Dec. 9, 1924.

1,518,403

C. W. FREDERICK ET AL.

PROJECTING SYSTEM

Filed June 9, 1922

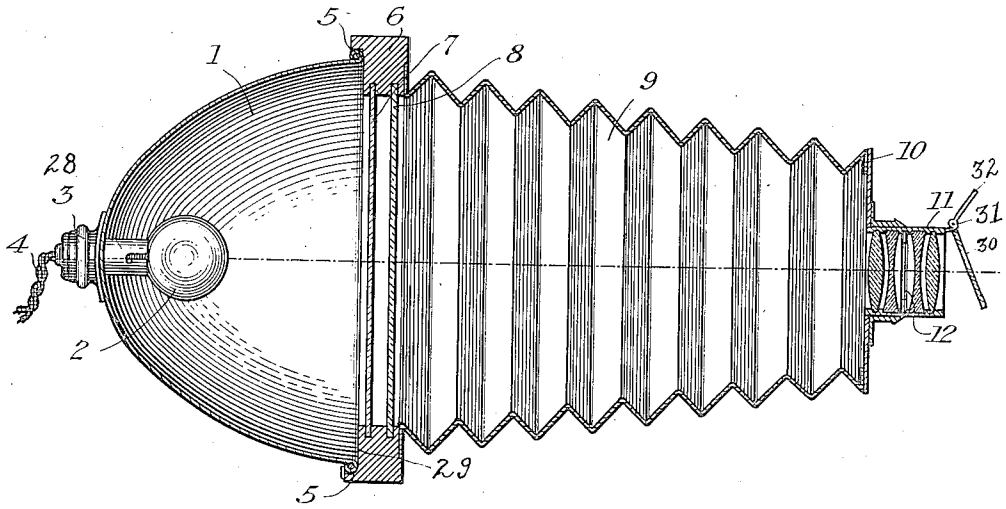


FIG. 1.

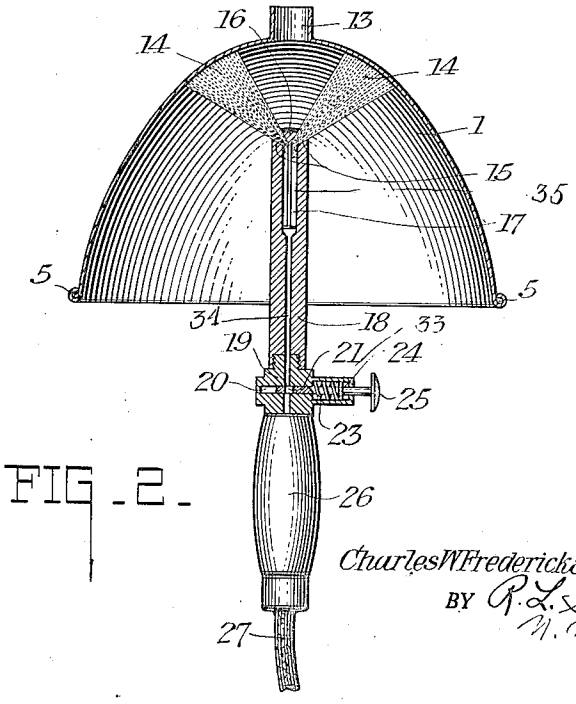


FIG. 2.

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Patented Dec. 9, 1924. 1,518,403

UNITED STATES PATENT OFFICE.

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PROJECTING SYSTEM.

Application filed June 9, 1922. Serial No. 567,206.

To all whom it may concern:

Be it known that we, CHARLES W. FREDERICK and ERNEST C. ALLEN, citizens of the United States of America, residing at Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Projecting Systems, of which the following is a full, clear, and exact specification.

This invention relates to improvements in projecting apparatus and more particularly to such apparatus as is used in the making by projection of enlarged photographic images from film negatives.

In order to expedite work by shortening exposures, such apparatus frequently includes lamps of high candle power which emit a large amount of heat, and when a large number of copies are made from a single negative, the latter may be exposed practically continuously to intense heat for long periods of time. Since such negatives are frequently of material which is easily blistered, mutilated or distorted by heat so as to be useless, it has been necessary in making a large edition either to use a less powerful illuminant, or to use the same negative for only a limited number of copies at a time, thereby delaying production.

