350-276 CROSS REFERENCE SEARCH ROOM

April 16, 1968 V. E. HAMILTON 3,378,636

COLOR TELEVISION TUBE WITH AMBIENT LIGHT FILTER

Filed May 20, 1965

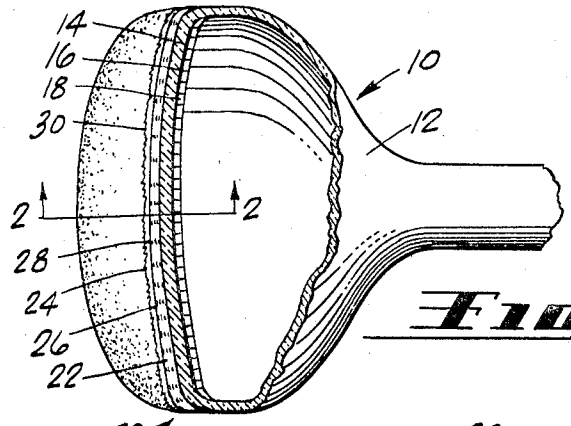


Fig. 1

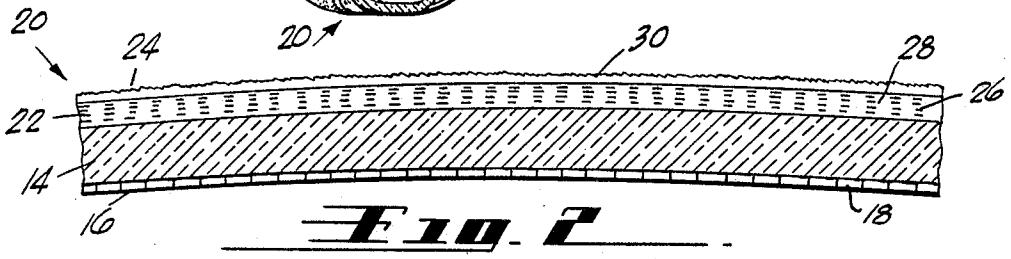


Fig. 2

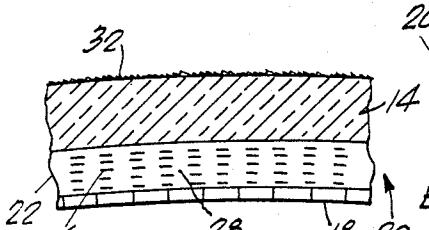


Fig. 3

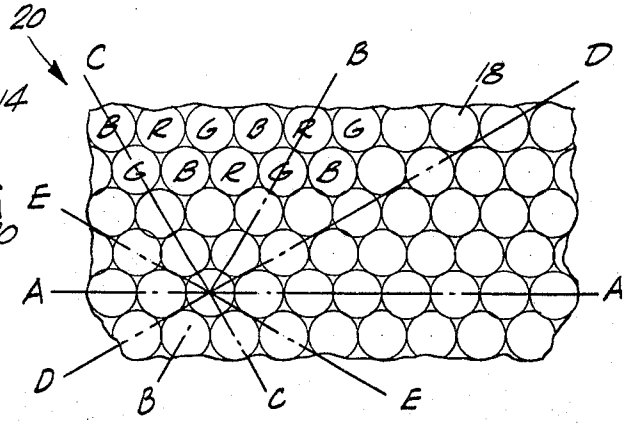


Fig. 4

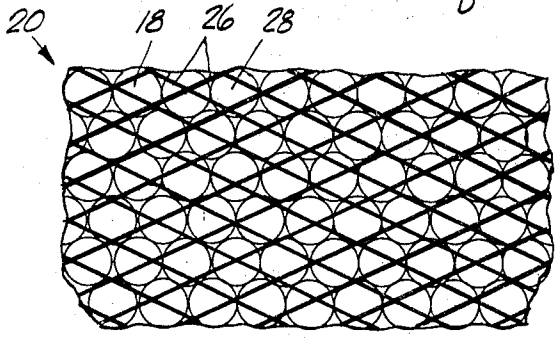


Fig. 5

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COLOR TELEVISION TUBE WITH AMBIENT LIGHT FILTER

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ABSTRACT OF THE DISCLOSURE

Ambient light trapping filter mountable in juxtaposition to outer face of color television tube having discrete phosphor dots in regular pattern producing raster lines of greater and lesser prominence extending in various angular directions. Filter is space lattice type having depthwise spaced tiers of grid lines at substantial angles to primary raster lines to avoid major moire patterns but smaller angles to secondary lines to produce minor moire patterns. Outer surface of filter is a light diffusing surface which obscures minor moire patterns without affecting sharpness of image signals. Surface is preferably etched, with rugosities in random pattern.

