Fig. 2
PHOTOGRAPHIC METHOD OF PRODUCING A COPY FROM AN ENDLESS SILVER SURFACE

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ABSTRACT OF THE DISCLOSURE

A method of reproducing copies in which an endless silver surface is used repeatedly by sensitizing it with iodine, bromine or chlorine, and exposure to produce a visible or invisible image, and the image is to be transferred to a receiving layer with or without reversal by wetting the silver or receiving layer with a liquid developer and bringing the layers into contact with one another. Upon separation of the layers, the silver surface is fractionally cleaned prior to a repetition of the reproduction sequence.

The present invention relates to a photographic method of producing a copy or reproduction of an original by means of a silver plate sensitized with iodine or the like, on which the reproduction of the original is exposed and subsequently used for the production of the picture in the manner hereinafter described.

The invention also comprises an apparatus for carrying out this method.

The invention is based on the Daguerréotype process in which a silver plate is first exposed to the action of iodine vapor in order to form a high-sensitive silver-iodine layer. It is also known to cause the development, of such layer, after exposure, by means of mercury vapor, or by pyrogallol or iron oxalate developers. The medium absorbing the image, that is, the picture developed on the silver plate and fixed with sodium chloride or a sodium thiosulphate, receives a mirror-image picture.

The silver plate mentioned above and comprised within the present invention may also be a carrier plate with a silver coating, as known in the art, such as, for example, a silver-coated copper plate, or a silver foil applied to a hardboard or plastic carrier.

In order to sensitize such a plate, it is known in the art to apply by evaporation iodine or mixtures of iodine and bromine and chlorine, the sensitization comprising possibly first an iodizing step, followed by a bromizing and finally again by an iodizing step. The present invention comprises all these possibilities.

The Daguerréotype process has mainly the disadvantage that this method of producing pictures is uneconomical, in view of the fact that the picture is permanent while the comparatively expensive material (i.e., a silver plate or silver mirror) can be used only for producing a single picture.

The present invention has the object of providing, with the use of the steps known from the Daguerréotype process, a novel, economical photographic method for producing a reproduction, said method being easily applied and particularly suitable also for purposes of duplication, and giving results in which the drawbacks inherent in reproducing according to the Daguerréotype process are avoided.

The invention also relates to an apparatus for carrying out the method outlined hereinafter, and particularly adapted for the production of large numbers of copies.

According to the invention, a sensitized silver plate on which a latent reproduction of an original has been formed transfers the image directly or indirectly onto a receiving material, on which it is rendered visible and fixed. In this manner it is possible to use a silver plate (wherein this term should also be read to include a silver coating applied to a carrier) several times, since the deposit or surface coating producing the sensitizing may be removed and/or replaced after the termination of one process. Of importance is also the use of another receiving material which may be, for example, a paper, and preferably a baryte paper or a paper coated with a colloidal substance. Such receiving materials are inexpensive, commercially available, and easily handled.

Prior to dealing in detail with the various preferred embodiments of the method of the invention, it is pointed out that it is known to produce on a sensitized silver plate a latent picture by means of a brief exposure, and a visible picture by a long exposure. Also these possibilities are used in the different variations of the invention.

According to the invention, the silver plate may be sensitized not only by evaporation as described above, but also by brushing with, or more conveniently by dipping into, a sensitizing solution. This solution consists preferably of iodine or mixtures of iodine, chlorine and bromine in highly volatile organic solvents, e.g., alcohol, acetone or carbon tetrachloride.

According to the invention, after the exposure of the reproduction the silver plate is brought into intimate contact with a receiving material under application of a photographic developing solution, and the receiving material is detached after a time sufficient for transferring the picture to the receiving material. This produces a negative copy of the original which is readable, that is to say, it is not reversed.

A photographic developer may be defined for the purposes of this application as a chemical developing solution, such as is known for carrying out the silver-salt-diffusion reproduction process, and is marketed under the trade name Agfacopygrafid. Such developers are commercially available and need not be specially formulated.

According to one embodiment of the invention, the photographic developer is applied to the silver plate before the receiving material is applied thereto in a layered relationship, while in another embodiment, the photographic developer is applied to the receiving material before the same is applied to the silver plate.

