

Sept. 15, 1942.

W. M. BUSKES

2,295,632

PROCESS FOR THE PRODUCTION OF SCREEN REFLEX COPIES

Filed Sept. 7, 1939

FIG. 1

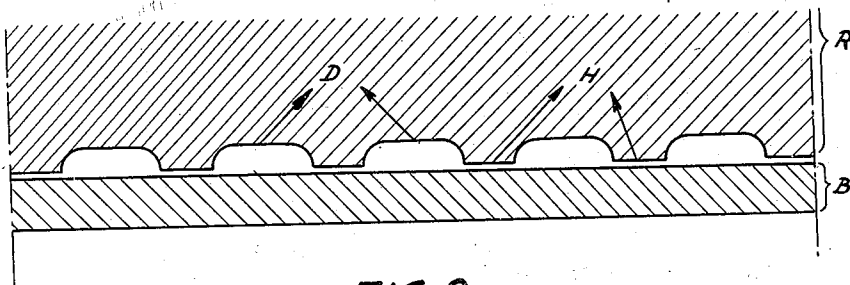


FIG. 2

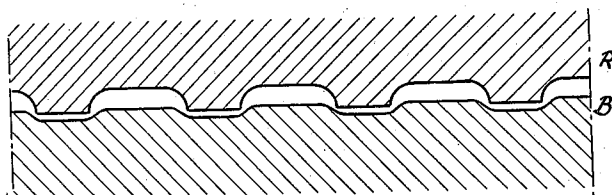


FIG. 3

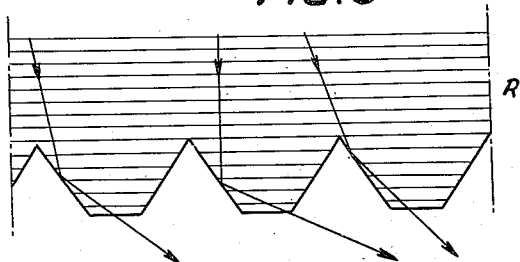
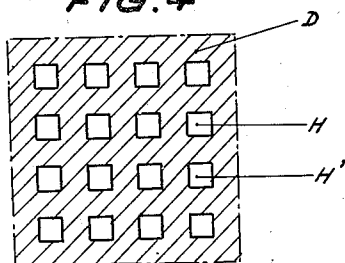


FIG. 4



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2,295,632

PROCESS FOR THE PRODUCTION OF
SCREEN REFLEX COPIES

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Application September 7, 1939, Serial No. 293,709
In the Netherlands April 14, 1939

11 Claims. (Cl. 95—5)

French patent specification 693,335 discloses a process for the production of reflex copies in which the radiation falling on the photo-sensitive material is distributed in screen form. In the U. S. patents to Van der Grinten Nos. 2,026,292; 2,051,582 and 2,051,586 further developments of this process are described and various methods are disclosed to obtain suitable screens for sub-dividing a radiation into small areas of lower and higher photochemical power.

In practice, the process is of particular importance in which the irradiation is already distributed in screen-like manner when it impinges upon the sensitised layer and in which this screen-like distribution is obtained by means (any desired screen) independent of the sensitive sheet. Various systems have been recommended for this, for example in the Dutch patent specification 39,687 and corresponding United States Patent Number 2,051,582. The use of the process on special layers or films and the use of particular auxiliary agents is described, inter alia, in the Dutch patent specification 40,033 and corresponding United States Patent Number 2,051,583, and Dutch Patent 46,056 and corresponding United States Patent 2,022,014. For a more or less complete review of the state of the art in the field of screen reflectography, reference may be made to a work by Van der Grinten in "The Photographic Journal" of September, 1938.

As already mentioned above, there is mostly used in practice a screen which is placed in front of the sensitised film.

Since in practice mostly a diffused radiation is the only available such for example as from an arc lamp with reflector, for practical purposes so-called cover screens have acquired importance, the screen elements of which are in or on one surface of a carrier which during the production of the reflex copy is in direct contact with the sensitive layer. In this way, in spite of the diffusion of the radiation there is a sufficiently sharp separation for practical purposes between the fields of great radiation capacity and those of smaller or no radiation capacity in the direct vicinity of the sensitive layer.

By way of illustration, there are described as examples three screens now used in practice for screen reflectography.

The screen is obtained in any desired photographic manner in a grainless layer, e. g. a diazo layer on a film. This screen film, in the production of the reflex copy, is in intimate contact with its screened side with the photo-sensitive ma-

terial, practically always a film, which again is in contact with the original.

