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Speigel

[11] **3,863,086**

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[54] **COATED PATTERN MASK FOR USE IN FORMING A COLOR CRT SCREEN STRUCTURE AND METHOD FOR COATING THE MASK**

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[52] **U.S. Cl.** .... **313/408,** 117/33.3, 204/181, 313/47 Z

[51] **Int. Cl.** **B01k 5/00,** C23b 13/00, H01j 29/46

[58] **Field of Search** .... 204/181; 117/33.5 C, 117/33.5 CM, 33.5 CP, 33.3; 313/85 S, 92 B

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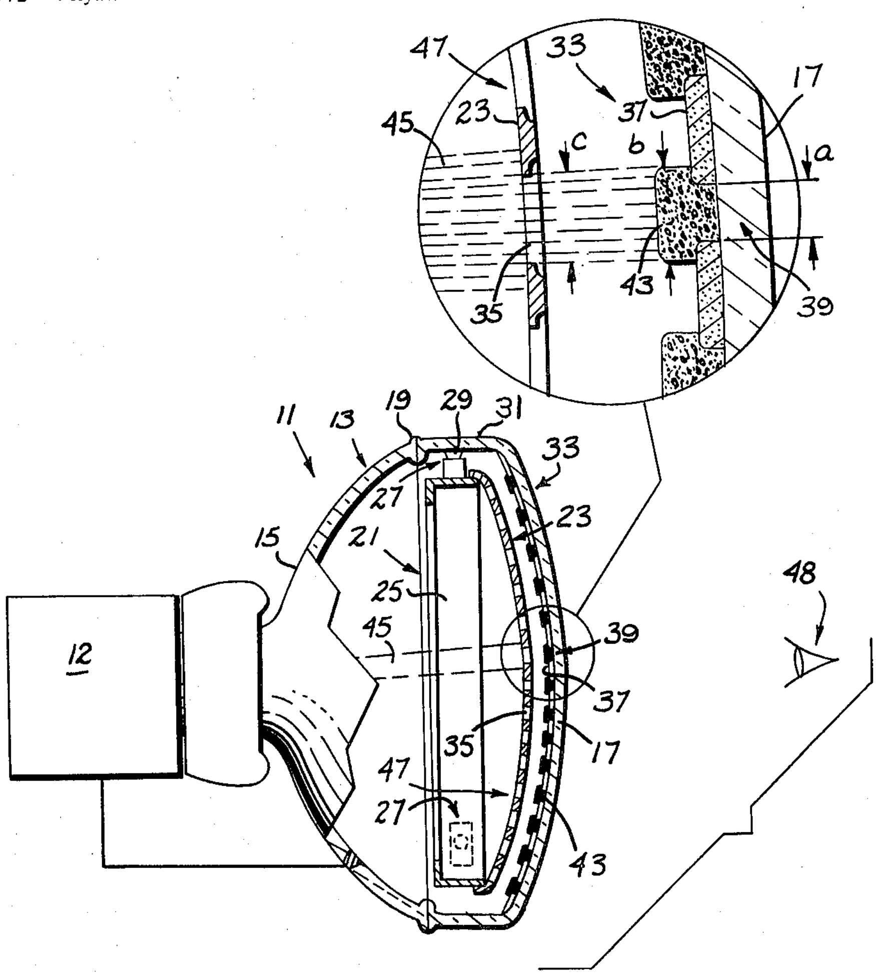
[57] **ABSTRACT**

An improvement is provided for temporarily modifying the aperture sizes in a patterned cathode ray tube mask member for utilization in selected steps of the procedure for fabricating a multiplex patterned color screen structure disposed on the interior surface of the tube viewing panel. A first coating material disposed as a substantially semiporous coating to reduce the sizes of the initially defined apertures is of a discrete material substantially absorbant and non-reflective of ultraviolet radiant energy in substantially the 340 to 380 nanometer range. A second coating of a substantially ultraviolet transparent permeative binder solution is applied thereover in a manner to impregnate the first coating material and form a compacture therewith to provide improved adherence and abrasion resistance therefor. An improved method is taught for applying the temporal duo-coatings to the apertured mask member.