In the former case, the sensitized silver plate is exposed through an original only for a short period so that a latent picture is produced on the plate. Then the plate is exposed to the action of a quick-acting, chemical photographic developer and preferably to the silver-salt-diffusion developer mentioned above, while forming a surface coating. This surface coating may be applied by dipping, brushing, spraying or any other means known in the art. After a comparatively short initial development period, the surface of the silver plate is brought into intimate contact (i.e. superimposed) with a photographic paper, preferably a so-called baryte paper. During this stage, the silver blackened by the developer and only loosely adhering to the plate is transferred to the paper, that is to say, to the receiving material. This transfer is a physical process which may, however, be promoted and affected by certain additives in the developer or receiving material. The transferred silver forms on the receiving material a negative copy of the original, corresponding to the exposed portions of the silver plate; this copy is a non-reversed copy.

The duration of the layered contact between the silver plate and the receiving material is important for the quality of the picture produced. Preferably, the receiving material should be detached shortly after the onset of the blackening of the image. After the onset of darkening, a certain period must not be exceeded, because other-
wise the silver again becomes fixed to the plate and will be prevented from being detached sufficiently to form a transfer reproduction. The exact timing may easily be determined by tests. Since the timing may be affected by the properties of the developing solution and the type of receiving material used, accurate data are unnecessary, and the statement that a limited time of the blackening should not be exceeded is sufficient to permit one to carry out the method according to the invention.

The preceding statement also indicates that the silver is supplied substantially from the silver plate so that the restriction of the developing time is expedient from the viewpoint of a good surface structure. Moreover, according to the invention, the plate is preferably cleaned prior to a subsequent further sensitizing by means which have a smoothing effect on its surface. Particularly suitable means for this purpose are brushing or lapping rollers.

According to a preferred embodiment of the variation hereinbefore described, the sensitized silver plate is briefly exposed with blue light, preferably for a duration of about eight seconds. After this exposure, the silver plate is conveniently dipped into a photographic developer for a period of about ten seconds. The layered application of the receiving material is preferably effected under contact pressure.

While in the preceding embodiment, the exposed silver plate is treated with the developer, in the above-mentioned second embodiment of the invention, the developer is applied to the receiving material. This developer is conveniently a solution containing about 7 percent by weight sodium sulphite, about 0.7 percent by weight meiol, about 1.7 percent by weight hydroquinone and about 2.7 percent by weight sodium hydrosulphite, as well as water.

This method has the advantage that the wetting of the silver plate can be controlled to the degree just sufficient without requiring any special expenditure. An additional advantage lies in the practical execution of the method because the handling of the receiving material, for example its transport to a known surface-wetting apparatus or the like, may be more easily effected than the corresponding handling of the silver plate.

The receiving material is brought in its wet condition into close surface contact with the silver plate containing the latent image. Such contact may be effected under pressure. In consequence of this contact, the silver picture is developed as described above and removed with the receiving material by detaching the latter within the period of time specified hereinbefore. Also in this case a negative copy of the original is formed and the properties of this copy are also affected by the timing of the removal of the receiving material from the plate.

A further preferred embodiment of the invention is again based on producing a latent picture in the silver plate by means of a short-duration exposure thereof, whereupon the plate is subjected to a comparatively short-duration action of a developer, such as Agafacopyrapid developer or the developer known and commercially available under the trade name "Gevaert." In this case, a short-duration development is essential. The silver plate is dipped into the photographic developer solution for a period of, say, one second. However, a corresponding wetting of the surface may also be effected by spraying or the like, in which case the control of the film of solution applied will replace the control of the immersion time. This has given surprisingly and unexpected result that, say, after dipping, the developer is distributed only over the exposed portions of the silver plate and forms thereon a fluid film according to the picture. During the contact with the receiving material, this film is directly transferred to the receiving material so that it can be used thereon, by virtue of the alkaline reactions of photographic developers, directly for triggering off the reactions forming the picture. During this process, color reactions and other contrast forming reactions are sustained in the alkaline medium, as demonstrated by the example given further below.

In principle it should be stated that the reference to the use of a photographic developer solution represents only a preferred embodiment. It is also possible to use other liquids acting by virtue of automatic distribution to portions determined after the onset of the outlines of the picture, and having properties which permit reaction with other media in order to produce a visible picture.

The production of the limited fluid film covering only portions of the silver plate depends on the quality of the sensitization and on the effects of the developer. Values which have a particular advantage are given in one of the examples further below. This embodiment of the method according to the invention yields a negative copy.

All methods mentioned so far are based on a latent picture produced on the sensitized silver plate by means of a short-duration exposure.

