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Sunstein

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[54] CATHODE-RAY TUBE AND SYSTEM TO ELIMINATE ELECTRICAL DISCHARGES DURING INDEXING

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[52] **U.S. Cl.**.....**315/21 C,** 315/12, 315/29

[51] **Int. Cl.**.....**H01j 29/70**

[58] **Field of Search** .....315/29, 21 R, 21 C, 12, 22

[56] **References Cited**

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Primary Examiner—Carl D. Quarforth
Assistant Examiner—J. M. Potenza
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[57] **ABSTRACT**

In a beam-index type of cathode-ray tube for presenting a color image, in which a cathode-ray beam of high energy scans across a beam index structure located adjacent an insulating portion of the tube envelope, as for example in an odd half-harmonic color television index tube, it has been found that brief bursts of interference occur occasionally in the tube during use, which apparently are due to brief discharges in the tube near the front face, and which can upset the operation of the index control operation. The invention overcomes this difficulty by providing an electrically conductive coating in smooth intimate continuous contact with the exterior of the insulating portion of the tube adjacent at least one edge of the scanned area of the tube. When one or more starting index stripes are utilized along one edge of the scanned area, the coating is placed on the exterior of the tube close to this edge. The coating is maintained at a substantially fixed potential, usually ground potential.

14 Claims, 5 Drawing Figures

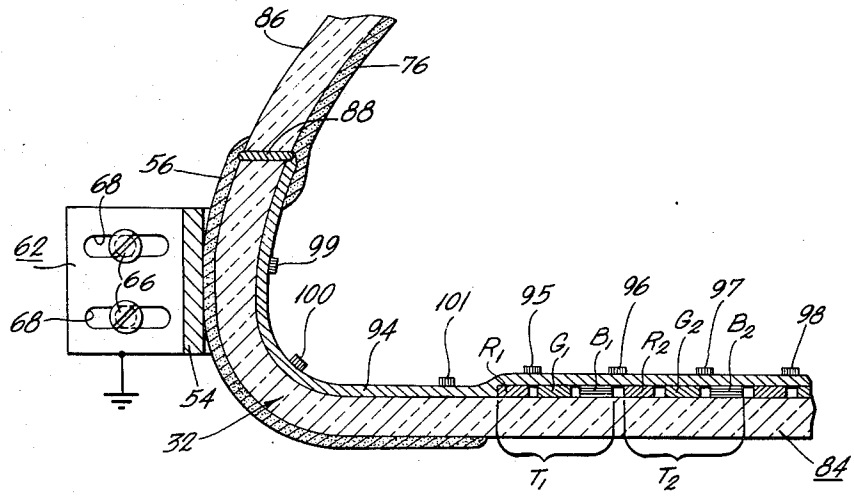


FIG. 1.

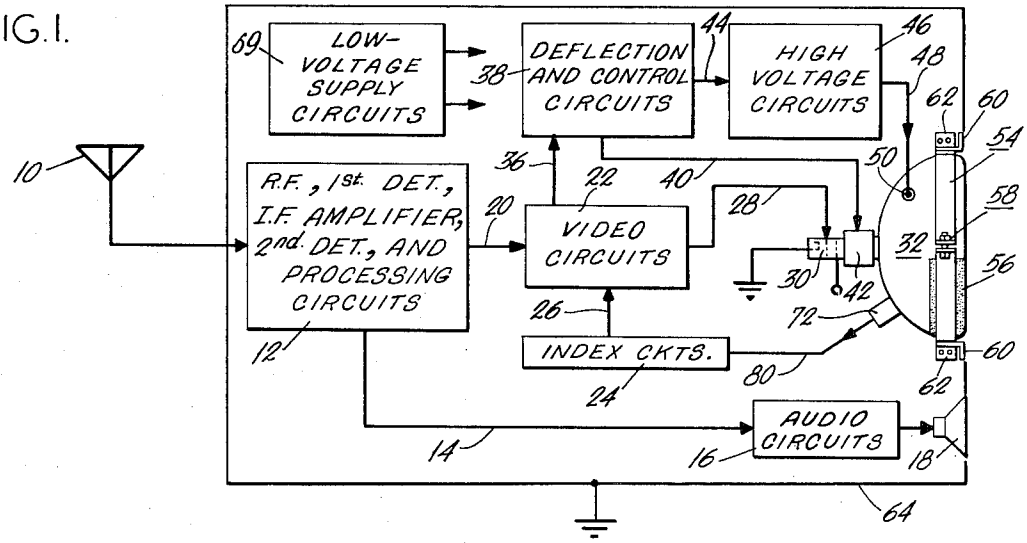


FIG. 3.

