

Oct. 8, 1957

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TELEVISION PICK-UP TUBES

2,809,315

Filed Dec. 23, 1953

FIG. 1.

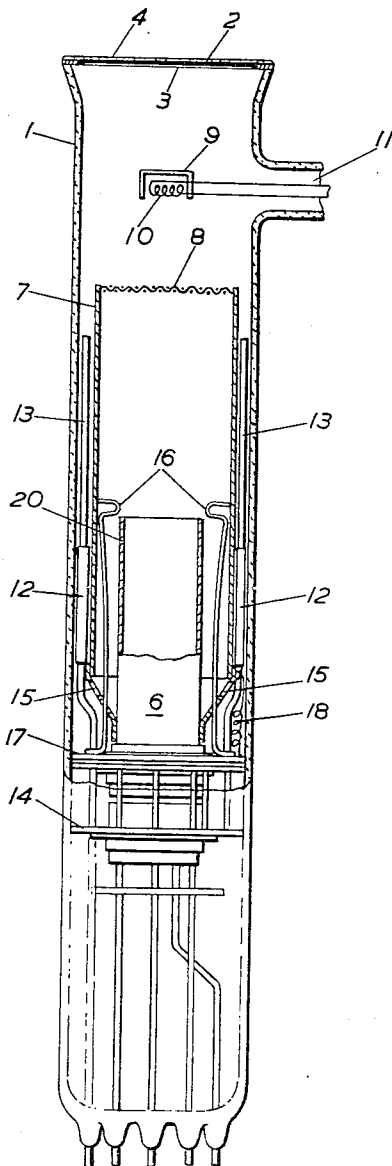
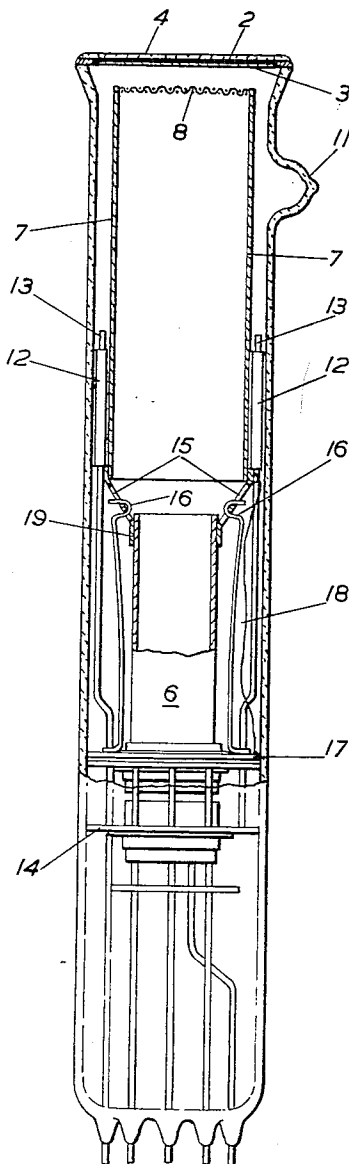


FIG. 2.



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TELEVISION PICK-UP TUBES

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Application December 23, 1953, Serial No. 399,940

Claims priority, application Great Britain

December 24, 1952

11 Claims. (Cl. 313—65)

The present invention relates to television pick-up tubes and more particularly to methods of depositing sensitive materials on only the desired surfaces in such tubes, where space is limited. The invention also relates to tubes made according to such methods.

The invention is more particularly applicable to television pick-up tubes of the photo-conductive type, the target surface of which comprises a thin layer of photo-conductive material, i. e. a material the conductivity of which varies with the illumination, the target being in contact with a transparent conducting signal plate through which the light from the scene is projected on to the photo-conductive material, the opposite surface of the target being scanned by a beam of electrons. One such photo-conductive tube is known under the trademark "Vidicon" and a description thereof appeared in the May 1950 issue of "Electronics."

Such photo-conductive tubes ordinarily comprise a glass envelope of generally cylindrical form, in one end of which is mounted a scanning gun, the opposite end of the tube being closed by a plain glass end face which is secured to the end of the cylindrical part of the envelope by a glass-to-metal seal, for example. The metal portion of the seal serves for making electrical connection to the transparent signal plate which is applied over the internal surface of the glass face and may comprise for example a layer of cadmium oxide within the tube. Between the gun and the target is arranged a conducting cylinder, which may be constituted by a wall coating, forming the final anode of the gun, the end of the cylinder adjacent the target being provided with a mesh screen spaced a short distance from the target.