15 Claims, 7 Drawing Figures



PRIOR ART

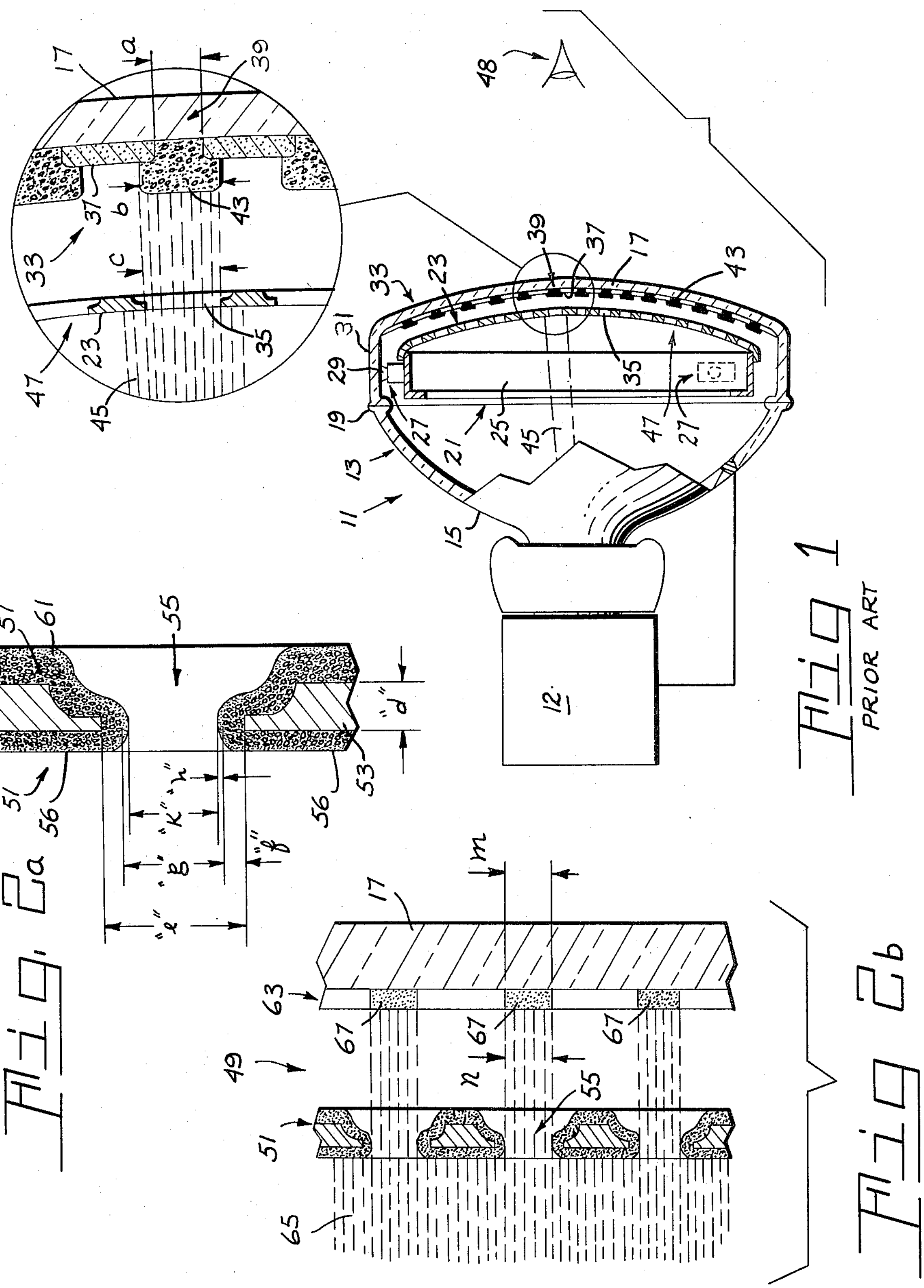


Fig 1 PRIOR ART

Fig 2a

Fig 2b

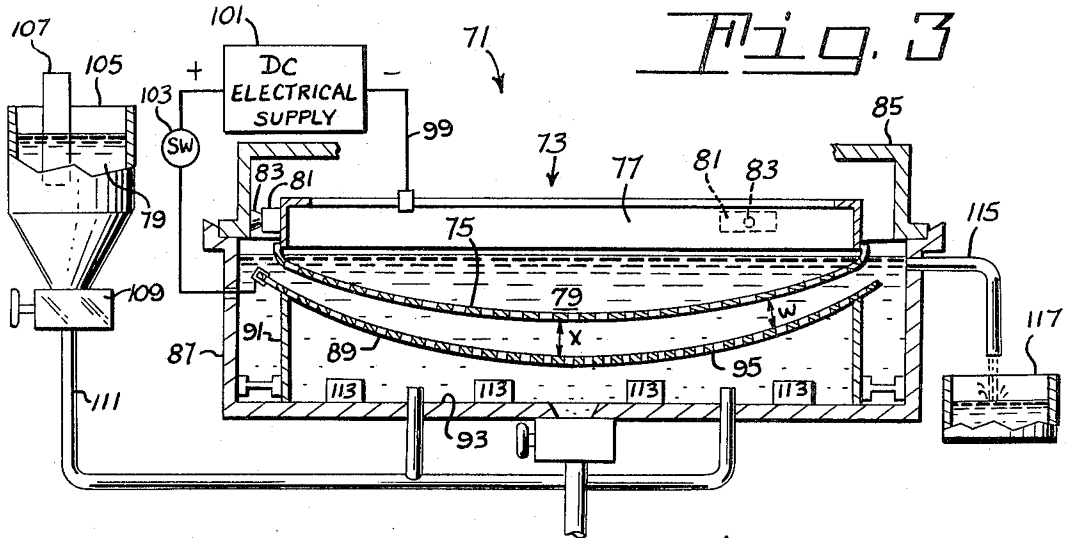


Fig. 3

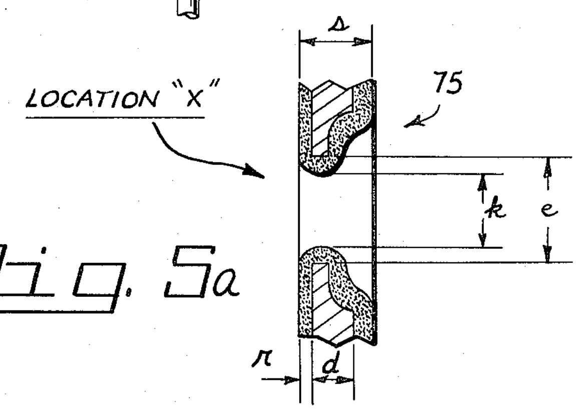


Fig. 5a

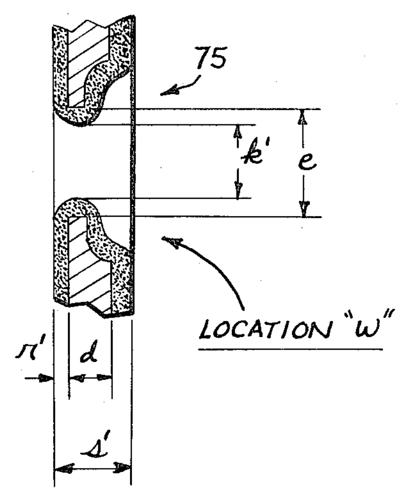


Fig. 5b

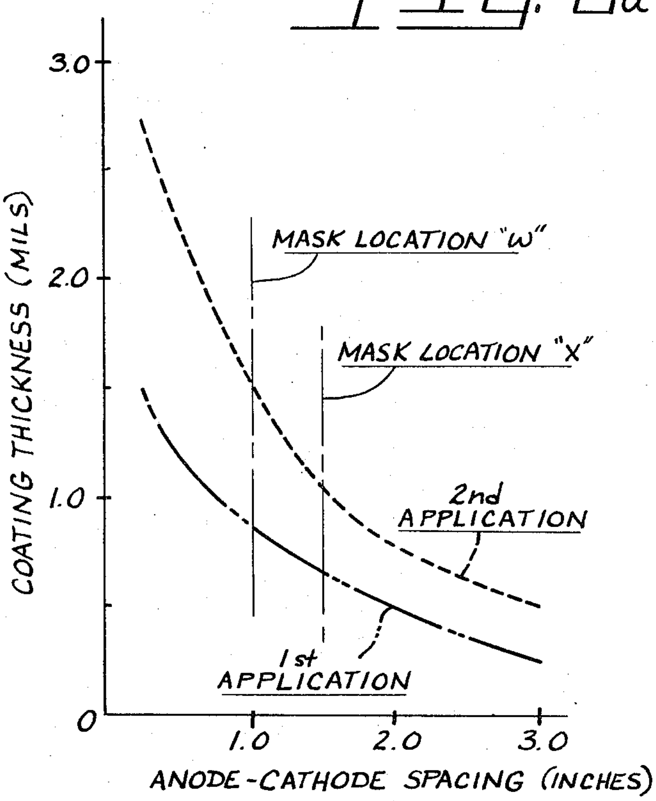


Fig. 4

COATED PATTERN MASK FOR USE IN FORMING A COLOR CRT SCREEN STRUCTURE AND METHOD FOR COATING THE MASK

CROSS-REFERENCE TO RELATED APPLICATIONS

This application contains matter disclosed but not claimed in two related United States patent applications filed concurrently herewith and assigned to the assignee of the present invention. These related applications are Ser. No. 310,704 filed Nov. 30, 1972, now U.S. Pat. No. 3,764,514, and Ser. No. 310,707, filed Nov. 30, 1972.

BACKGROUND OF THE INVENTION

This invention relates to color cathode ray tubes and more particularly to improved mask modifications means utilized in the forming of a patterned color screen structure.

Color cathode ray tubes, such as those employed in television applications, usually have patterned screen structures comprised of repetitive groups of related phosphor materials. These groupings are conventionally disposed as bars, stripes, or dots depending upon the particular type of color tube considered. For example, in the widely-used shadow mask tube construction, the related screen pattern is usually composed of a vast multitude of substantially round or discretely elongated dots formed of selected cathodoluminescent phosphors, which, upon predetermined electron excitation, produce additive primary hues to provide the desired color imagery. The individual dots comprising the screen pattern are often separated by relatively small interstitial spacings to provide improved color purity by reducing the possibility of electron excitation of adjacent dots. Associated with the screen and spaced therefrom is a multi-apertured shadow mask. Each of the apertures