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MOSAIC AND TRANSLUCENT SURFACE

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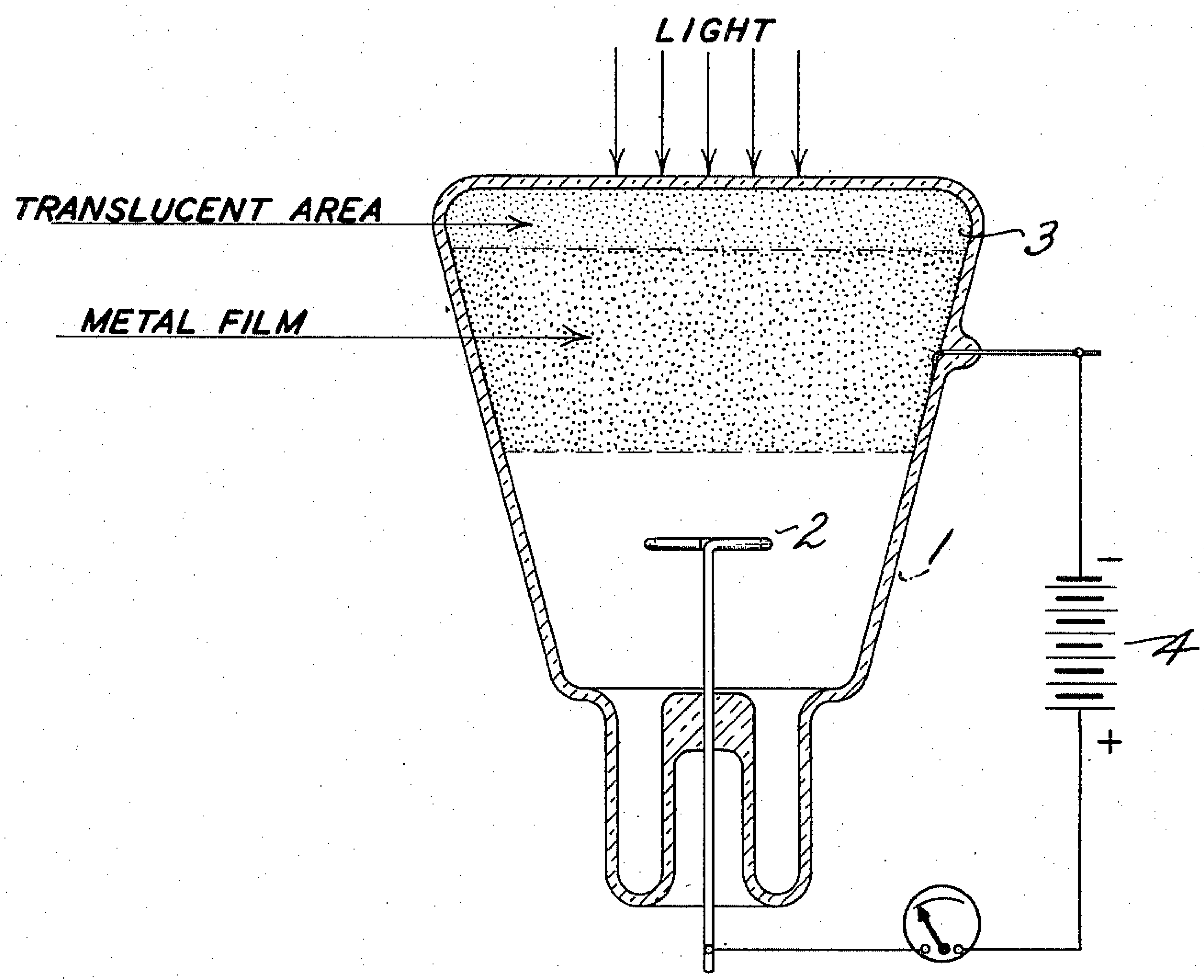

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MOSAIC AND TRANSLUCENT SURFACE

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3 Claims. (Cl. 250—27.5)

This invention relates to the manufacture of photosensitive surfaces and particularly to surfaces of this character which are translucent and capable of emitting electrons normal to the surface opposite to that upon which a light image is projected.

The objects of my invention are to provide an efficient translucent photosensitive surface; to provide a film of photosensitive character which responds to light in such manner as to release electrons thereoff in a direction in continuation of the direction of propagation of the light; to provide a method of producing a translucent film of photosensitive material; to provide a mosaic surface of highly refined character; to provide a uniform electrically non-conducting mosaic surface; and to provide a method of producing a mosaic of sufficiently refined character to form a satisfactory base for a photoemissive surface, which surface shall be capable of emitting electrons at one side thereof in response to an optical stimulus projected upon the other side thereof.

Other objects and advantages of my invention will become apparent upon reference to the following description of my improved method and product.

Other objects of my invention will be apparent or will be specifically pointed out in the description forming a part of this specification, but I do not limit myself to the embodiment of the invention herein described, as various forms may be adopted within the scope of the claims.

The single figure of the drawing is a sectional view of one form of photoelectric tube constructed in accordance with my invention.