The photo-conductive layer has to be applied under vacuum conditions over the inside surface of the transparent signal plate and this is ordinarily effected by cathode sputtering or a similar process which necessitates the insertion into the tube of a charge of photo-conductive material and an evaporating means therefor. This is effected by making an aperture in the wall of the tube through which the material and evaporating means are introduced, the aperture inserted then being sealed and the envelope evacuated. However, there is only a very small space between the electron-permeable screen electrode forming the end surface of the electron gun and the target which space is insufficient to accommodate the evaporating means and it has been usual to make the aperture some distance down the tube from the target and through the wall coating of the final anode also so that the evaporating means and the photo-conductive material are behind the electron gun end screen electrode with reference to the signal plate. Consequently, when evaporation is effected to deposit the photo-conductive material, the material has to pass through the mesh of the screen electrode and consequently the material has often been found to adhere to the screen, thereby closing up the mesh.

It is the particular object of the present invention to remedy this and analogous disadvantages, and accordingly to this end, the electron-permeable electrode of the tube is movably mounted in a supporting guide member or members in such a manner that said electrode may be temporarily moved out of its normal operative position, means being provided to allow it to be restored to and suitably held at the normal position.

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In the application of the invention to photo-conductive tubes, the final anode of the electron gun is a metal tube arranged within the envelope and mounted to slide upon suitable longitudinal supporting guides carried from any convenient point away from the target end of the tube. These guides enable the anode to be retracted towards the electron gun end of the tube leaving sufficient space for the entry of an evaporating means through an aperture in the tube envelope near the location for the target surface to allow the evaporation of photo-conductive material onto the signal plate. After such evaporation has taken place, the anode can be slid back along the supporting guides and restored to its normal position, its travel preferably being limited by suitable stops.

In order that the invention may be more readily understood, reference will now be made to the accompanying drawings which show one embodiment thereof by way of example, as applied to a photo-conductive pick-up tube and in which:

Fig. 1 shows a section through the tube during evaporation of the sensitive material and with the final anode held away from the surface being sensitised, and

Fig. 2 shows a section through the tube after evaporation, with the final anode in its normal position for use.

In the drawings, there is shown a photo-conductive tube having a glass envelope 1, one end of which is to be provided with a target that comprises a transparent signal plate 2 coated with a layer 3 of sensitive material that has the property of altering its conductivity when light impinges upon it. Such material is substantially an electrical insulator in the dark but exhibits slight conductivity when illuminated. Examples of such material are certain oxides, such as cuprous oxide, selenium, sulphur and certain sulphides and selenides, which are known in the art to be photo-conducting. The transparent signal plate 2 is protected by a front glass face 4 and between the tube envelope 1 and the glass face 4 there is provided a metal ring, for example, of the material known under the registered trademark "Kovar," this ring being arranged to be in electrical contact with the signal plate 2 to form the signal output termination for the tube.

The tube contains an electron gun assembly, indicated by reference numeral 6, whose final anode assembly is indicated at 7. The anode 7 is in the form of a metal tube terminated by an electron-permeable screen electrode 8 at the end next adjacent the target surface, the normal position of this anode being shown in Fig. 2.

In order to sensitise the target surface, the sensitive photo-conducting material has to be evaporated on to the transparent signal plate 2 and this is ordinarily effected by means of an evaporating means containing a charge of the sensitive material and shown at 9 in Fig. 1, arranged to be heated by any convenient means, for example, an electrical heating coil 10. This evaporating means must be introduced into the tube after manufacture and this is effected by making an aperture in the tube wall and passing the evaporating means therethrough.

A study of Fig. 2 will show that in the normal position of the anode 7 there is insufficient room between the screen 8 and the signal plate 2 to locate the evaporating means and therefore the practice hitherto has been to pass the evaporating means through an aperture 11 and to evaporate actually through the screen 8 whereupon the sensitizing material has often been found to adhere to the screen 8 thereby closing up its mesh.

This disadvantage is removed according to the invention by making the anode 7 movable away from the target surface so that it can be positioned remotely from the target during evaporation.

This movement is effected by providing the final anode at two diametrically opposite parts of its outer surface with a pair of sleeves 12 which are arranged to slide upon

two longitudinally-arranged rods 13 fixed to a ring 14 forming part of the electron gun assembly 6. By this means the anode 7 may slide longitudinally of the tube on the rods 13.

At the base of the anode 7 is provided a pair of diametrically-opposed apertures 15 in which engage two spring catches 16 to lock the anode in its normal operative position, as shown in Fig. 2. These spring catches 16 comprise thin longitudinal wire springs each supported at one end on a support 17 in the electron gun assembly.

Although the sleeves 12 and rods 13 form an electrical connection between the anode 7 and the electron gun assembly, it is nevertheless preferred to ensure good electrical continuity at all times and in all positions of the anode by means of pig-tail connections 18.

To form a further supporting guide for the anode during its movement, the anode may have a collar 19 at its end remote from the screen 8, which collar slidably engages over a tubular portion 20 of the electron gun assembly.