therein, being of a substantially round or elongated shaping, is cognitively related to a specific grouping of similar-shaped phosphor dots, comprising the spatially related screen pattern, in a manner to enable the selected electron beams traversing the apertures to impinge the proper dots therebeneath.

Improved brightness and contrast of the color screen image has been achieved by a multiplex screen structure wherein the dot-defining interstitial spacing between adjacent phosphor dots is covered by an opague light-absorbing material. Specifically, each phosphor dot is defined by a substantially dark opaque encompassment which collectively comprises a foraminous pattern in the form of a windowed webbing having an array of substantially opaque connected interstices. Such web-like structures have been fabricated, either before or after screening, by several known processes wherein photo-deposition techniques play a prominent part. An example of a typical web-forming procedure is disclosed in Ser. No. 41,535 by R. L. Bergamo et al., filed May 28, 1970, assigned to the assignee of this invention and now abandoned.

It has been found that further improvement can be realized from a mask-screen relationship wherein the respective phosphor covered windows of the opaque webbing in the finished multiplex screen are slightly smaller than the apertures in the related shadow mask. This aperture-to-window relationship is referenced in the art as "negative guardband" or a "window-limited" screen. In this type of screen construction, when a phosphor dot is impinged by an aperture-sized beam, the excited phosphor area completely fills the associated window area with a luminescent hue.

Several techniques have been employed to achieve a multiplex window-limited color screen structure in which the window openings in the opaque interstitial webbing are smaller than the associated apertures in the shadow mask subsequently utilized in the operable tube.

