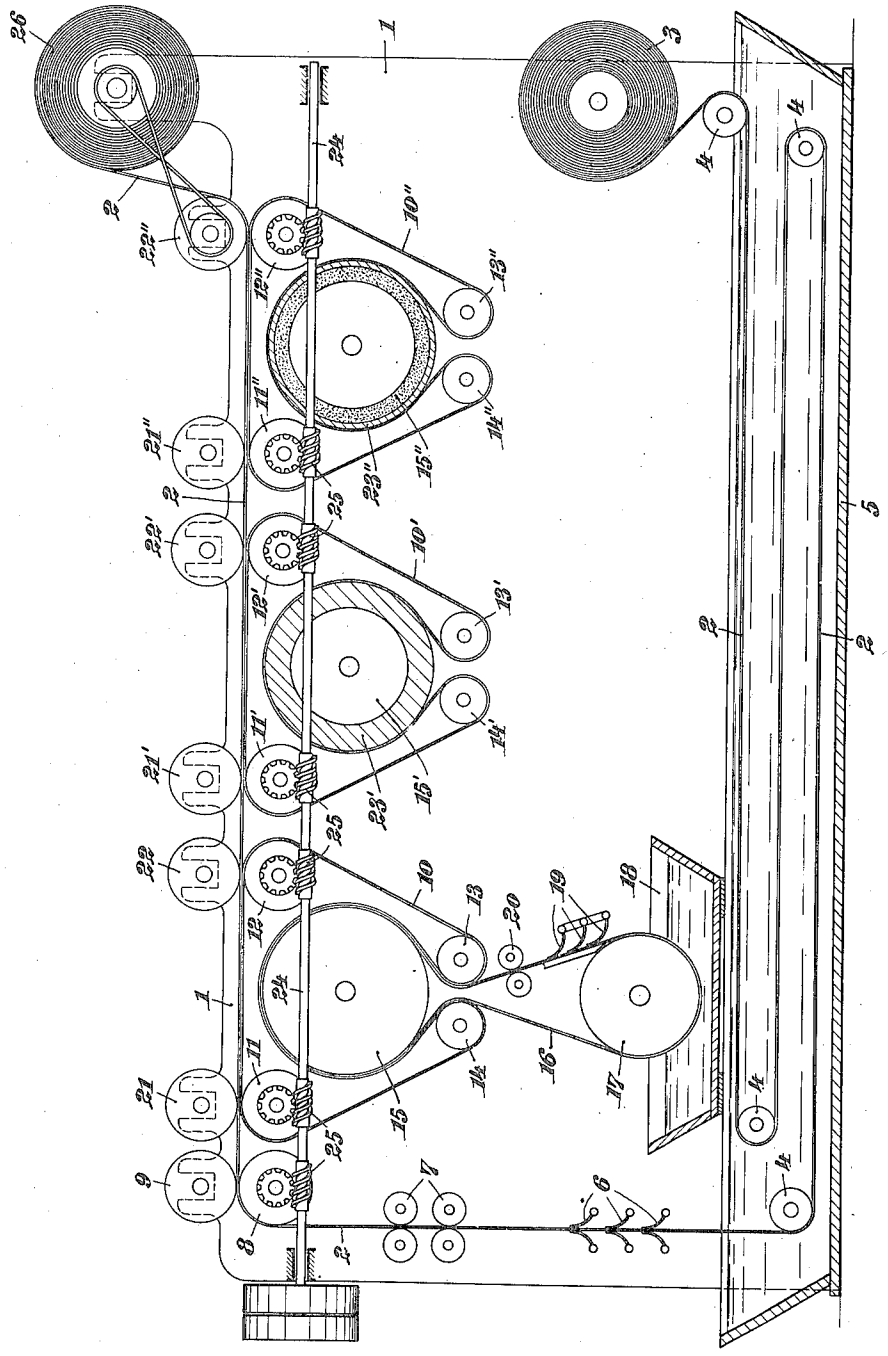
April 7, 1936. F. LIERG 2,036,945

PROCESS FOR THE PRODUCTION OF COLORED PICTURES, PARTICULARLY IN NATURAL COLORS ON PAPER, FILMS AND THE LIKE

Filed March 15, 1934



F. Lierg
INVENTOR
BY Marks & Clerk
ATTYS

Patented Apr. 7, 1936

2,036,945

# UNITED STATES PATENT OFFICE

2,036,945

## PROCESS FOR THE PRODUCTION OF COLORED PICTURES, PARTICULARLY IN NATURAL COLORS ON PAPER, FILMS, AND THE LIKE

Friedrich Lierg, Vienna, Austria

Application March 15, 1934, Serial No. 715,718
In Austria October 15, 1932

1 Claim. (Cl. 101—149)

This invention relates to a process for the production of colored pictures particularly in natural colors on paper, films and the like whereby colloid printing images produced by tanning in a picture-like manner or colloid relief images are soaked with a metallic salt solution yielding together with the electrolyte the color precipitate. The present invention has for its object the improvement of this process by carrying it out in an expeditious manner. It is already known to embody the reagent, yielding together with the electrolyte the color precipitate, into the printing surface in a water insoluble condition or in a state which can be removed by water with great difficulty only. In view thereof, the application of precipitating solutions after the printing is dispensed with, an image of perfect sharpness and shading being formed during the printing, because the electrolyte has no opportunity to spread over the printing layer. Consequently it is not necessary to wash away a precipitating liquid and remove the adhering liquid. The paper or the film can be preliminarily moistened for the whole print and provided with the color image is removed from the printing device. Care has to be taken that an excess of a solution of the electrolyte yielding color precipitates does not adhere to the printing matrices if they contact with the printing layer, seeing that the electrolyte is applied to the printing matrices before each printing operation.

Heretofore the electrolyte was applied to the printing matrix by bathing the latter in the solution. Therefore before the printing it is necessary to remove the adhering solution from the matrix. The present invention makes use of the characteristic that electrolytic solutions readily pass from colloidal layers and essentially consists in that before the printing the printing matrix is placed into contact with a moist colloidal substance in which the electrolyte yielding color precipitates is embodied.

The invention can be carried out in different ways, an arrangement for carrying out the present process for three color printing being shown diagrammatically and by way of example in the accompanying drawing.

