United States Patent

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[54] METHOD AND APPARATUS FOR CONNECTING TO A NESA LAYER

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[52] **U.S. Cl.** **313/65,** 174/50.61, 339/144

[51] **Int. Cl.** **H01j 31/26**

[58] **Field of Search** ..... 313/65, 73, 92 PF; 174/50.53, 174/50.52, 50.61; 339/144

[56] **References Cited**

UNITED STATES PATENTS

3,040,124	6/1962	Camras	313/73
3,522,576	8/1970	Cairns	339/96

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[57] **ABSTRACT**

Connection is made to the conductive Nesa layer of a television camera tube by drilling a hole from the backside of a substrate, putting the Nesa layer on the substrate, inserting an indium plug through the hole to contact the Nesa layer, and making contact with the plug on the backside.

6 Claims, 4 Drawing Figures

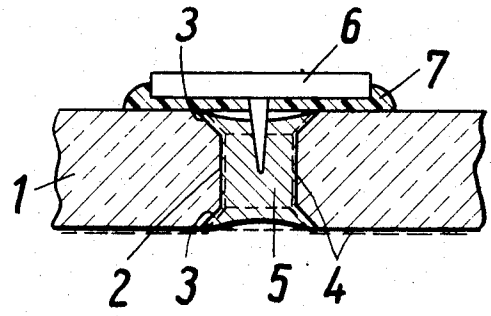


Fig.1

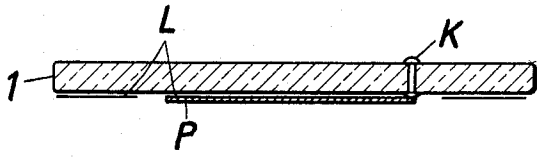


Fig.2

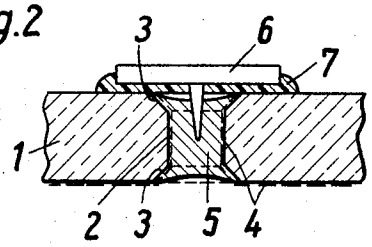


Fig.3

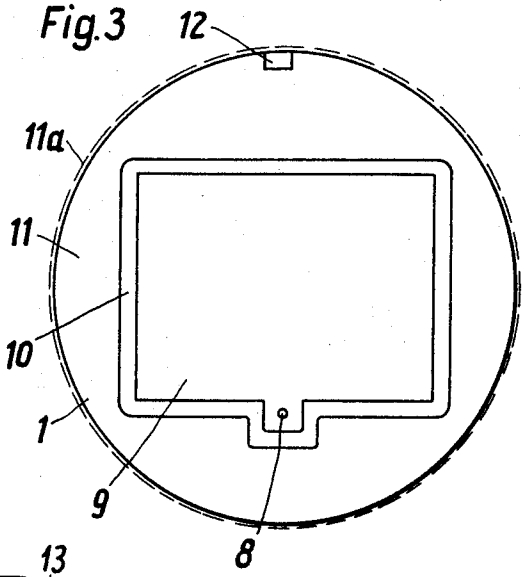
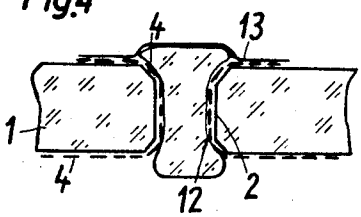


Fig.4



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METHOD AND APPARATUS FOR CONNECTING TO A NESA LAYER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to a method and apparatus for making a current connection to a wall electrode at the front plate of television camera tubes, in particular vidicon and plumbicon tubes. Such wall electrodes are, for example, in the nature of photo-cathodes or transparent conducting layers deposited from vapor, and serve as signal electrodes for picking up the picture signal from a target of photo-semiconductive material.

2. Description of the Prior Art

To reduce the undesirable capacitance of the signal plate of semiconducting tubes, it has already been proposed to restrict the effective surface of the signal electrode to approximately the size of the raster surface described by the scanning beam, and to apply the current lead directly to the edge of the raster surface in the front plate. According to this proposal, this contact was made by fusing a wire into the front disc. For this purpose an unpolished front plate was used, a bore was provided therein, into this bore there was inserted a contact wire provided with a glaze, which was then fused to the front plate. After this fusing operation the disc had to be ground and polished, in the course of which the projecting portions of the wire were ground away. However, this fusion technique involved various difficulties. It has proved to be disadvantageous to start off with an unground front plate, because significant faults in the front plate could only be recognized after the fusing operation had been completed. Further difficulties arose if the signal plate of the tube which was to be provided with a contact was a so-called Nesa layer. A Nesa layer consists of transparent tin oxide, which is produced from a strongly corrosive tin chloride solution by spraying-on and then heating the substrate up to almost 500° C. If this Nesa layer is produced after the fusing-in of the contact, then the strongly corrosive tin chloride solution causes corrosion of the fused-in wire, as a result of which the quality of the contact between the Nesa layer and the wire is very unfavorably influenced. The corrosive solution can creep into the interspace between the glass and the fused pin and can convert the surface of the wire into oxide or chloride. Even if the fused-in metal is a noble metal, the contact between the wire and the conducting layer is still uncertain. Moreover, those fused-in connections are expensive and are not vacuum-tight if there is not adequate matching to the type of glass used for the front plate. The method of the present invention overcomes these disadvantages and allows fused-in connections to be achieved in a very simple manner, which exhibits a good contact with the conducting layer.

SUMMARY OF THE INVENTION

According to the invention, the method of making current connections to conducting layers at the front plate of semiconducting tubes, in particular Nesa layers, consists in providing a bore in a polished and fault-free front plate, conically countersinking and polishing the bore at the openings, producing the Nesa layer, in a manner known per se, at that surface of the front plate facing the interior of the tube and, after the completion of this operation, pressing a plug of a plastic metal, preferably indium, into the bore.