In accordance with one screen forming procedure, wherein the size of the mask apertures remains fixed, a pattern of clear polymerized PVA dots is light disposed on the panel, on those areas subsequently to be windows in the opaque webbing, by photo-exposure through the related apertured shadow mask. After development, the resultant island-like polymerized dots are reduced in size by an erosion technique involving a chemical degrading agent. Next, an opaque graphite coating is applied to completely overcoat the pattern of the reduced-in-size clear dots and the adjacent bare interstitial glass areas. Then, an oxidizing agent is applied to completely degrade the pattern of dots thereby lossening the superjacent opaque coating thereon, whereupon the materials so loosened are removed by a subsequent water development step. Thus, there is formed an opaque interstitial web having multudinous windows defined as bare glass areas that are of a size smaller than the related mask apertures. The phosphor pattern elements are then disposed on these window areas upon photo-exposure through the same size mask apertures by one of the various processes known to the art. While the aforedescribed dot-erosion procedure is an acceptable production technique, it necessitates the inclusion of additional process steps.

By another procedure, after the dot-initiated windows and the overlaying phosphor elements are formed by a separate series of photo exposures through the initially apertured mask, the mask apertures are subjected to a chemical etching process to enlarge their sizes thereby effecting the desired dimensional differential between the final-sized apertures and the formed windows in the interstitial webbing. While, this too, is a production procedure, the aperture etching requires additional closely controlled processing steps. In addition, as a result of this aperture etching procedure, metallurgical inconsistencies of the mask material have been evidenced such as a ragged aperture periphery, a weakening of the mask material per se and destruction of the desirable dark oxide coating on the surface of the mask. Furthermore, with reference to the economics of tube production, etching of the mask apertures is an inherently costly procedure as it precludes any subsequent reuse of masks which ordinarily could be salvagable from the final stages of the tube manufacturing operation.

The prior art is replete with a variety of techniques for modifying the size of the shadow mask apertures for utilization in the forming or operation of specific types of color screen structures. In several disclosures the changing of aperture sizes is executed by the deposition within the aperture openings of peripheral fill-in substances applied, as for example, by painting, dipping, electrophoresis, electroplating and vaporization. The results of the respective depositions and their subsequent removals have been evidenced by varying degrees of success involving additional concomitant procedures and expense. In some instances, the controlled repeatability relative to production and consistent quality aspects has been annoyingly unsatisfactory.

OBJECTS AND SUMMARY OF THE INVENTION

It is an object of the invention to reduce the aforementioned disadvantages by providing a patterned shadow mask having improved temporary modifications of the apertures therein. Another object is to provide a temporarily coated pattern mask for utilization in the forming of a color cathode ray tube screen structure whereof the mask modification can be expeditiously, consistently and satisfactorily reproduced from a production concept. A further object is to provide an improved method for effecting the improved temporal mask modification that in no manner alters the basic mask metallic structure or the surface thereof.

These and other objects and advantages are achieved in one aspect of the invention by the provision of a patterned cathode ray tube shadow mask formed of a temporarily modified multi-apertured metallic pattern member having integral strengthening means conjunctive with the periphery thereof. The sizes of the apertures in the mask are temporarily modified in an improved manner for utilization in selected steps of the procedure for fabricating the windowed opaque webbing and the overlying phosphor elements of the multiplex color screen structure. The improvement in the temporarily modified apertured member is in the form of a basic or first coating of a substantially semiporous structure applied in a manner, such as by electrophoretic deposition, to effect predeterminate temporal reduction in the sizes of the initially defined apertures. The first coating being of a discrete material substantially absorbant and non-reflective of ultraviolet radiant energy in substantially the 340 to 380 nanometer range, has the chemical characteristic of being soluble in a solvent that is non-destructive to the metallic mask material. A second coating material, differing from that of the first coating, is uniformly applied over the first coating material. The second material is a permeative binder solution substantially ultraviolet transparent in the form of, for example, a polyhydric secondary alcohol which is applied in a manner to impregnate and provide improved adherence and abrasion resistance for the semiporous first coating material. An improved plural-step method is taught for sequentially applying the related duo-coatings to the apertured pattern member.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a prior art view of a color cathode ray tube in an operable environment and partially in section showing the relationship of the multi-apertured shadow mask to the patterned screen structure disposed on the viewing panel of the tube;

FIG. 2*a* is an enlarged sectional view of the apertured pattern member of the mask showing the invention;

FIG. 2*b* is an enlarged sectional view of a portion of the mask-screen assembly illustrating utilization of the invention during one step in the formation of the color screen structure;

FIG. 3 is a sectional view illustrating a procedure for electrophoretically coating the mask;

FIG. 4 is a graphic presentation showing the relationship between mask-coating thickness and anode-cathode spacing during the coating procedure; and

FIGS. 5*a* and 5*b* are enlarged sectional manifestations illustrating individual apertures in an exemplary mask coating gradient.

DESCRIPTION OF THE PREFERRED EMBODIMENT

For a better understanding of the present invention, together with other and further objects, advantages and capabilities thereof, reference is made to the following specification and appended claims in connection with the aforedescribed drawings.

While the ensuing description is primarily directed to an exemplary window-limited shadow mask-screen assembly, the concept of utilizing temporarily modified apertures in the screen forming operation is likewise applicable for tubes employing a focus mask-screen structure.

