

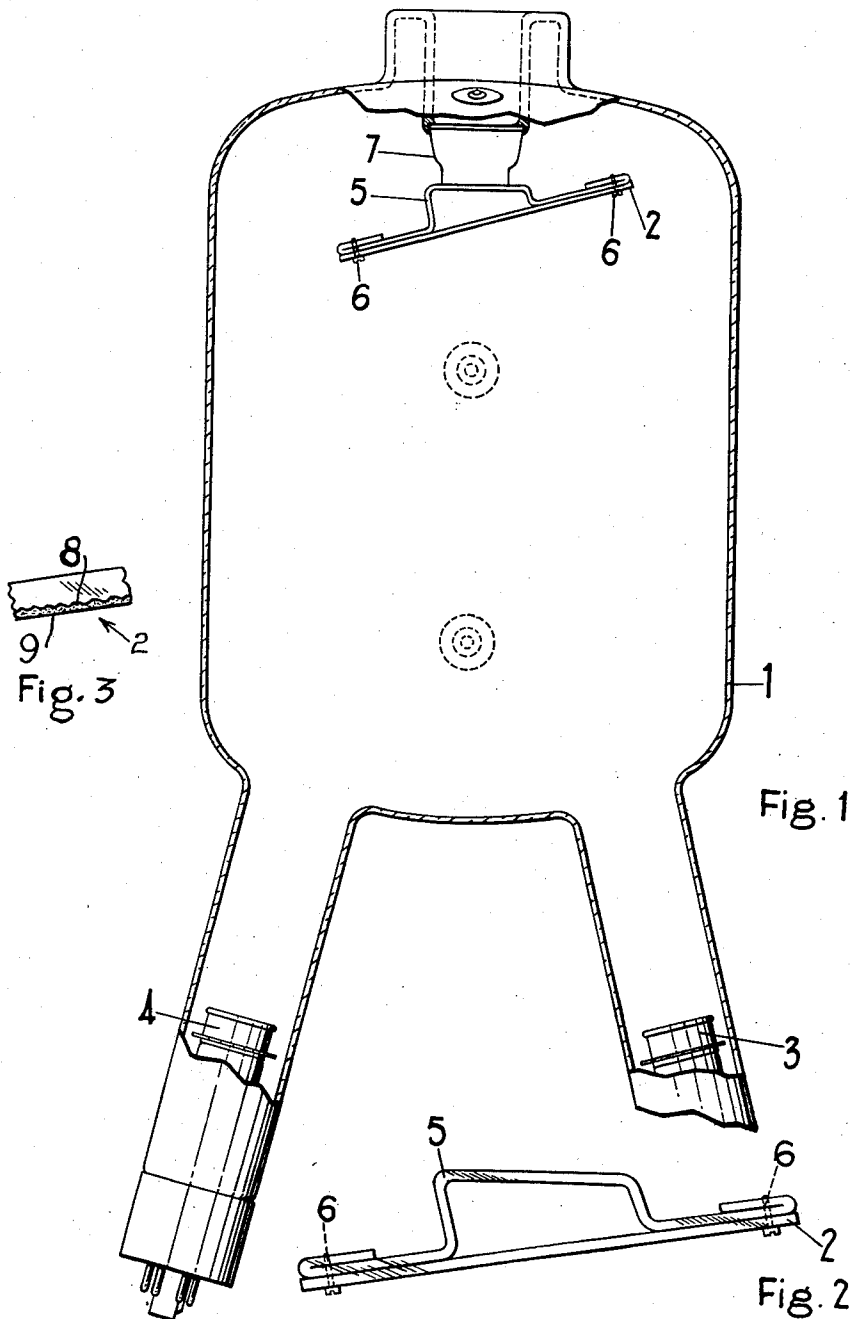
Sept. 9, 1958

L. S. ALLARD ET AL

2,851,626

CATHODE RAY TUBES

Filed Oct. 21, 1953



INVENTORS
LAWRENCE SIDNEY ALLARD
RAYMOND THOMAS JOSEPH HILL

BY *Myron K. Kuchta*

ATTORNEY

1

2,851,626

CATHODE RAY TUBES

Lawrence Sidney Allard, Eastcote, and Raymond Thomas Joseph Hill, Harrow, England, assignors to The General Electric Company, Limited, London, England