In order to obtain according to the invention also a positive copy without the use of an additional intermediate material, there is effected according to a further feature of the invention during the development of a silver plate, which has first been sensitized and then exposed for a short period, a second exposure after the application of the photographic developer on this silver plate, and exposure may be effected, for example, by a short incidence of light for a period of about ten seconds, and causes the picture on the silver plate to be reversed. This reversal of the picture by means of a second exposure is known in the art from other applications. According to the method of the invention, after the second exposure, the receiving material is applied as hereinbefore described and receives a reversed picture if only a portion is exposed.

The quality of the obtained picture may be further improved by brushing the receiving material additionally with a potassium halide, and more particularly with potassium iodide. The values indicated in the examples are empirical values valid particularly in conjunction with the example given, and are not intended to express any limitation.

In the following other advantageous embodiments of the method of the invention will be described, based on a visible picture produced on a sensitized plate by means of a more prolonged exposure.

According to one embodiment, a receiving material is used which consists of a photographic paper (e.g. baryte paper), and is coated with a potassium iodide solution as developer. Next the paper is placed in close layered contact with the silver plate and the receiving material is applied as hereinbefore described. After detaching the receiving material, the same carries a negative copy of the original. Without attempting to give a certain definition, this process might possibly be explained in that this copy is substantially effected by the iodine liberated by the exposure.

According to yet another embodiment of the invention, an intermediate material is used. This intermediate material may be, a rubber cloth, a plastic foil, or a similar sheet, treated with a potassium halide solution, preferably, with potassium iodide solution. Also this embodiment of the method of the invention is based on a visible picture produced by prolonged exposure. The intermediate material prepared in the manner outlined above is brought into close surface contact with the picture to be copied.

After removing the intermediate material, the picture transferred thereto is reinforced by the action of halide and preferably iodine vapors, where the chemical, for example, the iodine is deposited according to the reproduction of the original, such as a printed copy. Then the picture may be transferred to a sensitized plate, such as a reaction paper having a reactive substance responsive to iodine. By way of example, starch can be used for an iodine reproduction. The iodine applied to the starch causes the starch to assume a blue color, that is to say, the development is a color reaction. Thus, means of
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an intermediate material a positive copy may be produced.

In addition to the embodiments given for the receiving materials it should also be noted that glued papers may be used with advantage, having preferably an additional preparation with baryting or brushing with conventional colloidal coatings, such as gelatine, polyvinyl alcohol or the like.

The individual embodiments of the invention will be further described in an exemplified manner with reference to the following examples, in which the numerical data given represent merely particularly preferred specifications.

Example 1

A cleaned silver plate is dipped for about 5 seconds into a slightly heated solution of 2 grams of iodine in 200 ml. of carbon tetrachloride and then exposed for about 8 seconds to blue light (125 w.) with a bulb glass distance from the silver plate of 8.5 cm. A transparent original is used which is placed adjacent the silver plate and in contact therewith between the plate and the light source. Then the plate is dipped for about 10 seconds into a developer, such as Agfa or Gevaert Copyapid developer, containing silver halide solvents and known in the art for use in silver salt-diffusion processes. The plate is immediately afterward brought, by means of a pressure roller, into contact with a sheet of baryte paper, whereby the developed picture is transferred as a nonreversed, negative copy to the paper.

The following composition for the diffusion developer is given merely by way of example:

<table>
<thead>
<tr>
<th>Component</th>
<th>Grams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium sulphite (95%)</td>
<td>1.14</td>
</tr>
<tr>
<td>Sodium hydroxide (tablets, pure)</td>
<td>0.12</td>
</tr>
<tr>
<td>Potassium roxane (Erg. B 6)</td>
<td>0.12</td>
</tr>
<tr>
<td>Mercapto benzenothiazol (p.A.)</td>
<td>0.0015</td>
</tr>
</tbody>
</table>

Example 2

The cleaned silver plate is sensitized and exposed as described in Example 1. Then a sheet of baryte paper is treated with a very rapidly acting developer and applied under contact pressure by means of a roller to the plate, yielding a clear, nonreversed, negative copy of the original on the paper. The time for development is substantially 1 to 2 seconds. The used developer was the following solution:

<table>
<thead>
<tr>
<th>Component</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>300 ml</td>
</tr>
<tr>
<td>Sodium sulphite</td>
<td>20 g</td>
</tr>
<tr>
<td>Sodium hydroxide sulphate</td>
<td>2 g</td>
</tr>
<tr>
<td>Hydroquinone</td>
<td>5 g</td>
</tr>
<tr>
<td>Sodium hydroxide</td>
<td>8 g</td>
</tr>
</tbody>
</table>

Example 3

A well cleaned plate is placed for about 4 seconds into a solution of iodine in carbon tetrachloride, then exposed for about 10 seconds with blue light and finally dipped briefly for about 1 second into a developer from the silver salt-diffusion process. The adhering developer runs off the unexposed portions but remains adherent to the exposed portions. Then the liquid picture is transferred by contact pressure to a receiving material, such as paper which has been preliminarily prepared with a coloring substance, such as, alizarin.

Example 4

A cleaned silver plate is placed for about 8 seconds in a solution of 2 grams of iodine in 200 ml. of carbon tetrachloride and exposed until a visible picture has formed (about 2–3 minutes with blue light, or 8–10 minutes with yellow light). Then a sheet of baryte paper is wetted with a 30% potassium iodide solution and placed under contact pressure against the plate, yielding a negative reproduction of the original.

Example 5

The cleaned silver plate is sensitized and exposed as described in Example 4. Then the obtained visible image is transferred to a rubber cloth wetted with a 30% potassium iodide solution and pressed against the plate. The rubber cloth, carrying the copy is held for about 2 seconds over iodine vapors (solution of iodine in carbon tetrachloride), causing the iodine to be first deposited at the points corresponding to the composition of the original. This iodine picture can now be transferred under contact pressure to a paper wetted with starch solution and gives by means of the resulting starch color reaction a positive print of the original.

The preceding examples contain essential characteristics relating to the duration and compositions required for the individual processing steps; although these data have not been repeated in all the examples given, they apply also to other examples, where no specific data have been mentioned.

The apparatus for carrying out the method according to the invention comprises a cylinder, the shell of which is provided with a silver coating, wherein the said shell is rotatably guided between contact and/or application rollers and cleaning rollers, and comprising further in contact with the said shell at least one radiatable cylinder of a transparent material, for example, glass or plastic, which cylinder surrounds at least one light source.

Conveniently, the cylinder is associated during one revolution thereof successively with a surface-application device for the sensitizing media, an exposure device with a contact pressure cylinder and at least one further contact pressure device, such as a contact-pressure roller or a belt pressure arrangement for a receiving material. The arrangement also comprises, between the further contact pressure device or devices and the exposure cylinder a surface-wetting device for applying a liquid developer. In one embodiment of the invention, the surface-wetting device is associated with the cylinder having the silver surface.

According to another embodiment, this surface wetting device is associated with a guide whereby the receiving material is applied to the cylinder upstream of the contact pressure roller or rollers.

According to a further feature of the invention, there is arranged between the contact roller or rollers and the surface-wetting device for applying the sensitizing solution, at least one cleaning roller, and preferably a roller brush, in association with the silver cylinder, driven in the opposite sense of rotation to that of the cylinder so that it has at the same time a smoothing effect.

According to a further feature of the invention, there is provided in the above-mentioned use of a liquid for sensitizing the plate by means of a sensitizer dissolved in a volatile solvent, between the surface wetting device for applying the sensitizing solution and the exposure device, also a drying device, for example a device comprising a blower supplying warm air.

The apparatus for carrying out the method of the invention will be further described by way of example with reference to the accompanying drawing.

These drawings represent diagrammatically two embodiments of the apparatus in sectionalized side elevation, showing merely the elements necessary for explaining the operation of its parts; the relative movements of driving elements are indicated by arrows. Moving elements are mounted by conventional means in wall portions of the housing extending parallel to the plane of the drawings wherein the said mounting may comprise spring-loaded bearings in order to produce a pressure effect. A chamber behind one of the housing walls serving to hold the bearings may contain a special space for the electric terminals and driving means, and for storage tanks and pumping devices for the liquids used in the treatment.
In the drawing:

FIG. 1 is a side elevation of one embodiment of the invention in cross-section;
FIG. 2 is a side elevation of another embodiment of the invention in cross-section;
FIG. 3 is a sectionalized partial view along the line III—III in FIG. 1 and shows the mounting of the rollers in the housing walls;
FIG. 4 is a diagrammatic representation of the actuating circuit, for example for the apparatus according to FIG. 1; and
FIG. 5 is a part of the apparatus according to FIG. 1 explaining an additional embodiment.

