

**United States Patent** [19]  
**Steiner**

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[54] **COLOR TUBE HAVING FUNNEL SHIELD  
ATTACHED TO SHADOW MASK FRAME**

[75] Inventor: **Karl Steiner**, Ay/ller, Germany

[73] Assignee: **Licentia  
Patent-Verwaltungs-G.m.b.H.,  
Frankfurt, Germany**

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[52] **U.S. Cl.**..... **313/407, 313/240**

[51] **Int. Cl.** ... **H01j 29/06, H01j 31/20, H01j 29/08**

[58] **Field of Search**..... 313/85 S, 82 B, 92 PD,  
313/64

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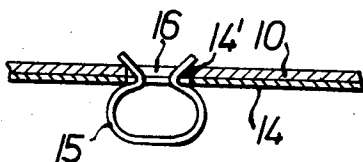
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*Primary Examiner*—Robert Segal  
*Attorney, Agent, or Firm*—Spencer & Kaye

[57] **ABSTRACT**

A color television picture tube including a glass tube vacuum vessel having a front screen portion, a conical portion and neck portion; with a ferromagnetic shielding funnel configured for reception within the conical portion, support means attached to said tube for supporting the funnel within the conical portion, and fastening means attached to the funnel for releasably connecting the funnel to the support means.