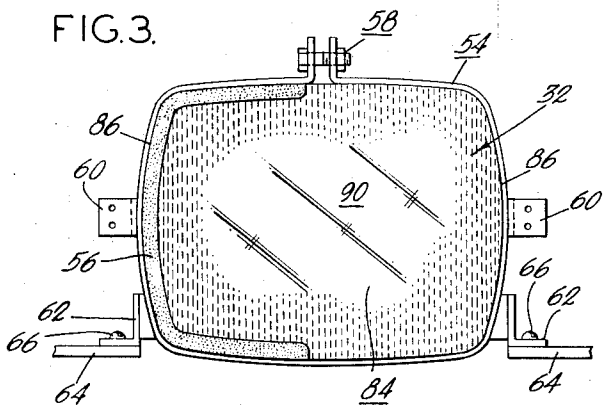


FIG. 2.

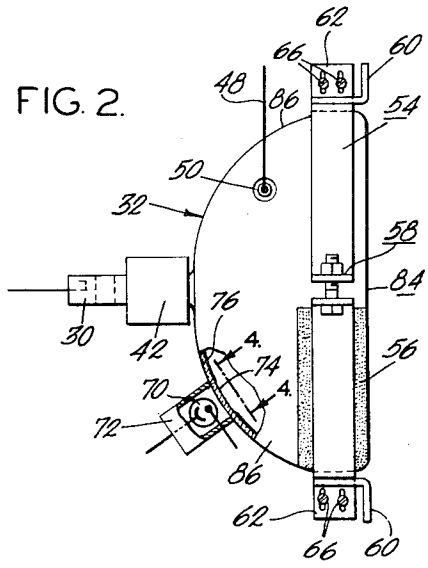


FIG. 5.

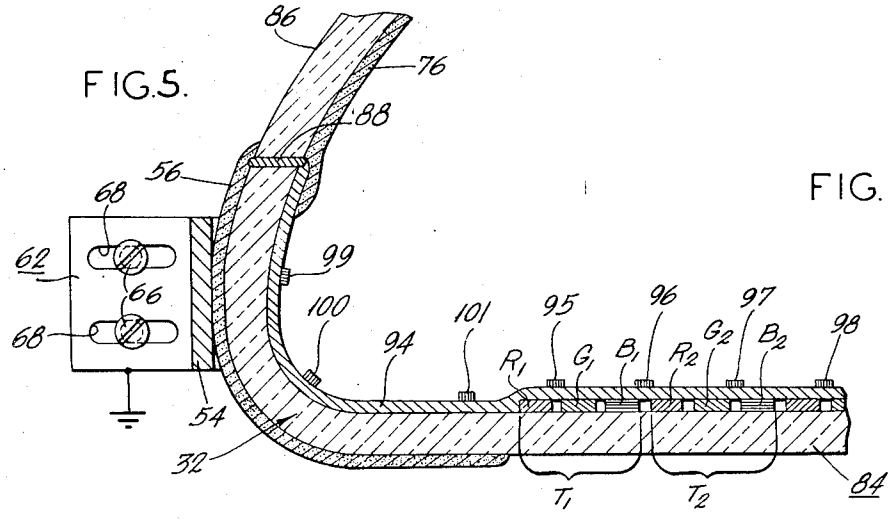
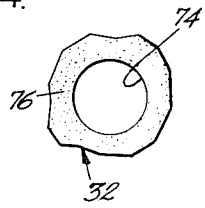


FIG. 4.



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CATHODE-RAY TUBE AND SYSTEM TO ELIMINATE ELECTRICAL DISCHARGES DURING INDEXING

BACKGROUND OF THE INVENTION

A variety of cathode-ray tube devices are known in which a cathode-ray beam is accelerated to impinge with high energy against surfaces in the tube, and is scanned across an arc in the tube with beam indexing elements disposed in spaced-apart predetermined locations so that, by detecting the times at which the beam impinges each index element, information in the form of an electrical signal can be derived which contains information as to the position of the beam at successive times as it scans across the index elements.