The object of our invention is to improve such a system so that a sufficient amount of heat may be eliminated from the rays reaching the film, without cutting down the exposure time, to permit of long continued use of a single negative under intense illumination. This object is attained by the use of a reflecting surface that will absorb heat rays but will reflect light rays and such actinic rays as affect a photographically sensitive material.

In order more readily to describe our invention, reference will be made to the accompanying drawing, in which like reference characters designate like parts throughout, and in which—

Fig. 1 is a section of a typical projection system, and

Fig. 2 illustrates the method of application of material to a reflector in accordance with one form of our invention.

The showing in Fig. 1 illustrates in a formal way a typical projection system comprising a lamp 2 mounted in a hollow reflector 1, by any suitable lamp socket 28 which extends through the tubular extension 13 shown in Fig. 2 and is held in place by attachment 3, current being supplied by wires 4. The front beaded edge 5 of the reflector is positioned in the seat 29 of a suitable frame 6, which also carries a diffusing screen 7, such as opal or ground glass, and a film negative 8. These features are broadly illustrated, as details of mounting are no part of the present invention. Connected at one end to the frame is the usual bellows 9 having at its other end a lens board 10, carrying a mounted objective 11, with the usual diaphragm 12, and a shutter or cover 30 hinged at 31 and having an operating handle 32.

A well designed projector of this type, even when used with incandescent lamps of such high candle power as to give exposures as short as is desirable in making enlargements, does not harm the film in ordinary work where the film is used for making only a comparatively small number of copies. When, however, the film is used for making rapidly a large number of copies, it is customary to let the lamp burn constantly and to control the light by the shutter. With such practice, even with a well designed system, the film will buckle and finally blister, thus destroying it for further use. It will, however, usually endure for a certain length of time, but not for a working day. It is highly desirable, therefore, to remove enough heat to make possible the exposure of the film to light for a period of several hours. Previous methods known to us for eliminating heat also reduce the light more than is desirable. It is always possible to use lamps of lower candle power and it has been proposed to introduce sheets of material between the illuminant and the film which will absorb or reflect the heat rays and transmit the light rays. We have found these inefficient because they also reduce the transmitted light rays to a point rendering necessary an undesirably prolonged exposure.

We have found that the heat passing to the negative can be reduced by the desired amount without noticeably affecting the light by applying to the reflector a coating material which will absorb heat rays but not

light rays, the reflective power as to the latter being substantially undiminished.

There are several ways in which this differentially reflective surface may be formed. It is now common practice to coat the inner surface of such reflectors with well known metallic lacquers, consisting of a finely pulverized metal powder, such as aluminum in a lacquer comprising a binding medium and a volatile solvent. Coating compositions of this kind are in general use. The metal powder is well mixed with the lacquer just before application and the volatile solvent evaporates rapidly leaving a coating of metal particles in the binder.

One way in which such a surface may be rendered differentially reflective is by mixing with the lacquer before application a small amount of an organic dye which absorbs light in the red and infra red portions of the spectrum. Such a dye is toluidine blue. A very small quantity of this is mixed in the varnish and then sprayed or brushed on the surface. The amount of dye necessary does not appreciably affect the appearance of the coated surface.

We prefer, however, to use an inorganic metallic material and have found nickel oxide to be suitable. This is pulverized to an exceedingly fine powder, and 30 grains of this dust is mixed with 16 ounces of lacquer and sprayed or brushed on the reflecting surface. While this is generally satisfactory, it renders the surface somewhat rougher than it otherwise would be. To overcome this, the dust may be applied to the surface just after the aluminum lacquer has been applied and while it is still tacky. When thus applied in small quantities, the dust is quite invisible on the surface. This method permits also of local application of the dust. In practice we have found that in a hollow reflector of the type shown, the desired result is obtained if the dust is applied only at the points from which the greatest amount of heat is reflected, in the present case a zone somewhat removed from the apex of the reflector.