**3 Claims, 12 Drawing Figures**



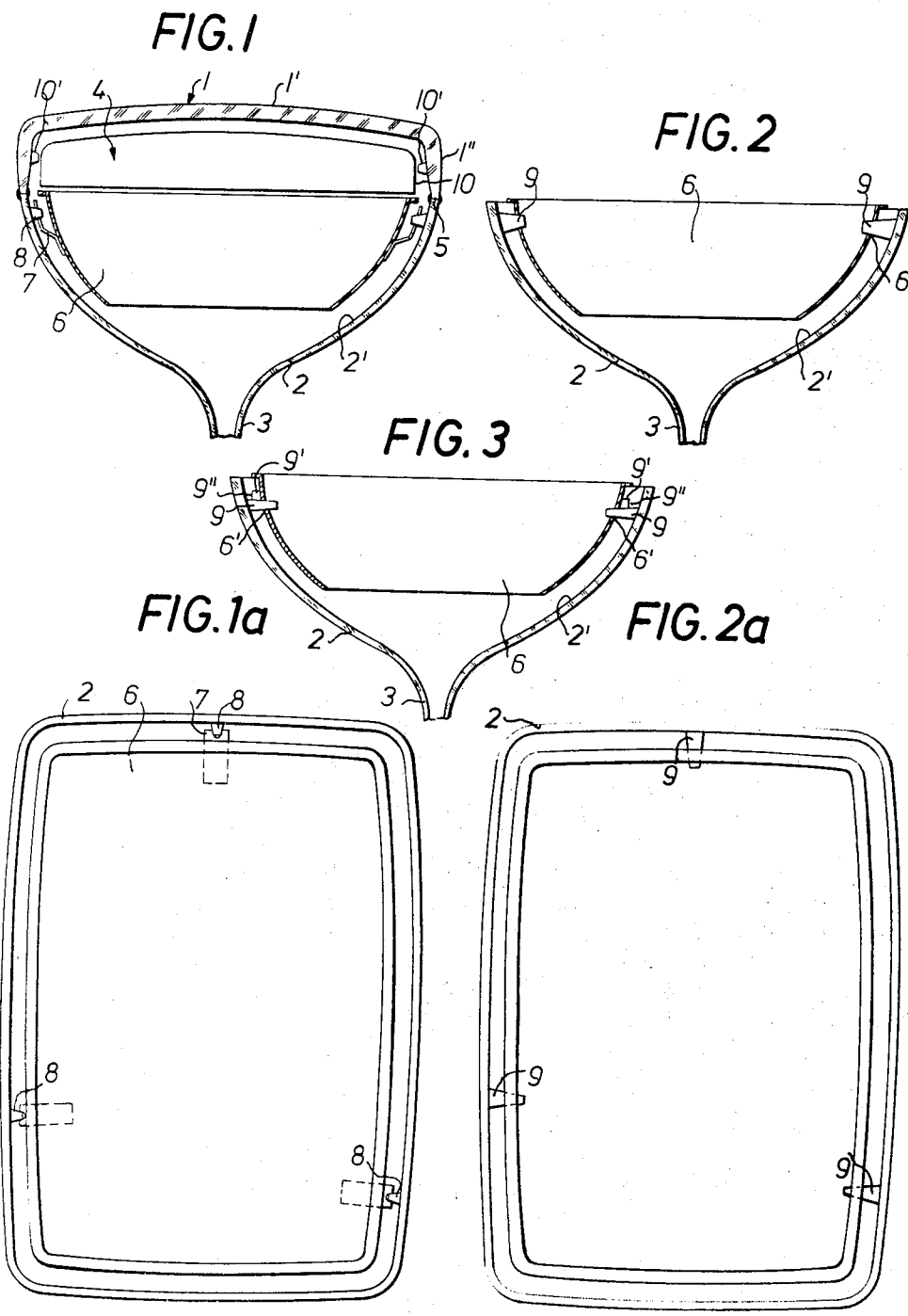


FIG. 4

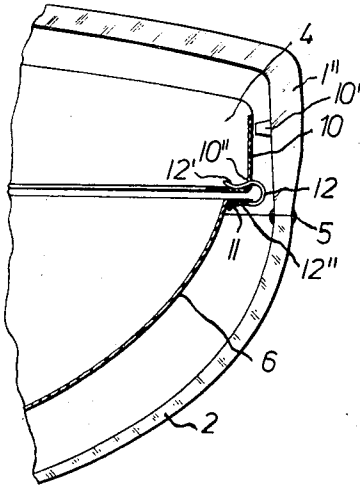


FIG. 5

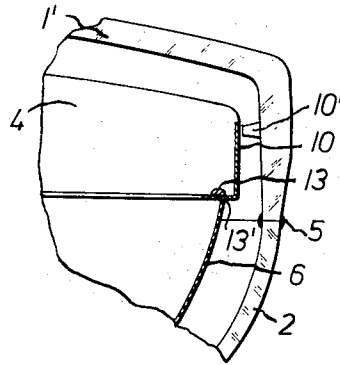


FIG. 6

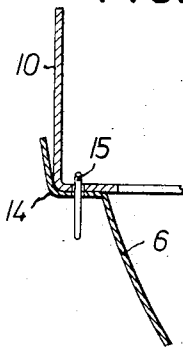


FIG. 6a

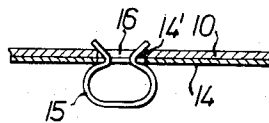


FIG. 7

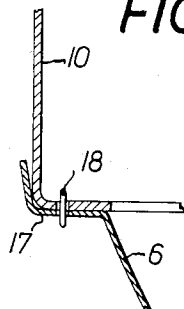


FIG. 7a

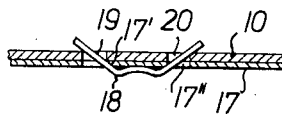
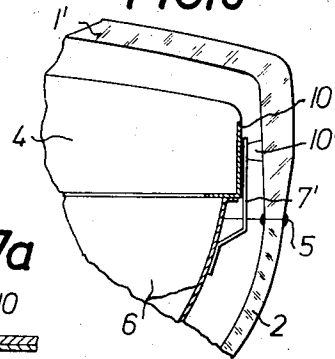


FIG. 8



## COLOR TUBE HAVING FUNNEL SHIELD ATTACHED TO SHADOW MASK FRAME

### BACKGROUND OF THE INVENTION

The present invention relates to a color television picture tube including a glass vacuum vessel tube having a front screen portion, a glass conical portion and a neck portion, and a ferromagnetic shielding funnel disposed within the conical portion.

