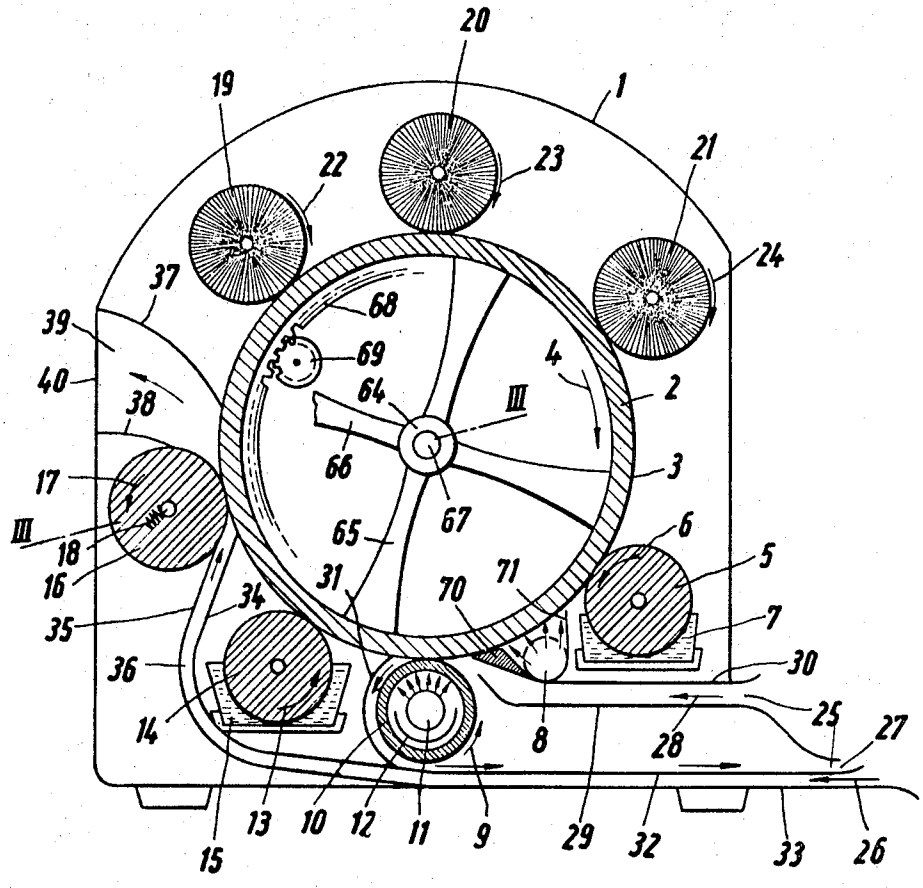
Dec. 29, 1970 W. LIMBERGER ET AL 3,551,049
PHOTOGRAPHIC METHOD FOR PRODUCING A COPY AND APPARATUS FOR CARRYING OUT THIS METHOD
Original Filed March 10, 1964 3 Sheets-Sheet 1

