

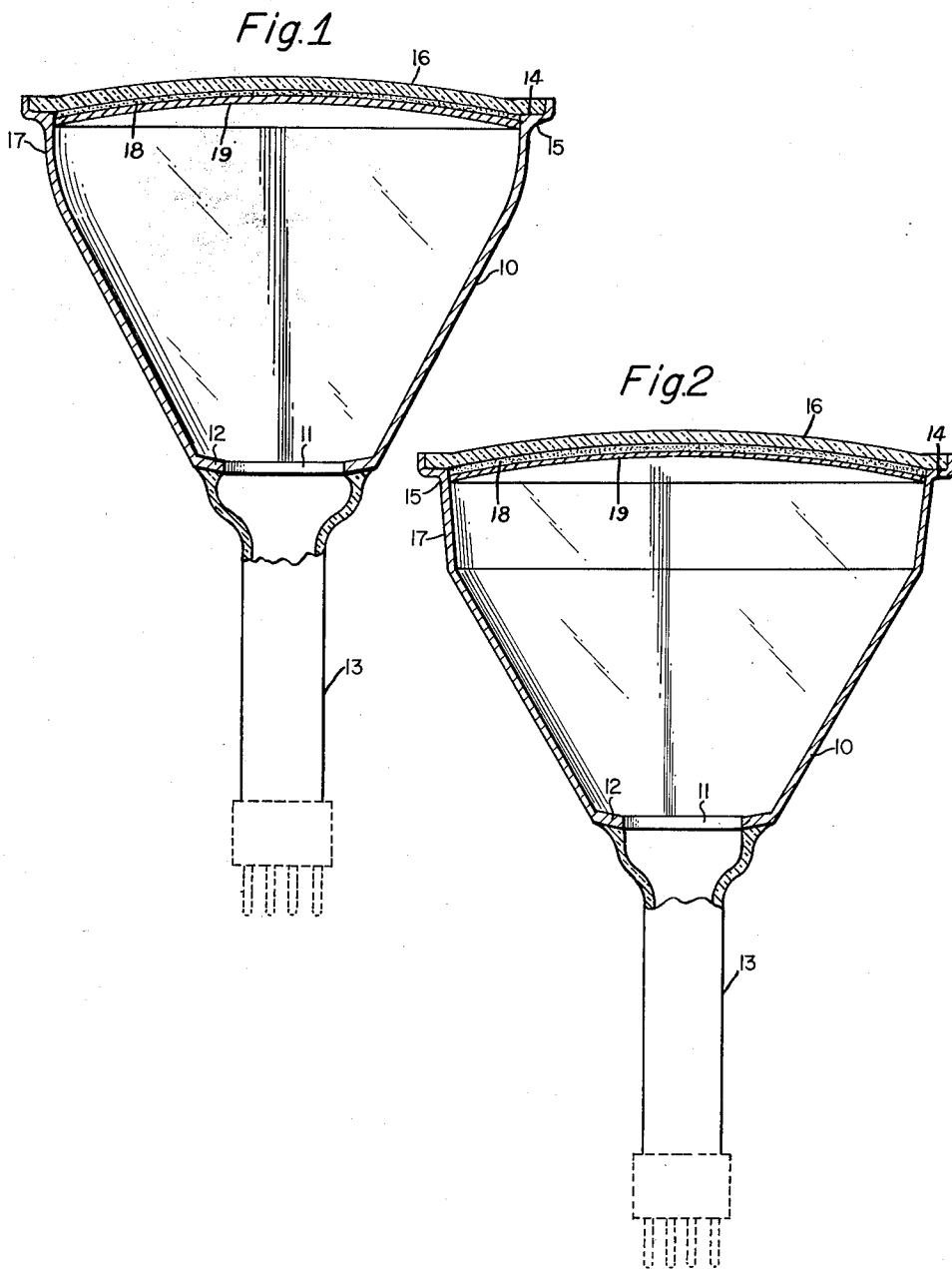
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METAL CONE CATHODE-RAY TUBE

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METAL CONE CATHODE-RAY TUBE

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2 Claims. (Cl. 313—92)

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This invention relates to cathode-ray tubes such as those employed for image-reproduction in direct-view television receivers, and more particularly to so-called "metal cathode-ray tubes" having a metal cone between the electron gun chamber and the fluorescent screen.