One specific type of cathode-ray tube device with particular reference to which the invention will be described is a color television beam index tube such as is shown and described in my U.S. Pat. No. 3,013,113, issued Dec. 12, 1961; 2,892,123, issued June 23, 1959 and 3,305,788, issued Feb. 21, 1967. In such a tube the image presentation means typically comprises a repeating sequence of colored light producing elements in the form of triplets of vertical stripes at the front face of the cathode-ray tube, the different stripes in each triplet producing light of different colors (e.g. red, green, blue) when impinged by the beam. The intensity of the cathode-ray beam as it traverses individual stripes in each triplet is so controlled as to produce such relative amounts of the different colors emitted by adjacent stripes as to produce, in the eye of the viewer, the color desired for the corresponding portion of the color image. The intensity of the beam is controlled by a received color television signal, and in order to produce a proper color image the information in the received signal must, in effect, be synchronized with impingement of the beam upon particular ones of the stripes in each triplet. Usually the side of the image-forming stripes which faces the source of the cathode-ray beam is covered with a thin light-reflective metallic layer pervious to the cathode-ray beam, and index elements are placed upon the rear, or inner, side of the metallic layer in predetermined geometric positions across the tube, in a specific predetermined relation to the positions of the stripes which produce the differently colored light. The metallic layer tends to maintain the beam-facing side of the image-presentation means at a nearly uniform potential, and to reflect the image light forwardly toward the viewer. In arrangements such as those referred to in my above-cited patents, these so-called "running" index elements may comprise photoemissive stripes which are scanned by the beam at a rate which is a non-integral multiple (greater than 1) times the rate at which the triplets are scanned by the beam. Each of the running stripes produces a burst of electromagnetic radiation (light) each time the beam impinges it, and an appropriate photoresponsive device, such as a photocell, viewing the interior side of the index structure, will respond to these bursts of electromagnetic radiation to produce a corresponding electrical index signal.

By the above-mentioned non-integral relationship, contamination of the index signal due to intensity-modulations of the scanning beam at the rate at which the triplets are scanned ("triplet frequency") is minimized. However, the running index signal is itself

ambiguous in that the successive peaks of the index signal do not occur at the time of scanning of the same stripes of different triplets, and merely converting the index signal frequency to the triplet frequency by conventional means will not resolve this ambiguity. My above-cited patents describe a method and apparatus for correcting the ambiguous running index signal to produce an unambiguous index signal at triplet frequency, by means of at least one so-called "starting" index stripes so located as to be traversed by the scanning beam prior to the horizontal scanning of each line in the viewing area of the image-presentation device, thereby to produce an unambiguous indication of the position of the beam. When more than one starting stripe is used, the horizontal position of the starting stripes is made such that they are scanned by the beam at a rate which is a subharmonic (including 1) of the triplet frequency. The one or more starting stripes are typically positioned along one marginal edge of the image-presentation means at the front of the cathode-ray tube, or even along a side interior surface of the tube adjacent the edge of the viewing area where they will still be scanned by the beam at the start of each horizontal scan.

Typically the metallic layer extends to, and makes contact with, the second-anode coating on the interior of the sides of the cathode-ray tube. The metallic layer therefore tends to maintain both the viewing area and the area occupied by the starting stripes at somewhere near the same high potential as the second anode, and as mentioned above this is one of its intended purposes. In addition, it is common to employ a metal mounting ring around the outside of the cathode-ray tube near the front face thereof, which commonly is connected to a substantially fixed source of potential highly negative with respect to the second anode potential, for example chassis ground potential, or the potential of the positive or negative low-voltage supply.

I have found that when such a beam index type of cathode-ray tube is utilized to produce indexing signals for beam control purposes, from time to time there will commonly occur small bursts of interference generated by or at the cathode-ray tube which upset the normal operation of the index signal generating and control system. This interference is commonly such that, in a color image-presentation cathode-ray tube of the beam indexing type, the color image will momentarily become greatly distorted along a given scanning line or lines at the time of or shortly after each such burst. The occurrences of such interference bursts causing erroneous color of scan lines are generally coincident with audible or visual tricks, or small sparkings, apparently at or on the cathode-ray tube near the front thereof, and are generally most prominent and objectionable in the displayed image when the beam intensity is strongly modulated, or upon change from scenes of one brightness to scenes of different brightness.

Accordingly it is an object of the present invention to provide new and useful cathode-ray tube apparatus of the beam index type.

A further object is to provide such apparatus in which the harmful effects of short bursts of interference which tend to be generated within or at the cathode-ray tube near the cathode-ray tube screen are greatly reduced or entirely eliminated.