From DOS ("Deutsche Offenlegungsschrift" — German Pat. application laid open prior to substantive examination) No. 1,512,323, which corresponds to U.S. Pat. No. 3,549,932 issued Dec. 22, 1970 to R. L. Lindemann, it is known to dispose a ferromagnetic shielding funnel within the vacuum vessel of a color television picture tube. This shielding funnel is disposed substantially in the area of the conical portion of the vacuum vessel. The funnel mainly serves to shield the electron beams passing to the apertured color mask against the influence of undesirable magnetic fields. The shielding funnel in this known arrangement is rigidly fastened to the frame of the apertured color mask so that the mask and the shielding funnel form a unit.

It has been found, however, that in the manufacture of the luminescent screens of such tubes such a rigid unit for the shielding funnel and the apertured color mask is very annoying. It has moreover been found that rigid fastening of the shielding funnel to the apertured color mask, particularly by spot welding, can produce deformations in the mask which might lead to color impurities of the television picture and thus to tube malfunctions.

### SUMMARY OF THE INVENTION

It is the object of the present invention to provide a novel color television picture tube of the above-mentioned type, which is improved particularly with respect to its manner of fabrication and reproducibility.

This and other objects are achieved by the present invention in all its various embodiments by the provision of a vacuum vessel glass tube which includes a front screen portion having a peripheral flange extending therefrom and a conical portion having a neck portion extending from one end thereof. The flange of the front screen portion is attached to the other end of the conical portion as by soldering. Within the vacuum vessel are an apertured color mask and a shielding funnel with the shielding funnel received within the conical portion while the color mask is received within the front screen portion. The shielding funnel is releasably fastened to supporting structure which in turn is connected to the glass tube.

In one embodiment, the shielding funnel is releasably fastened to the conical portion of the tube.

In another embodiment, the shielding funnel is releasably fastened to the color mask frame.

In still another embodiment, the shielding funnel is releasably fastened to the color mask frame fastening structure.

A significant advantage of the color television picture tube according to the present invention is that the shielding funnel can be fastened to the interior of the tube a short time before the tube is assembled. Thus, the shielding funnel need not be present during the fabrication of the luminescent screen so that the frequent

illumination processes required for the production of the luminescent screen are not interfered with. Moreover, when the funnel is subsequently fastened according to the invention, the damage and deformation of the apertured color mask, which have been known to occur in the rigidly fastened funnels, are substantially eliminated. It is further advantageous that with a defective tube it is possible to retrieve the shielding funnel as well as the apertured color mask without damaging either the funnel or the mask.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross-sectional view of one embodiment of the color television picture tube of the present invention showing the shielding funnel to have resilient tongues for engaging the projections of the conical portion.

FIG. 1a is a plan view of the embodiment shown in FIG. 1.

FIG. 2 is a cross-sectional view of another embodiment of the color television picture tube of the present invention showing recesses in the shielding funnel which receive therein the projections of the conical portion.

FIG. 2a is a plan view of the embodiment shown in FIG. 2.

FIG. 3 is a cross-sectional view of a modification of the funnel fastening arrangement shown in FIG. 2.

FIG. 4 is a partial cross-sectional view of another embodiment of the color television picture tube of the present invention showing the shielding funnel fastened to the frame of the apertured color mask by a resilient clamp.

FIG. 5 is a partial cross-sectional view of another embodiment of the color television picture tube of the present invention showing the shielding funnel fastened to the frame of apertured color mask by a resilient tongue.

FIG. 6 is a partial cross-sectional view of another embodiment of the color television picture tube of the present invention showing the shielding funnel to have a flange which cooperates with a resilient clip to fasten the funnel to the frame of the apertured color mask.

FIG. 6a is a partial side view of the embodiment shown in FIG. 6 showing further details of the resilient clip.

FIG. 7 is a partial cross-sectional view of another embodiment of the color television picture tube of the present invention showing the shielding funnel to have a flange which cooperates with another embodiment of a resilient clip to fasten the funnel to the frame of the apertured color mask.