With reference to the drawings, there is shown in FIG. 1 a prior art view illustrating a shadow mask type of color cathode ray tube **11** in an operable environment denoted diagrammatically as **12.** The encompassing envelope **13** of the tube includes a funnel portion **15** to which a viewing panel **17** is suitably attached as by a continuous bead of bonding frit **19.** Within the panel there is positioned a metallic shadow mask structure **21** which comprises a curved or domed multi-apertured pattern member **23** formed of, for example, an iron alloy material having a strengthening means or perimetral frame **25** integral with the periphery thereof. This peripheral frame has a plurality of positioning means **27,** attached at spaced-apart locations thereon, which mate with supporting protuberances such as metal studs **29** projecting inwardly from the sidewall portion **31** of the viewing panel **17.** Disposed on the interior surface of the viewing panel is a patterned screen structure **33,** the elements of which are formed in accordance with the apertures **35** in the adjacent mask pattern member **23,** the substantially domed contour of the mask being related to the surface contour of the interior of the panel.

The multiplex patterned screen structure is comprised of repetitive groupings of two or more elemental cathodoluminescent areas of different phosphors overlaid on the discretely formed window areas of the opaque interstitial webbing portion of the structure **33.** For example, in the screen structure shown in FIG. **1,** the opaque interstitial webbing **37** has an exemplary window area **39** which is dimensioned as *a;* such is intended to be normally representative of the multitudinous windows therein. The window openings per se are substantially round, elongated, or of other discrete shapings in keeping with the screen pattern desired. Overlaid on each of the window areas is a related phosphor area, of which phosphor pattern element **43** is representative of one of the pattern components. The phosphor area is dimensioned as *b* being at least as large as or preferably larger than the associated window area **39.** To facilitate clarity in the drawing, the usually present aluminum coating or backing on the screen structure is omitted. Spaced rearward from the screen structure **33** is the shadow mask multi-opening pattern member **23,** wherein a representative aperture denoted as **35,** is dimensioned as *c* and is larger than the related window area **39.** The aforementioned windows and related phosphor areas are usually formed in accordance with the shapings of the apertures by known photo-exposure techniques. An exemplary electron beam 45, emanating within the tube from a source not shown, is directed toward the mask-screen assembly 47. Upon striking the apertured pattern member 23 of the mask, a portion of the beam that is sized by the large aperture 35, traverses therethrough, impinges a related phosphor area 43 therebeneath and substantially excites the whole of the phosphor area to a state of luminescence. Since each of the excited phosphor areas 43 in this "window-limited" screen is as large as or larger than its associated window area 39, the total area of each window comprising the screen pattern is fully luminous. The resultant display in an operating tube is easily discernible by the viewer 48.

The present invention provides an improvement in the temporary modification of the apertured pattern member of the shadow mask; the temporary modification being utilized in selected steps of the procedure for fabricating the windowed opaque webbing and the associated phosphor elements of a window-limited color screen structure.

With reference to FIG. 2*a*, an enlarged sectional view of a single aperture portion of the temporarily modified shadow mask pattern member 51 is illustrated. This apertured member, for example, is formed of a basic material 53 such as S.A.E. 1010 cold rolled steel having a conventional thickness *d* within the range of 0.005 to 0.007 inch, and is normally domed in a manner related to the interior contour of the viewing panel as priorly shown in FIG. 1. The mask structure is priorly subjected to a known controlled atmospheric heat treatment to form a dark coating comprising a mixture of iron oxides, not shown, on both the inner and outer surfaces thereof. It is conventionally desired to retain such dark coating for use in the finished tube to enhance efficiency and uniformity in the radiation of the heat in the mask induced by electron bombardment. As a result, the mask operating temperature is lowered and heat-up distortion in the mask is noticeably reduced. It has been found that tubes having the dark coated masks can be expeditiously and facilely adjusted in operating environments. Therefore, it is important that the temporary mask modification of the invention should in no manner affect the advantageous dark iron oxide surface condition on the mask, nor should it in any way permanently alter the initially formed apertures in the mask.

An exemplary initially formed aperture 55 in the pattern member material 53 is dimensioned as *e* and may be in the order of 0.0145 inch. The invention being a temporary coated modification 56 of the mask member is consummated by applying a first coating 57 to the apertured member 51 to effect a predeterminate reduction in the order of 0.0015 to 0.0025 inch in the sizes of the initially defined apertures in the pattern member. This first coating is in the form of at least one uniformly disposed substantially semiporous application of a discrete particulate material that is applied, for example, by electrophoretic deposition. The coating material is substantially absorbant and non-reflective of ultraviolet radiant energy in substantially the 340 to 380 nanometer range. This material characteristic is a very important consideration in photo-exposing both the basic window pattern and the subsequently disposed pattern of phosphor elements thereover. The uv absorbent material prevents deleterious reflection of the actinic exposure radiation thereby promoting better control of the exposure technique with marked improvements in size control and definition of the respective resultant patterns. In addition, the first coating material has the chemical characteristic of being soluble in an easily removed substance nondestructive to the mask material. This electrophoretically applied first coating is an opaque minutely particulate material selected, for example, from the group consisting essentially of zinc oxide, titanium dioxide, and a mixture of zinc oxide and titanium dioxide. A first coating thickness of such materials, being defined as *f* effectively decreases the size of the aperture 55 from, for example, 0.0145 inch to the reduced dimension of *g* which may be of a modified value such as 0.012 to 0.013 inch.

An application of a second coating material 61 is uniformly applied as a permeative coating over the first coating 57. The second coating material differs from the first coating material and is disposed in at least one uniform application of a substantially ultraviolet transparent synthetic binder solution in the form of, for example, a polyhydric secondary alcohol, such as polyvinyl alcohol, which wets and impregnates the substantially semiporous first coating material thereby imparting improved adherence and abrasion resistance thereto. In FIG. 2*a*, the presence of the second coating is designated as having thickness *h*. Actually, practically all of the second coating 61 permeates the minutely particulate material of the semiporous first coating 57 whereupon only a thin film or residuum is evidenced on the surface of the first layer. Upon deposition of the second coating 61 the final dimension of the aperture 55 is denoted as *k* which substantially equals the first coating modified aperture dimension *g*.