Another object is to provide an improved construction of color television image-presentation tube of the beam index type.

A further object is to provide such a construction which accomplishes such improvement and is simple to construct and operate.

SUMMARY OF THE INVENTION

These and other objects of the invention are achieved, in a cathode-ray tube of the beam indexing type in which index signals are generated by scanning the beam across the index elements and in which at least parts of some of the index elements are positioned adjacent an insulating portion of the cathode-ray tube, by the provision of a layer of electrically-conductive material extending over and in intimate contact with the exterior surface of the insulating envelope portion adjacent the positions within the tube where said parts of said index element are located, together with means for maintaining said layer at a substantially fixed potential.

Preferably the layer of electrically-conductive material is an adherent coating on the exterior surface of the cathode-ray tube envelope, and the means for maintaining the layer at a substantially fixed potential preferably comprises a source of such substantially fixed potential electrically connected to said layer, the fixed potential preferably being chassis ground potential. In a preferred form, a metal band extends around the cathode-ray tube, over and against the layer or coating, and in turn is connected to the source of fixed potential.

Where the cathode-ray tube is of the type containing image presentation means having a predetermined viewing area at or adjacent the front of the cathode-ray tube, the layer or coating will normally extend along the outside of the cathode-ray tube envelope adjacent one edge of the viewing area, so as to provide its desired electrical effects without interfering with normal viewing.

More particularly, where the cathode-ray tube is of the type comprising color television image presentation means made up of groups or triplets of segments producing light of different colors, the external coating or layer will be located on the outside of the tube adjacent that margin of the normal viewing area at which scanning of horizontal lines begins, particularly where the beam indexing system is of the type utilizing one or more starting stripes located adjacent said margin.

In the preferred form of the invention, there is employed a color television image-presentation tube of the type comprising triplets of nominally vertical stripes of differently colored light producing segments arranged across the front of the cathode-ray tube so as to be scanned transversely at a predetermined triplet rate by the cathode-ray beam, running index segments disposed on the rear or inward side of a metallic layer covering the light-producing segments and arranged in spaced-apart positions so as to produce a signal when scanned by the cathode-ray beam having a frequency which is an odd half-harmonic of the frequency of scanning of the color triplets, and at least one starting index segment located adjacent the margin at which horizontal scanning of the image begins and positioned such that when it is scanned by the beam it produces a signal which can resolve any phase ambiguity otherwise created by the odd-half harmonic index stripe structure, together with the improvement comprising an adherent coating of electrically-conductive material extending along the exterior of the cathode-ray tube near the front face thereof and adjacent the starting index segment or segments, the coating being connected to a reference potential differing substantially from that supplied to the metallic layer. In one preferred form, the metallic layer is internally connected to the second anode of the cathode-ray tube, and the exterior electrically-conductive coating extends around the front edge of the tube to a position immediately adjacent that edge of the normal viewing area at which horizontal scanning thereof begins, the coating preferably being of a light-absorbant material so that it not only provides the desired inhibition of the bursts of interference mentioned above, but also aids in preventing transmission of image light through the wall of the cathode-ray tube envelope and around the metallic layer to within the tube where it might interfere with photo-detection of the impingement of the beam upon index segments.

By utilizing the electrically-conductive layer or coating in accordance with the invention, it has been found that the bursts of interference, which normally would occur occasionally and interfere with the indexing signal generation and control, are greatly reduced or entirely eliminated.

BRIEF DESCRIPTION OF FIGURES

Other objects and features of the invention will be more readily understood from a consideration of the following detailed description, taken in connection with the accompanying drawings in which:

FIG. 1 is a schematic diagram principally in block form, showing in plan view a cathode-ray tube constructed in accordance with the invention, and illustrating one system in connection with which the improvement of the invention may be employed;

FIG. 2 is an enlarged plan view of the cathode-ray tube shown in FIG. 1, showing further details thereof;

FIG. 3 is a front elevational view of the cathode-ray tube shown in FIG. 2;

FIG. 4 is a fragmentary sectional view taken along lines 4—4 of FIG. 2; and

FIG. 5 is an enlarged fragmentary view, in section, showing a corner and a portion of the front construction of the cathode-ray tube of FIG. 2.

