

[54] LUMINOUS INDICATORS INVOLVING PHOSPHORS

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Related U.S. Application Data

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[51] Int. Cl. G09t 13/20

[58] Field of Search 40/130 R, 130 M, 40/132, 134; 273/DIG. 24; 252/301 R, 301.6

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[57] ABSTRACT

Luminescent, specifically phosphorescent, indicia or insignia are disposed on a visible translucent substrate mounted on a carrier wherein an artificial light source is disposed within the carrier rearwardly and spacedly of the substrate so that the heat of the source of light will not affect the luminescent properties of the phosphorescent indicia or insignia which latter are formed of homogeneously dispersed phosphor particles in glass or porcelain frit, and as such are bonded to the substrate.

6 Claims, 5 Drawing Figures

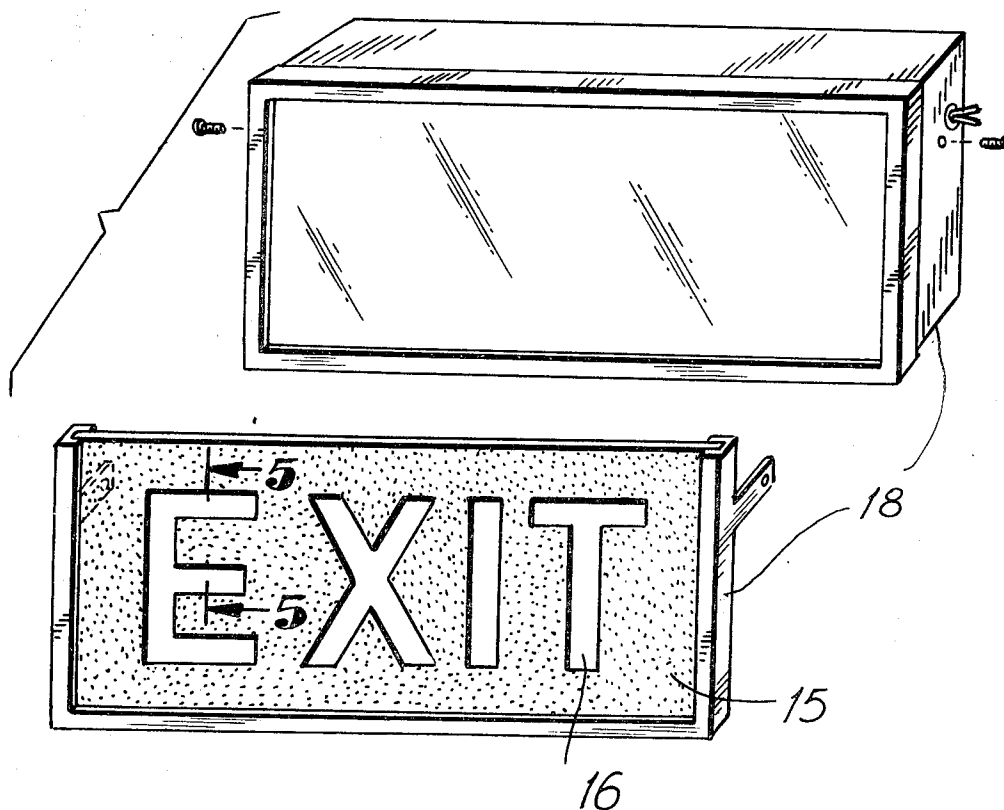


FIG. 1

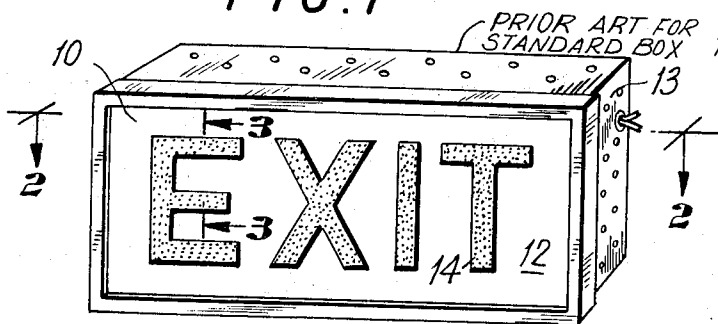


FIG. 2

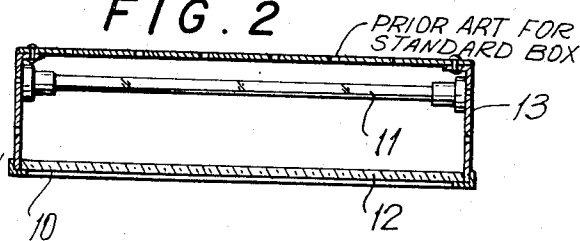


FIG. 3

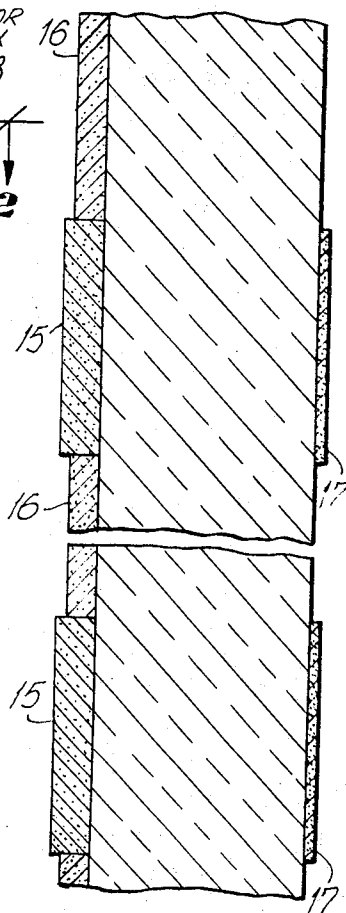


FIG. 4

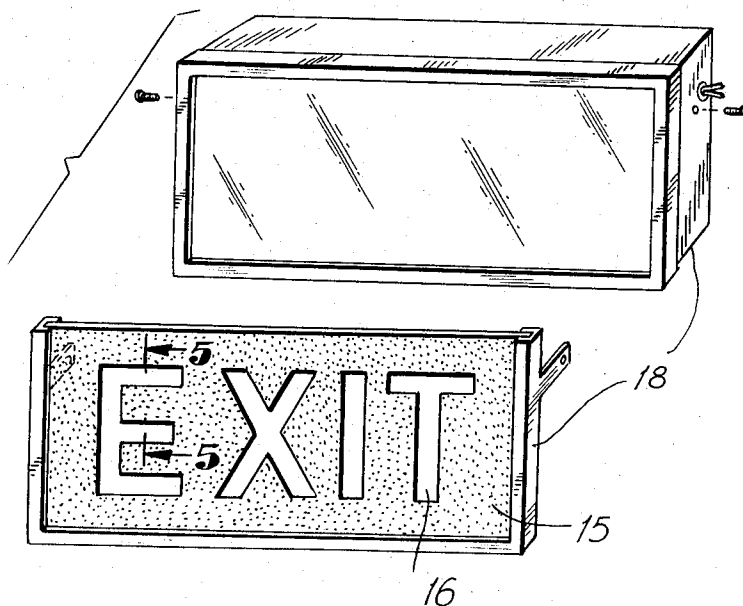
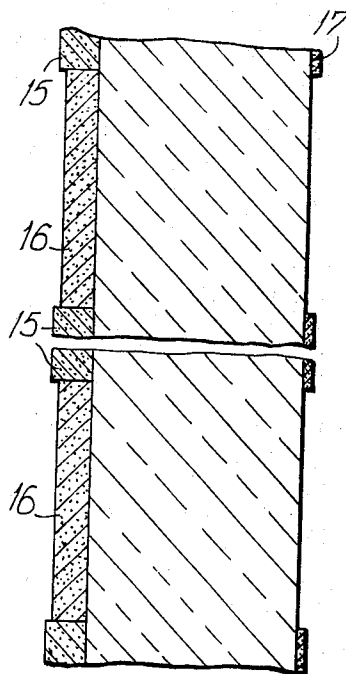


FIG. 5



LUMINOUS INDICATORS INVOLVING PHOSPHORS

This is a continuation of application Ser. No. 863,785, filed Oct. 6, 1969 now abandoned.