In referring to FIG. 2*b*, an enlarged sectional view of a portion of the mask-screen assembly 49 is shown wherein the duo-coated temporarily modified mask 51 is positioned utilization in fabricating the windowed interstitial webbing of the color screen structure. The inner surface of the panel 17, having been coated with a substantially clear photosensitive resist material 63, such as dichromated polyvinyl alcohol, is exposed to substantially actinic light 65, from a discretely located source not shown, which is beamed through the temporarily modified apertures of the positioned shadow mask 51. In those photoresist areas 67 impinged by the actinic exposure radiation, the affected area of sensitized coating is light-polymerized as a pattern dot having the dimension *m*, this being directly related to the dimension *n* of the light beam which is sized by the modified aperture 55. This polymerized pattern dot 67 subsequently becomes a window in the opaque interstitial webbing of the color screen structure such as taught in the previously mentioned web-forming procedure disclosed in U.S. patent application Ser. No. 41,535 by R. L. Bergamo et al., now abandoned. After forming of the basic window pattern, as exemplified by the polymerized area 67, and the subsequent similarly disposed overlaid pattern of phosphor elements, not shown, the temporary duo-coatings 57 and 61 are expeditiously and completely removed from the shadow mask by treatment with a weak solvent, such as acetic acid, followed by a water rinse. Such coating removal treatment is in no way deleterious to the mask material. Th precisely formed apertures are maintained as initially fabricated, and the dark iron oxide coating formed on the surface of the mask material is desirably retained to enhance uniform heat radiation in the finished tube. Thus, an efficient and improved color cathode ray tube, utilizing a window-limited multiplex color screen structure is expeditiously manufactured by using the temporarily modified duo-coated mask formed in accordance with the invention.

The application of the temporary modification coating to the domed and formed apertured pattern portion of the completed shadow mask structure is facilitated by an improved electrophoretic coating procedure prior to fabrication of the multiplex screen structure. Reference is made to FIG. 3 wherein an improved electrophoretic coating apparatus **71** is illustrated. A shadow mask structure **73**, having a domed apertured portion **75** peripherally attached to a frame-like strengthening means **77**, is invertedly positioned in a manner that only the apertured portion is immersed in an electrophoretic bath of a first coating suspension **79**. A plurality of supportive means **81**, attached in a spaced-apart manner about the mask frame **77**, are mated with stud-like projections **83** extending from mask holding means **85**. This partially shown mask holding means is constructed to move the mask in a vertical predetermined manner to effect immersion and removal of the domed apertured portion **75** into and out of the electrophoretic suspension **79** by actuation means not shown. The coating suspension is held by a non-conductive liquid-holding container **87** having sufficient depth to accommodate a formed foraminous electrode **89** which is edge supported by a perimetric frame **91** positioned relative to the bottom **93** of the coating bath container. The foraminous electrode **89**, being formed of a mesh or multitudinous apertured material is shaped to a contour relative to that of the domed aperture portion **75** of the mask to which it is spacedly related when the mask is immersed in the coating suspension **79**. The functioning area of the electrode **89** at least equals the area of the apertured portion **75**. The multitudinous openings **95** in the electrode are, for example, in the order of from **15** to **20** mils in diameter, being much larger than the solid particles comprising the coating suspension **79**. Electrical connections **97** and **99** from a d.c. electrical supply **101** are connected through switching means **103** to the electrode **89** and mask **73** to effect coating deposition on the mask apertured portion **75**. In the example shown, the foraminous electrode is the anode and the mask the cathode to effect cataphoretic deposition of the suspension solids on the mask **73**.

A supply of the first coating suspension **79** is contained in reservoir **105** wherein agitation means **107** maintains the suspension. Valving means **109** regulates the flow of the coating suspension from the reservoir through the piping **111** to the apparatus coating container **87**. Within the container are a plurality of spaced-apart agitation means **113**, such as ultrasonic or fluid vibrators, which are operated to continue the suspension and expedite flow of the suspended particles through the foraminous electrode. Several spaced apart out-flow means **115**, of which one is shown, maintain the level of suspension within the container. The several outflow means discharge into a collector reservoir **117**.

For example, the first coating electrophoretic bath is a suspension of an opaque minutely particulate uv absorptive material selected from the group consisting essentially of zinc oxide, titanium dioxide, and a mixture of zinc oxide and titanium dioxide. These suspended solids are preferably of sub-micron size particles having a mean particle size within the range of approximately 0.10 to 0.20 micron. The upper limit of particle size should not exceed substantially 5.0 microns.

Zinc oxide is preferred because of its property of being readily soluble in a weak acid. While on the other hand, it appears that minute particles of titanium dioxide are readily maintained in long-life suspension, the resultant coating is not appreciably dissolvable in a desired weak type of solvent, such as acetic acid. Therefore, when employing the long-life suspension characteristics of titanium dioxide, sufficient zinc oxide should be present to assure subsequent removal of the temporal coated modification **56** from the mask material **53**. Two procedures for utilizing titanium dioxide are:

1. Electrophoretic application of a base or primary coating of zinc oxide from a zinc oxide suspension followed by the electrophoretic application therefrom of a secondary coating of titanium dioxide from a substantially titanium dioxide suspension. Later dissolution or removal of the primary coating with a weak solvent carries with it the overlaid secondary coating of titanium dioxide.
2. Electrophoretic application of a composite coating from a suspension comprising a mixture that is predominantly zinc oxide with not more than 40 percent by weight of total solids being titanium dioxide. Subsequent dissolution of the zinc oxide component likewise removes the associated titanium dioxide.