This invention lies in the field of television receiving equipment, and it is particularly directed, although not limited, to improvement of the image presented by the usual color television set of today as seen by the viewer.

Cathode ray tubes are particularly susceptible to the effects of being struck by ambient light rays. As is generally known, a cathode ray tube has a glass front wall or face plate, the inner surface of which is coated with phosphors which are caused to glow momentarily when struck from the rear by electrons from one or more electron guns in a selective manner to produce an image of some sort. When ambient light rays strike the front surface of the glass they are refracted inwardly and strike a multiplicity of phosphors. The light energy is reflected diffusely from these phosphors whether or not they are also being activated by electron guns. The result is that many of the shadow areas, or low lights, are illuminated and confused with the high lights, thus degrading the contrast. These low lights may be made as bright as the high lights in some cases and the picture may be completely lost.

Various schemes have been devised to prevent ambient light rays from striking the "screen" but these have been very clumsy or ineffective or both. My co-pending application for patent on Ambient Light Filter, Ser. No. 230,644, filed Oct. 15, 1962, which is a continuation in part of my now abandoned application Ser. No. 138,855, filed Sept. 18, 1961, discloses a novel construction which solves the problem.

Briefly, that novel construction comprises a filter body of transparent material in which are embedded a plurality of filter elements having duplicate grid patterns. Each element constitutes a tier of alternating transparent and light absorbing areas in closely spaced relation to constitute a multiplicity of light transmitting apertures bordered by light absorbing material. The grid pattern may take various forms including generally parallel straight or wavy lines, or lines crossing each other to produce cells of varying shapes including but not limited to squares, rectangles, and diamonds. The tiers are in generally parallel relation to each other and are spaced depthwise of the filter body, forming a three-dimensional light trapping "space lattice" with the light transmitting apertures in depthwise registry to constitute depthwise directed viewing cells. The axes of the cells may be normal to the general plane of the filter body or at some other

preselected angle, and may be parallel or divergent within limits.

Ambient light rays striking the surface of the filter body at acute angles from light sources outside a predetermined cone of viewing angles are refracted into the cells at various angles, striking one or another of the depthwise spaced areas of light absorbing material and are absorbed thereby. The success of such filter results from the fact that the cells are very small in at least one lateral dimension and the light absorbing material forming the cell boundaries is extremely thin in the depthwise direction. The construction and operation of the "space lattice" filter are fully described in the co-pending application previously mentioned.

As indicated above, the primary problem is that of ambient light rays from the exterior striking and lighting up various portions of the phosphor layer and degrading the image contrast. My previous invention eliminated this difficulty in general when used as disclosed. The grid patterns usually are actual lines extending in preselected directions but in some instances the arrangement of light absorbing areas which are not of themselves continuous lines may produce apparent or virtual lines so far as the viewer is concerned.

In radar scopes, oscilloscopes, and other tubes having no raster the direction of the multiplicity of lines of the filter grid pattern is not important. In "black and white" television tubes there is normally a multiplicity of parallel, horizontal raster lines. If the grid lines, whether actual or virtual, of the filter are parallel or nearly parallel to the raster lines, a moire pattern is produced. Although this pattern, or patterns, is not as prominent as the image it is annoying and must be eliminated. This has been done by arranging the grid lines at substantial angles to the raster lines, and it has been found that angles above 20 degrees are quite satisfactory. Therefore the filter of my previous invention can take care of the entire problem with black and white television tubes.

A color television tube, however, presents a more complex problem. The phosphor screen is not a simple uniform phosphor layer but is made up of a multiplicity of discrete phosphor dots having blue, green, and red signal characteristics or "colors." The dots are arranged in horizontal lines with the colors repeated in sequence and the dots in succeeding lines are set over a half space, with all of the dots substantially in contact with adjacent dots. The resulting geometrical pattern consists of one series or group of primary lines of adjacent dots extending horizontally and two series of groups of primary lines of adjacent dots extending at angles of 60 degrees to the horizontal and to each other. In addition there are secondary lines of spaced dots extending in other angular directions. All of these lines of dots produce corresponding raster lines of respectively greater and lesser prominence.

