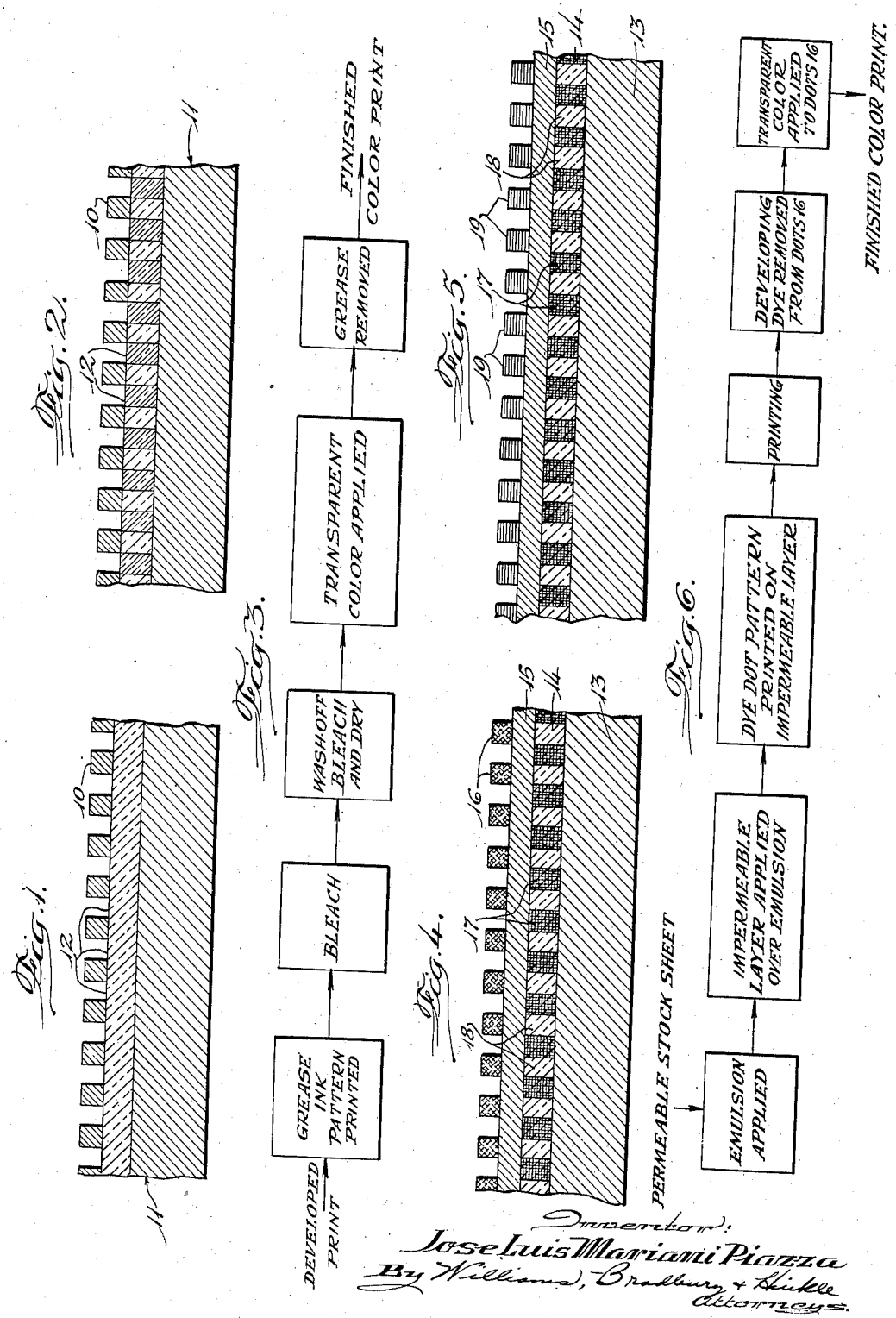
Feb. 13, 1945. J. L. MARIANI PIAZZA 2,369,476

PROCESS FOR COLORING PHOTOGRAPHS OR THE LIKE

Filed June 5, 1940 2 Sheets-Sheet 1



Inventor:
Jose Luis Mariani Piazza
By Williams, Bradbury & Hinkle
Attorneys.

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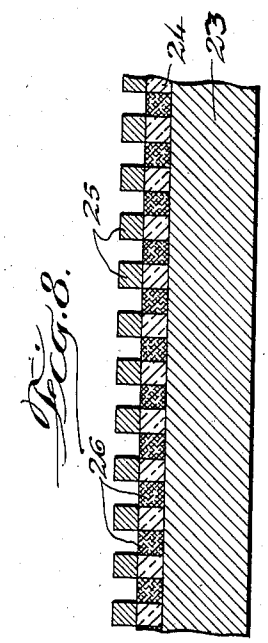


Fig. 8.