The liquid vehicle of the suspension is comprised of a C_1–C_2 monohydric alcohol, such as methanol and/or ethanol, combined with a C_3–C_5 monohydric alcohol, such as a propyl, butyl or amyl alcohol, or mixtures of the same, and water. A small amount of aluminum nitrate is included to promote electrical conductivity. A generic formulation per liter for cataphoretic deposition comprises, for example:

a C_1–C_2 monohydric alcohol	cc	100 – 800
a C_3–C_5 monohydric alcohol	cc	200 – 900
water	cc	10 – 80
suspended solids	gr	5 – 20
aluminum nitrate	gr	0.1 to 0.2

A preferential cataphoretic formulation per liter comprises, for example:

methanol	cc	310 – 330
2 — propanol	cc	650 – 670
water	cc	10 – 20
suspended solids	gr	5 – 8
$Al(NO_3)_3 \cdot 9\,H_2O$	gr	0.1 to 0.2

The coating procedure is accomplished by invertedly positioning the domed apertured pattern member **75** of the shadow mask in the first coating bath **79** to a predetermined depth in spaced relationship to the aforedescribed foraminous electrode structure **89** as for example in the order of 0.5 to 1.0 inch spacing. Movement is initiated within the electrophoretic bath by activation of the plural agitation means **113**. The d.c. power supply **101** is then activated to apply an electrical potential of, for example, 100 to 200 volts to establish a coating application current of a sufficiency, such as 2 amperes, between the mask **73** (cathode) and the electrode **89** (anode); the voltage being dependent upon the interelectrode anode-to-cathode spacing therebetween. An electrical potential activation period of from one to two minutes effects a semiporous cataphoretic deposition of from 1 to 1.5 mils of particulate material, such as zinc oxide, on the pattern portion of the mask which temporarily modifies or reduces the size of the apertures therein. Upon inactivation of the d.c. supply, the mask is removed vertically from the coating suspension by a relatively rapid withdrawal, whereupon the mask is turned dome-up to allow the residual liquid coating to flatten or evenly spread thereover. The mask is then dried in any appropriate orientation. It has been found expeditious to make a second or repeat application of the first coating material to achieve the desired coating build-up to further reduce the aperture dimensioning. Sequential applications of a relatively thin coating deposition, such as approximately 1 mil of thickness, produces a composite first coating that is less prone to crack, and one wherein slight irregularities become smoothed and minimized.

In referring to FIG. **4**, a graphic presentation illustrates the relationship between mask-coating thickness and anode-to-cathode spacing during the electrophoretic coating procedure. At a constant coating potential, the current density varies in accordance with the inter-electrode spacing, the closer the electrodes, the thicker the coating. With reference to FIGS. **3**, **4**, **5***a* and **5***b*, the mask apertured portion **75** having a basic metallic thickness of *d* may for purposes of illustration have a zero gradient basic aperture array, i.e., wherein all of the apertures formed thereacross in the metallic mask material are of substantially the same dimensioning *e*. In considering the exemplary separated aperture locations *x* and *w*, the cathode-to-anode spacing at *x* is greater than at *w;* therefore, the thickness of the coating deposition *r* at location *x* is less than coating thickness *r* at *w*. Thus, the coated mask thickness evidences a gradually increasing thickness from *s* to *s'*, whereof the gradient of aperture dimensions exhibits a gradual reduction from *k* to *k'*. By this manner, when so desired, a coating gradient on the mask can be predeterminately and expeditiously achieved by the inter-electrode spacing relationship effected by specific shaping of the foraminous electrode **89**.

A second coating **61** of a binder material is next applied to the coated mask to permeate the semiporous first coating. Application is accomplished by a suitable wetting procedure such as by dipping or immersing only the domed apertured portion **23** of the mask structure into a vat, not shown, containing the second coating binder material. Usually one immersion application is sufficient to provide enough binder to adequately permeate the first coating. An exemplary second coating uv transparent binder solution comprises:

water	10 to 20 percent by volume
methanol	80 t0 90 percent by volume
polyvinyl alcohol	.20 to .50 percent by weight.

Upon drying of the second coating, the temporarily modified duo-coated mask is ready for utilization in the fabrication of the color screen structure. The temporal mask modification is achieved in a manner that is expeditiously, consistently and satisfactorily reproducible from a production concept.

While there has been shown and described what are at present considered the preferred embodiments of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the scope of the invention as defined by the appended claims.

What is claimed is:

1. An improvement in the method for temporarily modifying the apertured pattern member of a formed cathode ray tube metallic aperture mask having peripheral supportive means integral therewith, said mask being subsequently oriented relative to and utilized in forming the patterned screen structure disposed on the viewing panel of a color cathode ray tube, the improvement of said modification method comprising the steps of:

positioning said apertured pattern member of said mask by said supportive means in a first coating electrophoretic bath to a predetermined depth in spaced relationship to a shaped foraminous electrode structure immersed in said bath, said bath including suspended particulate solids of a material substantially absorbent of ultraviolet radiation in substantially the 340 to 380 nanometer range, the openings in said foraminous electrode being larger than said solid particles;

initiating movement of said first coating electrophoretic bath by agitation means associated therewith to assure suspension of said particulate solids and the free movement of said suspension through said foraminous electrode;

applying an electrical potential to said mask and said foraminous electrode for at least one defined period of time to effect a substantially semiporous electrophoretic deposition of said first coating solid material on substantially the pattern portion of said mask;

removing and drying said coated electrode;

applying a second coating of a permeative binder material in a manner to wet said coated mask to impregnate and form a compacture with the substantially semiporous first coating, said permeative second coating material differing from said first coating material being in the form of a substantially ultraviolet transparent synthetic binder solution; and

drying said duo-coated mask for subsequent positioning and utilization in the screening of said panel.