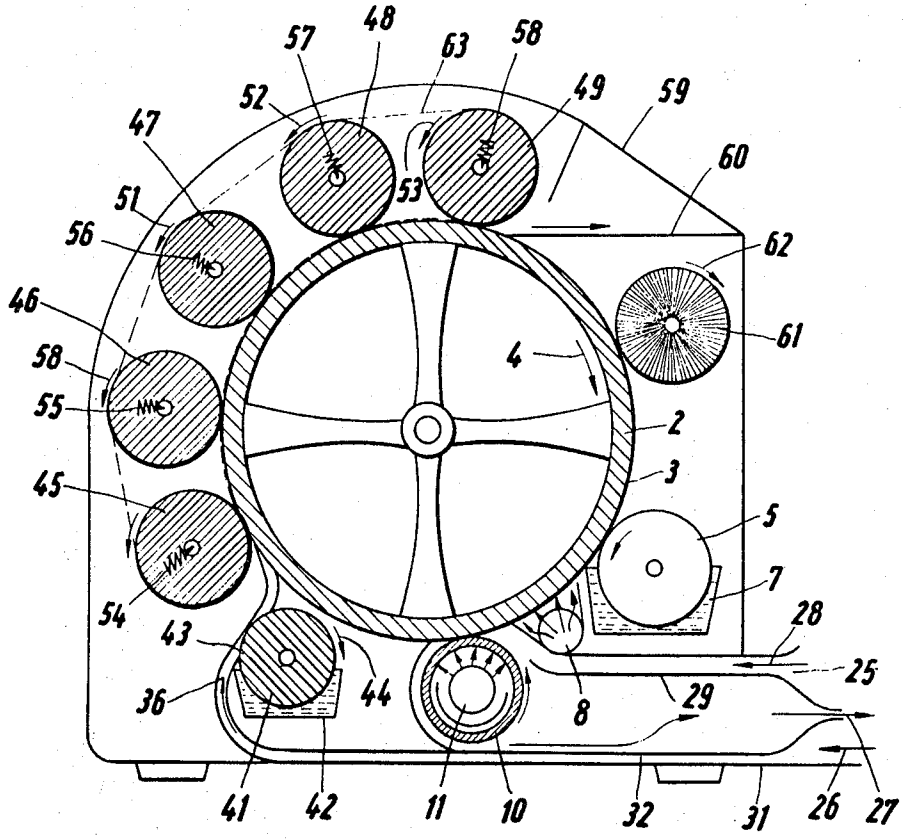
Fig. 1



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Fig. 2



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Original Filed March 10, 1964 3 Sheets-Sheet 3

Fig. 3

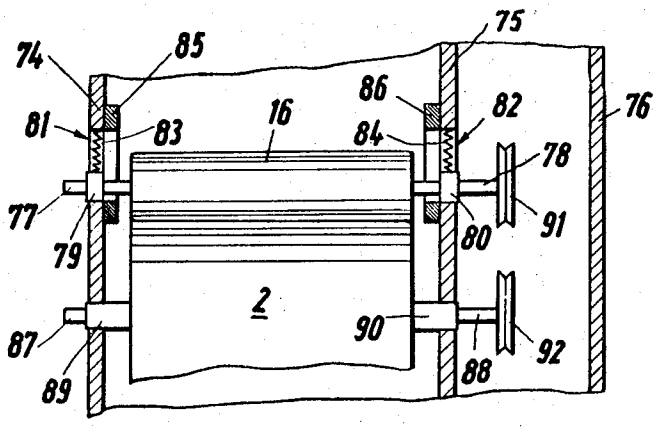


Fig. 4

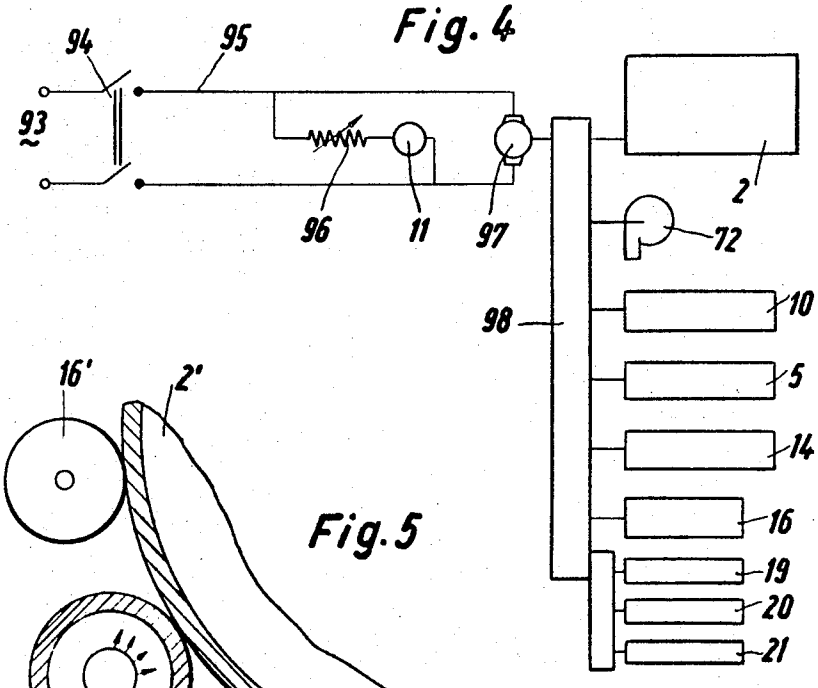


Fig. 5

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3,551,049

PHOTOGRAPHIC METHOD FOR PRODUCING A COPY AND APPARATUS FOR CARRYING OUT THIS METHOD

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Original application Mar. 10, 1964, Ser. No. 353,015, now Patent No. 3,416,920. Divided and this application Aug. 22, 1968, Ser. No. 802,298
Claims priority, application Germany, Mar. 14, 1963, L 44,359
Int. Cl. G03b 27/18
U.S. Cl. 355—107 4 Claims

ABSTRACT OF THE DISCLOSURE

An apparatus for manufacturing a reproduction by photographic means comprising a silver plate in the form of a cylinder, the outside of which is provided with a silver coating, a light source, a first wetting device to apply sensitizing media to the silver surface before exposure to the original, a second wetting device to apply developer after such exposure, contact pressure rollers around the circumference of the cylinders and guide channels for the proper routing of original and copy within the apparatus. The cylinder is rotatably located on a frame, the wetting devices and contact pressure rollers located at points along its circumference while the entire assembly is enclosed within a single housing. At each point along the circumference, the apparatus is so constructed as to allow each step in the reproduction process to be performed automatically after manual insertion of the original and image receiving paper. Copies are produced by bringing the receiving layer into physical contact with the developed image on the silver surface.