The arrangement of the examples given hereinbefore it should be noted that the apparatus of FIG. 1 is suitable for carrying out the method of Examples 1 and 3, and the apparatus according to FIG. 2 for carrying out the method of Example 2.

According to FIG. 1, a cylinder 2 is rotatably mounted in the cylinder 2 is made of a base material, such as plastic, hardboard, or the like, and has an external shell or coating 3 of silver. Its sense of rotation is indicated by the arrow 4. It may be equipped with its own drive, but may also be rotated by rollers acting upon its circumference. The cylinder 2 may have a hub 64 and be supported by spokes 65, 66, 67, etc., one axis 67 of the cylinder is located within this hub and may be driven after the manner shown in FIG. 3. Alternatively, the inner periphery of the cylinder may be equipped with a rack 68 or internal gear which meshes with a driving pinion 69.

In the drawing, the spoke 66 is broken away in order to show the driving pinion 69. In the sense of rotation of the shell 3 of the cylinder 2 there are arranged successively for collaboration therewith, a surface-wetting device with a liquid-application roller 5, driven in the direction of the arrow 6 and revolving in a storage tank 7 for the sensitizing solution, a drying station 8 with a blower supplying hot air which is blown on the shell 3 and vented through a side wall, by means not shown. This drying station 8 is equipped with lateral guide faces 70, 71, extending parallel to the axis of the cylinder 2 in order to prevent the uninhabited passage of hot air from the drying station. The chamber formed by the guide members 70, 71 has on one side an inlet connected with a blower 72 (FIG. 4) and an outlet on the other side.

After the drying station 8 follows (as viewed in the direction of rotation of the cylinder 2) a cylinder 10 made of glass and revolving in the direction of the arrow 9; the cylinder 10 contains a light source 11, preferably equipped with a reflector 12. Naturally, a slight contact pressure may be produced between the cylinder 10 and the shell 3. A further surface wetting device, for example, an application roller 14 driven in the direction indicated by the arrow 15 and revolving in a tank 15 for a liquid developer, is located ahead of the exposure station 10 (as viewed in the direction of the arrow 4). This roller 14 is so associated with the shell 3 that the shell is uniformly wetted. Reference numeral 16 indicates a contact pressure roller driven in the direction of the roller 17 and made of an elastic material, such as rubber, plastic or the like, and having at least on its peripheral surface a coating resistant to attack by chemicals. Preferably this roller is resiliently mounted and is radially urged in the direction of the cylinder 2 as indicated by the diagrammatically illustrated spring 18.

Around the remaining portions of the shell 3, there are arranged between the contact pressure roller 16 and the application roller 5 cleaning means in the form of roller brushes 19, 20, 21, which are so driven in the direction of the arrows 22, 23 and 24, that their sense of rotation is opposite to that of the cylinder in order to improve the frictional contact between them and the cylinder 2.

If the contact pressure of the group of roller brushes is such that an entrainment of the cylinder by the roller 5, 14, 16 and the cylinder 10 cannot be guaranteed, an independent drive must be provided for the cylinder by means known in the art, through an axis of this cylinder, not shown, or by means of a gear rim 68 located on the cylinder.

The parts mentioned hereinbefore are mounted in a housing 1. This housing has on one side thereof two adjacent inlet slots 25, 26, between which is arranged an outlet slot or delivery slot 27. The original is inserted in the direction of the arrow 28 through the slot 25 and directed by guide members 29, 30 to the exposure cylinder 9 that the latter entrains the original along the shell 3 and carries out an exposure of the surface 3 through the master. On the side of the cylinder 9 remote from the exposure opening of slots a guide member 31 associated with a guide member 32 effects the return of the original to the delivery slot 27.

These guide members are mounted on the housing walls located in and parallel to the plane of the drawing. Accordingly, also the storage tanks 7 and 15 for the liquid are mounted on the walls.

Naturally, the insertion channel may have at the point indicated by the arrow 28 switches for actuating either only the light source or all actuating circuits according to whether an original has been inserted. Switches of this kind are known in the art. Moreover, the wetting stations, that is to say the embossing shown in the rollers 5 and 14, may be removed from the cylinder in order to permit rotation thereof for cleaning purposes merely in conjunction with the actuated brush drive.