It is well known in the cathode-ray tube art that the provision of a metallic film adjacent the fluorescent screen of a cathode-ray tube affords a number of advantages, two of the most important of which are increased brightness and freedom from ion burn. In spite of these advantages, metal-backed screens have been employed only in cathode-ray picture tubes of the all-glass variety and have not found general application to cathode-ray picture tubes of the type employing a metal cone member. Indeed, numerous steps have been taken to avoid ion burn in metal-cone cathode-ray tubes by providing ion-trap arrangements including external permanent magnets and requiring rather accurate adjustment. Although the use of a metal backing for the fluorescent screen obviates the requirement for an ion-trap mechanism and in addition affords the advantage of increased brightness, it has not been found feasible to form a metal backing for the fluorescent screen in cathode-ray tubes of the type employing conventional spun-metal cone members.

In the processing of all-glass cathode-ray tubes, the metal backing layer is conventionally applied by first casting a solution of a synthetic resin and a suitable plasticizer on the surface of a casting liquid, allowing a thin volatilizable organic film to solidify, and subsequently decanting the casting liquid to permit the solidified film to lay evenly over the fluorescent screen; the metal backing layer is then formed on the organic film, and the film is removed by volatilization. The process is described and claimed in a copending application of James S. Bailey, Serial No. 4,207, filed January 24, 1948, for Process of Coating Luminescent Screens, and assigned to the present assignee. The difficulty in applying this process to a conventional metal-cone cathode-ray tube may be traced to the mechanics of film formation. When the solution of the synthetic resin and the plasticizer is poured on the surface of the casting liquid, it spreads uniformly over that surface. The solvent begins to evaporate, forming a thin layer of organic film on the surface in contact with the air. Should the casting liquid be decanted while the film is only partially solidified, some of the still-liquid film solution is found to streak or swirl over the surface of that portion which

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has already solidified, thereby resulting in inadmissible variations in thickness. As a consequence, it is necessary to wait until the solvent is substantially entirely evaporated before decanting the casting liquid. At this stage, the solidified film has lost its spreading power and has a tendency to curl back at the edge during the decantation process. This results in a discontinuity in the subsequently-applied metal backing layer.

It is an important object of the present invention to provide a new and improved metal cone member for a cathode-ray picture tube of suitable configuration to permit the formation of a high quality metal backing layer for the fluorescent screen.

The present invention is predicated on the discovery that defects in the formation of an organic film of the type described are substantially avoided if the metal cone member is made of such configuration that the area of the surface of the casting liquid, and hence the area of the solidified film before deposition on the fluorescent screen, may be at least substantially equal to the screen surface area. To this end, a cathode-ray tube cone constructed in accordance with the invention comprises a hollow thin-walled metal member of generally frusto-pyramidal form having at one end a relatively small axial aperture bounded by a flange adapted to be sealed to a generally cylindrical glass electron-gun chamber and at the other end a relatively large axial aperture bounded by a flange adapted to be sealed to a glass fluorescent-screen-receiving face plate. The cone member further has an intermediate portion, palpably distant from the face plate end, of a transverse area at least substantially equal to that of the large aperture.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. The invention, together with further objects and advantages thereof, may best be understood, however, by reference to the following description taken in connection with the accompanying drawing, in the several figures of which like reference numerals indicate like elements, and in which:

Figure 1 is a cross-sectional view of a metal cone member constructed in accordance with the invention, the other portions of the cathode-ray tube being indicated in phantom, and

Figure 2 is a similar view of another embodiment of the invention.

As illustrated in Figure 1, a metal cone member 10 for a cathode-ray tube comprises a rela-

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tively small axial aperture 11 bounded by an intumed flange 12 adapted to be sealed to a generally cylindrical electron-gun chamber 13. At the other end of the metal cone member 10, there is a relatively large axial aperture 14 bounded by an outwardly-directed flange 15 to which is sealed a glass face plate 16; a fluorescent screen 18 is affixed to glass face plate 16. Metal cone member 10 is bulged at the face plate end to provide an intermediate portion 17, palpably distant from the face plate end, of a transverse area substantially equal to that of aperture 14 (at least sufficiently distant to permit complete immersion of the screen-receiving face plate in a casting liquid having a surface area substantially equal to the transverse area of aperture 14). Viewed in another way, metal cone member 10 is provided with an intermediate portion 17 of substantially constant transverse area extending from aperture 14 for a palpable distance toward aperture 11.