Some of the filter grid patterns previously employed are at sufficient angles to the primary lines to preclude formation of major moire patterns therewith but, as a result, cannot deviate angularly from the secondary lines to a sufficient extent to preclude formation of minor moire patterns. These patterns are, of course, rather soft and vague in comparison with the sharp and distinct patterns produced by the image signals but they are nevertheless quite noticeable. They distract attention from the images and are quite annoying. Therefore they must be eliminated or made indistinguishable.

In carrying out the principles of the present invention, a filter is made up generally as described above, having a thin, laterally extensive filter body of about the same shape and area as the face plate of the color tube and incorporating a light trapping space lattice. The actual or virtual

grid line patterns are so arranged that the filter body may be mounted in front of the face plate in such an attitude that the grid lines are at substantial angles to the primary lines of dots. While the filter body may be mounted independently, it is preferred for best results to cement its rear face to the external surface of the face plate. When the filter is in place and the tube is activated major moire patterns are avoided because of the grid line arrangement but some minor moire patterns remain.

The forward, or exterior, face of the externally mounted filter body is so formed as to constitute a diffusing surface, which may be termed lenticulated. While the protuberances may be substantially lens shaped, this is not essential and the rugosities may take various forms. In order to perform their function properly the rugosities must be extremely fine, and it has been found that etching produces a surface having the desired texture, which is actually smooth to the touch and yet has the property of very low reflection. The etching works best on a glass surface and in practice at the present time the filter is made up of a filter body of suitable transparent plastic material with a glass cover plate cemented thereto. Superior results are obtained when the pattern of rugosities is random and this effect is being obtained with the etching process now being used.

In the absence of the diffusing surface the remaining moire patterns would be visible to the viewer along with the image which he desires to see, and the distracting effect would be very annoying. The processed surface which is interposed between the image screen and the viewer diffuses the moire patterns, blurring their outlines so that they become indistinguishable at normal viewing distances. The random pattern further distorts their outlines. Coarse rugosities or lenticulations would also distort the image signals and such result would not be acceptable. However, it has been determined that the difference in sharpness between the image signal and the moire is so great that it is possible to provide a texture which inhibits the moire without having any significant effect on the sharpness of the image signal. This texture is readily obtainable by the etching process.

The filter body may be mounted internally of the face plate. In this case it is built up of glass and made integral with the face plate, as by fusing. The phosphor image screen is then deposited on the rear face of the filter body, and the exterior exposed face of the face plate is etched or otherwise formed with a diffusing surface.

The diffusing surface further improves the presentation by performing a further, dual function. In the event that there are any specular light sources within the cone of viewing angles, the rays which pass through the viewing cells cast shadows of the grid patterns on the image screen and produce minor but undesirable moire patterns. The diffusing surface acts on these light rays as they enter and diffuses the shadows, in some cases eliminating the moire patterns. If the light intensity is great enough, some moire will still be produced. However, the surface now acts as described above to diffuse the remaining pattern and render it indistinguishable.

Various other advantages and features of novelty will become apparent as the description proceeds in conjunction with the accompanying drawing, in which:

FIGURE 1 is a perspective view, partly in section, of a typical color television tube incorporating the invention;

FIGURE 2 is a sectional view taken at line 2—2 of FIGURE 1 illustrating the construction on a greatly enlarged scale;

FIGURE 3 is a view similar to FIGURE 2 showing a modification;

FIGURE 4 is a fragmentary view in elevation of a portion of a phosphor dot image screen showing the dot pattern; and

FIGURE 5 is a similar view showing a typical filter grid pattern superimposed on the image screen.

It is to be noted that various elements shown in the drawing are reproduced on a greatly exaggerated scale compared with the cathode ray tube for clarity of illustration. In a typical construction, the diameter of the phosphor dots is about .013 to .015 inch. The width of the grid lines is .002 inch and they are spaced about .010 inch on centers. The etched surface is so smooth that the rugosities are practically imperceptible.

As seen in FIGURES 1 and 2, a conventional television cathode ray tube **10** has a main body **12** with a transparent glass front wall or face plate **14**. Secured to the inner surface **16** of the face plate are a multiplicity of phosphor dots **18** substantially in contact with each other and combining to constitute an image screen. In operation, they are activated by electron bombardment in known manner. Filter **20**, which may be independently supported but preferably is cemented by its rear face to the outer surface of the face plate, includes a filter body **22** and in most cases a cover plate **24**. When so cemented, the entire assembly constitutes the composite face plate of the tube. In one embodiment presently being produced, the body **22** is of plastic material and the cover plate **24** is of glass. All elements have substantially the same index of refraction, as does the cement.