DETAILED DESCRIPTION OF SPECIFIC EMBODIMENTS

Referring now to the embodiment of the invention specifically shown in the drawings by way of example only, FIG. 1 illustrates one type of color television receiver to which the invention is applicable. An appropriate antenna 10 delivers color television radio-frequency signals to the RF, first detector, IF amplifier, second detector, and processing circuits 12 which derive and supply signals over line 14 to audio circuits 16 and thence to loudspeaker 18 to produce the desired reproduction of the audio portion of the received transmissions. The circuits 12 also supply output signals over line 20 to video circuits 22, wherein they are appropriately processed and combined with or controlled by index signals supplied from index circuits

24 over line 26. The output signals from video circuits 22 are supplied over line 28 to the intensity-controlling grid 30 of the color-image reproducing cathode-ray tube 32 to control the intensity of the scanning cathode-ray beam therein.

Appropriate output signals from video circuits 22 are also supplied over line 36 to control the deflection and control circuits 38, thereby to produce on output line 40 thereof deflection signals appropriate for application to the deflection control means 42, which may be a conventional horizontal and vertical deflection yoke surrounding the neck of the cathode-ray tube 32. Circuits 38 also provide suitable output signals over line 44 to control generation, in the high-voltage circuits 46, of a suitable second-anode high voltage which is delivered over high-voltage lead 48 to the second-anode connection 50 of the cathode-ray tube 32.

As shown in FIGS. 1, 2, 3 and 5, the cathode-ray tube 32 is encircled, near its front face, by a flexible metal band 54, which overlies and makes electrical contact with, an electrically-conductive layer or coating 56 on the exterior of cathode-ray tube 32. Band 54 includes a suitable screw-type clamping arrangement 58 for drawing it tightly around the exterior of the cathode-ray tube, and in this example is provided with a plurality of mounting flanges such as 60 for securing it to a vertical support, and with an additional pair of flanges 62 by which it may be affixed to, and in electrical contact with, the metallic chassis 64 (chassis ground). The latter mounting and electrical connection may be provided by means of the screws such as 66 (FIG. 5) extending through appropriate slotted holes such as 68 in the chassis-mounting flanges.

The usual low-voltage supply circuits 69 provide the required low-voltage power for operating the various elements of the system.

In the present example the invention will be described with particular reference to its use in connection with photo-index tubes of the type described in detail in my above-cited patents. Accordingly, in this case there is shown a photocell 70 mounted within a light-sealed enclosure 72 having one end open, or translucent, so as to view the interior side of the front of the cathode-ray tube 32 by way of a "window" 74 in the cone of the cathode-ray tube; the window may comprise translucent glass of the cathode-ray tube envelope, the interior side of which is free of the normally-opaque second anode coating 76. While for simplicity a simple photocell is shown, in practice a photomultiplier tube is preferred. Light from the photoresponsive index elements to be described hereinafter is received by the photocell 70 and converted into an electrical index signal supplied over the line 80 (FIG. 1) to the index circuits 24, wherein it is appropriately processed into a form suitable for supply to the video circuits 22.

The purpose, construction and operation of such indexing circuits, and the manner in which the index signals produced thereby may be combined with received television signals, are described in my above-cited patents, and certain aspects thereof are claimed therein. Accordingly the details of their construction and operation will not be repeated here. In brief, the photocell 70 picks up short bursts of electromagnetic radiation from the index stripes which radiation may be in the visual portion of the spectrum but will be referred to herein as light even if not in the visible spectrum. These bursts of light are produced by the impingement of the cathode-ray beam, during its scanning, upon certain starting stripes and certain running stripes which will be described herein with particular reference to FIG. 5 and are fully described in the above-cited patents. In general, the running stripes extend across the image-presentation means throughout the viewing area, and are so arranged as to produce an ambiguous index signal substantially free from contamination due to modulation of the intensity of the cathode-ray beam at the triplet frequency by the received color-television information. The starting stripes produce a signal prior to the scanning of the portion of each horizontal line lying within the viewing area, and are arranged adjacent that edge of the viewing area at which horizontal scanning of the viewing area begins. The signal generated by these starting stripes is used in the index circuits 24 to produce, from the ambiguous index signals, corresponding unambiguous index signals throughout the scanning of the remainder of each horizontal line.

