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ELECTRONICS DEPARTMENT

# TECHNICAL INFORMATION SERIES

Title Page

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| Von G. Knoerzer translated by A. Libenson | Tube-Cathode-Ray Electron Beams | 51-E-665 / 12-14-51 |

TITLE On the Removal of the Disturbing Charge on a Non-Conducting Object and on a Fluorescent Screen in an Electron Beam

ABSTRACT

The removal of sticking potential via the use of an internal incandescent wolfram wire placed in front of the fluorescent screen.

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CONCLUSIONS

Sticking potential on a CR Tube can be removed by ionization caused by heating a wolfram wire in front of the screen internally.

By cutting out this rectangle and folding on the center line, the above information can be fitted into a standard card file.

For list of contents—drawings, photos, etc. and for distribution see next page (AO-147-A).

INFORMATION PREPARED FOR Cathode Ray Tube Division

Translation by: ~~TESTS MADE BY~~ Arthur Libenson

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# ON THE REMOVAL OF THE DISTURBING CHARGE ON A NON-CONDUCTING OBJECT AND ON A FLUORESCENT SCREEN IN AN ELECTRON BEAM

Von G. Knoerzer

Translated by: A. Libenson
Engineering
CATHODE RAY TUBE

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## ON THE REMOVAL OF THE DISTURBING CHARGE ON A NON-CONDUCTING OBJECT AND ON A FLUORESCENT SCREEN IN AN ELECTRON BEAM

The disturbing effect which the charging of a screen by an electron beam can have on a picture is shown already by the example of the shadow of simple objects in very characteristic form. Picture 1 shows in the direction of the geometrical shadow of a simple wire spiral, it brightening as soon as it is grounded (a); and shows broadened shadows as soon as it is insulated (b). In this second case, it is obvious that the suspended wire has charged up with the sign of the electron (-). The shadow picture is thereby widened, and the repelled electrons border it with a maximum of brightness.

In Picture 1a, at first glance, it is surprising that the grounded wire acts as a concentrating lens, (except some pieces obviously covered with oxides which have become charged) especially clear in the pretty caustics which are shown where the beam grazed along a winding. The field responsible for the phenomenon can only be caused by the fluorescent screen and this is corroborated when we cover it with an electron penetrable metal skin. Picture 1a appears as long as this skin remains insulated. Grounded it shows, as we know, a normal shadow image. We can surmise from this, that the concentrationsof the force lines coming from the screen and going to the wire acts as a cylindrical lens. All the effects of the negative charge disappear immediately when a suitable tungsten wire is brought to incandesce outside of the beam path in front of the screen--one obtains a fully correct shadow picture.

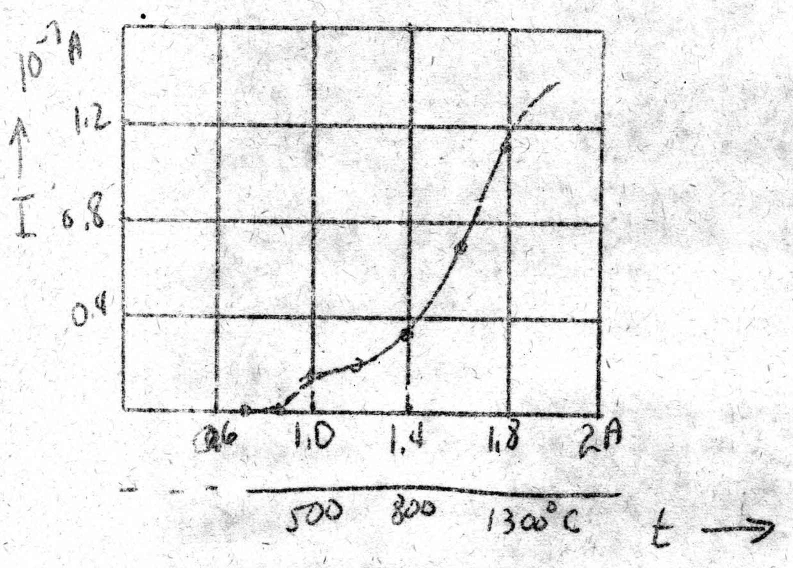
This effect is surprising; that a negative charge on the screen should vanish, and this phenomenon cannot occur due to the electrons from the filament, but takes place due to the positive ions produced which are in sufficient number.

In order to further show that this explanation is correct, we set up the heating circuit in isolation and connected a circuit from it to ground through a galvanometer. As long as the wire did not glow the meter registered no flow of electrons. With increasing filament current, the results of Picture 3 developed--a current appeared which corresponded to the removal of electrons to ground or of the supplying of positive ions by the wire to the screen. In the region where the thermal velocities are effective--from approximately 1 to 1.3 amperes heater current--the distortions of the screen vanish immediately. It appears again when the leakage through the galvanometer to ground is disconnected while the filament is still glowing.

Further control experiments, using an insulated and charged wire mesh placed between the filament and the fluorescent screen, supported as a whole the concept we have expounded. The temperatures judged from its ohmic resistance are given on the second scale below the horizontal axis--its electron emission lies at these low temperatures still under the reaction threshold of the galvanometer.

What we have observed here for fluorescent screens (and also for gelatin plates) holds naturally with the same significance and with the decided advantage for insulated bodies; for instance, for crystals grazed or penetrated by cathode ray beams.

Also in this case, a weakly glowing wire effects a decisive improvement on the focusing of microscopic and interference pictures.




Dependence of the emission current I on the filament current i of a .15 mm. filament. The bottom scale gives the temperature in degrees centigrade.