FIG. 7a is a partial side view of the embodiment shown in FIG. 7 showing further details of the resilient clip.

FIG. 8 is a partial cross-sectional view of another embodiment of the color television picture tube of the present invention showing the shielding funnel to have resilient tongues which engage the projections of the front panel.

### DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference will now be made to the drawings, wherein the same parts are provided with the same reference numerals in each of the figures.

FIG. 1 shows a cross-sectional view of a color television picture tube whose vacuum envelope comprises, in the usual manner, a glass front panel 1 having a phosphor screen portion 1' and a peripheral flange 1'', a conical glass portion 2 and the tube neck 3. In the usual manner the base contacts (not shown) are disposed at the tube neck 3. The flange 1' of the front panel 1 is connected with the conical portion 2 in a vacuum-tight manner, preferably by means of a glass solder 5.

Within the front panel 1, on whose inner surface the layers of luminescent material are known to be disposed, an apertured color mask 4 is provided which generally consists of a thin perforated metal sheet which is tensioned in a frame structure 10. The frame 10 is fastened to the inner wall of the front panel 1 by any known fastening means, the front panel 1 being provided with projections 10' for this purpose.

To shield the electron beams against undesired external magnetic fields, a ferromagnetic shielding funnel 6 is disposed within the conical portion 2, the shape of the funnel being adapted to the shape of the inner wall of the conical portion 2, but preferably with a certain spacing from the inner wall thereof.

In one preferred embodiment of the present invention shown in FIGS. 1 and 1a, the inner wall 2' of the conical portion 2 is provided with supporting structure for the funnel 6 in the form of a plurality of projections 8, preferably three, although it should be understood that any number could be utilized as desired. These projections may be integral extensions of the conical portion 2 or they may consist of pins or the like, e.g., of metal, which are inserted through the glass wall of the conical portion 2. The outer surface of the shielding funnel 6 bears a number of resilient tongues 7 which correspond to the number of projections 8 and which enclose the ends of the projections 8 with appropriately configured openings or recesses so that the accurate positioning of the shielding funnel 6 within the conical part 2 is assured.

With this type of fastening, the shielding funnel 6 can be retrieved without difficulty by releasing the resilient tongues 7 from their engagement with the projections 8.

The degree of resiliency preferably desired in this and the other embodiments is such that with any deviations in the dimensions of the shielding funnel due to tolerance values, heat expansion or the like, no interfering deformation forces will be transferred to the fastening parts.

FIGS. 2, 2a and 3 show another preferred embodiment of the present invention in which the shielding funnel 6 is provided with openings or recesses 6' along its periphery. These openings or recesses engage therein the ends of the funnel supporting structure which is again in the form of projections 9 extending from the inner wall 2' of the conical portion 2. The releasable fastening of the shielding funnel 6 in this embodiment occurs in one instance (FIG. 2) because of the inherent elasticity of the shielding funnel 6 which makes it possible to deflect the funnel 6 sufficiently to release the engagement of the openings and the projections, and in another instance (FIG. 3) because the shielding funnel 6 may be configured to include tongues 9' which border the openings 6' and extend from the shielding funnel 6 and include a bent-over portion 9'' which in turn engage the projections 9. Again, the funnel 6 can be deflected to release it.

FIG. 4 shows another embodiment of the present invention in which the shielding funnel 6 is provided with outwardly bent tongues or an outwardly bent flange 11 at its larger periphery, so that the funnel 6 can be clamped to the supporting structure in the form of the frame or carrier 10 of the apertured color mask 4. The tongues or flange 11 are fastened to the carrier 10 by resilient spring clips 12, which have one arm 12' inserted through opening 10'', so that arms 12' and 12'' may clamp the tongues or flange 11 and the carrier 10 therebetween.

In another embodiment according to FIG. 5, the shielding funnel 6 is provided with tongues 13 which protrude upwardly through the corresponding openings 13' in the frame 10 of the apertured color mask 4 and are then twisted or bent over. This type of fastening can also be released at any time without any damage to the members being fastened.