Referring now particularly to FIGS. 3 and 5, in this example at least the front face 84 and the adjacent side surface 86 of the cathode-ray tube 32 are made of an electrically insulating material such as transparent glass. Typically the front portion 84 of the tube and the immediately adjacent side portions may be made of one piece of glass, and the remainder of the cone portion 86 and the neck of the cathode-ray tube made as a separate portion, the two portions later being appropriately secured together by a glass weld 88, by well-known techniques. This makes it easier to fabricate and apply the various image-presentation and indexing elements on the interior surface of the front of the cathode-ray tube.

The normal color television image viewing area 90 (FIG. 3) comprises a plurality of groups or triplets, such as T_1 and T_2, of stripe-like elements such as those labeled R_1, G_1, B_1, R_2, G_2, B_2, and which are responsive to impingement by the cathode-ray beam to produce a different color of light for each element or stripe within a given triplet; for example, red, green, and blue light. These groups of elements or stripes cover the entire viewing area of the cathode-ray tube, and in this example are provided by known techniques directly on the interior surface of the glass front 84 of the cathode-ray tube.

On the interior side of the cathode-ray tube, extending over the phosphor stripe elements and around the edge of the front of the tube onto the interior side surfaces thereof, there is provided a conventional evaporated metallic film 94, which is typically of aluminum. The second-anode coating 76, which is typically of aquadag, preferably extends over, and in contact with a portion of the metallic layer 94, as shown in FIG. 5.

On the rear, or beam, side of the metallic layer 94 are located the running index stripes such as 95, 96, 97 and 98, for example, which are spaced across the tube in the direction of horizontal beam scanning so that the rate of their scanning by the beam is 3/2 times the rate at which the triplets T_1 and T_2 are scanned by the beam. In other words, there are three indexing stripes for each

two triplets. In the example shown, these index stripes are placed in alignment with the spaces between alternate color stripes, as shown. These index stripes are designated as the running index stripes since they extend entirely across the scanned viewing area of the image-presentation device, in contrast with the starting index stripes such as **99**, **100** and **101**, which are placed along a marginal edge (to the left in FIG. **5**) of the normal viewing area so as to be scanned successively by the cathode-ray beam at the start of each horizontal line scanning, prior to the scanning of the running index stripes in the viewing area.

As described in my above-cited patents, the starting stripes **99**, **100** and **101** are spaced laterally apart from each other in such manner that the rate at which they are scanned by the cathode-ray beam is a subharmonic of the rate at which the triplets of phosphor stripes are scanned by the beam. Both the running stripes and the starting stripes in this example are photo-responsive, so as to produce momentary bursts of light when they are impinged by the cathode-ray beam, although secondary-electron emissive index stripes may be used. Preferably the material used for the indexing stripes is a short-persistence phosphor so that the bursts of light which each index stripe produces on impingement will disappear quickly after each scanning thereof.

The photo-responsive device **70**, which views the interior of the front of the cathode-ray tube, responds to the bursts of light from the starting stripes and from the running stripes to produce a corresponding electrical index signal, which is then processed in the index circuits **24** of FIG. **1** and applied to the video circuits **22** to produce the desired control of the intensity modulation of the beam, so as to produce an accurate reproduction of the color image on the image-presentation device.

When the type of cathode-ray tube described above is provided with a surrounding supporting metallic band, such as band **54**, and this band is connected to a source of potential differing substantially from the second anode potential, for example is connected to chassis ground, the above-described small discharges, tickings, and bursts of interference have been found to occur. While all of the reasons for these bursts of interference and the mechanisms of their production are not entirely clear, they tend to occur more often when the beam is modulated or when a scene changes, and when they occur, they cause miscoloring or lack of image in a few scan lines, momentarily.

It is believed that a significant factor is that the band **54**, by its physical nature cannot readily make an intimate continuous electrical contact with the exterior of the glass envelope of the cathode-ray tube, but at best makes contact primarily over a number of discrete relatively small areas; within each such area even minute variations in the surface of the tube or of the band will produce small gaps between band and tube surface. A voltage charge can then build up on the exterior of the glass, either by electrical leakage through the glass or by electrons penetrating into the interior of the glass, or otherwise. When this charge reaches the breakdown potential of the surrounding air or of the surface film on the glass, it can discharge quickly. This discharge can produce light to which the photocell **70** will respond, undesirably; or it can produce undesirable changes of potential within the cathode-ray tube, particularly in that the thin metallic layer **94**, in practice, may not always provide a definite reliable low-resistance connection between the second anode and all portions of the front part of the cathode-ray tube supposedly covered by the layer. Accordingly, this metallic layer may not actually maintain all parts of the cathode-ray tube adjacent the indexing stripes at a single fixed potential, particularly when these indexing stripes are scanned by the modulated cathode-ray beam. Whatever the reasons, the above-described intermittent and occasional bursts of interference, which can upset the indexing operation, have been experienced, particularly when using the grounded support band **54** in direct contact with the exterior of the insulating cathode-ray tube envelope.

