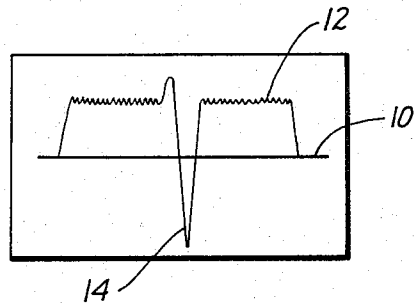
Dec. 26, 1967 F. J. SALGO ETAL 3,360,671

VIDICON WITH CONNECTED CONDUCTIVE COATINGS ON BOTH SIDES OF FACEPLATE

Filed April 26, 1965

Fig. 1



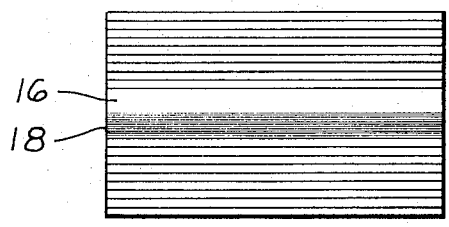
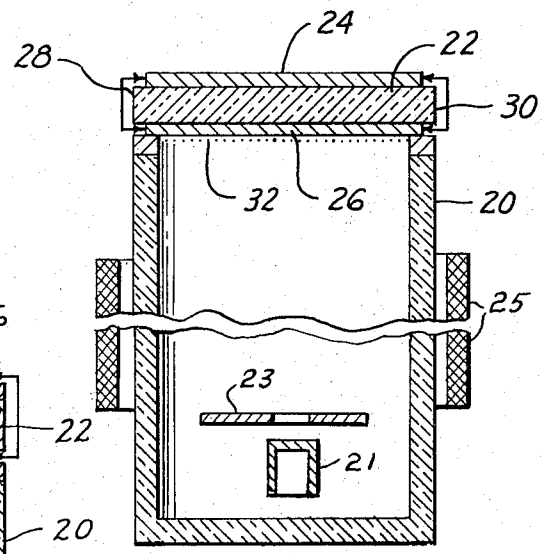


Fig. 2

Fig. 3



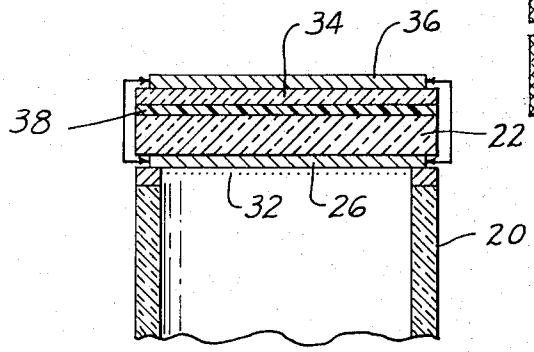


Fig. 4

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VIDICON WITH CONNECTED CONDUCTIVE COATINGS ON BOTH SIDES OF FACEPLATE

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ABSTRACT OF THE DISCLOSURE

A vidicon camera tube with a conductive coating on both faces of the faceplate, the conductive coatings being connected together to cancel out spurious signals generated by pressure variations on the faceplate.

This invention pertains generally to electron discharge devices and particularly to any tube in which electromagnetic radiation or acoustical radiation is converted to an electrical signal and in which the signal collecting electrode is connected to the external closure window of the tube.

Background of the invention, summary, brief description of the drawing, and description of the preferred embodiments

The present invention has found special applicability to vidicon tubes used in the television industry. Vidicon tubes are well-known in the television industry inasmuch as such vidicon tubes are in wide use, particularly in televising motion pictures. A general discussion of vidicon tubes is set forth on pages 21–22 and 22–23 of Radio Engineering Handbook, Fifth Edition, published by McGraw-Hill Book Company, Inc.