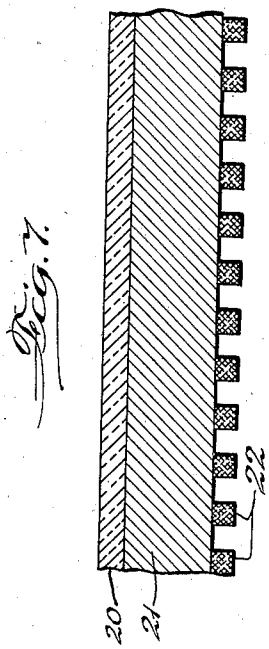


Fig. 7.

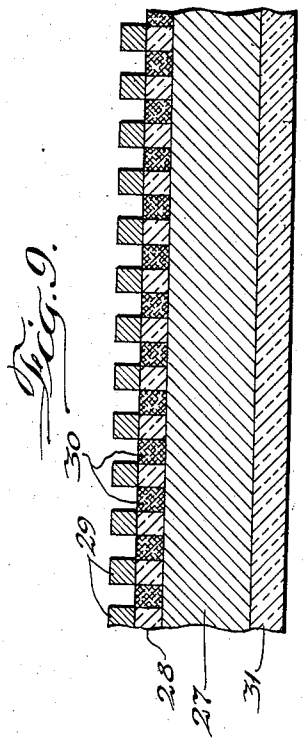


Fig. 9.

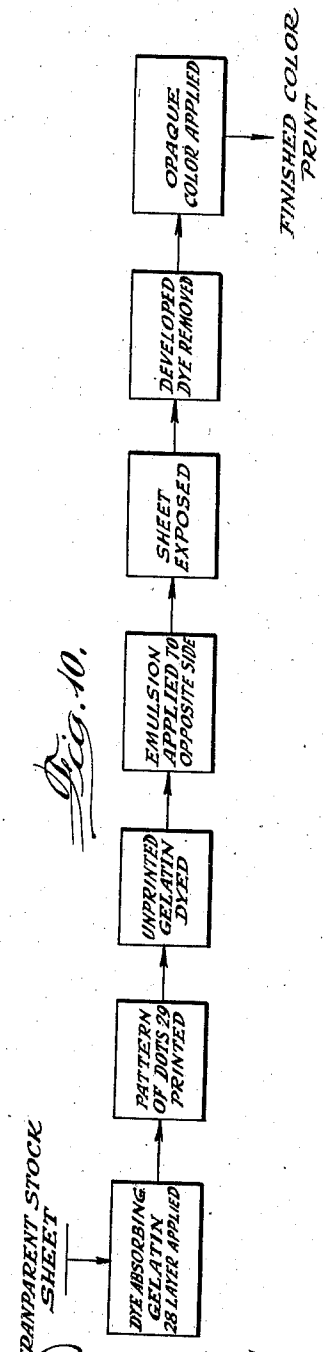


Fig. 10.

Inventor:
Jose Luis Mariani Piazza
By Williams, Bradbury & Hinkle
Attorneys.

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PROCESS FOR COLORING PHOTOGRAPHS OR THE LIKE

Jose Luis Mariani Piazza, Seville, Spain

Application June 5, 1940, Serial No. 338,927

15 Claims. (Cl. 95—6)

This invention relates in general to colored photographs, transparencies and the like, and more particularly is concerned with a novel method for their preparation.

The principal object of my invention is to provide a novel method for the preparation of colored photographs, transparencies and the like having great brilliance and which are easily formed.

An additional object of my invention is to provide a novel paper or transparency particularly adapted for carrying out the present method.

In ordinary processes of coloring photographs, the color acts by subtraction. That is, the coat of uniform transparent color overlying the black, white and gray image stops or detains the light radiations foreign to its color, and the white, black or gray of the black and white image is converted into an intensity gradation of the given color up to the black. If the color applied, as is usually the case, has any proportion of white, that is, the color is not pure, this color will retain the same proportion of white in all the different parts of the image regardless of the intensity of the light reflected by the black, white or gray image.

This is not in accordance with what takes place in reality or in practice. My studies have brought me to the conclusion that in the shaded parts of a real object, the color becomes purer, that is, the proportion or percentage of white is less. This is due, among other things, to the fact that the white surface reflection is less on the shaded parts since the shaded parts ordinarily receive more diffused light. This brilliant surface reflection exists even on relatively dull bodies such as fabrics, although this is not ordinarily appreciated.