However subtle is the cause of these very annoying visual effects in the final image, their occurrence is overcome by use of the electrically-conductive layer or coating **56**, which in this example extends around the left-hand half of the periphery of the viewing area, on the exterior of the cathode-ray tube envelope, in the form of a band of electrically-conductive material. It is positioned on the exterior of those portions of the cathode-ray tube wall whose inner surfaces are nearest the starting stripes **99**, **100** and **101**, and as shown preferably extends around the front edge of the cathode-ray tube onto a portion of the front surface, as far as the edge of the normal viewing area. This causes the coating **56** to be disposed adjacent not only starting stripes such as **99**, **100** which are on the side or at the corner of the cathode-ray tube, but also adjacent starting stripes such as **101** which are disposed along the front of the cathode-ray tube.

A suitable material for coating **56** is graphite in the form known as aquadag, although other electrically-conductive materials may be utilized. It is conveniently applied by painting a liquid suspension, solution or slurry of the conductive material onto the exterior of the cathode-ray tube, and allowing it to dry. The coating is maintained at a fixed potential in this example by means of the metal mounting band **54**, which is secured to the conductive chassis **64**.

With this arrangement, even though the contact between the band **54** and the layer **56** may not be intimate or continuous, it is sufficient to provide adequate electrical connection to the coating **56**, which in turn extends continuously over the surface of the envelope in stable intimate contact therewith, adjacent the starting stripes. It is believed that the principal mechanisms by which the coating **56** reduces the undesired bursts of interference are by elimination of charge buildup on the exterior of the bulb to the point where electrical discharge in air or along the glass surface can take place; and/or by providing uniform capacitive coupling between the metallic layer **94** and the grounded band **54**. Thus the metallic layer **94** and the coating **56** on the inner and outer sides of the wall of the insulating glass envelope comprise a capacitor such that any substantial tendencies toward rapid changes in the potential of the metallic layer **94** (or portions thereof, if it is broken into segments insulated from each other) caused for example by scanning of starting stripes by the cathode-ray beam, are in effect capacitively shorted to ground. In this way local high-intensity sudden changes in potential are prevented, and the bursts of interference which

normally result therefrom eliminated or greatly reduced.

As mentioned above, the coating is preferably of light-absorbant material, such as aquadag for example, so that the light generated by the image phosphors such as R_1, G_1, B_1 which might tend to be internally reflected around the adjacent corner of the cathode-ray tube, along the interior of the tube wall, and into the photocell, tends to be absorbed at the interface between the coating 56 and the exterior of the tube envelope and thus is reduced in intensity.

While the invention has been described with particular regard to specific embodiments thereof in the interest of complete definiteness, it will be understood that it may be embodied in a variety of forms diverse from those specifically shown and described, without departing from the scope and spirit of the invention as defined by the appended claims.

What is claimed is:

1. In a cathode-ray tube indexing system comprising a cathode-ray tube the envelope of which includes an electrically insulating portion, means for generating a cathode-ray beam in said tube, high-voltage means in said tube for accelerating said beam toward the inner surface of said envelope portion, index elements in said tube adjacent predetermined areas of said inner surface of said envelope portion and responsive to impingement by said beam to generate detectable index emanations, means responsive to deflection signals for deflecting said beam to cause it to traverse said index elements, and means responsive to said emanations to produce electrical index signals indicative of the times at which said index elements are impinged by said beam:

the improvement which comprises a layer of electrically-conductive material extending over and in intimate contact with the exterior surface of said envelope portion adjacent said areas of said inner surface, and means for maintaining said layer at a substantially fixed potential.

2. Apparatus in accordance with claim 1, in which said layer comprises an adherent coating of electrically-conductive material on said exterior surface.

3. Apparatus in accordance with claim 1, in which said means for maintaining said layer at a substantially fixed potential comprises an electrical connection to said layer and a source of substantially fixed potential connected to said connection.

4. Apparatus in accordance with claim 3, in which said connection comprises a metal band extending around said tube and over and against said coating.