It has been found that, when a metal cone member of the type shown in Figure 1 is employed in place of the conventional cone of straight or unbulged configuration, difficulties of the type discussed do not arise in the formation of an organic film over the fluorescent screen. Since the surface of the casting liquid may have a transverse area substantially equal to that of the screen surface on which the film is to be deposited, the solvent may be allowed to evaporate before decanting the casting liquid, and the solidified film formed on the surface of the casting liquid may be laid directly over the fluorescent screen without tending to tear or stretch as the casting liquid is decanted. It has been found that, with a metal cone member of the type shown in Figure 1, a substantially perfect organic film of uniform thickness may be formed, and the formation of the metal backing over the deposited organic film may be carried out in a conventional manner to provide a finished product of high quality and uniformity. After volatilization of the organic film, a thin uniform electron-permeable metallic coating 19 remains over fluorescent screen 18.

In the embodiment of Figure 1, intermediate portion 17 of cone member 10 is cylindrical so that the transverse area in a plane sufficiently removed from the plane of aperture 14 to provide for complete immersion of the screen in a casting liquid is exactly equal to the transverse area of aperture 14. It has been found that exact equality of the transverse areas of aperture 14 and intermediate portion 17 is not required to provide satisfactory film formation. Thus, the metal cone member may be formed in the manner shown in Figure 2, wherein intermediate portion 17 is not exactly cylindrical but instead corresponds to a frustum of a cone having an apex angle of about 10 degrees. Such a construction represents a limiting condition for satisfactory film formation; suitable results cannot be obtained on a commercially feasible basis when the cone converges from the screen-receiving aperture 14 at a more rapid rate.

It has also been found, in accordance with the invention, that satisfactory results may be obtained if the cone member is so formed that the transverse area of an intermediate portion is greater than that of the screen-receiving aperture 14.

Consequently, in the appended claims, the specification of an intermediate portion having a transverse area "at least substantially equal" to

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that of the screen-receiving aperture 14 comprehends structures wherein the area of the intermediate portion is greater than that of the screen-receiving aperture and structures such as that shown in Figure 2 wherein the transverse area of the intermediate portion is only very slightly smaller than that of the screen-receiving aperture, as well as structures wherein the two areas are exactly equal.

Moreover, while the invention has been shown and described in connection with metal cone members of generally frusto-conical form, it is apparent that the same principles are applicable in the fabrication of so-called rectangular cones. The term "frusto-pyramidal" is therefore employed in the appended claims as a generic term descriptive of both round and rectangular cone members, since a cone is in fact a limiting form of pyramid.

While particular embodiments of the present invention have been shown and described, it is apparent that various changes and modifications may be made, and it is therefore contemplated in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

We claim:

1. A cathode-ray tube comprising: a hollow thin-walled metal cone member of generally frusto-pyramidal form having at one end a relatively small axial aperture bounded by a flange and at the other end a relatively large axial aperture also bounded by a flange, and further having an intermediate portion of substantially constant transverse area extending from said large aperture for a palpable distance toward said small aperture; a generally cylindrical glass electron-gun chamber sealed to said first-mentioned flange; a glass face plate sealed to said second-mentioned flange; a fluorescent screen affixed to the internal surface of said face plate; and a thin uniform electron-permeable metallic coating applied to said fluorescent screen.

2. A cathode-ray tube comprising: a hollow thin-walled metal cone member of generally frusto-conical form having at one end a relatively small axial aperture bounded by an intumed flange and at the other end a relatively large axial aperture bounded by an outwardly-directed flange, and further having a substantially cylindrical intermediate portion extending from said large aperture for a palpable distance toward said small aperture; a generally cylindrical glass electron-gun chamber sealed to said intumed flange; a glass face plate sealed to said outwardly-directed flange; a fluorescent screen affixed to the internal surface of said face plate; and a thin uniform electron-permeable metallic coating applied to said fluorescent screen.

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