Another screen now often used in practice, consists of a mirror on glass, from which in any desired manner, the reflecting layer has been removed locally and in screen form. Here also in the production of a reflex copy the screen-like reflecting surface is brought into intimate contact with the sensitive layer. The reflecting surface is, although not permeable to the light, extremely thin (about 1μ) and, furthermore, it is mostly varnished to protect it from injury and corrosion. The screen side of such a reflecting screen can therefore be regarded as practically quite flat.

When lenticular covering screens are used, then the lenses are naturally always at a certain distance from the sensitive layer and the space between the lenses and the sensitive layer is filled with any desired transparent material, the side of which directed towards the sensitive layer is also always flat. With the covering screens also a distance between the screen parts and the sensitive layer is possible when a sufficiently parallel directed irradiation is used.

With all these possibilities of execution, however, the surface which must be kept in intimate contact with the sensitized material, is flat.

When using a covering screen and a sensitive material not connected therewith, there occur in practice some difficulties which—although they may have different causes—yet essentially always have as a result that unless extremely high pressures are used (which, however, presents difficulties) the screen-like distribution locally is not transferred sharply on to the sensitive material. Thus, for example, the fact can be mentioned that the sensitive material, e. g. the film during the exposure becomes warm, consequently dries out and thereby contracts. There then takes place during the exposure to the rays, and mostly in the part externally of the central zone of the copy, a displacement of the sensitive material with respect to the screen and this need, under certain circumstances, only to be very slight—in view of the generally small dimensions of the screen elements (a few hundredths of a millimeter)—alone to cause a prejudicial action. If this takes place then, except in the central zone, the screenlike distribution is not sharp in the sensitive layer and the copy is thereby made imperfect.

Another way in which a change of position takes place between the sensitive layer and the screen during the exposure can occur for ex-

ample with those sensitive layers, such as diazo films, which develop a gas during and in consequence of the exposure (with diazo compounds, nitrogen). When the pressure between the surface of the sensitive layer and the smooth surface of the screen placed thereon is high then this gas can only escape with difficulty and then frequently destroys the intimate contact. Assuming that this takes place with a covering screen and while working with diffuse radiation, then locally the sharpness of the separation between the radiation beams and the shadows falling on the sensitive layer will be reduced. In this way also local reduction of force of the copy is caused, mostly in the form of specks or spots. This can also be caused by air which, from the outset, has been enclosed between the screen and the sensitive material.

A further reduction of the contact which is troublesome and which occurs in practice is caused by dust particles between the screen and the sensitive layer. Apart from the fact that such a particle itself causes trouble when it is located in a beam of rays, its presence has, as a result, that round the point at which it is placed there may exist a zone of reduced contact so that the particle works out on the copy as a kind of aureole of reduced pictorial strength.

According to the present invention, the surface of the covering screen which during the production of a screen reflex copy is directed towards the sensitive material (termed hereafter for the sake of brevity "the screen side") is not flat but is made in the form of a relief. The screen side therefore has depressed parts; "depths" or "depressions" and raised parts: "elevations." The relief figure coincides with the screen figure and the "elevations" with the transparent parts of the screen.

The invention will be more fully described below with reference to the drawing which shows some examples of execution diagrammatically:

Figure 1 represents a diagrammatic cross-section of a screen with relief; the screen R is in contact with a sensitive sheet B; D are the depths or depressions of the covering screen and H the transparent or translucent elevations. Somewhat similar screen surfaces are known per se, but their use for screen reflectography has never been proposed and this use has the astonishing result of a better and unshakable contact between separate screens and the sensitive material during the exposure, less trouble from enclosed air and dust particles and from gases developing during the exposure and, in brief: reduction of the above-mentioned objections.

If the sensitive material should develop a gas during the exposure, it is important that this gas can escape and for this it is necessary for the depressions of the screen side to form continuous conduits, if necessary with crossing conduits or the like which permit such escape. With crossing "depression conduits" the elevations form small islands and the depressions a continuous system.

A particularly good effect is obtained when the material of the screen is hard, at least harder than the substance of the sensitive material. A very unshakable contact is obtained with a hard screen material, e. g. glass and a soft sensitive material, e. g. cellulose derivative with plasticisers.

Figure 2 shows how the elevations of the

screen can as it were press a little into the surface of the sensitive material.

The invention has the following advantages.

1. As a rule, the covering factor in screen reflectography is greater than 0.5 and consequently when the covering parts coincide with the depressions, these depressions take up much of the total surface and the elevations take up less of the total surface. This increases the unshakability of the contact even with low pressure, as the surface pressure exerted by the elevations on the photo-sensitive material is greater when their total surface is comparatively smaller.

2. For the same reason as under (1), there is more opportunity for carrying away the developed gases than in the opposite case.