5. Apparatus in accordance with claim 1, in which said envelope contains image-presentation means at the front of said tube for producing an image in response to impingement by said beam when it scans across said image-presentation means from one side to the other thereof, and in which said layer extends along the exterior of said tube adjacent said one side of said image-presentation means.

6. Apparatus in accordance with claim 5, in which at least some of said index elements extend outside the normal viewing area of said image-presentation means and said layer is disposed on the outer surface of said envelope adjacent said at least some index elements.

7. Apparatus in accordance with claim 1, in which said tube contains color image-presentation means at the front thereof comprising an image-forming area made up of a plurality of different phosphor elements differently responsive to impingement by said beam to produce light of differing colors, said deflecting means being effective, when operated, to scan said image-forming area from one side to the other thereof with said beam, said index elements being located at predetermined positions with respect to said phosphor elements including positions adjacent said one side, said layer extending over a part of said insulating portion of said tube adjacent said one side.

8. Apparatus in accordance with claim 1, in which said tube comprises a transparent front face having on the inner surface thereof a layer of phosphor elements arranged in a regular order and differently responsive to impingement by said beam to produce light of differing colors throughout a normal viewing area, and a metallic layer pervious to said beam and disposed over said phosphor layer on the side from which said beam approaches said phosphor layer, at least some of said index elements being located adjacent but beyond one edge of said viewing area and on said metallic layer, said layer of electrically conductive material extending along the side surface of said tube adjacent said edge.

9. In a cathode-ray indexing tube comprising a set of laterally spaced-apart running index stripes in said tube positioned to be impinged sucessively with a first periodicity by the cathode-ray tube beam as it is deflected tranversely to said stripes to produce an ambiguous index signal representative of the position of said beam with respect to said running stripes, and at least one starting stripe along one edge of said set in predetermined laterally-spaced relation to said set of running index stripes for producing another index signal indicative of the position of said beam with respect to a particular one of said running stripes, the improvement comprising:

a layer of electrically-conductive material in intimate contact with the exterior of said tube in a position adjacent said at least one starting stripe.

10. In the tube of claim 9, means for maintaining said layer at a substantially fixed potential.

11. In a color television image-presentation tube comprising a cathode-ray tube envelope, means for forming a cathode-ray beam in said tube, a transparent front face on said tube, color-image forming means on said front face and comprising an array of periodically-positioned groups of light-emissive stripes, different stripes in each group being differently responsive to impingement by said beam to produce light of differing colors, means for scanning said beam transversely to said stripes at successively different vertical positions to produce a television raster on said color-image forming means, means responsive to color television signals and to index signals for controlling the intensity of said beam as it scans the stripes in each of said groups to produce a color of light from each successively scanned group area which is appropriate to the desired color of the television image in that area, a conducting layer extending over said image-forming means on the side of approach by said beam, a plurality of running photo-index stripes periodically recurrent in the horizontal direction along said image-forming means on the side

of said conductive layer impinged by said beam and recurrent transversely of said image-forming means with a periodicity different from that of said light-emissive stripes, starting photo-index stripes positioned on said side of said conductive layer and adjacent the edge of said image-forming means first impinged by said beam in its horizontal scannings, said starting stripes having a different periodicity along said horizontal direction than said running stripes, and means responsive to light emanations from said starting stripes and from said running stripes to generate an index signal representative of the instantaneous horizontal position of said beam, the improvement comprising:

an intimate continuous electrically-conductive coating on the exterior of said tube adjacent said edge of said image-forming means.

12. In a beam-indexing color-image display cathode-ray tube having a beam-indexing structure therein responsive to impingement by the beam as it performs successive horizontal line-scanning of said structure to produce index signals, the improvement which comprises means for maintaining at a substantially fixed potential the exterior portions of said tube adjacent the regions of said structure at which said line-scannings begin.

13. The tube of claim 12, in which said structure includes a portion along one edge thereof at which said scannings being for producing unambiguous indications of impingement by said beam, and said means for maintaining said exterior portions of said tube at a substantially fixed potential comprises a conductive coating overlying said exterior portions and means for maintaining said coating at a substantially fixed potential.

14. The tube of claim 13, in which said tube is of the type employing groups of generally-vertical image-forming line segments differently responsive to impingement by said beam to produce light of different colors extending throughout a normal viewing area and said beam-indexing structure comprises an array of beam responsive index line segments disposed inwardly of said tube from said image-forming line segments and in predetermined geometric relation thereto, said array including index line segments positioned along said edge.

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