Sept. 4, 1923. 1,467,132

L. C. BILSTEIN

APPLICATION OF LUMINOUS COMPOUNDS

Filed Jan. 17, 1922

Fig. 1

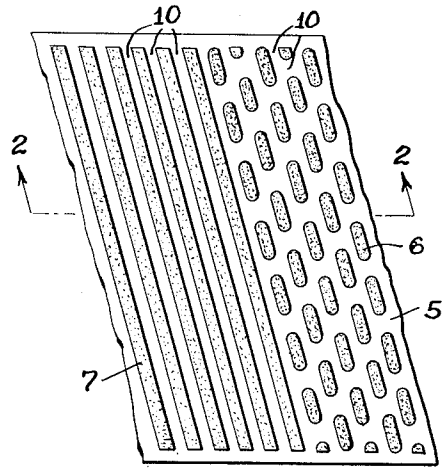



Fig. 2

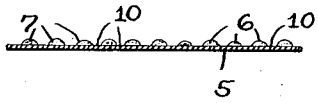



Fig. 3

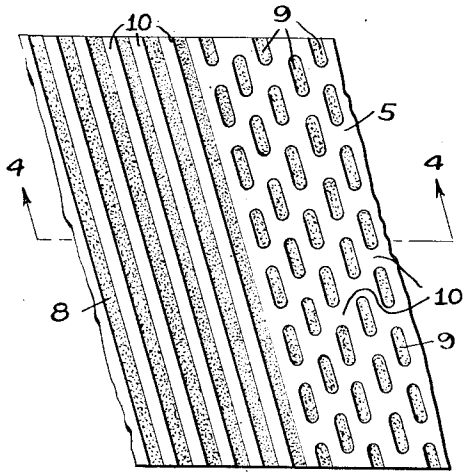
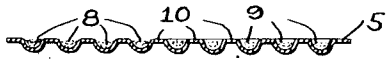



Fig. 4




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# UNITED STATES PATENT OFFICE.

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## APPLICATION OF LUMINOUS COMPOUNDS.

Application filed January 17, 1922. Serial No. 529,826.

*To all whom it may concern:*

Be it known that I, LOUIS C. BILSTEIN, citizen of the United States, residing at West Orange, in the county of Essex, State of New Jersey, have invented certain new and useful Improvements in the Application of Luminous Compounds; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to the use of luminescent materials, and involves more particularly the application of luminous compounds, such as zinc sulfide and radium salts, to objects, or the surfaces of objects, to render them visible in the dark.

In the use of materials of this character on objects to be made self-luminous, it has been the practice heretofore to apply the luminous compound to the surface of the object by painting or coating it, or to apply the compound to a recess in the surface. Thus, either the entire surface or a part only of the object is covered with a coating or layer of the compound, but in either case the coating or layer is continuous; that is, the compound as applied has an unbroken or uninterrupted surface.

Luminous materials as now made usually consists of radio active and radio sensitive substances. The light giving phenomenon which results when such substances are combined is attributed to the interaction between particles of the radio active and radio sensitive substances, sometimes described as the bombardment of rays. When the luminous material is applied so as to present a continuous surface, the degree of luminosity obtained depends for instance upon the degree of luminosity inherent in the material used, and the quantity of the radio active agent combined with the radio sensitive substance.

In the commercial use of luminous compounds, it is, of course, of the highest importance to utilize as economically as possible all of the original luminosity inherent in the luminous compounds when, for example, applied to objects to render them self-luminous in the dark.

The present invention is based upon the discovery that by applying luminous compounds, such as zinc sulfide and radium salts, to the surfaces of objects in the form of a plurality of spaced bodies or areas, as for instance spaced strips or lines, making up a discontinuous coating or layer of the compound, an equal degree of luminosity is obtained with a less amount of material; or, where a given quantity of material is applied in the form of a continuous coating or layer, as has heretofore been the practice, and the same quantity of material is applied in the form of a discontinuous or broken coating, the luminosity obtained with the latter disposition of the material is increased to a marked degree.

The invention may be put to practical use in employing luminous materials with increased effectiveness to render objects self-luminous in a great variety of ways. Among these might be mentioned the method of applying the material in bodies in spaced relation by providing the surface of the object to be treated with irregularities such as a plurality of depressions and coating these depressions with the material. The material so applied may be made to produce a degree of luminosity equal to that obtained by covering the entire surface, depending upon the shape and arrangement of the depressions and the quantities of material used in each instance. It will, of course, be understood that the foregoing, described in connection with a surface having depressions, applies equally well to a surface having any form of irregularities and similar results would be obtained by providing the surface with raised portions and coating them or the spaces between them with the luminous compound. So also it has been found that highly satisfactory results are obtained by applying the coating upon a plane surface in the form of a plurality of separated but closely adjacent spots or parallel lines.

This division of the total area coated with the luminous compound into a multiplicity of small coated areas separated one from another by narrow uncoated spaces results in the production of greater activity of the radio-active element upon the radio-responsive element of the compound, the rays from the radio-active element acting across these spaces upon the responsive element in the adjacent bodies of the coating, and as a consequence there is a substantially increased amount of scintillation and the

development of a substantially increased amount of luminosity.