3. There is—again for the same reason—more room for any dust particles which naturally do not obstruct or obstruct less in the depressions under the covering parts.

4. There is less danger of injury and wear of the covering parts.

5. Just those parts, which allow the passage of the irradiation, are in themselves easy to keep quite flat and have the most intimate contact which promotes the penetration of the rays into the sensitive material.

Apart from the above mentioned facts, there are also other advantages.

If the covering parts are reflecting at least inwardly i. e. towards the side from which the irradiation impinges, then these parts, if they are in the depressions and in particular if these depressions have a form particularly suitable thereto, can also cause a certain economy of irradiation. They deflect as it were part of the rays, which otherwise are lost by reflection, towards the permeable elevations (see Figure 3). A general rule for the most suitable shape of such a relief naturally cannot be given as this depends upon the direction of the radiation used. If this radiation predominantly contains rays with a small angle of incidence then for example the tips of the cross-sectional triangles in Figure 3 are advantageously raised somewhat, whilst when using a radiation with many rays with large angles of incidence, these tips should preferably be somewhat lowered. If the covering parts in the depressions reflect outwardly i. e. towards the sensitive material, then this shortens the necessary exposure.

Naturally the invention also relates to lenticular covering screens.

The relief of the screen side can naturally be obtained in various ways known per se, e. g. by etching or grinding a glass surface, by goffering a plastic material, and the like. The following may illustrate one such a screen:

A glass plate one surface of which has a relief obtained by etching according to Figure 4, wherein H are the elevations and D the depths ($H=0.035 \times 0.035$ mm., and the distance between the centres of H and of H' is 0.08 mm. whilst the depth of the relief is approximately 0.015 mm.) is provided with a mirror on this one side and then polished. The mirror surface then disappears from the elevations and remains in the depressions. It is then varnished, and heat treated, for the purpose of strengthening. To produce a reflex copy, the original is placed with the side to be reproduced upward in a printing frame and upon this a photo-sensitive diazo type film of a thickness of 0.07 mm. the upper surface of which is sensitised is placed, and upon this the above-described screen with the screen side

downward, that is, in contact with the sensitive diazo layer. The whole is pressed intimately together by means of pressure or vacuum. The diazo type film consists of acetyl cellulose. It is superficially saponified on one side and this saponified surface is treated with a diazo compound with para-positioned, tertiary amino group, e. g. with para-diazo ethyl-benzyl aniline. The exposure takes place with a vertical arc lamp with surrounding reflector.

What I claim is:

1. Process for the production of screen reflex copies which comprises projecting actinic rays onto an original through a screen having alternate opaque and transparent areas and a sensitized sheet, one face of the latter contacting with the screen and the other face contacting with the original, the face of the screen contacting with the sensitive sheet having the form of a relief in which the alternate elevations and depressions coincide with the alternate transparent and opaque portions of the screen respectively.

2. Process, according to claim 1, in which the non-transparent parts of the screen are located in the depressions of the screen.

3. Process, according to claim 1, in which the non-transparent parts are located in the depressions of the screen and are of a reflecting nature.

4. Process, according to claim 1, in which the non-transparent parts are located in the depressions of the screen and reflect towards both sides.

5. Process, according to claim 1, in which the non-transparent parts are mirrors, located in the depressions of the screen.

6. Process, according to claim 1, in which diazotype material is used as the photosensitive material in the sensitized sheet.

7. A covering screen having alternate opaque and translucent areas for use in making reflex

copies of an original on a sensitive sheet held between the original and the covering screen, comprising a translucent member with a contact surface having small spaced translucent flat elevated contact areas in one plane and opaque depressed areas therebetween, wherein the depressed areas are interconnected between the contact areas, substantially as and for the purpose described.

8. A covering screen for use in making reflex copies of an original on a sensitive sheet held between the original and the covering screen, comprising a translucent member with a contact surface having small spaced translucent flat elevated contact areas in one plane and opaque depressed areas therebetween, the opaque depressed areas having light reflecting outer surfaces, substantially as and for the purpose described.

9. A covering screen for use in making reflex copies of an original on a sensitive sheet held between the original and the covering screen, comprising a translucent member with a contact surface having small spaced translucent flat elevated contact areas in one plane and opaque depressed areas therebetween, the outer surfaces of the opaque areas forming mirrors, substantially as and for the purpose described.

10. A covering screen, as defined in claim 7, wherein the opaque areas are mirror surfaces which reflect light both outwardly and inwardly, substantially as described.

11. Screens for use in the production of screen reflex copies characterized by a screen side in the form of a relief with small transparent elevations and larger non-transparent reflecting depths in which the reflecting depths are formed by mirrors reflecting towards both sides.

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