For sensitizing the surface of the signal plate with the sensitive material, the tube is arranged to be manufactured with the anode 8 displaced on the supporting guides 13 away from its normal position. In this position the spring catches 16 merely press on the outer surface of the tubular anode. The evaporating means 9 with heater 10 and the charge of photo-conductive material are then introduced into the tube through the aperture 11 (Fig. 1) and the aperture sealed off. Evaporation then takes place by passing current to the heating coil 10 whereupon the photo-conductive material is evaporated on to the signal plate without having to pass through the anode screen 8, as it would have done in prior arrangements. After evaporation, the evaporating means 9 is removed and the tube re-sealed and vacuumised.

The anode may be placed in its normal operative position, as shown in Fig. 2, by any convenient means, such as by magnetic attraction, by sliding a suitable magnet along the outside of the glass envelope, or by gently tapping with the tube held target downwards. When the anode is correctly positioned, the catches 16 engage in the wall apertures 15 of the anode to limit further movement.

It will be appreciated that the invention has been described only by way of example and that various modifications could be made to the specific details disclosed without in any way departing from its scope. For example, although the invention has been described in connection with the manufacture of photo-conductive pick-up tubes, it will be apparent that the invention can equally well be applied to any other kind of pick-up tube in which it is required to deposit a layer of sensitive material upon a surface where space is restricted.

We claim:

1. A television pick-up tube having an electron gun, the final anode of said electron gun comprising a tubular metal member mounted to slide upon longitudinal supporting guides carried within the tube from a point away from the target end of the tube, and means for locking said tubular member in its normal operative position.

2. A television pick-up tube as claimed in claim 1, in which said tubular member has two sleeves on diametrically opposite parts of its outer surface, and comprising further a support in said tube, two longitudinally-arranged rods secured to said support, said sleeves locating over and slidable along said longitudinally-arranged rods.

3. A television pick-up tube as claimed in claim 2, in which said support comprises a ring carried by a part of the electron gun assembly.

4. A television pick-up tube comprising an electron gun, the final anode of which is in the form of a tubular metal member arranged to slide longitudinally within the tube, a pair of apertures in the base of said anode remote from the target surface, and a pair of spring catches located in said tube at a position to engage in said apertures to lock said anode in its normal operative position.

5. A television pick-up tube as claimed in claim 4, in which said spring catches comprise thin longitudinal wire springs, each supported at one end by the electron gun assembly.

6. A television pick-up tube comprising an electron gun, the final anode of said gun comprising a tubular metal member mounted to slide upon longitudinal supporting guides within the tube, a collar at the end of said anode remote from the tube target, a tubular portion located to project from the electron gun of the tube, said collar slidably engaging over said tubular portion.

7. A television pick-up tube having an electron gun, the final anode of said electron gun comprising a tubular metal member arranged within the envelope and mounted to slide upon longitudinal supporting guides carried within the tube from a point away from the target end of the tube, two sleeves on diametrically opposite parts of the outer surface of said tubular member, a support in said tube, two longitudinally-arranged rods secured to said support, said sleeves locating over and slidable along said longitudinally-arranged rods, a pair of apertures in the base of said anode remote from the target surface, and a pair of spring catches located in said tube at a position to engage in said apertures to lock said anode in its normal operative position.

8. A television pick-up tube as claimed in claim 7, in which said support comprises a ring carried by a part of the electron gun assembly.

9. A television pick-up tube as claimed in claim 7, in which said spring catches comprise thin longitudinal wire springs, each supported at one end by the electron gun assembly.

10. A television pick-up tube having an electron gun, the final anode of said electron gun comprising a tubular metal member arranged within the envelope and mounted to slide upon longitudinal supporting guides carried within the tube from a point away from the target end of the tube, two sleeves on diametrically opposite parts of the outer surface of said tubular member, a support in said tube, two longitudinally-arranged rods secured to said support, said sleeves locating over and slidable along said longitudinally-arranged rods, a collar at the end of said anode remote from the tube target, a tubular portion located to project from the electron gun of the tube, said collar slidably engaging over said tubular portion, and means for locking said tubular member in its normal operative position.

11. A television pick-up tube having an electron gun, the final anode of said electron gun comprising a tubular metal member arranged within the envelope and mounted to slide upon longitudinal supporting guides carried within the tube from a point away from the target end of the tube, two sleeves on diametrically opposite parts of the outer surface of said tubular member, a support in said tube, two longitudinally-arranged rods secured to said support, said sleeves locating over and slidable along said longitudinally-arranged rods, a collar at the end of said anode remote from the tube target, a tubular portion located to project from the electron gun of the tube, said collar slidably engaging over said tubular portion, a pair of apertures in the base of said anode remote from the target surface and a pair of spring catches located in said tube at a position to engage in said apertures to lock said anode in its normal operative position.

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