The invention is illustrated in the accompanying drawings by representations of objects whose surfaces are treated with luminous material disposed in spaced relation by painting the material directly on the surface, or in depressions or grooves in the surface, in the form of a plurality of separated but closely adjacent bodies of the radio-luminous coating. In these drawings

Figure 1 is a perspective view of an object treated with luminescent material by having the material painted upon the plane surface of the object in accordance with the improved method, the view being greatly magnified, as is also Fig. 3.

Fig. 2 is a section along the line 2—2 of Fig. 1;

Fig. 3 is a perspective view of an object having a surface provided with depressions and grooves which are filled with the luminescent material as described; and

Fig. 4 is a section along the line 4—4 of Fig. 3.

Referring to Figs. 1 and 2, part of an object to be rendered self-luminous is represented. The luminous compound, such as zinc sulfide and radium salts, is applied directly on the plane surface of the object in the form of a plurality of separated but closely adjacent spots 6, or substantially parallel lines 7.

In Figs. 3 and 4 part of an object is represented in a manner similar to Figs. 1 and 2, but the surface of part of an object there shown is provided with a plurality of separated but closely adjacent grooves 8, arranged substantially parallel to one another, and a plurality of closely spaced rows of depressions 9, the grooves and depressions being filled with luminous compound.

Where the surface of the object is a plane surface to which the luminescent material is applied as by painting the material thereon in the form of strips or spots, or one having irregularities such as grooves or depressions filled with the material, the total area coated with the material is divided into a multiplicity of small coated areas separated one from another by narrow spaces 10. The activity of the luminescent material disposed on the surface in this manner is intensified to a marked degree, the rays from the radio-active element in one strip, line, row of depressions, or grooves acting across the uncoated spaces separating it from adjacent strips, lines, etc., as the case may be, and upon the radio-responsive element of the compound contained in the material making up the latter. This action results in a substantially increased amount of scintillation and the development of a substantially increased amount of luminosity.

It is apparent that the disposition of the material in this manner is of advantage not only in the increased luminosity obtained, but in the great saving in material which can be effected in obtaining a sufficient degree of luminosity with a less amount of material.

I claim:

1. The method of applying a luminous compound to an object to be rendered self-luminous, which consists in providing a surface of the object with a plurality of spaced bodies of the material, said bodies being so spaced as to permit the ingredients in one body of the material to act upon the ingredients of adjacent bodies of material, substantially as described.

2. The method of applying a luminous compound to an object to be rendered self-luminous, which consists in providing a surface of the object with a plurality of strips or lines of the material, said strips or lines being so disposed relatively to one another as to permit the ingredients in one strip or line of the material to act upon the ingredients of the material in adjacent strips or lines.

3. The method of applying a luminous compound to an object to be rendered self-luminous, which consists in providing the object with a plurality of surface irregularities which are separated one from another but closely adjacent, and applying to certain of said irregularities a coating of the self-luminous compound, said irregularities being so disposed relatively to one another as to permit the ingredients of the compound applied to one irregularity to act upon the ingredients of the compound applied to adjacent irregularities.

4. The method of applying to the surface of an object a luminescent material composed of a radio-sensitive compound admixed with a radio-active compound, which consists in forming a plurality of spaced depressions in the surface of the object, and coating the depressions with the luminescent material, said depressions being so disposed relatively to one another as to permit the radio-active compound in one depression to act upon the radio-sensitive compound in adjacent depressions.

5. The method of applying a luminescent compound to an object, which consists in forming a plurality of grooves in the surface thereof, and coating the inside of the grooves with the compound, said grooves being so relatively disposed as to permit the ingredients of the luminescent compound lying in one groove to interact with the compound lying in adjacent grooves.

6. An article of manufacture consisting of an object having on its surface a multiplicity of bodies of radio-active self-luminous compound, said bodies being spaced

apart but lying within the range of interactivity of the particles of the compound forming such bodies.

7. An article of manufacture consisting of an object having a surface provided with a plurality of depressions which are coated with a luminescent compound, said depressions being so disposed relatively to one another as to permit the interactivity of the masses of compound located therein.

8. An article of manufacture consisting of an object having a surface provided with a plurality of grooves which are coated with a luminescent material consisting of a radio-sensitive compound admixed with a radio-active compound, said grooves being relatively so disposed as to permit the radio-active compound in one groove to act upon the radio-sensitive compound located in adjoining grooves.

9. The method of rendering an object luminous which consists in applying thereto over spaced areas a compound containing a radio-active and a radio-sensitive material, said areas being so disposed relatively to one another as to lie within the range of interactivity of the said radio-active and radio-sensitive materials.

10. The method of rendering an object luminous which consists in providing the surface of the object with a discontinuous coating of a radio-active material admixed with a radio-sensitive material, the areas so coated being disposed relatively to one another so as to permit the radio-active material in one area to act upon the radio-sensitive material in adjoining areas.

In testimony whereof I affix my signature.

LOUIS C. BILSTEIN.