The drawing illustrates a photoelectric tube 1 as provided with an anode 2 and a photosensitive cathode surface 3 produced in the manner hereinafter more specifically set out. If light is projected upon the upper surface 3 from the direction of the arrow, electrons are emitted upon the lower side of the surface; that is, on the anode side, the rate of emission being proportional to the intensity of light falling on the opposite side. The electrons so emitted may be directed to the anode 2 by a source of potential 4.

The photosensitive film may be produced on a desired surface such as glass, quartz, or similar substance, the illustration being that of a film deposited on the end wall of the glass tube 1. As a preliminary step in the method of forming such a film, the surface of the glass to be treated is exposed to the atmosphere, to water vapor, or immersed in water, or the like. The reason for this seems to be that a certain occlusion of water vapor or other gases in the glass surface to be treated is highly desirable to successful practice of the process. Sufficient occlusion may take place if the glass be allowed to stand at ordinary temperatures and degrees of humidity for some time prior to treatment, thus permitting gases to be absorbed in the surface of the glass. Such absorption may, however, also take place incident to an initial step of one modification of the process as will be pointed out.

A thin film of a selected metal, such as silver, is now deposited on the surface of the glass base in any suitable manner, as by deposition from solution as practiced in the making of mirrors, or by vaporization of the silver within a partial vacuum. At present, the method of deposition from solution is preferred since a more uniform coating may be obtained, and a certain amount of moisture or water vapor will be absorbed in the glass or in the film or in both, thus making it unnecessary to otherwise insure the presence of occluded gases or vapor in the glass base. The glass base is then heated as by means of a torch or other suitable means until a change in the appearance of the film takes place.

It is found that as a result of the above treatment, the silver film is changed in character, and the evidence indicates that a true film no longer exists. In its stead, the surface seems to be that of a mosaic of discrete particles of silver on the glass base. This conclusion is thought to be borne out by the facts that the surface is electrically non-conducting, is translucent, and will produce interference colors by light defraction such as the colors similarly produced in transparent films as found in soap bubbles and oil films. Examination of the surface under a microscope of moderate power fails to indicate the size of the particles, but it is estimated that the particles themselves are probably of the order of one-tenth to one-half micron, and are separated distances of like order.

It is believed, without wishing to be bound thereby, that what occurs during the process is that, prior to heating the glass base and the silver film, the structure of the film is continuous to the extent that it is composed of contacting silver particles or crystals, and in this condition is not light-transmitting; that in this condition, the region surrounding the boundaries between the glass and the metal film contains trapped particles of gas or water vapor; and that when the glass base and the silver film are heated the crystals are forced apart by the rending action of gas molecules expanding due to applied heat, and each individual crystal of silver is isolated from each of the others, each crystal contracting to form a globular particle.

The mosaic surface thus produced may be used simply as a mosaic, or it may be further treated for the purpose of forming a translucent electron-emitting surface of purely mosaic structure, or a translucent electron-emitting film of continuous character having the mosaic base, in which latter two cases the mosaic surface is first oxidized. A photosensitive material such as caesium may then be deposited upon the mosaic in such degree as to produce a resultant surface as a mosaic of silveroxide-caesium coated silver particles. The deposition of caesium may be continued, however, until the silver-silveroxide particles are joined by a very thin, electrically conductive film of caesium, as well as being coated thereby. The latter film of caesium should, however, be so thin that light may pass therethrough.

Either resultant emitting surface is, so far as I have been able to ascertain, as highly responsive to light passing therethrough as to light incident thereon from the caesium coated side, which fact further indicates a very high degree of segregation of silver particles as a result of the described process.

The utility of the surface capable of responding in the manner indicated should be at once apparent to those skilled in the art, with but brief reference to the fact that in order to avoid complicated and angularly placed optical systems, it is desirable to cause light to fall on the emissive surface from a direction normal thereto, and for the released electrons to also travel away from the surface on a normal line from the point of release. This is clearly true of my device, and it will be clear that the anode in no way interferes with the light image projected upon the emissive surface.

Having described my invention in such manner as to enable those skilled in the art to practice the same, it will be appreciated that variations thereof may be resorted to without substantial departure from its spirit. Accordingly, it is to be understood that I consider myself entitled to all such modifications and variations as properly fall within the purview of the following claims.

I claim as my invention:

1. The method of forming a translucent photoelectric surface on an envelope wall which comprises exposing said wall to moisture, coating said wall with an opaque film of silver, heating said wall until a change in light transmission occurs and the film becomes substantially non-conducting, oxidizing the film and depositing an alkali metal on said oxidized film until the film becomes conductive again.

2. The method of forming a translucent photoelectric surface on an envelope wall which comprises exposing said wall to moisture, coating said wall with an opaque film of silver, heating said wall until a change in light transmission occurs and the film becomes substantially non-conducting, oxidizing the film, depositing an alkali metal on said oxidized film until the film becomes conductive again, and keeping the amount of alkali metal below that amount necessary to destroy translucency.

3. The method of forming a mosaic on an envelope wall which comprises occluding moisture in said wall, depositing an opaque mirror of silver on said wall and heating said wall in air until said opaque mirror changes to a translucent layer having particles small enough to show interference colors.

BERNARD C. GARDNER.