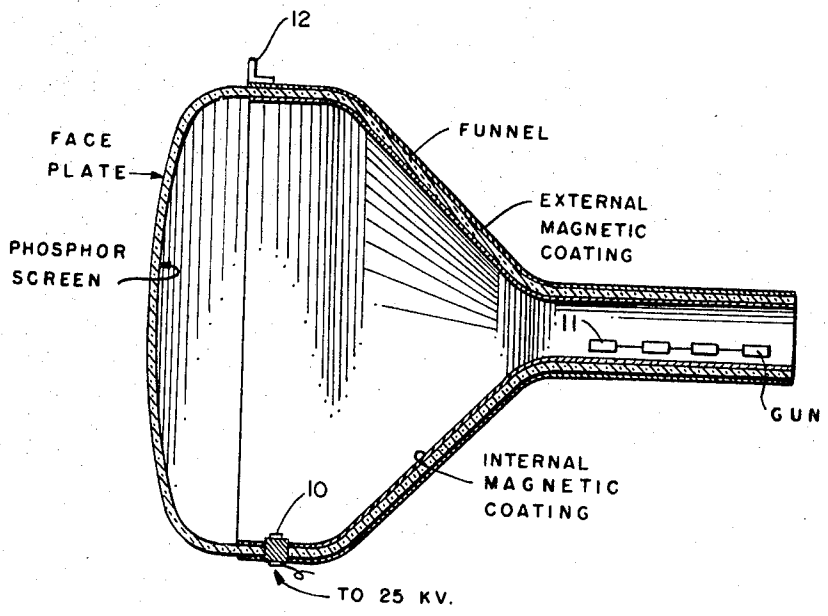
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MAGNETIC SHIELDING MEANS FOR CATHODE RAY TUBE

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MAGNETIC SHIELDING MEANS FOR CATHODE RAY TUBE

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ABSTRACT OF THE DISCLOSURE

This invention relates to a cathode ray tube and, more particularly, to a television picture tube equipped with a unique magnetic shield in the form of a coating applied at least to the interior of the tube.

Summary of invention

Present practice in the manufacture of cathode ray tubes, particularly those used in television sets, involves the application of a carbon coating such as a carbon layer known as "Aquadag" on the interior of the envelope. Further, in most cases, the exterior is framed or otherwise protected by a suitable magnetic shield. These expedients have persisted, notwithstanding the difficulties both in manufacture and use of tubes employing them. Where internal shielding has been employed, further problems arise. In particular, there has been a problem of degaussing—the flux from the external degaussing coil being unable to penetrate the interior shield. Through the practice of the instant invention, the difficulties inherent in following contemporary practices can be avoided and the provision of a novel magnetic coating such as a ferromagnetic coating, for the envelope which avoids these drawbacks constitutes an object of the invention.

The invention will be explained in conjunction with the accompanying drawing which is a schematic picturization of a television picture tube, partially in sections.

In the illustration given, a typical television picture tube is presented—with the socket and associated gun-supporting members omitted for the ease of presentation. A gun is seen in the positioned neck of the envelope. The gun pictured is off-axis and could thus be one of three guns provided in the usual color television picture tube. In the case of the black-and-white tube, the gun is located on the axis and it will be appreciated that the invention applies with equal facility to both types of tubes.

The envelope defining the tube is conventionally constructed of two glass portions, a funnel which provides the previously referred to neck portion and a face plate—the latter being at the enlarged end of the envelope and carrying on its inside face the usual phosphor screen. Omitted for the sake of ease of presentation is the usual shadow mask positioned just interiorly of the face plate—the shadow mask constituting no part of the instant invention.

The funnel portion is equipped with an electrical connection as at **10** which is adapted to be coupled to a source of high voltage, i.e., of the order of 25,000 volts—as indicated. The high voltage is coupled to the G–4 grid **11** by means of the previously referred to internal magnetic coating which is electrically conductive. Thus, the magnetic coating on the inside of the envelope performs a dual function—not only as a shield but also as a conductor. When used in color tubes, the surface advantageously can be blackened as by oxidation or carburization to reduce reflection of heat generated in the interior of the tube. For example, the heat radiated from the impingement of the electron beams on the shadow mask

should be absorbed by the coating to avoid undue buildup of interior temperature.

