

April 25, 1944.

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2,347,285

FLUORESCENT GLOW SHEET AND THE METHOD OF MANUFACTURING THE SAME

Filed May 15, 1942

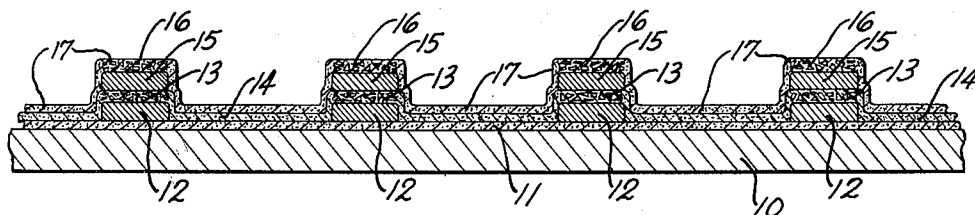


FIG. 1.

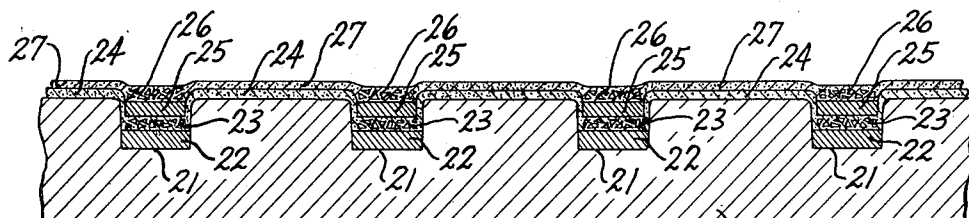
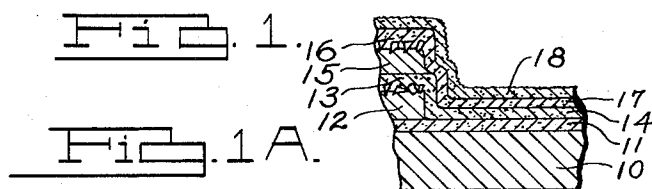


FIG. 2.

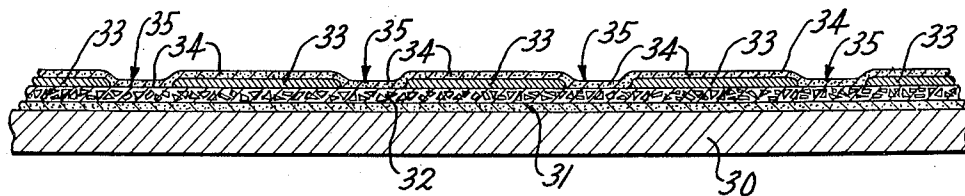
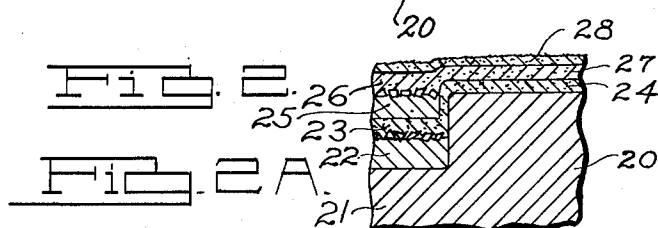
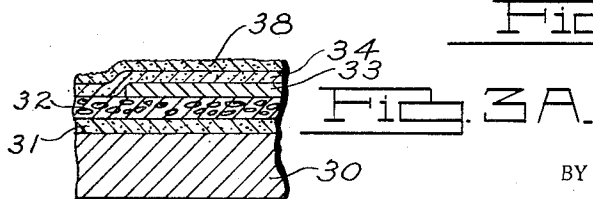
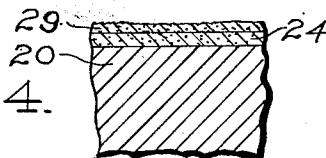


FIG. 3.

FIG. 4.



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FLUORESCENT GLOW SHEET AND THE
METHOD OF MANUFACTURING THE
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Application May 15, 1942, Serial No. 443,160

4 Claims. (Cl. 40—134)

This invention relates to improvements in fluorescent glow sheets and deals with improved graphic art methods of manufacturing glow sheets, bombardier charts, dials, computers, and the like from paper and plastic stock.

There have been a number of developments in the manufacture of fluorescent, phosphorescent and luminous pigments, however, it has heretofore been impractical to use these coarse crystalline pigments in the graphic art industries because of the loss of luminosity life when mixed with the usual varnishes and carrying agents employed in the printing industry and in printing inks.