Furthermore, the wetting arrangement shown herein may also be replaced by other arrangements, such as spray devices or the like.

The inlet slot 26 leads between the housing base 33 and the guide member 32, extended by the guide elements 34, 35 so as to form a channel 36, and terminates at the contact pressure roller 16 so that an image-receiving material inserted into the slot 26 is pressed against the cylinder shell 3 wetted with developer. The travels are so dimensioned that receiving material of conventional size may be sufficiently advanced by hand to enable its leading edge to reach the roller 16. The travels between the inlet slots and the exposure cylinder 10 on the other hand, and the contact pressure roller 16 on the other hand, are so dimensioned that with the same introduction of the original and of the receiving material, the latter makes contact with the exposed portions of the shell 3. In the direction of the arrow 4, the roller leads to an outlet channel 39, defined by guide elements 37, 38 and thus to an outlet 40.

FIG. 2 shows a similar arrangement in which parts corresponding to those shown in FIG. 1 are marked with the same reference numerals. An essential difference between this embodiment and the embodiment of FIG. 1 is that the cylinder 10 with the light source, a wetting device, for example, an application roller 41 and a storage tank 42 for the liquid developer, is associated with the channel 43 which has at this point an aperture 43 into which projects the roller 41. In order to advance the receiving material, this roller 41 driven in the direction of the arrow 44.

In the direction of revolution of the cylinder 2, indicated by the arrow 4, there follow next several contact pressure rollers 45, 46, 47, 48, 49, driven in the directions indicated by the arrows 50, 51, 52, 53 and preferably mounted resiliently so as to produce an elastic contact pressure on the shell 3 radially relative to the cylinder 2 in the direction of the spring arrows 54, 55, 56, 57 and 58.

Behind the roller 49, there is a guide element 60 leading to the outlet 59 which lifts the receiving material off the cylinder and removes it from the housing. Also here, there is arranged between the contact pressure roller arrangement and the application station 5, 7 for a sensitizing medium at least one cleaning roller, and more particularly a roller brush 61, revolving in the direction opposite to
that of the cylinder 2, as indicated by the arrow 62 and already described before.

When adjusting a certain operating speed, it may be seen from the foregoing that it is possible to define the contact pressure period by the length of the arrangement of contact pressure rollers or by the number of contact pressure rollers. This arrangement of contact pressure rollers could also be replaced by a belt arrangement, having only belt pulleys, corresponding to the rollers 45 and 49, about which pass one or more elastic belts 63 which ensure a surface contact pressure with the cylinder. This belt arrangement is indicated in the drawing by dotted lines.

The lengths of the individual zones may also be determined by increasing the dimeter of the cylinder 2 so as to provide more space for a longer travel. This applies, for example, where a certain duration of the application of the developer, is to be ensured.

For applying the liquid required for the treatment it is also possible to use nozzle arrangements which may be more easily mounted in a movable manner than the rollers, 4, 14, or 41, respectively, and whose rate and duration of delivery may be defined the duration of operation and capacity of a pump.

The arrangements discussed also show clearly that a second exposure may easily be carried out after the application of the liquid developer, for example, by arranging in FIG. 1 a second exposure station between the roller arrangement 14 and the contact pressure roller 16.

FIG. 3 shows a section of the arrangement according to FIG. 1. This section comprises the lower portion of the cylinder 2, the first exposure cylinder 10', the liquid applicator with the roller 14', a second exposure cylinder 73 and the contact pressure roller 16'.

FIG. 3 shows, merely by way of example for the mounting of the parts, a cross-section along the line III-III of FIG. 1 through the mounting of the roller 16 and the cylinder 2, the parts themselves not being shown in cross-section. It may be seen that both parts are mounted between end walls 74, 75 of the frame and located therein. A further end wall 76 is provided in spaced relationship to the end wall 75 and forms therewith a chamber receiving the driving units and terminals.

The stub axles 77, 78 of the roller 16 pass through journals 79, 80. These journals are movable in oblong slots 81, 82 radially with respect to the cylinder 2 and are blanked by means 83, 84, provided on the side remote from the cylinder 2. These springs are located in the said slots. The rollers are axially guided in slotted covers 85, 86 on the walls 74, 75.

The ends 87, 88 of the cylinder axis 67 are located in bearing arrangements 89, 90, located in the walls 4, 75. The stub 78, or the end 88, respectively, have a driving pulley 91, 92, forming part of the main transmission drive.