The colloid from which the electrolyte yielding color precipitates passes to the printing matrix may be applied, for instance, in a thin layer to a preferably flexible base, for instance to a celluloid band, and alternately is led through the electrolyte solution and pressed onto the printing film. Before this compression it is of advantage to remove the adhering excess of the solution although it may be possible to press out any excess of the solution by this compression. Still the borders of the printing matrices may contain some excess of the solution. The excess is removed from the colloid layer preferably by rubber wipers, rollers or the like. There is no danger that the colloid layer is damaged thereby, because, contrary to the printing matrix, the colloid layer forms an uninterrupted surface.

Any residue of the liquid can be removed by wiping rollers made of linen or the like or provided with a finely porous but non-colloidal surface. It has been found that the degree of concentration of colloidal layers, imbibed with electrolytic solutions of a certain degree of concentration, is not varied by contact with absorbent layers of non-colloidal characteristic. In this respect for instance filter paper possesses a certain colloidal characteristic which is noticeable in that the degree of concentration of the electrolytic imbibition is varied in the colloidal layers. Washed out fabrics do not show this effect. Therefore it forms a part of this invention to remove an excess of adhering solution from colloidal layers, which are utilized for transferring the electrolyte yielding color precipitates to the printing matrix, by means of finely porous faces of a noncolloidal characteristic (terra-cotta, textile fabrics, metal fabrics, rubber sponge or the like). Of course also the printing matrix can be treated with materials of this kind, for instance by textile fabric rollers which do not damage the fine characteristics.

In order to dispense with any means for removing the adhering liquid such as wipers, rollers and the like it is proposed by the inventor to use a gelatinous colloidal mass containing the corresponding electrolyte and, besides the hardening agent (for instance chrome alum), also a moistening agent (for instance glycerine).

When in contact with the printing matrix, the electrolyte yielding color precipitates passes from a colloidal mass of this kind into said matrix until a state of equilibrium is reached. The electrolyte, withdrawn from the surface of the colloid, is uninterruptedly replaced from the interior of the mass. In case of a sufficient thickness of the colloidal layer, the concentration of the electrolyte is noticeably reduced only after a very considerable number of prints.

Further the withdrawn electrolyte can be replaced from the backside. For this object it is not necessary that the colloidal surface is of any considerable thickness. The colloidal surface is applied for instance to a surface or a cylinder

of porous clay or the like. The backside of the surface is in contact with the electrolytic solution or the cylinder is filled with the latter. This solution diffuses through the porous wall and always maintains the colloidal layer on the same degree of concentration of the electrolyte. The electrolytic solution can be subjected to pressure in order to effect a fast diffusion through the porous wall.