The embodiment shown in FIGURE 3 is essentially like FIGURE 2 but the elements are rearranged so that the filter body **22** is secured to the inner surface of the face plate **14** and the phosphor dots **18** are secured to the rear surface of filter body **22**. In this case cover plate **24** is eliminated and the outer surface **32** of the face plate is lenticulated or provided with rugosities which make it a light diffusing surface. When the filter body is mounted internally it is preferable to build it up of glass rather than plastic to withstand the temperatures encountered in final fabrication of the tube and to avoid outgassing problems resulting from the high vacuum of the tube. If desired, the external filter can likewise be made of glass. In either position the filters may be built up separately and secured in place, as by fusing, or they may be built up in situ. The result is a composite face plate and filter with an image screen on the inner surface and may well be referred to either as a filter or as a face plate.

The filter body is normally made up of a plurality of very thin layers, each bearing a duplicate grid pattern of alternating transparent and light absorbing areas and united in depthwise registry to produce a multiplicity of depthwise directed viewing cells, as more fully explained in my co-pending application mentioned above. While the grids may take a variety of forms, the one selected for illustration here is shown in FIGURE 5 where a multiplicity of parallel lines **26** are arranged in crossing relation to form diamond shaped viewing cells **28**. The three dimensional space lattice formation can be observed in FIGURES 2 and 3, the louvered louvers formed by the depthwise spaced lines **26** defining the depthwise directed viewing cells **28**.

The geometry of the phosphor dots **18** is shown in FIGURE 4, where it will be seen that they are arranged in horizontal rows to cover substantially the entire inner surface **16** of face plate **14** or of filter body **22**. In present day color television tubes these dots are about .013 to .015 inch in diameter and are arranged as shown with the three "colors" arranged in repeated sequence. The dots in adjacent rows are staggered one half diameter and all of the dots are substantially in contact although this is not essential to the invention. It will be seen that any group of dots in a triad provides the three basic colors.

There are a multiplicity of rows of dots which contact each other extending in a horizontal direction as indicated by line A—A and also two sets of rows of adjacent dots extending at 60 degrees to each other and to the horizontal as indicated at B—B and C—C. There are other rows of spaced dots extending angularly in other directions as indicated at D—D and E—E. These primary lines of adjacent dots and secondary lines of spaced dots pro-

duce corresponding raster lines of greater and lesser prominence respectively.

FIGURE 4 shows the same dot pattern as FIGURE 3 with typical diamond grid lines superimposed thereon. Lines **26** diverge from the primary lines of dots at a substantial angle and thus preclude the production of any major moire patterns. However, in order to accomplish this, lines **26** must be angularly fairly close to the secondary lines of dots with the result that minor moire patterns are produced. As pointed out above, even these minor moire patterns can be quite annoying and it is highly desirable to eliminate them or make them indistinguishable under normal viewing conditions. Various other grid patterns have been or may be used which include at least segments of lines extending close to parallelism with the various raster lines and they produce similar undesirable moire patterns.

The outer surface **30** of the cover plate **24** is lenticulated or provided with rugosities which make it a light diffusing surface substantially identical to surface **32** of FIGURE 3. While a multiplicity of lens forms can be molded on the surface they are preferably so fine that a molding process is rather impractical. The desired texture can best be obtained by etching, and the method disclosed in the patent to Gilstrap and Falls, No. 2,622,016, dated Dec. 16, 1952, has been found to produce excellent results. The texture is extremely fine and the rugosities blur or distort the moire patterns so that they become indistinguishable to the viewer at normal viewing distances. The function is particularly effective because the pattern of rugosities is random as a result of this etching process. Because of the substantial difference in sharpness between the image signal and the moire, the texture of the etched surface makes it possible to inhibit the moire without having any significant effect on the sharpness of the image signal.

A further problem arises out of the use of the space lattice filter whether the image screen is a uniform phosphor coating or a pattern of dots as illustrated. It sometimes happens that a specular light source is located within the cone of viewing angles. If the rays from such a source penetrate the filter without alteration they cast shadows of portions of the grid pattern on the image screen. These shadows then combined with the grid pattern to produce additional moire patterns. While they are rather minor like those previously mentioned, they are also annoying and should be reduced or eliminated if possible.