STATE OF THE PRIOR ART

Up to the present time carriers known as "light boxes" are maintained in enclosed structures such as theatres, auditoriums, and multiple floor structures to indicate directions or method of ingress and egress, and have been formed of shells such as metal boxes with a glass or plastic substrate carrying indicia or insignia painted thereon as by screening or the like, the aforesaid glass or plastic substrates being maintained in grooved frames and although these substrates are spaced from ambient or artificial, such as, electrical sources of light, when the light source, be it artificial or ambient, is for any reason removed or destroyed, the effectiveness and particularly the visibility of such indicia is destroyed. Of course, it is understood that the effectiveness of these aforesaid light boxes is essentially to be utilized in regions normally maintained in darkness as aforesaid where exit signs or similar signs must be positioned in accordance with the requirements of the laws.

DISCLOSURE OF THE INVENTION

This invention primarily relates to phosphorescent indicia or insignia having luminescence in the dark which at all times must be visible, particularly in auditoriums, theatres or enclosed spaces for the purpose of delineating the avenues of ingress or egress, specifically where electric power or other sources, including ambient light which serves to supply the initial illumination upon the phosphor insignia or indicia may fail, and wherein by virtue of the relative longevity of the luminescent effect of the dispersed phosphorescent material forming the indicia or insignia will maintain the function of making direction signs visible.

It is an object of the invention to provide devices and method of making the same applicable for providing media to indicate sources of ingress and egress in enclosed structures wherein such devices incorporating a phosphorescent medium for providing luminescence are visible in the dark irrespective of whether or not a medium for providing the ambient or electrical charging or exciting light is available, the period of time of visibility in the dark to the eye being usually in the range of 8 to 10 hours.

Specifically, it is an object of this invention to provide devices including substrates carrying phosphorescent material dispersed in frit fixedly adhered to the substrate, the devices, in the nature of exit signs or the like, being mountable at various locations in enclosed structures such and involving casings having a source of light capable of acting upon plastic or glass surfaces incorporating indicia or insignia carried thereon.

DRAWINGS

In the drawings

FIG. 1 is a perspective view of a standard light box of the prior art fitted with an indicia-carrying substrate in accordance with the present invention;

FIG. 2 is a vertical section of the light box taken along lines 2—2 of FIG. 1;

FIG. 3 is a cross-sectional view of a substrate taken along line 3—3 of FIG. 1;

FIG. 4 is an exploded perspective view of a light box incorporating the substrate of FIG. 3; and

FIG. 5 is a vertical section of a substrate taken along line 5—5 of FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in the Figures, inorganic indicia, the method of manufacture which will be later described, are mounted on a glass or plastic substrate 10, in front of a source of artificial illumination 11. The substrate 10 serves as the front plate 12 of a light box 13 at the rear of which is mounted the illuminating source 11, usually an electrically activated light bulb, or alternately the plate 12 carrying the indicia 14 may be mounted on a closed artificial lighted box having a front panel 12 of glass or plastic from which the indicia carrying plate 10 is forwardly spaced and capable of removable mounting.

The spacing 18—18 as applied to FIG. 4 is one of several forms to permit the sufficient activation and maintenance of illumination by the phosphor of the indicia without affecting the luminescent characteristics thereof.

The method of forming the inorganic indicia substrate is as follows: A micronized glass frit and a phosphor such as zinc sulfide (ZnS) or cadmium sulfide (CdS) each ranging in size from 15 to 45 microns are blended in the proportion of from 1:1 up to 1:5 parts of frit to parts of phosphor. The blended mix in slurried with a suspending agent such as carbazole, in an amount of 1 to 5 percent with sufficient water to allow the mix, which is usually from light green to yellow, to be either screened or sprayed. The specific gravity of the slurry usually is from 1 to 4 dependent upon the end method of application thereof to the substrate plate, viz., screening or spraying.

The slurry is then screened or sprayed to form a layer or layers 15 of 8–9 mills dry thickness down to 6 ½ to 7 mill thickness.

The plate carrying the sprayed or screened mix is then air dried or oven dried dependent upon the speed of the drying desired, but in no event should the oven drying extend above 150°–175°F. The coated plaster or glass substrate will then be provided with a film of dried phosphorescent frit in the thicknesses above indicated.