Inorganic fluorescent pigments of the zinc sulphide and cadmium sulphide class which are considered preferable by the applicant in practicing the invention consist of hard crystals of relatively large size and heavy in weight which properties prevent them from remaining in suspension and dispersion in printing inks.

The war has brought about a large demand for fluorescent glow sheets, bombardier charts, dials, computers, and the like, the copy and outlines of which become visible responsive to ultra violet ray activation. To meet the large demand for highly efficient and effective fluorescent products, the applicant herein has developed and improved ultra violet ray responsive glow sheets, bombardier charts, dials, computers, and the like, and has developed and improved the methods of manufacturing the same, largely employing graphic arts methods and equipment.

One object of the invention is to provide improved fluorescent paper and plastic products such as glow sheets, bombardier charts, dials, computers, and the like wherein the fluorescent copy is ultra violet ray responsive and will not readily deteriorate, and upon which products notations may be penciled and erased without destruction of the fluorescent copy.

Another object of the invention is to provide a simple, effective and economical method of manufacturing fluorescent paper and plastic ultra violet ray responsive products of the type hereinbefore mentioned which assures the highest quality and permanency of the products.

Other objects of the invention will become apparent by reference to the following detailed description taken in connection with the accompanying drawing, in which:

Fig. 1 is a greatly enlarged cross sectional view through a paper fluorescent glow sheet embodying the invention manufactured in accordance with my improved method.

Fig. 1a is an enlarged, fragmentary sectional view taken through a glow sheet similar to that shown in Fig. 1 but provided with an additional outer roughened coating;

Fig. 2 is a greatly enlarged cross sectional view through a plastic glow sheet embodying the invention manufactured in accordance with my improved method.

Fig. 2a is an enlarged, fragmentary sectional view taken through a glow sheet similar to that shown in Fig. 2 but provided with an additional outer rough coating;

Fig. 3 is a greatly enlarged cross sectional view through a paper fluorescent glow sheet embodying the invention manufactured by a modified improved method.

Fig. 3a is an enlarged, fragmentary sectional view taken through a glow sheet similar to that shown in Fig. 3 but provided with an additional outer rough coating; and,

Fig. 4 is a fragmentary, sectional view of a construction such as that shown in Fig. 2 in which a roughened thermo-plastic sheet is employed in place of the final film 27 of the construction shown in Fig. 2.

Referring now to the drawing wherein like numerals refer to like and corresponding parts throughout the several views, Fig. 1 shows a fluorescent glow sheet embodying the invention composed of a paper stock base sheet 10 which is first sprayed or roll coated with an ethyl cellulose, acrylic or methyl methacrylate lacquer coating or other protective film 11 which does not fluoresce under ultra violet rays and which will bar chemical reaction between the paper base and the later applied fluorescent material. After this protective coating 11 is allowed to dry, the sheet 10 is then printed with a white opaque or clear pyroxylin ink or other suitable ink 12 compatible with the protective coating 11, and while the ink 12 is still wet or tacky, fluorescent pigment preferably of the zinc sulphide or cadmium sulphide type 13 is dusted over the sheet. The said ink 12 is then allowed to dry and excess fluorescent pigment 13 which does not adhere to the said ink 12 is reclaimed. A protective film 14 preferably of ethyl cellulose, acrylic or methyl methacrylate lacquer is then sprayed over the entire sheet, however, other lacquers which have high light transmission qualities and which do not fluoresce under ultra violet rays can be used in place of the ethyl cellulose, acrylic or methyl methacrylate protective lacquer film 14.

If desired, a second printing of clear pyroxylin or other suitable clear ink 15 compatible with the

protective film 14 may be placed in registry over the fluorescent pigment 13. While the latter layer of clear ink 15 is still wet or tacky, fluorescent pigment 16 like or similar to the fluorescent pigment 13 is dusted over the sheet. When the said ink 15 becomes dry, excess fluorescent pigment 16 is reclaimed, and the entire sheet is then sprayed with a protective non-fluorescent clear lacquer coating 17 preferably ethyl cellulose, acrylic or methyl methacrylate lacquer or other lacquer having high light transmission qualities.

It will be noted that whether or not a single or double layer of fluorescent pigment is used, the fluorescent pigment becomes embedded in the ink employed; the lacquer top coating providing protection to the fluorescent pigment from the elements, from oxidation, and from other chemical deterioration. It has also been found that the protective lacquer top coating serves as a preservative against ultra violet deterioration of the fluorescent pigment employed.