Optimally, the magnetic coating indicated is a ferromagnetic coating bonded to the inner surface of the tube. As such, it is advantageous in eliminating the previously-mentioned carbon layer and the attendant flaking and arcing thereof. It will be appreciated that the contemporary carbon coating is made up of a series of discrete particles which can become detached and cause objectionable arcing. This is not the case with a truly bonded coating such as the inventive ferro-magnetic coating.

In some instances, it is advantageous to apply a similar ferro-magnetic coating to the exterior of the tube and this is especially effective to eliminate the need for auxiliary magnetic shielding of color television tubes. When this is done on black-and-white tubes, the conventional implosion band can be eliminated. Further, the mounting lugs **12** which are normally secured to the implosion band can be fused directly to the external coating. The external coating may extend forwardly over the sides of the face plate to accommodate the mounting lugs which are used to secure the tube to the cabinet of the set. In the event X-ray shielding is needed, heavy metals or their compounds are added to either or both coatings. One advantageous way of effecting the coating is set forth in the example below.

Example

In the practice of the invention, the funnel portion of the envelope is cleaned with a suitable cleaning solution such as "Alkanox," "Oakite," etc. In some instances, the cleaning can be accompanied by a "frosting" or etching operation making use of bifluoride (40 grams of NH_4HF_2, 12 milliliters of 40% HF along with 4 milliliters of water). Thereafter, iron is deposited on the funnel interior using vacuum-evaporation technique. In one procedure, the confined envelope is evacuated to about 10^{-4} mm. Hg after which elemental iron is vaporized by applying RF heating to a porcelain crucible containing the iron. For this purpose, the iron is heated to above about 1500° C. Nickel and cobalt, or alloys thereof with iron can be used to provide the coating by the same evaporation procedure. In the event tungsten filament evaporation is employed with iron, I prefer to utilize temperatures above 1700° C. to prevent alloying with the filament.

An analogous procedure is utilized to provide the exterior coating if desired. With the exterior coating, there is provided the implosion protection mentioned above as well as magnetic shielding. In either case, there is provided a shield effective to prevent spurious fields from affecting the beam paths while still permitting degaussing at relatively low field strengths. It should also be appreciated that other procedures for applying the magnetic coating come within the purview of the invention such as electroless plating, electroplating and plasma techniques, the invention being concerned primarily with the resultant structure which is adapted to provide advantages both in manufacture and use over what has gone before.

While in the foregoing specification a detailed description of the embodiment of the invention has been set down for the purpose of explanation, many variations of the details hereingiven may be made by those skilled in the art without departing from the spirit and scope of the invention.

I claim:

1. A television tube comprising an elongated envelope having an electron gun at one end and a screen at the other end, said tube having a generally funnel shape to provide a constricted portion at one end, a coating of magnetic material bonded to the interior of said funnel and extending continuously from a location adjacent said

screen substantially over said funnel and said constricted portion.

2. The structure of claim 1 and further having a coating of magnetic material bonded to the exterior of said envelope substantially coextensive with said interior magnetic coating.

3. The structure of claim 2 in which connecting lug means are secured to said glass envelope by said exterior coating, said exterior coating also providing implosion protection.

4. The structure of claim 1 in which said magnetic coating includes heat-absorptive material to reduce reflection of heat inwardly of said tube.

5. The structure of claim 4 in which said heat-absorptive material is provided on the inwardly-facing surface of said magnetic coating.

6. The structure of claim 1 in which a heavy metal is included in said coating to provide X-ray shielding.

7. A tube for color television compising an elongated envelope having a generally funnel shape thereby defining a constricted portion at one end and an enlarged viewing screen at the other; means in said constricted portion for generating a plurality of electron beams; and a magnetic coating bonded to the exterior surface of said envelope and covering substantially all of said funnel and said constricted portion.

References Cited

UNITED STATES PATENTS

3,213,498	10/1965	Lehmann.	
2,721,995	10/1955	Friend	315—8 X
2,890,362	6/1959	Francken	315—8 X

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