The dried plate is then placed on a flat silica tray and conveyed through an oven at a temperature of 1,000°F for a period of approximately 40 minutes, at which time the mixture of phosphor and glass frit becomes fused with the glass.

In the instances above mentioned, the uncoated front and/or rear face of the glass substrate has screened thereon a slurried mixture 16 of micronized frit and a translucent backing such as red, the phosphorescent luminescence being green or yellow, and the substrate is run through the oven at the same temperature as previously for the same period of time so as to bond the frit carrying the color indicia to the rear of the substrate with the frit carrying the phosphor serving as the background.

Thereafter a translucent white backing 17 in the nature of titanium dioxide paint is sprayed at the rear of the substrate behind the phosphor frit indicia to form a thin layer as a reflective backing for the phosphor-frit indicia.

The inverse of the above involves the screening of phosphorescent-frit letters on one face of the substrate and thereafter heating in the manner above described, and after firing the phosphorescent indicia on one face of the substrate, the reverse side is screened with a translucent white enamel which is aligned with the indicia formed by the phosphorescent frit and dried in the oven at 350°F for approximately one-half hour, after which the rear surface of the substrate is sprayed with a translucent red paint intermixed with the frit and bonded.

Although in the inorganic system glass frit has been utilized, it is within the province of this invention to form a mix between a phosphor and porcelain frit which can be applied to a white frit substrate based on metal. It is preferred in connection with the inorganic and organic procedure that they be free from lead and iron elements, particularly sulfides thereof since upon ignition at higher temperatures the phosphors formed, particularly the zinc sulfide, may be darkened or discolored.

Attention is called to the fact that in all the constructions described above and shown in the Figures, the phosphor is so located on substrate 10 as to be activatable by ambient light as well as by light-source 11 within the box.

What we claim is:

1. An indicia-carrying substrate normally visible by ambient light in front thereof or by artificial light therebehind and visible by phosphorescence subsequent to failure of said ambient light or artificial light, said substrate serving to indicate avenues of ingress and egress, comprising a glass substrate, a glass frit forming indicia fired thereto, a phosphorescent material selected from the group consisting of ZnS and CdS dispersed in said glass frit, the ratio of said frit to said phosphorescent material lying in the range from 1:1 to 1:5, and a film of translucent red paint covering at least those portions of said substrate not covered by said glass frit, one of said frit and said paint serving as the background for the other, whereby the contrast in color between the areas covered by said phosphorescent fired glass frit and by said paint makes said indicia more clearly visible whether said substrate is or is not illuminated, said

phosphorescent material having the characteristic of glowing for a substantial period of time subsequent to failure of ambient or artificial illumination of said substrate.

2. A substrate as defined in claim 1, wherein said glass frit comprises said indicia.

3. A substrate as defined in claim 1, wherein said glass frit forms said indicia by occupying that part of the surface of said substrate comprising the background of said indicia.

4. A substrate as defined in claim 1, wherein said surface is the front surface of said substrate and those portions of the back surface in alignment with said glass frit on said front surface are covered with a translucent white enamel which serves to enhance by reflection the visibility of said phosphorescent material in the event of failure of ambient or artificial light.

5. A substrate as defined in claim 1, wherein said glass frit and said phosphorescent material range in size between 15 and 45 microns in the unbonded state.

6. An indicia-carrying substrate normally visible by ambient light in front thereof or by artificial light therebehind and visible by phosphorescence subsequent to failure of said ambient light or artificial light, said substrate serving to indicate avenues of ingress and egress, comprising a metal substrate, a white frit fired to substantially the entire front surface thereof, a porcelain frit forming indicia fired thereto, a phosphorescent material selected from the group consisting of ZnS and CdS dispersed in said porcelain frit, the ratio of said frit to said phosphorescent material lying in the range from 1:1 to 1:5, and a film of translucent red paint covering at least those portions of said substrate not covered by said porcelain frit, one of said frit and said paint serving as the background for the other, whereby the contrast in color between the areas covered by said phosphorescent fired porcelain frit and by said paints makes said indicia more clearly visible whether said substrate is or is not illuminated, said phosphorescent material having the characteristic of glowing for a substantial period of time subsequent to failure of ambient or artificial illumination of said substrate.

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