This is a division of application Ser. No. 353,015, originally filed, Mar. 10, 1964, now Pat. No. 3,416,920, for Photographic Method for Producing a Copy and Apparatus for Carrying Out This Method.

The present invention relates to a photographic method for 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 Daguerreotype process in which a silver plate is first exposed to the action of iodine vapours in order to form a light-sensitive silver iodine layer. It is also known to cause the development after exposure by means of mercury vapors, or by pyrogallol or iron oxalate developers. The medium absorbing the picture, that is to say, the picture developed on the silver surface and fixed with sodium chloride or a sodium thiosulphate, is 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, an 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, 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 Daguerreotype process has mainly the disadvantage that this method of producing pictures is uneconomical, in view of the fact that the picture is to be permanent whilst 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 Daguerreotype 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 Daguerreotype process are avoided.

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

According to the invention, based on a sensitized silver plate on which a reproduction of an original has been exposed, this exposed reproduction is transferred directly or indirectly on to a receiving material, on which it is rendered visible and fixed. In this matter 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 processing. Of importance is also the use of another receiving material which may be, for example, a paper, and preferably a baryta paper or a paper coated with a colloidal substance. Such receiving materials are cheap, 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 short exposure time, and a visible picture by means of a long exposure time. 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 organic solvents such as, for example, alcohol, acetone or carbon tetrachloride, which are preferably very volatile.

According to the invention, after the exposure of the reproduction the silver plate is brought into layered relationship with a receiving material under application of a photographic developing solution, and the receiving material is detached after a certain time which is 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 specification as a chemical developing solution, such as is known in a preferred embodiment for carrying out the silver salt diffusion process, and marketed, for example, under the trade name of Agfacopyrapid developer. Such developers are commercially available and need not be specifically 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. According to another preferred 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 known silver salt diffusion developer, whilst 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 developing period, the surface of the silver plate is brought into intimate layered contact with a photographic paper, preferably with a so-called baryta 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 supported 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 picture. After this moment, a certain period must not be exceeded, because otherwise the silver will again be fixed to the plate and will be prevented from becoming detached sufficiently to form a picture. 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 duration after the onset of the blackening should not be exceeded is sufficient 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.

Whilst in the preceding embodiment, the exposed silver plate is treated with the developer, in the above-mentioned second preferred 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 metol, about 1.7 percent by weight hydrochinon and about 2.7 percent by weight sodium hydroxide, as well as water. This method has the advantage that the wetting of the sliver plate can be controlled by means of a just sufficient amount 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 picture. Such contact may be effected under contact 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 Agfacopyrapid developer or the developer known and commercially available under the trade name "Gevaert." In this case, the 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 a quantity control of the film of solution applied will replace the control of the dripping time. This has given the surprising 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 included 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 reacting in their automatic distribution to portions determined by the outlines of the picture, and having properties which permit after application reactions 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 been found particularly advantageous 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 to this silver plate. This second 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 said 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 particular embodiment, also in this case a receiving material is used, consisting of a photographic paper, for example, baryta paper, and coated with a potassium iodide solution as developer. Next the paper is placed in close layered contact with the picture to be copied. After detaching the receiving material, the same carries a negative copy of the original. Without attempting to give a certain definition, this process might pos-

sibly 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, for example, a rubber cloth, a plastic foil, or a similar sheet, treated with a potassium halide solution, and 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 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 receiving material, such as a reaction paper having a reactive substance responsive to iodine. By way of example, starch may be used in conjunction with an iodine reproduction. The iodine applied to the starch causes the starch to assume a blue colour, that is to say, a colour reaction. Thus, by means of 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 grammes of iodine in 200 ml. of carbon tetrachloride and then exposed for about 8 seconds at 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 e.g. Agfa or Gevaert Copyrapid developer, containing silver halide solvents and known in the art for use in the silver salt diffusion process, and is immediately afterwards brought by means of a pressure roller into contact with a sheet of baryta paper, whereby the developed picture is transferred as non-reversed, negative copy to the paper. The following composition for a normal diffusion developer is given merely by way of example:

143 grammes sodium sulphite siccum—(95%)
30 grammes sodium hydroxide—(tablets, pure)
0.12 grammes potassium rodanide—(Erg B 6)
0.0015 gramme hercapto benzthiazol—(p.A.)

EXAMPLE 2

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

300 ml. water
20 gr. sodium sulphite
2 gr. p-monomethyl aminophenolsulphate
5 gr. hydrochinon
8 gr. sodium hydroxide

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 suitable for the silver salt diffusion process. The adhering developer runs off the unexposed portions but remains adhering 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 colouring substances, such as, e.g. alizarin.