Application October 21, 1953, Serial No. 387,514

Claims priority, application Great Britain October 28, 1952

2 Claims. (Cl. 313—70)

This invention relates to the manufacture of cathode ray tubes of the type having an evacuated envelope containing a storage electrode, a cathode ray gun for providing a first electron beam for scanning the surface of the storage electrode and storing a pattern of electrical charge thereon in accordance with electrical input signals applied to the gun, and a cathode ray gun for providing a second electron beam for scanning said storage electrode and reproducing the electrical signals as output signals in response to the said pattern of electrical charge.

Usually the said two cathode ray guns are separate but in some cases they may share common parts and be adapted to produce the two different electron beams by virtue of different voltages applied to the electrodes from the circuit with which the tube is used.

The first said cathode-ray gun for producing the first electron beam will hereinafter be referred to as the writing gun and the cathode ray gun for producing the second electron beam will be referred to as the reading gun.

One form of storage electrode which has been found very suitable for use in cathode ray tubes of the type specified consists of an aluminium plate having a layer of aluminium oxide formed thereon by anodising, the aluminium oxide layer being presented to the electron guns in use of the electrode. However, a difficulty is sometimes experienced with such storage electrodes in that the reproduced electrical output signals do not always correspond closely with the input signals, as is, of course, desirable, and the object of this invention is to reduce this difficulty.

We have found that the difficulty is associated with the occurrence of a very fine crazing of the anodised layer of aluminium oxide, formed when the electrode is heated during manufacture of the tube, and that it can be largely avoided by preventing the formation of such crazing.

According therefore to the invention, in the manufacture of a cathode ray tube of the type specified, wherein the storage electrode is of aluminium and at least that surface of the electrode on which the electron beams from the writing and reading guns are required to fall in operation of the tube is provided with an anodised layer of aluminium oxide, the said surface is subjected to a roughening treatment before the anodising process, so that the layer of aluminium oxide formed thereon by the anodising process remains substantially free from crazing during subsequent heating processes in manufacture of the tube.

It will be understood that the term "aluminium" includes alloys of aluminium that are suitable for use as storage electrodes.

We have found in general that when the surface of the aluminium plate is suitably roughened, the layer of aluminium oxide formed thereon by the anodising process will remain substantially craze-free for all thicknesses of the layer which can in practice be produced by anodising, though it will be appreciated that this maximum thickness is seldom, if ever, required since the thickness of the oxide layer to be used is otherwise limited

2

by requirements as to the electrical conductivity of the layer. We believe that the freedom from crazing is due to improved elasticity of the oxide layer imparted by local thinning of the layer along the sides of ridges formed in the aluminium surface by the roughening treatment.

Preferably the roughening treatment used is one which has a random, rather than a regular, effect, such as shot-blasting the surface of the aluminium.

The invention will be further described with reference to Figures 1 and 2 of the accompanying drawing, in which Figure 1 shows schematically a plan view of the relevant parts of one form of storage cathode ray tube manufactured in accordance with the invention, Figure 2 shows the storage electrode arrangement on a larger scale, and Figure 3 is a magnified view of an intermediate part of the storage electrode itself.

Referring first to Figure 1, the drawing represents a cathode ray tube having an evacuated envelope 1 containing a storage electrode 2, a writing cathode ray gun represented by the block 3 arranged in one neck part of the envelope for providing an electron beam for the purpose of storing a pattern of electrical charge on the electrode 2, and a reading cathode ray gun represented by the block 4 arranged in a second neck part of the envelope for providing a second electron beam for the purpose of reading the stored pattern of charge on electrode 2. The electron guns 3 and 4 can be of any suitable known kind.

The storage electrode 2 is supported on a bracket 5 to which it is attached by means of screws 6, the bracket itself being mounted on a thimble seal closure 7 of a re-entrant part of the end wall of the envelope.