FIGS. 6 and 6a show a further embodiment of a clamp-type fastening to connect the shielding funnel 6 with the supporting structure in the form of the frame or carrier 10 of the color mask. A plurality of laterally extending tongues or an annular flange 14 with openings 14' is disposed at the larger periphery of the shielding funnel 6. As illustrated, the flange 14 terminates in an end portion which extends in substantially the same direction as the funnel along the side of the frame 10. Corresponding openings 16 are provided in the section of the L-shaped frame or carrier 10 which extends transverse to the axis of the tube, which openings 16 are placed in alignment with openings 14'. A resilient metal clamp 15 which is inserted into the two aligned openings 14' and 16 is used to assure the releasable fastening of the shielding funnel to the carrier 10 of the color mask 4. The elastic configuration of this type of fastening further assures that no undesired deformations of the parts to be fastened together, and particularly of the color mask, can occur when there are tolerance deviations.

FIGS. 7 and 7a show a further preferred embodiment of the fastening of the shielding funnel 6 to the carrier 10 of the color mask 4. The shielding funnel 6 is provided at its larger periphery with a plurality of tongues or an annular flange 17 which is provided with openings 17' and 17''. The carrier 10 is also provided with appropriately disposed openings 19 and 20. The two parts to be fastened together are so placed on top of one another that the openings 17' and 17'' are in alignment with the openings 19 and 20. An elastic metal clamp 18, e.g., a wire, provides the fastening means which is inserted into the aligned openings 17', 19 and 17'', 20 for resiliently connecting the funnel 6 and carrier 10.

A further suitable releasable fastening for the shielding funnel 6 within the vacuum vessel is shown in FIG. 8 and consists in the use of the funnel supporting structure in the form of projections or pins 10', usually provided on the inner wall of the peripheral flange 1'' of the front panel 1 for holding the color mask 4 as fastening members for the shielding funnel as well. In this case similar fastening elements 7' as those shown in FIG. 1 should advisably be provided extending from the shielding funnel 6.

It will be understood that the above description of the present invention is susceptible to various modifications, changes and adaptations, and the same are in-

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tended to be comprehended within the meaning and range of the equivalents of the appended claims.

I claim:

1. A color television picture tube including: a glass vacuum tube having a front screen portion with a peripheral flange extending therefrom, a conical portion having a neck portion extending from one end thereof and means for attaching the flange of said screen portion to the other end of said conical portion; a beam source of electrons mounted in the neck portion of the tube to be deflected by means attached to the tube so that the electron beam scans the front screen portion; a ferromagnetic shielding funnel disposed within said conical portion; an apertured color mask mounted on a color mask frame positioned between said ferromagnetic shielding funnel and said display screen, said frame having an L-shaped cross section with one section extending transversely to the axis of said tube; means for attaching said frame to said peripheral flange for said front screen portion; and means for fastening said funnel to said frame to support same within said conical portion;

said funnel being provided with a flange member extending transversely from the larger end thereof and including a plurality of openings, said trans-

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versely extending member having a portion, at the end thereof opposite the large end of said funnel, which extends in substantially the same direction as said funnel along the side of said frame;

the transverse section of said frame being provided with a like plurality of openings aligned with the opening in the transverse portion of said flange member; and said fastening means comprises means for releasably fastening said funnel to said frame including a plurality of resilient clamps each engaging said funnel and said frame through an aligned pair of openings of said funnel and said frame.

2. A color television picture tube as defined in claim 1, wherein said plurality of resilient clamps each engage said funnel and said frame through adjacent aligned pairs of openings in said funnel and said frame, so as to releasably fasten said funnel to said frame.

3. A color television picture tube as defined in claim 1, wherein said fastening means is sufficiently resilient so that deformation forces which result from a deviation in the dimensions of the shielding funnel due to tolerance values, heat expansion or the like, will not be transferred to said frame.

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