In the illustrated arrangement for a method of expeditiously printing in three colors by means of electrolytic solutions, are employed endless film bands which carry the printing matrices in the shape of gelatinous wash-out reliefs. In the illustrated example, the printing paper or the printing film is coated by a colloidal layer, containing a ferric salt, lead bromide and dimethylglyoxime as precipitating agent.

Rollers for leading and guiding the printing paper and the matrix film are arranged in a frame 1. The printing paper 2 is wound off of a roller 3 and passes by way of rollers 4 through a water bath 5, and is led between rubber wipers 6 and pairs of wiping rollers 7 to a pair of rollers 8 and 9 for starting the proper printing process. The first printing arrangement for carrying out the blue print consists of an endless band 10 which is in the form either of a thin flexible metal tape carrying the individual printing matrices or of a celluloid band which, if desired, is provided directly with the washed relief. The band 10 moves over rollers 11, 12, 13 and 14 and around the drum 15. An endless celluloid band 16, which is coated with a colloid layer on its outside and passes over a roller 17, moves between the drum 15 and the band 10, whereby the printing matrices face the drum 15. The roller 17 partly dips into a trough 18, containing a solution of potassium ferrocyanide. The excess of solution is removed by rubber wipers 19 or porous rollers 20. During the movement over the drum 15, the solution passes from the band 16 to the printing matrices of the band 10, which thus are permanently provided with the electrolyte yielding color precipitates up to a certain degree of concentration. The printing paper 2 is pressed onto the matrix band 10 between the rollers 11 and 21 and now both the printing paper 2 and the band 10 remain in contact until the rollers 12 and 22 are reached. During contact the solution of potassium ferrocyanide embodied in the relief of the printing matrix 10 passes into the printing paper 2 and forms the blue part-image in the form of Prussian blue. The blue part-image is the most important for the characteristic of the image and therefore here the absorption of the electrolyte from the solution is the most satisfactory, because by varying the concentration of the solution it is possible to readily change the force of the blue print. The yellow print matrices, arranged on the band 10' are imbibed with potassium monochromate for carrying out the yellow print now carried out. For this object, a band 10' passes round rollers 11' 12' 13' 14' and a drum 15' the latter being coated with a thick layer 23' of a gelatinous substance containing the potassium monochromate. The latter is a very easily soluble salt and therefore a quantity sufficient for a long period of printing is applied; very small quantities thereof passing to the printing matrices at a time. The printing paper 2, coming from the rollers 12 and 22, is pressed onto the band 10' between the rollers 11' and 21' and is separated from the said band on leaving the rollers 12' and 22'. Now the printing paper 2 passes between the rollers 11'' 12'' and is pressed onto the band 10'' carrying the red print matrices, which are imbibed with a nickel salt. In this case the drum 15'' is in the form of a hollow cylinder of porous clay or the like, which is permanently filled with a solution of nickel salt. The outside of the clay cylinder is coated with a colloid layer 23'' the backside of which is continuously supplied with the solution of nickel salt penetrating through the clay wall of the drum 15''. The solution of nickel salt may be supplied by way of a hollow shaft. The printing paper 2 and the red print film band 10'' are pressed onto each other between the rollers 11'' and 21''. The nickel salt, which has been embodied in the printing matrices, together with the dimethylglyoxime forms a red image of nickel dimethylglyoxime in the layer of the paper. Finally the paper band 2 is wound up on a roller 26. The printing devices are driven by a common shaft 24 by means of worm wheel gears. Each worm 25 is separately adjustable on the shaft 24 in order to adjust the bands 10, 10' 10'' for coinciding exactly with the images on the printing band 2. For printing film bands for cinematographic reproduction, printing matrices films of a length corresponding to the length of the film band to be produced are substituted for the endless bands 10 10' 10''. Of course one of the printing devices can be used for printing pictures in a single color.

What I claim is:—

In a process for the production of colored pictures particularly in natural colors on the colloidal printing surface of papers, films and the like containing reagents which with electrolytes yield colored precipitates in a water insoluble condition and in which colloid printing matrices produced by tanning in a picture-like manner are imbibed with an electrolyte solution able to yield a color precipitate with said reagents, placing into contact said matrices with said colloidal printing surface to produce the precipitate in a picture-like manner, and separating said matrices from said printing surface, the step of providing said printing matrices with a colloidal surface soaked with said electrolytic solution before placing in contact said matrices with said printing surface.

FRIEDRICH LIERG.