Although known vidicon tubes have provided many advantages in their use in the television industry, such known vidicon tubes have had some undesirable characteristics. One such undesirable characteristic has been the creation of a spurious signal which is generated by pressure which is applied to the faceplate of a vidicon tube. For example, in many industrial, aviation, military, and space vehicle uses of vidicon tubes, such vidicon tubes are subject to very severe shock and vibration environmental conditions. Under accelerations which are generated during these shock and vibration environmental conditions, and particularly when acceleration force vectors having a component parallel with the axis of symmetry of the vidicon tube are encountered, pressure may be exerted on the faceplate of the vidicon tube where such faceplate bears against an axial movement stop member. When a pressure is generated in the manner described, a voltage signal, comparable in amplitude with the peak video signal, is realized at the vidicon target conducting layer signal plate. Such voltage signal reverses in polarity as the pressure on the faceplate is released and the net result is one cycle of an AC signal which produces on the displayed television picture a composite, and approximately horizontal bar which is alternately white and black in the vertical direction. When continuous vibration conditions are encountered, a spurious signal generation can interfere seriously with the interpretation of the information content of the television picture. The undesirable spurious signal generation also is a problem in other tubes such as photocells and photomultipliers.

Thus, it is an object of the present invention to provide an improved tube structure.

Another object of the present invention is to provide a tube which eliminates spurious signal generation caused by pressure exerted on the external window of such tube.

Yet another object of the present invention is to provide an improved vidicon tube which eliminates spurious signals generated by pressure exerted on the faceplate of the vidicon by providing simple, economical, and reliable improvements which are adaptable to vidicon tubes now in use.

Yet another object of the present invention is to provide an improved vidicon tube characterized by its relative simplicity and economy in manufacture of such vidicon tube to eliminate spurious signals which are generated by pressure exerted on the faceplate of the vidicon tube.

In the drawings FIGURE 1 shows an oscilloscope trace of a vidicon tube signal during single impact on the faceplate of such vidicon tube;

FIGURE 2 is a television picture corresponding to the trace shown in FIGURE 1;

FIGURE 3 is a cross-sectional elevational view of a vidicon tube showing one embodiment of the present invention; and

FIGURE 4 is a cross-sectional elevational view of the faceplate end of a vidicon tube showing another embodiment of the present invention.

Briefly stated, the present invention is directed to an improvement in a tube to eliminate spurious signal generation when pressure is applied to the external closure window of such tube. The elimination of these spurious signals in a vidicon tube is achieved by providing an electrically conducting layer of material on the electron beam portion of the faceplate of the vidicon tube and on either an exterior portion of the faceplate or on a suitable disc member which is positioned near the faceplate. The electrically conducting layers are coupled electrically to each other.

In alleviating the problem of spurious signal generation discussed previously in connection with vidicon tubes, it was observed that the frequency and amplitude of the spurious signal is a function of the frequency and intensity of the exciting pressure impulse. Such a spurious signal was observed with a faceplate constructed from vitreous or crystalline insulating materials conventionally used in vidicon tubes. The spurious signal generation appeared also to be substantially independent of the method of attachment of the faceplate to the envelope or bulb of the vidicon tube so that hot welding, metal to glass seal, indium cold pressure seal, pressure diffusion welding, or cementing did not affect the spurious signal generation. Further experiments also determined that voltages were not generated by flexure of the faceplate or by pressure on the faceplate sealing medium. However, a simulated faceplate constructed from metal did not exhibit the spurious signal when pressure excited and thereafter the problem solved by the present invention was developed.

Referring now to the drawings in detail, FIGURE 1 shows an oscilloscope trace of a vidicon signal during single impact on the faceplate of the vidicon tube. The black level is indicated as **10** while the white video signal is represented as **12**. Signal **14** designates the undesirable spurious signal.

FIGURE 2 shows a television picture corresponding to the oscilloscope trace shown in FIGURE 1. A white bar **16** is shown along with a substantially black bar **18** to designate a spurious signal. It will be apparent that if a plurality of spurious signals are generated in rapid succession that the television picture will become greatly distorted because of the alternate white and black bars so that the television picture is difficult if not impossible to interpret.

FIGURE 3 is a cross-sectional elevational view of a vidicon tube. Envelope or bulb **20** is shown with faceplate **22**. As is well known in the art, a cathode, or electron gun, depicted somewhat schematically at **21**, is provided

to emit a beam of electrons through an aperture in an anode **23**. The beam of electrons is caused to scan the faceplate end of the tube by a deflection yoke illustrated schematically at **25**. The structure of these elements and related elements within and associated with the tube may be conventional and need not be further described herein. In accordance with the present invention the faceplate **22** is coated with a continuous conductive layer **24** on the external portion of the faceplate and with a continuous conducting layer **26** on the internal portion of faceplate **22**. The conducting layer **26** may be of the conventional type used in vidicon tubes with photoconductor **32** adjacent layer **26**. These conducting layers **24** and **26** may have a resistivity as high as many thousands of ohm-centimeters. Layers **24** and **26** are connected electrically along edges **28** and **30** of teh faceplate so that the combination of layers forms a target signal plate of the vidicon tube. Thus, the spurious voltage impulse is not released into the target lead and into the video amplifier.

