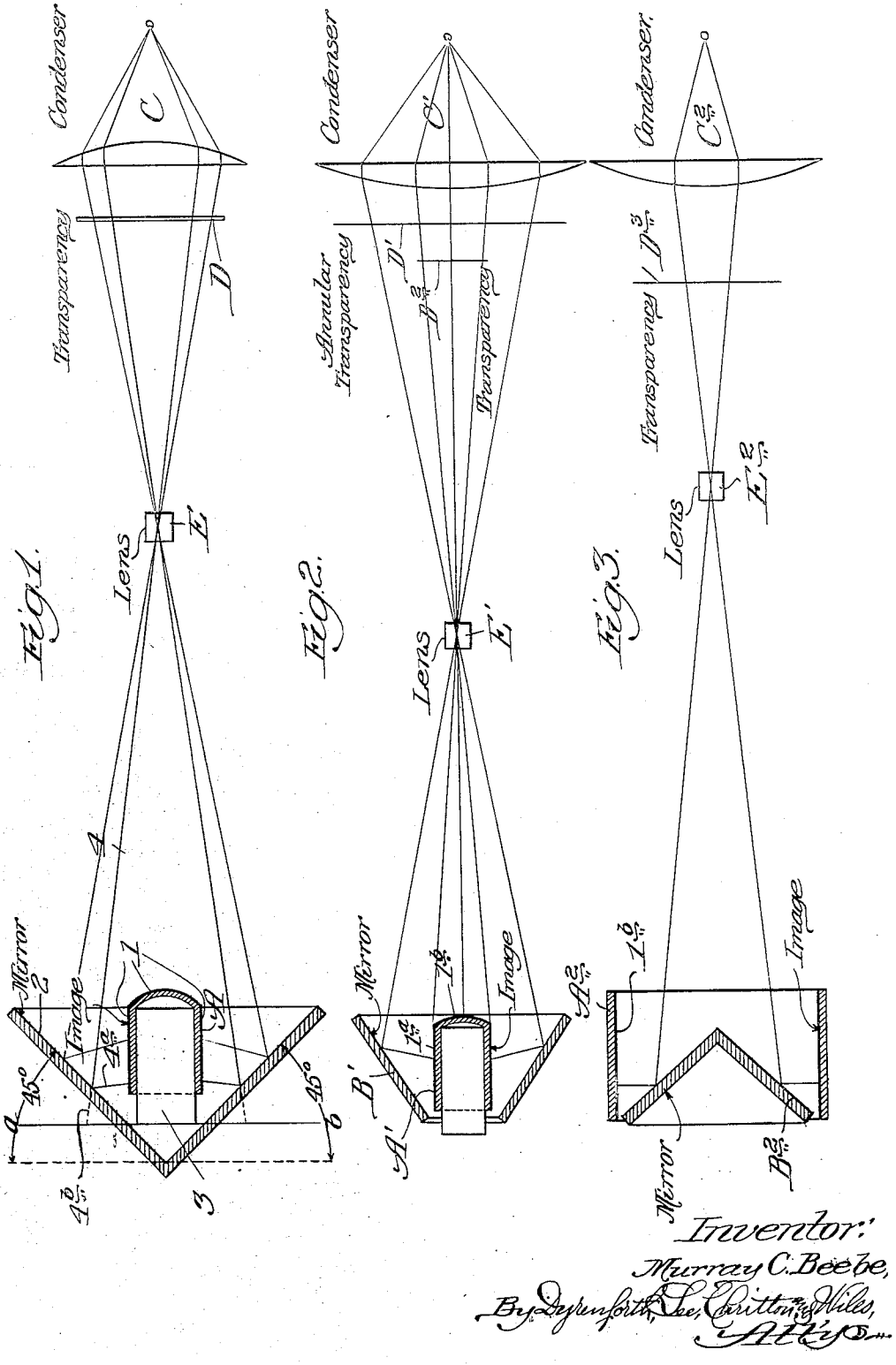
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SURFACE ORNAMENTING PROCESS AND APPARATUS

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SURFACE-ORNAMENTING PROCESS AND APPARATUS.

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This invention relates particularly to a method and apparatus for decorating curved, or irregular, surfaces. The invention is applicable, for example, to the production of pictures, or etchings, upon cylindrical surfaces, or other curved, or irregular, surfaces.

The primary object of the invention is to provide for a direct optical copying of an image, design or character upon a curved, or irregular, surface. In accordance with the invention, light may be transmitted through a suitable transparency, either a negative or a positive, and reflected from a suitable mirror upon a light-sensitive coating applied to the surface which is to be decorated, or etched. The relation of the mirror to the coated surface is such that the image rays projected upon the mirror will be reflected therefrom and focused upon the sensitized coating with which the object or surface to be decorated is preliminarily provided.

The sensitive coating employed on the surface or object to be decorated may be any suitable sensitive coating which is adapted to be selectively acted upon or transformed in accordance with light transmitted thereto through a transparency containing an image, design or character. The coating, for example, may be a light-sensitive varnish comprising a suitable oil, a resin, natural or artificial, or a suitable compound of such materials, a suitable sensitizing agent being added, if required. Halogen-liberating compounds may be employed, if desired, in connection with varnishes of the character referred to. Any other suitable light-sensitive photographic medium may be employed in lieu of the varnish, or varnishes, referred to.

The invention will be explained with reference to the accompanying drawing which illustrates the improved process and apparatus suitable for the practice thereof.

In the drawing—

Fig. 1 represents diagrammatically an apparatus and method for decorating an exterior cylindrical surface; Fig. 2 represents diagrammatically a method and apparatus for decorating an exterior cylindrical surface and an end surface; and Fig. 3 represents diagrammatically a method and apparatus for decorating an interior cylindrical surface.