The diffusing surface **30** or **32** here performs a dual function. When the rays from a specular light source within the cone of viewing angles strike the surface **30** or **32** they are diffused, and the shadows are either eliminated or made very soft and vague, depending on the intensity of the light source. If there are any remaining shadows, their combination with the grid pattern produces a very weak moire. This in turn is again diffused because surface **30** or **32** is between the pattern and the viewer and this weak moire is therefore rendered indistinguishable. In addition, of course, surface **30** or **32** diffuses the reflection of the specular light from the surface itself. The net result is the presentation of a superior image accomplished by the use of the space lattice type light trapping filter together with elimination of the undesirable moire effects by the use of the diffusing surface.

It will be apparent to those skilled in the art that various changes and modifications may be made in the construction as disclosed without departing from the spirit of the invention, and it is intended that all such changes and modifications shall be embraced within the scope of the following claims.

I claim:

1. Means for presenting a superior color television image, comprising: a cathode ray tube having a transparent face plate; an image screen on the inner surface of said face plate comprising a multiplicity of discrete phosphor dots of uniform size responsive to electron bombardment to emit image signals in varying color effects; said dots being substantially in marginal contact with each other and arranged in parallel horizontal rows; the dots of each row being horizontally staggered from the dots of adjacent rows by a distance equal to one half of the diameter of a dot; the resulting pattern including primary lines of adjacent dots extending horizontally and at angles of 60 degrees to each other and to the horizontal, and secondary lines of spaced dots extending at other angles to the horizontal; said lines of dots producing corresponding raster lines of greater and lesser prominence; a space lattice type ambient light trapping filter mounted directly in front of said face plate in parallelism therewith; said filter comprising a thin transparent body having a forward face and a rear face and bearing between said faces a plurality of filter elements of grid form; each element constituting a thin tier of alternating light absorbing and transparent areas, and said tiers being in parallel depthwise spaced relation; the corresponding areas of the grid pattern in each tier being in predetermined depthwise registry to produce a multiplicity of depthwise directed viewing cells; said light absorbing areas combining to define grid lines extending at substantial angles to said primary lines of dots to preclude formation of major moire patterns, leaving only minor moire patterns; and a thin glass cover plate secured to the forward face of said filter and having an etched exterior face presenting a pattern of extremely fine rugosities serving to diffuse light passing therethrough sufficiently to render the minor moire patterns indistinguishable while producing no appreciable effect on the sharpness of the image signals emitted by said image screen.

2. The construction as claimed in claim **1**; said etched exterior face presenting a random pattern of rugosities to increase its effectiveness in obscuring the moire patterns.

3. The construction as claimed in claim **1**; the confronting surfaces of said face plate, filter, and cover plate being cemented together with transparent cement to form them into a unitary body.

4. The construction as claimed in claim **1**; the grid lines defined by said light absorbing areas being continuous lines intersecting each other at a multiplicity of loci.

5. The construction as claimed in claim **4**; said grid lines consisting of two groups of parallel lines extending in opposite directions at equal angles to the horizontal and overlying each other to form a pattern of diamond shaped viewing cells.

6. Means for presenting a superior color television image, comprising: a cathode ray tube having a transparent face plate with inner and outer surfaces; an image screen on said inner surface formed of a multiplicity of discrete phosphor dots of uniform size responsive to electron bombardment to emit image signals in varying color effects; said dots being substantially in marginal contact with each other and arranged in parallel horizontal rows; the dots of each row being horizontally staggered from the dots of adjacent rows by a distance equal to one half of the horizontal width of a dot; the resulting pattern including primary lines of adjacent dots extending horizontally and at angles of 60 degrees to each other and to the horizontal, and secondary lines of spaced dots extending at other angles to the horizontal; said lines of dots producing corresponding raster lines of greater and lesser prominence; a space lattice type ambient light trapping filter between said inner and outer surfaces and consisting of a plurality of filter elements of grid form; each element constituting a thin tier of alternating light absorbing and transparent areas, and said tiers being in depthwise spaced relation and generally parallel to said surfaces; the corresponding areas of the grid pattern in each tier being in depthwise registry to produce a multiplicity of depth wise directed viewing cells; said light absorbing areas combining to define grid lines extending at substantial

angles to said primary lines of dots to preclude formation of major moire patterns, leaving only minor moire patterns; the outer surface of said face plate being etched and presenting a pattern of extremely fine rugosities serving to diffuse light passing therethrough sufficiently to render the remaining moire patterns indistinguishable but not sufficiently to significantly affect the sharpness of the image signals emitted by said image screen.