In such charts, glow sheets, and the like, upon the fluorescent surface of which it is desired to write in lead pencil or ink and later erase such writing, it has been found that, as disclosed in Fig. 1a, a final coating 18 of lacquer like or similar to and compatible with the protective coating 14 or 17 sprayed on the protective coating 14 or 17 under high pressure produces a toothed or rough surface firmly anchored to and integral with the protective coating 14 or 17 which can be written upon in pencil and ink and erased without destroying the usability of the said charts or the like.

The embodiment of the invention disclosed in Fig. 2 is like and similar to the embodiment of the invention hereinbefore described and disclosed in Fig. 1 except that the base sheet 20 is of a plastic sheet stock of such material as nitrocellulose, cellulose acetate, ethyl cellulose, methyl methacrylate, vinyl acetate, acrylic resin or the like which is debossed at 21 to the outline of the lettering or other copy thereon. The debossed area is then printed with an opaque or clear pyroxylin ink or other suitable ink 22 compatible with the plastic base stock, and while the said ink 22 is still wet or tacky, fluorescent pigment preferably of the zinc sulphide or cadmium sulphide type 23 is dusted over the sheet. The said ink 22 is allowed to dry and excess fluorescent pigment 23 which does not adhere to the said ink 22 is reclaimed. A protective coating preferably of a clear lacquer 24 of a type compatible to the base sheet 20 and having non-fluorescent qualities is then sprayed over the entire sheet.

If desired, a second printing of clear pyroxylin ink or other suitable ink 25 compatible with the protective coating 24 may be placed in registry over the fluorescent pigment 23. While the second layer of ink 25 is still wet or tacky, fluorescent pigment 26 like or similar to the fluorescent pigment 23 is dusted over the sheet. When the said ink 25 becomes dry, excess fluorescent pigment 26 is reclaimed, and the entire sheet is then provided with a protective non-fluorescent spray coating of clear lacquer or a laminated film 27 preferably of the same type as the lacquer coating 24 and compatible therewith.

The properties of the finished plastic sheet disclosed in Fig. 2 are like and similar to the properties hereinbefore set forth as the properties of the finished paper sheet disclosed in Fig. 1. In such charts, glow sheets, and the like, upon the fluorescent surface of which it is desired to write in lead pencil or ink and later erase such writing, it has been found, as disclosed in Fig. 2a, that a

final coating 28 of lacquer like and similar to and compatible with the protective coating 24 or 27 sprayed on the protective coating 24 or 27 under high pressure produces a toothed or rough surface firmly anchored to and integral with the protective coating 24 or 27 which can be written upon in pencil and ink and erased without destroying the usability of the said charts or the like.

A third embodiment of the invention is shown in Fig. 3 which discloses a fluorescent glow sheet composed of a paper stock base sheet 30 over which a roll coat or spray coat of ethyl cellulose, acrolid or methyl methacrylate lacquer or other protective film 31 is applied to bar chemical reaction between the paper base and the later applied fluorescent material. It is essential that the protective film 31 does not fluoresce under ultra violet rays. After the protective coating 31 becomes dried, a layer 32 of lacquer not incompatible with the coating 31 having a fluorescent pigment preferably of the zinc sulphide or calcium sulphide type dispersed therethrough is either sprayed or roll coated over the coating 31 and allowed to dry. The background of the sheet is then printed with an opaque pyroxylin or other ink 33 compatible with the layer 32, and lastly, a clear coating of ethyl cellulose, acrylic or methyl methacrylate lacquer or other sprayed, roll coated or laminated protective film 34 which does not fluoresce under ultra violet rays and which has high light transmission qualities. The printing of the background 33 leaves the fluorescent lettering and copy 35 to show through the surface of the sheet.

If it is desired to write in pencil or ink upon the fluorescent surface of the sheet disclosed in Fig. 3, and later erase such writing, it has been found, as disclosed in Fig. 3a, that a final coating 38 of lacquer like and similar to and compatible with the protective coating 34 sprayed on the protective coating 34 under high pressure produces a toothed or rough surface firmly anchored to and integral with the protective coating 34.

In the embodiments of the invention disclosed in Figs. 2 and 3, the rough or toothed final writing surface may be accomplished by laminating on top of the product in place of the protective coatings 27 and 34 respectively a thin transparent thermoplastic film using a mat or finely roughened embossing plate in the upper portion of the laminating press. Such a construction is illustrated in Fig. 4 as applied to a modification of the construction shown in Fig. 2, the roughened thermo-plastic film being indicated at 29.