The preferred method of application is illustrated in Fig. 2. A flexible tube 27 is connected to a source of compressed air (not shown) and has a handle 26 and a nozzle 18, the passage of air from the tube to the nozzle being controlled by a valve situated in advance of the handle, so that the user can control it with his thumb. This comprises a hollow extension 23 connecting with the seat 20, in which slides the apertured valve member 21 which is normally pressed outwardly by spring 33 bearing against collar 24, and is operated by thumb piece 25. The end of the nozzle has an inclined annular aperture 15 and is closed by the button 16, the core or support 35 of which extends into the enlarged end 17 of the central aperture 34 and is supported by the walls thereof. When the reflector is freshly lacquered and is still tacky, the end of the nozzle is dipped in a supply of the dust or powder which collects in the annular aperture. It is then located in substantially the position shown, and a puff of air admitted, suddenly blowing the dust upon the reflector along path 14 and coating it in the zone as illustrated. When thus applied, the area dusted is indistinguishable to the eye from the rest of the reflective surface.

Another powder that has also been found efficacious is made by melting borax and dissolving therein metallic cobalt or a cobalt salt, such as the nitrate or oxide. When this has hardened it is finely powdered and applied in the manners described.

While by no means all of the heat rays are eliminated, but only a portion of those that would otherwise be reflected, the heat falling upon the negative is nevertheless so reduced as to permit the practical use of the system where otherwise the negative would not withstand the heat for extended periods. The condition where this method is particularly useful is at about the critical point, where the negative is almost but not quite able to withstand the heat. By this means it is possible easily to reduce the heat past this critical point so that the negative may be used continuously for an apparently indefinite period, as shown by numerous practical experiments and extensive use.

It is to be understood that the image on the film may be a negative or positive one, formed by photographic processes or otherwise, and that we include all such image-bearing sheets in the term "transparency," meaning thereby a sheet that transmits at least a portion of the light waves falling thereon, so that an image on the sheet may be inspected, projected, or reproduced by such transmitted light.

It is obvious, as indicated above, that other materials having the physical properties described may be substituted and that we contemplate a wide range of equivalents as falling within the scope of our invention as defined in the appended claims.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. A concave reflector adapted to contain a source of light and having a surface of which a certain zone is more absorbent of heat rays than of actinic rays and more capable of reflecting actinic rays than heat rays.

2. A reflector adapted for use in a projecting system and having a thin, opaque reflective coating including an ingredient which absorbs a large proportion of heat rays but such a small proportion of light rays that its effect is not visibly apparent.

3. A reflector adapted for use in a projecting system and having a reflective coating including in an annular zone an ingredient having the property of absorbing a large proportion of heat rays but a small proportion of light rays, so that the reflector reflects a larger proportion of light rays than of heat rays.

4. A reflector having a surface that reflects visible light rays with substantial uniformity from its entire area and a portion only of which absorbs more heat rays than light rays.

5. In a system for projecting light upon an object readily injured by heat, a source of light, a reflector and a seat for such an object in the path of rays from the source of light and from the reflector, the reflecting surface having a limited zone which is more absorbent of heat rays than of light rays and more reflective of light rays than of heat rays.

6. In a system for projecting light through a transparency readily injured by heat, a concave reflector, a source of light within said reflector, a seat for such a transparency across the end of said reflector, the reflector having a surface of high uniform reflective properties as to visible rays, and having on a portion only of said surface an ingredient with the property of absorbing heat rays more than light rays.

7. In a system for projecting light through a transparency readily injured by heat, a concave reflector, a source of light within said reflector, a seat for such a transparency across the end of said reflector and in the path of rays from the source of light and from the reflector, the reflector having a surface with a thin, opaque coating of high light reflecting properties, and containing in an annular zone only, an ingredient having the property of absorbing heat rays but not visibly affecting the light reflective power of the reflector.

8. In a system for projecting a light image from a transparency readily injured by heat, a concave reflector, a source of light within said reflector, a seat for such a transparency in the path of rays from the source of light and from the reflector, and a lens for projecting light transmitted through the transparency, the reflector having on its surface an annular zone more absorbent of heat rays than of actinic rays and more reflective of actinic rays than of heat rays.

Signed at Rochester, New York, this 5th day of June, 1922.

CHARLES W. FREDERICK.
ERNEST C. ALLEN.