The advantage of this method is that a good quality contact is thereby achieved between the Nesa layer and the lead-through, which also is capable of withstanding thermal loading and makes a good vacuum seal. If indium is used as the metal for the plug, then it is advisable to strip the indium plug of its oxide skin by etching before performing the pressing-in operation. In this case a very intimate contact is established with the glass by the pressing operation. The front plate, thus provided with the front contact, can now be provided with a photo-conductive layer and can be connected with the tube.

For the purpose of utilizing the advantages of a low-capacitance lead to the signal plate, it is advisable that the part

of the signal plate, which is scanned by the electron beam, including the contact situated at the edge of the raster, be separated from the remaining portion of the front plate, (the Nesa layer deposited from vapor). For this purpose, the Nesa layer is interrupted at the outline of the portion provided for the scanning, so that for scanning and signal production the signal electrode alone is the determining factor in the size of the scanned raster. In this way a target capacitance is achieved which is reduced to one-third or one-quarter of that with a tube not provided with a lead-through at the front plate. This reduction in capacitance has a very advantageous influence upon the signal-to-noise ratio of the generated signal.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be explained in more detail with reference to the accompanying drawings.

FIG. **1** shows the front plate in cross-section.

FIG. **2** shows a part of the front plate with a fused-in contact.

FIG. **3** shows a plan view of the front plate.

FIG. **4** shows an alternative form of contact to the conductive layer.

DESCRIPTION OF A PREFERRED EMBODIMENT

In FIG. **1** a television camera tube, preferably of vidicon or plumbicon type, has a front plate **1**, which is provided with a conductive layer L and a photosensitive layer P. A so-called Nesa layer serves as the conductive layer. For the purpose of establishing a connection of the shortest possible length to the conductive layer L, a contact K is provided at the edge of the photo layer P. According to this method of the invention, reference being made to FIGS. **2** and **3**, the making of this contact is effected in the manner described as below. The front plate **1** (referring to the enlarged representation of FIG. **2**) is provided with a bore **2** of a diameter between 1 and 2 mm. This bore is situated close to the edge of that part of the target provided for scanning. Bevelled countersinks **3** are provided in this bore for the subsequent anchorage of the lead-through. The internal surface of the bore **2** is polished so that it presents a good base for the Nesa layer to be deposited thereon. Upon applying the Nesa layer **4** to the heated front-plate by spraying the latter with a solution containing tin chloride, a coating of tin oxide is provided not only for that side of the front plate which is directed towards the interior of the tube but also the major part of the bore.

A plug **5** of indium, previously stripped of its oxide skin, is now pressed into the bore, so that a surface thereof is obtained which coincides at both sides with the surface of the front plate. In order to prevent a subsequent corrosion of the indium plug from outside, it is now preferable to force into the outer side of the indium plug a tack-shaped steel plate **6** provided with a bolt and, by the use of an intermediate layer **7** of synthetic resin, to provide a hermetic seal of the indium surface. The arrangement of the lead-through contact in the front plate with respect of that part of the Nesa layer used for signal production can be seen from FIG. **3**. The front plate has introduced therein a contact **8** produced in the above described manner. This contact is situated at the edge of the picture surface **9** used for signal production. For the purpose of reducing the capacitance of the signal electrode, the Nesa layer is interrupted by an insulating margin **10**, which can be produced by a chemical method or by the use of a grinding pencil. The remaining portion of the Nesa layer **11** can be connected with the sealing ring **11***a* of the indium metal for the purpose of controlling the potential, the sealing ring serving to connect the front plate to the envelope of the tube. It is appropriate to provide this sealing ring with an external contact **12** in order to be able to control the potential of the Nesa portion **11**.

According to another method of making an electrical contact which is illustrated in FIG. **4**, instead of a plug of indium a plug **12** of soft glass melting at a lower temperature than the front plate glass is inserted into the hole **2** by partly melting

the plug. This insertion takes place after the preparation of the Nesa layer **4**. Thereupon the contact with the interior Nesa layer is easily performed by painting the external part of the Nesa layer with silver paint so that a contact face **13** is formed. If necessary the volatile components of the silver paint can be evaporated by heating the front plate **1**.

What is claimed is:

1. A method of making an electrical contact with a conductive layer mounted on a non-conductive substrate comprising the steps of

A. boring a hole through the substrate,

B. producing conical countersinks on the hole,

C. producing the conductive layer on the substrate over an area that extends at least partially into the interior of the countersunk hole, and

D. placing a plug of easily deformable metal into the hole and into contact with the conductive layer.

2. A method according to claim **1** wherein said substrate is a glass plate in the front of a television camera tube and said conductive layer is a Nesa layer.

3. A method according to claim **2** wherein said easily deformable metal is indium.

4. A method according to claim **3** wherein the outer side of said indium plug is coated with a layer of hermetically sealing material and a tack-shaped means is used to pierce the seal and penetrate the indium to make electrical contact, whereby the head of the tack-shaped element can provide electrical contact to the conductive layer.

5. In a television camera tube having a front plate provided with a conductive Nesa layer, an improved means for making contact with the conductive layer comprising:

A. a hole through the plate under the Nesa layer, countersinks at opposite ends of the hole, the Nesa layer extending partially into the countersink hole,

B. a soft metal plug extending through the hole and contacting said Nesa layer, and

C. contact means connected to the plug on the side on said plate opposite said Nesa layer.

6. Means according to claim **5** wherein, said plug is of indium and said contact means comprises a tack-formed device for piercing the indium plug.

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