In the embodiment shown in FIGURE 3, the preferred resistivity of the electrically conducting layers on the faces of the faceplate is in the region of several hundred ohm-centimeters and the interconnecting link or coupling between the faces has a preferred resistance in the region of tens of ohms.

The mechanism by which the spurious signal is both generated and suppressed in accordance with the present invention is not clearly understood. There maye be piezoelectric, thermoelectric, or phonon-molecular interactive phenomena involved. Apparently under the influence of pressure impulses, potentials equal but opposite in polarity appear on the faces of the faceplate. By connecting these surfaces electrically, the induced charges neutralize one another to leave a zero potential impulse to be released into the video amplifier input. Conventional tin oxide layers have been found to be very satisfactory for coating both faces or surfaces of the faceplate. These layers or coatings may be coupled electrically by vacuum evaporated metal, by metallic loaded paints, or by graphite suspensions. The conducting layers or coatings must allow passage of the image to be analyzed by the vidicon tube so that such layers must be of a nature transmissive of the radiation wave lengths utilized in a particular situation.

FIGURE 4 is a cross-sectional elevational view of the faceplate end of a vidicon tube wherein another embodiment of the present invention is shown. Photoconductor **32** is shown positioned within envelope or bulb **20** in a known manner adjacent conducting layer **26** on the internal portion of the faceplate **22**. However, in the embodiment shown in FIGURE 4 instead of the faceplate **22** having an external coating, a suitable disc member **34** coated with an external conducting layer **36** is joined to faceplate **22** by suitable cementing means or bonding material which may be optical cement **38**. Disc member **34** does not require any specific electrical resistivity and the only limitation on the type of disc material used is that the optical transmission of the disc material must be satisfactory. Thus, a thin wafer of quartz or soda lime glass may be used with equal effectiveness as the disc member **34** of FIGURE 4.

The embodiment of FIGURE 4 offers economy in production of vidicon tubes since no extra work is expended until the vidicon tube has been tested and determined to be commercially satisfactory. Also, in the embodiment of FIGURE 4 the disc member construction may be utilized

on vidicon tubes which are in use or have been manufactured previously.

The bonding material utilized in coupling the disc member or plate **34** to faceplate **22** in FIGURE 4 may be of any suitable material so long as optical clarity is maintained.

Thus, the present invention provides an improved tube structure which prevents or eliminates spurious signal generation when pressure is developed on the external closure window of such tube. The improved tube structure of the present invention is characterized by its simplicity, economy, reliability, and ease of installation in manufacturing various tubes and electron discharge devices and in the installation on vidicon and other tubes which have been in use previously.

Although preferred embodiments of the invention have been shown and described as required by the statutory laws of the United States, it will be apparent to those skilled in the art of tube manufacture and utilization that modifications may be made to the disclosed embodiments without departing from the spirit of the invention defined by the following claims. Although such claims may be presented in indented format to facilitate reading and understanding of such claims, the indented format is not to be construed as a structural or functional limitation of the elements or steps recited in the claims.

We claim:

1. A vidicon tube including in combination,

an envelope,

a faceplate coupled to said envelope, said faceplate having a first face and a second face with said first face being coated with a transparent conductive material having a photoconductive layer of material adjacent thereto,

a transparent, insulative disc member having a first face and a second face, with said first face being coated with electrically conductive material,

cementing means coupling said second face of said disc member to said second face of said faceplate, and

means for electrically coupling to each other the electrically conductive coatings on said faceplate and on said disc member to substantially eliminate spurious signal generation from pressure on said faceplate.

2. A vidicon tube including an envelope, a faceplate closing one end of said envelope, electrically conducting, continuous layers of material transmissive of radiation to be detected on both sides of the faceplate, means electrically connecting said conducting layers, an electron gun at the other end of said envelope, a photoconductive layer on said conducting layer facing said gun, means scanning said photoconductive layer with electrons from said electron gun whereby a signal may be derived from at least one of said conducting layers.

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