7. Means for presenting a superior television image, comprising: a cathode ray tube having a transparent face plate with inner and outer surfaces; an image screen on said inner surface formed of a multiplicity of discrete phosphor dots of uniform size responsive to electron bombardment to emit image signals; said dots being arranged in a regular pattern over substantially the entire inner surface of said face plate; said pattern including primary lines of adjacent dots extending in a plurality of angular directions and secondary lines of spaced dots extending in other angular directions; said lines of dots producing corresponding raster lines of greater and lesser prominence; a space lattice type ambient light trapping filter between said inner and outer surfaces and consisting of a plurality of filter elements of grid form; each element constituting a tier of alternating light absorbing and transparent areas, and said tiers being in depthwise spaced relation; the corresponding areas of the grid pattern in each tier being in depthwise registry to define a multiplicity of depthwise directed viewing cells; said light absorbing areas combining to define grid lines extending at substantial angles to said primary lines of dots to preclude formation of major moire patterns, leaving only minor moire patterns; and a light diffusing surface on the exterior of said face plate to diffuse light passing therethrough and render the remaining moire patterns indistinguishable.

8. Means for presenting a superior television image, comprising: a cathode ray tube having a transparent face plate with inner and outer surfaces; an image screen on said inner surface formed of a multiplicity of discrete phosphor dots responsive to electron bombardment to emit image signals; said dots being arranged in a regular pattern in which lines of dots extend in several angular directions and produce corresponding angularly directed raster lines; a space lattice type ambient light trapping filter between said inner and outer surfaces and composed of a plurality of parallel depthwise spaced tiers of filter elements, each arranged in a grid pattern of alternating light absorbing and transparent areas; the corresponding areas of the grid pattern in each tier being in depthwise registry to define a multiplicity of depthwise directed viewing cells; the arrangement of said areas being such as to combine with some of the raster lines of said image screen to produce moire patterns when the cathode ray tube is in operation; and a light diffusing surface on the exterior of said face plate to diffuse light passing therethrough and obscure the moire patterns.

9. The combination as claimed in claim 8; the light diffusing surface presenting a pattern of rugosities so fine as to obscure the remaining moire patterns without significantly affecting the sharpness of the image signals emitted by said image screen.

10. The combination as claimed in claim 9; the pattern of said rugosities being random.

11. The combination as claimed in claim 9; the light diffusing surface being an etched surface.

12. An ambient light trapping filter for use with a television cathode ray tube having a transparent face plate bearing on its inner surface an image screen formed by phosphor dots arranged in a regular pattern in which primary lines of adjacent dots extend in several angular directions and secondary lines of spaced dots extend in other angular directions, producing corresponding raster lines of greater and lesser prominence, comprising: a thin, laterally extensive filter body of transparent material having a forward face and a rear face and mountable in juxtaposition to the face plate of the cathode ray tube to intercept undesired ambient light rays angularly directed toward the face plate; said filter body bearing between its faces a plurality of filter elements of grid form; each element constituting a thin tier of alternating light absorbing and transparent areas, and said tiers being in parallel depthwise spaced relation; the corresponding areas of the grid pattern in each tier being in depthwise registry to produce a multiplicity of depthwise directed viewing cells; the arrangement of said light absorbing areas being so pre-selected that they will combine to define a multiplicity of grid lines extending at such angles to a reference line that they will be angularly displaced from the primary lines of dots sufficiently to preclude formation of major moire patterns; and the forward face of said filter body having a light diffusing surface adapted to diffuse light passing therethrough and render indistinguishable any remaining moire patterns produced when the filter is in juxtaposition to the cathode ray tube and the latter is in operation.

13. The combination as claimed in claim 12; the diffusing surface presenting a pattern of rugosities so fine as to obscure the remaining moire patterns without significantly affecting the sharpness of the image signals emitted by said image screen.

14. The combination as claimed in claim 13; the pattern of said rugosities being random.

15. The combination as claimed in claim 13; the forward wall of said filter body being glass and said diffusing surface being an etched surface.

