L-shape mounting elements for said foundation plate are supported upon said frame by said means for exerting said clamping force upon said plate.

7. A temperature-compensated target assembly for use in a cathode-ray tube, said assembly comprising a translucent foundation plate having an electron-sensitive target surface, a frame for supporting said foundation plate and containing a central aperture through which electrons may pass to said target surface, adjustable mounting elements carried by said frame in a position to engage discrete edge portions of said

plate, a resilient refractory material disposed adjacent to said discrete edge portions of said plate and through which a clamping force is applied to said plate by said clamping elements, and an apertured electrode secured to said frame in spaced relation with respect to said electron-sensitive target surface of said translucent foundation plate.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,473,220	Rose -----	June 14, 1949
2,493,539	Law -----	Jan. 3, 1950
2,538,836	Jensen -----	Jan. 23, 1951
2,539,442	Larson -----	Jan. 30, 1951
2,546,828	Levy -----	Mar. 27, 1951
2,563,488	Rose -----	Aug. 7, 1951