The influence of this surface brilliance becomes apparent by observing an object first painted in color and then varnished. If the light is directly reflected on the varnish coat, a reflection of white light is seen, but if that same object is observed under diffused light, one sees it in the color with which it is painted. Now, woven materials and the majority of other colored objects, are made up of very small brilliant particles which behave like the varnished object mentioned, but because of the general diffusion they seem to the eye to be more or less dull. The result is that on brightly illuminated parts of an object there are a large number of very small brilliant surface reflections which affect the eye, and consequently the resulting color has a larger percentage of white than in the shaded parts.

In order to obtain this effect on color photographs, I have developed a process in which, instead of completely substituting a gradation of color for the gradation of white, gray and black, I let stand part of that gradation of white, gray and black and add thereto a gradation of color having a substantially invariable proportion of white therein. This gradation of color is of the same order in intensity as the gradations of black, white and gray in the image, but is of much lower contrast. In fact, in some applications of the process I prefer that the color be uniform. That is, all of one intensity.

In order to obtain this effect, I divide the image into very small juxtaposed elements. Some small parts of these elements subsist in the original intensity and constitute an image in white, gray and black. The other elements constitute an image also, and these I bleach to a very low contrast and intensity, or I may bleach them to pure white. These latter white or very light gray mixed with white elements are then dyed with the transparent color to give the final color image, while the black, white and gray image supplies the contrast and brilliance.

In connection with the following description reference may be had to the drawings in which:

Fig. 1 is a section of developed black and white print immediately after the first step in the process;

Fig. 2 is a section of the print of Fig. 1 after the transparent color has been applied;

Fig. 3 is a flow chart showing the steps of one form of my improved process;

Fig. 4 is a section of a specially prepared photographic paper immediately after it has been exposed and developed;

Fig. 5 is a section of the sheet of Fig. 4 after the transparent color has been applied;

Fig. 6 is a flow chart showing the steps in preparing, exposing and developing the sheet of Figs. 4 and 5;

Fig. 7 is a section of a transparency made according to the present invention;

Fig. 8 is a section of a sheet made by a modification of my process;

Fig. 9 is a section of a sheet adapted to receive an opaque color; and

Fig. 10 is a flow chart showing the steps in the process of making the print of Fig. 9.

To obtain the above stated result, one may proceed in different manners. For example, if a photograph is to be finished on projection or con-

tact printing paper, a regular or irregular pattern 10 is printed on the developed and fixed print 11 with grease ink and, thus, the covered parts are protected against future operations (Fig. 1). The photograph is then introduced into a bleach which diminishes the contrast and intensity in the portions 12 where there is no grease protection, thus producing a thin, soft image, or an image completely substituted by little white dots if the bleaching process is carried on to completion. After the print has been washed and dried, it is then colored with a transparent color and the grease removed by a suitable solvent. It is evident that the color will be absorbed only by those parts 12 which are free from grease. The result is an image in white, gray and black to which is juxtaposed another colored image. The two images are so intimately mixed that the eye sees them as one. The steps in this process are plotted in Fig. 3.

As the dyed image has been bleached, it will not have any pure black sections, but white and gray, or white only, depending upon the extent of the bleaching operation, and upon the application of the transparent color, this color will give to the parts corresponding to the black sections of the image a dark color when observed together with the juxtaposed black dots. This avoids the difficulty experienced when coloring photographs by the ordinary process with transparent colors, which consists in the fact that the black parts of the image do not seem to take the color. This is due to the subtracting character of the process. That is, the black does not reflect any light through the applied color and therefore no color is seen.

The black, white and gray image, which is protected by the grease, increases the proportion of whiteness in the light parts of the image and because of the great contrast of its pure white, gray and black sections, it contributes vigor to the image.

A paper especially adapted for carrying out the process may be made as follows and is shown in Fig. 4, the steps in the process being set out in order in Fig. 6. The support paper 13 should be very permeable to the developing and fixing solutions so that the exposed emulsion can be developed and fixed through the back of the paper. This paper is provided with a suitable light sensitive emulsion layer 14 covered by an impermeable varnish or collodion layer 15. Upon the collodion layer 15 is printed a multiplicity of microscopic spaced dots 16 made up of gelatin impregnated with a soluble filter dye. With ordinary bromide projection papers, this filter dye may be yellow or light orange, depending upon the strength of image desired beneath these dots.