16. An ambient light trapping filter for use with a television cathode ray tube having a transparent face plate bearing on its inner surface an image screen formed of phosphor dots arranged in a regular pattern in which lines of dots extend in several angular directions and produce corresponding angularly directed raster lines, comprising: a thin, laterally extensive filter body of transparent material having a forward face and a rear face and mountable with its rear face in juxtaposition to the face plate of the cathode ray tube to intercept undesired ambient light rays angularly directed toward the face plate; said filter body including an ambient light trapping space lattice composed of a plurality of parallel depthwise spaced tiers of filter elements, each arranged in alternating light absorbing and transparent areas; the arrangement of said areas being such as to combine with some of the raster lines of said image screen to produce moire patterns when the cathode ray tube is in operation and the filter is used in conjunction therewith; said areas also having the property of casting shadows on said image screen when subjected to light rays from external specular light sources passing through said filter, which shadows combine with said areas to produce other moire patterns; the forward face of said filter body having a light diffusing surface adapted to diffuse light passing therethrough to dissipate the shadows resulting from external light sources and to render indistinguishable the moire patterns produced in operation.

17. A filter as claimed in claim 16; said filter body comprising a thin layer of plastic material bearing said filter elements, and a thin cover plate of glass cemented thereto.

18. Means for presenting a superior television image, comprising: a cathode ray tube having a transparent face plate with inner and outer surfaces; an image screen on said inner surface formed of a multiplicity of discrete phosphor dots responsive to electron bombardment to emit image signals; said dots being arranged in a regular pattern in which lines of dots extend in several angular directions and produce corresponding angularly directed raster lines; a space lattice type ambient light trapping filter between said inner and outer surfaces and composed of parallel depthwise spaced tiers of filter elements, each arranged in a grid pattern of alternating light absorbing and transparent areas; the corresponding areas of the

grid pattern in each tier being in depthwise registry to define a multiplicity of depthwise directed viewing cells; the arrangement of said areas being such as to combine with some of the raster lines of said image screen to produce moire patterns when the cathode ray tube is in operation; said areas also having the property of casting shadows on said image screen when subjected to light rays from external specular light sources passing through said filter, which shadows combine with said areas to produce other moire patterns; the forward face of said cathode ray tube having a light diffusing surface adapted to diffuse light passing therethrough to dissipate the shadows resulting from external light sources and to render indistinguishable the moire patterns produced in operation.

19. The combination as claimed in claim **18**; said light diffusing surface presenting a pattern of rugosities so fine as to have no significant effect on the sharpness of the image signals emitted by said image screen.

20. The combination as claimed in claim **19**; the pattern of said rugosities being random.

21. The combination as claimed in claim **19**; the outer surface of said face plate being etched to provide light diffusing characteristics.

22. An ambient light trapping filter for use with a television cathode ray tube having a transparent face plate bearing on its inner surface an image screen formed of a phosphor layer, comprising: a thin, laterally extensive filter body of transparent material having a forward face and a rear face and adapted to be mounted with its rear face in juxtaposition to the face plate of the cathode ray tube to intercept undesired light rays angularly directed toward the face plate; said filter body including an ambient light trapping space lattice composed of a plurality of parallel depthwise spaced tiers of filter elements, each arranged in alternating light absorbing and transparent areas; said areas having the property of casting shadows on said image screen when subjected to light rays from external specular light sources passing through said filter, which shadows combine with said areas to produce moire patterns; the forward face of said filter body having a light diffusing surface adapted to diffuse light passing therethrough in either direction to dissipate the shadows resulting from external light sources and to render indistinguishable any remaining moire patterns.

23. Means for presenting a superior television image, comprising: a cathode ray tube having a transparent face plate with inner and outer surfaces; an image screen on said inner surface formed of a phosphor layer responsive to electron bombardment to emit image signals; a space lattice type ambient light trapping filter between said inner and outer surfaces and composed of parallel depthwise space tiers of filter elements, each arranged in a grid pattern of alternating light absorbing and transparent areas; the corresponding areas of the grid pattern in each tier being in depthwise registry to define a multiplicity of depthwise directed viewing cells; said areas having the property of casting shadows on said image screen when subjected to light rays from external specular light sources passing through said filter, which shadows combine with said areas to produce moire patterns; the outer surface of said face plate being a light diffusing surface adapted to diffuse light passing therethrough in either direction to dissipate the shadows resulting from external light sources and to render indistinguishable any remaining moire patterns.

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