With the exception of the above mentioned thermoplastic film which may be laminated to the glow sheets disclosed in Figs. 2 and 3, all coatings and ink employed are classed broadly as "siccative" coatings or inks and are selected for the particular properties herein defined which dry either from evaporation, oxidation, crystallization or polymerization. The term "compatible" is employed herein to designate that the coating or ink is not chemically deleterious to the adjacent ink or coating and will not destroy the siccative qualities thereof.

Like in the other embodiments of the invention, the fluorescent crystals become embedded in the pyroxylin or other ink employed and are covered by a protective top coating which prevents the fluorescent crystals from becoming oxidized or otherwise deteriorating. The protective top coating also provides a preservative against ultra violet deterioration of the fluorescent pigment employed.

The methods employed are adaptable to automatic equipment of the graphic arts industry, and,

it has been found that the applicant's products are superior in quality and provide maximum brilliance under both visible light and ultra violet radiation with a minimum of loss of luminosity life. Also, where fluorescent pigments have been specified, it is understood and it is obvious that phosphorescent or radio active pigments may be substituted.

Although but several embodiments of the invention and methods of practicing the same have been disclosed herein in detail, it is obvious that many variations in the method steps and in the selection of equivalent materials, pigments, lacquers and the like may be made in practicing the invention without departing from the spirit and scope thereof as defined by the appended claims.

I claim:

1. A glow sheet comprising a plastic sheet debossed to the form of copy to be applied thereon, copy applied to said debossed portions of said sheet comprising ink compatible with said plastic sheet, a layer of fluorescent pigment on said copy, a protective film over the entire sheet composed of a siccative material nonfluorescent under ultra violet rays having high light transmission qualities and compatible with the ink employed, a second copy layer comprising a clear ink having high light transmission qualities compatible with the last-named protective film disposed thereover in registry with the under copy, a layer of fluorescent pigment on said second copy layer, and a final protective film over the entire sheet of siccative material non-fluorescent under ultra violet rays having high light transmission qualities and compatible with the ink employed.

2. A glow sheet comprising a base having a face non-fluorescent under ultra violet rays and non-responsive to the effects of later applied fluorescent pigment, copy applied to said face comprising an ink compatible with the material from which said face is formed, fluorescent pigment adhered to said copy, a protective film over the entire base and said copy and pigment thereon composed of siccative material non-fluorescent under ultra violet rays having high light transmission qualities and compatible with said ink, a second copy layer co-extensive with the first mentioned copy and comprising a transparent ink having high light transmission qualities compatible with the last named protective film disposed over said last named film in registry with the first mentioned copy, a layer of fluorescent pigment on said second copy layer, and an additional protective film of siccative material non-

fluorescent under ultra violet rays having high light transmitting qualities and compatible with the ink employed disposed over said second copy layer.

3. A glow sheet comprising a base having a face non-fluorescent under ultra violet rays and non-responsive to the effects of later applied fluorescent pigment, copy applied to said face comprising an ink compatible with the material from which said face is formed, fluorescent pigment adhered to said copy, a protective film over the entire base and said copy and pigment thereon composed of siccative material non-fluorescent under ultra violet rays having high light transmission qualities and compatible with said ink, a second copy layer coextensive with the first mentioned copy and comprising a transparent ink having high light transmission qualities compatible with the last named protective film disposed over said last named film in registry with the first mentioned copy, a layer of fluorescent pigment on said second copy layer, an additional protective film of siccative material non-fluorescent under ultra violet rays having high light transmitting qualities and compatible with the ink employed disposed over said second copy layer, and a transparent coating of material non-responsive to ultra violet rays and compatible with said film and having a roughened outer face applied over said film.

4. A glow sheet comprising a paper base, a protective face over said paper base comprising a film of siccative material non-fluorescent under ultra violet rays and non-responsive to the effects of later applied fluorescent pigment, copy applied to said face comprising an ink compatible with the material from which said face is formed, fluorescent pigment adhered to said copy, a protective film over the entire base and said copy and pigment thereon composed of siccative material non-fluorescent under ultra violet rays having high light transmission qualities and compatible with said ink, a second copy layer coextensive with the first mentioned copy and comprising a transparent ink having high light transmission qualities compatible with the last named protective film disposed over said last named film in registry with the first mentioned copy, a layer of fluorescent pigment on said second copy layer, and an additional protective film of siccative material non-fluorescent under ultra violet rays having high light transmitting qualities and compatible with the ink employed disposed over said second copy layer.

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