Referring to Fig. 1, A designates a cylindrical article whose exterior surface is to be decorated, or etched, the exterior cylindrical surface being provided with a light-sensitive coating 1; B designates a mirror provided with an interior reflecting surface designed to reflect the image rays therefrom and focus them upon the sensitive coating; C designates light-projecting mechanism, including a suitable condenser; D designates a transparency containing the image, design or character which is to be copied, which may be either a negative or a positive; and E designates the lens through which the rays pass, the lens being interposed between the transparency and the mirror.

In the illustration given in Fig. 1, the mirror-surface is designated at 2, being the interior surface of a hollow conical mirror. If desired, the mirror may be of frusto-conical shape. At the axis of the mirror is a central support 3 for the cylindrical article A. The apparatus is so arranged that a light ray 4 striking the mirror is reflected as indicated by the line 4^a. The apparent focusing plane for the image is at the line a, b; and were the ray of light 4 to continue through the mirror, the line 4^b produced thereby would equal the line 4^a. In other words, the apparatus is so arranged and disposed that the rays of light will be reflected from the interior surface of the mirror and focused upon the sensitive coating 1. This results in forming an image in the sensitive coating. That is, the sensitive coating becomes selectively transformed, or hardened, in accordance with the light reflected thereon from the mirror.

The picture, or image, thus formed in the sensitive coating may be developed by means of any suitable developing agent. That is, if desired, the portions of the coating which are not transformed, or reacted, by means of the light may be removed by means of a suitable solvent or developing agent. The reacted portions of the coating may remain upon the surface, a suitable dye, or pigment, being applied thereto, if desired, at a desired stage.

The picture produced on the cylindrical surface may be used for decorative purposes; or, if desired, the resistant coating afforded by the image on the cylindrical surface may be used as a resist during a subsequent etching operation. That is, the article having

the resist thereon may be subjected to the action of a suitable etching agent which will cause the exposed, or partially exposed, portions of the metal, glass, or other surface to be etched.

In the illustration given in Fig. 1, the conical mirror surface has an included angle of 90°, from which it follows that the walls of the mirror form a 45° angle with a plane perpendicular to the axis of the mirror.

In the illustration given in Fig. 2, A′ designates an article to be decorated; B′, a hollow frusto-conical mirror; C′, light-projecting means; D′ and D², transparencies containing pictures, designs or characters which are to be copied on article A′; and E′ a lens through which the rays pass on their way to the mirror. In this illustration, the apparatus is so arranged that an image projected from the transparency D′ is reflected from the interior of the mirror B′ and focused on a sensitive coating 1^a on the exterior cylindrical surface of the article A′; and the rays of light projected through the transparency D² are focused on the sensitive coating 1^b on the exterior surface of the end of the article A′. The negative D′ may be of annular form.

In the case of the negative D shown in Fig. 1, the central portion may be clear so that rays passing therethrough and striking the coating on the end surface of the article A will transform the coating on the end surface and render it insoluble in the developing agent, thus protecting the surface during the subsequent etching operation.

In the construction shown in Fig. 3, A^2 designates a cylindrical article whose interior surface is to be decorated; B^2 designates a conical mirror having an external reflecting surface which is introduced into the article A^2; C^2 designates the light-projecting device; D^3 designates the negative; and E^2 designates the lens. In this case the apparatus is so arranged that the rays projected through the negative D^3 strike the exterior mirror surface and are reflected and focused upon the sensitive coating 1^b which is applied to the interior surface of the article A^2.

Any suitable form of light-projecting mechanism may be employed. If desired, the dimensions of the mirror with respect to the article to be decorated may be such that the parts may be moved axially with relation to each other. For example, in Fig. 2, if a long cylindrical surface is to be decorated, the article may be shifted with relation to the mirror to enable fresh surfaces to receive the image from the negative. In this way, any number of replicas may be made on the surface which is to be decorated.

The improved method may also find practical application to the purpose of etching suitable designs upon rolls for printing or otherwise reproducing such designs. For example, a roll which is to be used as a printing roll, or an embossing roll, may be provided with a light-sensitive coating, and light may be projected upon an interior reflecting surface encircling the roll and reflected therefrom into focus upon the light-sensitive coating to cause the coating to be selectively acted upon by the light in accordance with the image, design or character. The coating may then be developed, and the roll may be prepared in any suitable manner for printing or embossing operations. Thus, for example, the roll may be subjected to an etching operation, or it may have applied thereto a suitably resistant lacquer, or the like, applied to the design and capable of taking ink and producing printing impressions.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom.

What I regard as new, and desire to secure by Letters Patent is:

1. The method of ornamenting a cylindrical surface provided with a light-sensitive coating which consists in projecting light in accordance with an image, design or character upon a conical reflecting surface and reflecting the same therefrom into focus upon said light-sensitive coating, one of said surfaces being encircled by the other one.

2. The method of applying a design to a roll for printing or embossing purposes which consists in applying a light-sensitive coating to the surface of said roll, and then projecting light in accordance with an image, design or character upon a reflecting surface encircling said roll and reflecting the light therefrom into focus upon said light-sensitive coating.

3. The method of decorating an external cylindrical surface and an end surface on an article which comprises applying to said surfaces a light-sensitive coating, projecting light rays in accordance with an image, design or character directly upon the light-sensitive coating applied to said end surface, and projecting light rays in accordance with an image, design or character upon a reflecting surface encircling said cylindrical surface and reflecting the light rays therefrom into focus upon the light-sensitive coating upon said cylindrical surface.

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