According to FIG. 4 the drive circuit has an electric terminal 93 which may be energized from a main switch 94. The connected circuit 95 contains the light source 11 operating in conjunction with a rheostat 96. A drive motor 97 is connected in parallel to the light source circuit. This motor drives the transmission 98 to which are connected the parts described, one of which is formed by the part 72 of the blower unit. This transmission may comprise belts or a gearing with several take-off shafts for the individual sub-assemblies driven at the same speed.

Having thus fully disclosed my invention, what I claim and desire to secure by Letters Patent is:

1. A method of producing a copy of a master with a metallic silver layer and an image-receiving layer, comprising the steps of:
   (a) sensitizing said metallic silver layer by treating it with at least one halogen from the group which consists of iodine, bromine and chlorine;
   (b) exposing the silver layer sensitized in step (a) in juxtaposition with said master to form a latent image on the sensitized silver layer;
   (c) applying a photographic liquid developer to one of said layers after exposure of said silver layer in step (b), bringing said layers into surface contact to form a visible reproduction upon said image-receiving layer, and separating said image-receiving layer from said silver layer;
   (d) cleaning the silver layer after the separation of said image-receiving layer therefrom to remove the sensitized coating and;
   (e) repeating steps (a) through (c) with an intervening cleaning of said silver layer in step (d) between repetitions.

2. The method defined in claim 1 wherein the liquid developer is applied in step (c) to said image-receiving layer prior to bringing said layers into surface contact with one another.

3. The method defined in claim 1 wherein said liquid developer is applied to said silver layer in step (c) prior to bringing said layers into surface contact with one another.

4. The method defined in claim 1 wherein:
   said image-receiving layer is a baryte paper;
   said liquid developer is an aqueous solution containing about 7% by weight sodium sulphite, about 7% by weight p- monomethylaminophenol sulfmate, about 1.7% by weight hydroquinone and about 2.7% by weight sodium hydroxide;
   the sensitizing of said silver layer in step (a) is effected by treating said silver layer with a slightly heated solution of said halogen for a period of about 5 seconds; and
   said silver layer is exposed for a period of at least 10 seconds in step (b).

5. The method defined in claim 1 wherein said silver layer has an endless surface displaceable in a closed path to effect said repetition, said silver layer being exposed in step (b) for a relatively short exposure period sufficient to form an invisible latent image on the sensitized silver layer but insufficient to render said latent image visible, said developer being applied to said silver layer in step (c) by briefly contacting said silver layer with said liquid developer thereby depositing said liquid developer on zones of said image, the visible reproduction on said image-receiving layer being formed by transfer of liquid from said sensitized silver layer to said image-receiving layer and sustaining an interaction between a coloring substance on said image-receiving layer and the liquid transferred thereto.

6. The method defined in claim 5, further comprising the steps of exposing said silver layer in step (c) to light after the application of said liquid developer to said silver layer and prior to bringing said layers into surface contact to form a reverse image reproducible on said image-receiving layer upon bringing said layers into surface contact with one another.

7. The method defined in claim 5 wherein the coloring substance is an alizarin-based or potassium iodide based material.

8. The method defined in claim 1 wherein said silver layer has an endless surface displaceable in a closed path to effect said repetition, said silver layer being exposed in step (b) for a relatively long period sufficient to produce a visible image therefrom prior to step (c) and said image-receiving layer is treated with a potassium halide solution to form said visible reproduction upon said image-receiving layer upon bringing said layers into surface contact with one another.

9. The method defined in claim 8 wherein said silver layer is exposed for a period of 2 to 3 minutes to blue light.

10. The method defined in claim 8 wherein said silver layer is exposed in step (b) for a period of 8 to 10 minutes to yellow light.

11. The method defined in claim 8, further comprising
the step of exposing the reproduction upon said image-receiving layer after separation thereof from said silver layer in step (c) to halide vapor, bringing the image-receiving layer thus treated into surface contact with a flat surface previously treated with a substance capable of reacting with the halide.

12. The method defined in claim 11 wherein said image-receiving layer is wetted with a substantially 30% potassium iodide solution, the image-receiving layer is treated for about 2 seconds with iodine vapor constituting said halide vapor, and substance capable of reacting with said halide is starch.

References Cited

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Patent Number</th>
<th>Date</th>
<th>Inventor</th>
<th>Classification</th>
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<td>3,142,567</td>
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U.S. Cl. X.R.