Referring now more particularly to Figure 2 and Figure 3, the storage electrode 2 consists of a sheet of aluminium which is roughened as at 8 on its surface facing the electron guns 3 and 4 and is provided over its roughened surface with a craze-free anodized layer 9.

In this example, the storage electrode comprises a sheet of 16 gauge aluminium of 99.9% purity, having a width of 90 mms. and a length of 110 mms., and the surface of the sheet is roughened by shot-blasting the surface, in known manner, using alumina particles which are of such size that they will pass through a screen having 120 meshes per inch, but will not pass through a screen having 150 meshes per inch, and an air pressure of 50-80 lbs. per square inch; after the shot-blasting process is complete, the sheet is boiled in distilled water for five minutes.

For forming the anodised layer on the surface of the sheet, the sheet is placed in a solution comprising 1 part of caustic potash to 20 parts of water for approximately 10 minutes, and the plate is then removed from the solution and thoroughly washed in hot water and dried.

The sheet is then suspended, by means of an aluminium wire, in a plating bath containing a solution of 10 ozs. of sulphuric acid having a specific gravity of 1.84 and 73.6 ozs. of distilled water; a further sheet of 99.9% pure aluminium is also suspended in the bath by means of an aluminium wire.

The two sheets are then connected to a source of D. C. supply, having a voltage of approximately 12 volts, the sheet having the shot-blasted surface being connected to the positive terminal of the supply and the said further sheet being connected to the negative terminal; current is then allowed to flow for approximately ½ hour for forming an anodised layer on the surface of the shot-blasted sheet and the sheet is then removed from the bath, thoroughly washed in hot water and dried. This final washing in hot water also forms the layer of aluminium oxide on the surface of the aluminium sheet into a solid mass in known manner.

The storage electrode is then mounted in the cathode

3

ray tube envelope in known manner and the manufacture of the tube, including heating and de-gassing of the envelope and electrodes, completed in the usual way, when it will be found that the layer of aluminium oxide on the storage electrode remains substantially free from crazing.

We claim:

1. A cathode ray tube having an evacuated envelope containing a storage electrode, a cathode ray writing gun providing a first electron beam for scanning said storage electrode and storing a pattern of electrical charge thereon in accordance with electrical input signals applied to the gun, and a second cathode ray reading gun providing a second electron beam for scanning said storage electrode and reproducing the electrical signals as output signals in response to said pattern of electrical charge, said storage electrode consisting of aluminium having a mechanically roughened surface with an anodized layer which has been heated subsequent to anodization, said heating having occurred during a heating process in the manufacture of the tube and said anodization having taken place after the surface was roughened and before said heating process, whereby said anodized layer is craze free and will reproduce signals in said reading gun which always correspond closely with the signals fed in by the writing gun.

2. In a cathode ray tube of a type having an evacuated envelope containing a storage electrode, a cathode ray writing gun providing a first electron beam for scanning said storage electrode and storing a pattern of electrical charge thereon in accordance with electrical input signals applied to the gun, and a second cathode ray reading gun

4

providing a second electron beam for scanning said storage electrode and reproducing the electrical signals as output signals in response to said pattern of electrical charge: that improvement constituting a storage electrode consisting of aluminium having a mechanically roughened surface with an anodized layer which has been heated subsequent to anodization, said heating having occurred during a heating process in the manufacture of the tube and said anodization having taken place after the surface was roughened and before said heating process, whereby said anodized layer is craze free and will reproduce signals in said reading gun which always correspond closely with the signals fed in by the writing gun.

References Cited in the file of this patent

UNITED STATES PATENTS

2,324,106	Pettit	July 13, 1943
2,503,949	Jensen et al.	Apr. 11, 1950
2,713,648	Gardner	July 19, 1955
2,728,020	Pensak	Dec. 20, 1955

FOREIGN PATENTS

378,521	Great Britain	Aug. 15, 1932
403,560	Great Britain	Dec. 28, 1933

OTHER REFERENCES

Finishes for Aluminum," Section One, 1947, page 33.
Finishes for Alcoa Aluminum, 1947, pages 23-25.
The Anodic Oxidation of Aluminum and Its Alloys, Jenny et al., 2nd impression, pages 145, 146, 191-196, 1950.