EXAMPLE 4

The cleaned silver plate is placed for about 8 seconds into a solution of 2 grammes 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 baryta paper is wetted with a 30% potassium iodide solution and placed under contact pressure against the plate, yielding a negative copy of the original.

EXAMPLE 5

The cleaned silver plate is sensitized and exposed as described in Example 4. Then the obtained visible picture 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 wheel of which is equipped 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 rotatable cylinder of a transparent material, such as, for example, of 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 equipped with a silver shell. According to another preferred 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 drawings.

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 movements of driving elements are indicated by means of arrows. Moving elements are mounted by conventional means in wall portions of the housing extending parallel to the plane of the drawing, wherein the said mounting may comprise sprung bearings in order to produce a definite 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 drawings:

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;

FIG. 5 is a part of the apparatus according to FIG. 1 explaining an additional embodiment.

In connection with the examples given hereinbefore it should be noted that the apparatus according to 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 according to Example 2.

According to FIG. 1, a cylinder **2** is rotatably mounted in a housing **1**; this cylinder **2** is made of a base material, such as plastic, hardboard, or the like, and has an external shell **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 the rollers affecting its circumference. The cylinder **2** may have a hub **64** and be supported thereon by spokes **65**, **66**, 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** into which engages 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 an 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 uninhibited 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, for example, of glass, and revolving in the direction of the arrow **9**, and containing a light source **11**, possibly 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 **13** and revolving in a tank **15** for a liquid developer, is located behind 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 arrow **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 arrow **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 their friction with 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 there 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 guided by guide members **29**, **30** so to the exposure cylinder **9** that the same passes the original along the shell **3** and carries out an exposure. On the side of the cylinder remote from the arrangement 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 the plane of the drawing. Accordingly, also the storage tanks **7** through **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 station, that is to say, in the embodiment shown 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 sprays 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 a 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 one 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 FIG. 1 embodiment is that behind 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 **36** which has at this point an aperture **43** into which projects the roller **41**. In order to advance the

receiving material, this roller **41** is 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 arrangement is indicated in the drawing by dotted lines.

The lengths of the individual zones may also be determined by increasing the diameter 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, for example, of the developer, is to be provided.

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, or the delivery of which may be defined in time and quantity by means 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. 5 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 to the cylinder **2** and are affected by springs **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 unit.

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 this light source circuit. This motor drives a 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 our invention, what we claim and desire to secure by Letters Patent is:

1. An apparatus for manufacturing a reproduction by means of a silver plate sensitized with a halide, and on which is produced a reproduction of an original, to which silver plate is applied, after exposure and under application of a developer, a flat receiving material in close surface contact therewith so as to transfer the reproduction to the said receiving material, comprising a frame, with the silver plate in the form of a cylinder the outside of which is provided with a silver coating, said cylinder being rotatably located in the said frame; a second rotatably mounted cylinder of a transparent material on the periphery of the first cylinder; a light source in the said second cylinder and so arranged that its radiation is directed towards the said first cylinder; a first surface wetting device at the said first cylinder in the direction of rotation thereof in front of the said second cylinder and serving to apply the sensitizing media on to the silver coating; a contact pressure roller arrangement mounted in a mounting in the frame so that it rests under elastic pressure against the said first cylinder; the arrangement of a first guide channel extending from one side wall of the housing in which there is provided an inlet to this first guide channel to the zone of contact between the said first and second cylinders which is opposite the sense of rotation of the said first cylinder; a second guide channel extending from the other side of this zone of contact to the side wall of the housing adjacent to the inlet for the first guide channel to a point forming the outlet of this second guide channel; a third guide channel located near the inlet or outlet, respectively, of the said first and second guide channels and extending to the zone of contact between the said first cylinder and the arrangement of contact pressure rollers to the side thereof opposite the sense of rotation of the said first cylinder; a fourth channel, extending from the zone of contact between the first cylinder and the arrangement of contact pressure roller, from the side located in the sense of rotation of the said first cylinder and leading to a second outlet in a wall of the housing; an arrangement comprising a second surface wetting arrangement between the third channel and the first cylinder for applying a developer to one of the parts comprising the silver coating of the first cylinder and the receiving material brought into surface contact with the silver coating; and driving means for driving the revolving parts.

2. An apparatus as claimed in claim **1**, comprising at least one cleaning device, and preferably a revolving brush, located in the sense of rotation between the contact pressure roller arrangement and the first surface wetting device for applying the sensitizing medium.

3. An apparatus as claimed in claim **1**, comprising a drying device located between the surface wetting device for applying the sensitizing medium and the second, transparent, cylinder, acting on the first cylinder, and mounted in the frame or housing.

4. An apparatus as claimed in claim **1**, comprising a second exposure device between the said second surface wetting device and the contact pressure roller arrangement, acting on the said first cylinder after the application of the developing medium and before the receiving material for transferring the picture is applied to the said first cylinder.

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