2. The method for temporarily modifying the apertured pattern member of a cathode ray tube mask according to claim **1** wherein the suspended solids of said first coating electrophoretic bath are selected from the group consisting essentially of zinc oxide, titanium dioxide, and a mixture of zinc oxide and titanium dioxide.

3. The method for temporarily modifying the apertured pattern member of a cathode ray tube mask according to claim **2** wherein said first coating electrophoretic bath substantially comprises per liter:

a C_1–C_2 monohydric alcohol	cc	100 – 800
a C_3–C_5 monohydric alcohol	cc	200 – 900
water	cc	10 – 80
suspended solids	gr	5 – 20
aluminum nitrate	gr	0.1 to 0.2.

4. The method for temporarily modifying the apertured pattern member of a cathode ray tube mask according to claim **2** wherein said first electrophoretic coating comprises a primary coating of zinc oxide with a secondary coating of titanium dioxide electrophoretically applied thereupon.

5. The method for temporarily modifying the apertured pattern member of a cathode ray tube mask according to claim 2 wherein the mixture of zinc oxide and titanium dioxide is comprised of not more than 40 percent of titanium dioxide.

6. The method for temporarily modifying the apertured pattern member of a cathode ray tube mask according to claim 2 wherein said first coating electrophoretic bath substantially comprises per liter:

methanol	cc	310–330
2-propanol	cc	650–670
water	cc	10–20
zinc oxide	gr	5 to 8
$Al(NO_3)_3 \cdot 9\ H_2O$	gr	0.1 to 0.2.

7. The method for temporarily modifying the apertured pattern member of the mask according to claim 1 wherein the foraminous electrode in said first coating bath has an area at least substantially equalling that of the pattern member of said mask, and wherein the spacing between said electrode and said mask member is predetermined to effect a gradient of electrophoretic coating deposition on said mask.

8. A method for temporarily modifying the apertured pattern member of a cathode ray tube mask according to claim 1 wherein said second coating permeative material is applied by at least one application coating procedure.

9. A method for temporarily modifying the apertured pattern member of a cathode ray tube mask according to claim 1 wherein said second coating permeative binder material is a synthetic polymer in the form of a polyhydric secondary alcohol.

10. A method for temporarily modifying the apertured pattern member of a cathode ray tube mask according to claim 1 wherein said second coating permeative binder solution comprises:

water	10 to 20 percent by volume
methanol	80 to 90 percent by volume
polyvinyl alcohol	.20 to .50 percent by weight.

11. A cathode ray tube patterned metallic aperture mask formed of a multi-apertured pattern member having strengthening means conjunctive with the periphery thereof and having a plurality of positioning means attached relative to said strengthening means to facilitate orientation of said mask within the viewing panel of a color cathode ray tube, said apertured pattern member being temporarily modified in an improved manner for utilization in selected steps of the procedure for fabricating a patterned screen structure disposed on the interior surface of said panel having an interior contour related to that of said apertured mask member, the improvement in said temporary modification comprising:

a first coating applied to said apertured pattern member in the form of at least one substantially semiporous application of a discrete material substantially absorbent and nonreflective of ultraviolet radiant energy in substantially the 340 to 380 nanometer range, and having the chemical characteristic of being soluble in a weak solvent substance non-destructive to the mask material, said first coating material being electrophoretically applied in a manner to effect a predeterminate reduction in the sizes of the initially defined apertures in said pattern member; and

a permeative second coating applied to said first coated pattern member in a manner to wet and impregnate substantially the apertured portion thereof, said second coating material differing from said first coating material being in the form of at least one uniformly disposed permeative coating of a substantially ultraviolet transparent synthetic binder solution applied to wet and impregnate said substantially semiporous first coating material and form a compacture therewith.

12. The pattern mask temporary modification according to claim 11 wherein said permeative binder second coating is a polyhydric secondary alcohol.

13. The pattern mask temporary modification according to claim 12 wherein said polyhydric secondary alcohol is substantially polyvinyl alcohol material.

14. The pattern mask temporary modification according to claim 11 wherein said opaque first coating material is selected from the group consisting essentially of zinc oxide, titanium dioxide, and a mixture of zinc oxide and titanium dioxide.

15. In a color cathode ray tube screen-related mask of iron alloy construction, an improved temporary modification of the apertured pattern portion for utilization in at least one selected photoexposure step of the procedure for fabricating a patterned screen structure disposed on the interior surface of a related viewing panel, the improvement in said temporary modification comprising:

an electrophoretically disposed substantially semiporous application of a minutely particulate opaque material substantially absorbent and nonreflective of ultraviolet radiant energy in substantially the 340–380 nanometer range, said material being applied in a manner to effect a predeterminate temporary reduction in the sizes of the initially defined apertures in said pattern portion, said particulate coating material having the chemical characteristic of being soluble in a weak solvent nondestructive to said iron alloy mask material.

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