The paper as above prepared is exposed through a negative and developed, fixed and washed in the usual manner excepting that the solutions reach the emulsion through the back of the paper. While development of the image is taking place, the dye will be also removed from the overlying gelatin dots. The image if examined through a magnifying glass at this point in the process will show a normal image made up of spaced elements 17 lying between the gelatin dots, and a second very thin image made up of spaced elements 18 lying beneath the gelatin dots. This second image is very thin because the actinic light reaching the sensitive emulsion through the gelatin dots was inhibited by the filter dye in these dots.

The print is now colored with transparent color such as anilin dyes which are readily absorbed by the gelatin dots but are not absorbed by the collodion layer. The final image, therefore, is made up of dyed gelatin dots 19 overlying a thin image and a black, white and grey image interspersed between these dots (Fig. 5).

A transparency may be made by a slight modification of the above process (see Fig. 7). This is done by coating the sensitive emulsion 20 on one side of a sheet of film stock, waterproof Cellophane, or the like 21, and coating the other side with the spaced dots 22 of gelatin carrying the filter dye. This sheet is exposed through the side carrying the dots and then is developed, fixed and washed in the usual manner to produce the two separate images previously mentioned and to remove the filter dye. The washed transparency is then colored on the dot carrying side in the same manner as the print to produce the final colored transparency.

Either the paper or transparency may be made by a modification of the above which consists in coating the paper, film or the like 23 with a sensitive emulsion 24 (Fig. 8). The emulsion 24 is then coated with a multiplicity of dots 25 of collodion and the sensitive emulsion dyed with a soluble filter dye as indicated at 26. After the dyeing step, the emulsion between the dots which has absorbed the insensitive dye, becomes relatively insensitive to light, while the emulsion beneath the dots remains sensitive, since no dye reaches it and no dye is absorbed by the collodion. This prepared paper or transparency is then exposed, developed, fixed, washed and colored in the manner previously described.

If it is desired to prepare a film to be colored with dull colors, as for example oil colors, a transparent sheet of paper, Cellophane, film stock, or the like 27, is coated with a very thin layer of gelatin or other substance 28 which easily absorbs a filter dye (see Figs. 9 and 10). On top of this is printed a multiplicity of semi-opaque white dots 29 of a substance such as collodion which will not absorb dyes. The film is then placed in a filter dye bath which is absorbed only by the uncovered gelatin 30 since the white particles do not absorb the color. On the opposite side of the transparent support paper, film or the like, a sensitive emulsion 31 is spread. This emulsion is exposed through the side carrying the white dots 29, and the dots, even though semi-opaque, let the light through better than the filter dyed portions 30. During the developing, fixing and washing operations, the filter dye will dissolve and the photograph will be in a condition to receive the opaque color. The color should be applied on the back of the image which, in this case, is the side with the white dots. The opposite side is the side with the sensitive emulsion and the side from which the finished photograph is observed.

I claim:

1. The method of preparing photographic papers or films particularly adapted for use in producing colored photographs which comprises, coating a sheet of paper, film or the like with a light sensitive emulsion, coating said emulsion with a multiplicity of minute substantially transparent areas of collodion, and dyeing said emulsion in the areas between said coated minute transparent areas with a soluble dye adapted to filter out a substantial portion of light to which said emulsion is sensitive.

2. The method of preparing colored photographs which comprises, coating a sheet of paper, film or the like with a light sensitive emulsion, coating said emulsion with a multiplicity of minute substantially transparent areas of collodion, dyeing said emulsion in the areas between said coated minute transparent areas with a soluble dye adapted to filter out a substantial portion of light to which said emulsion is sensitive, exposing, developing, fixing, and washing said light sensitive emulsion and removing said soluble dye therefrom, and finally absorbing a dye of the selected color in the surface of the emulsion exposed between said collodion areas.

3. The method of producing a colored photograph which comprises, providing a support paper which is readily permeable to photographic emulsion processing solutions, coating said paper with a light sensitive emulsion, coating said emulsion with a dye impermeable layer, coating said dye impermeable layer with a multiplicity of minute spaced areas of dye absorbing substance, said dye absorbing substance having therein a soluble dye adapted to filter out a substantial portion of light to which said emulsion is sensitive, exposing said emulsion through said dyed layer, developing, fixing and washing said emulsion through the back of said support paper and removing said soluble dye and finally coloring the said multiplicity of dye absorbing areas with at least one selected color.

4. The method of producing colored transparencies which comprises, providing transparent emulsion support, coating said transparent support on one side with a multiplicity of minute spaced areas of dye absorbing substance having therein a soluble dye adapted to filter out a substantial portion of light to which a photographic emulsion is sensitive, coating the other side of said support with a light sensitive emulsion, exposing said emulsion through the support, developing, fixing and washing said emulsion and removing said filter dye, and finally coloring said dye absorbing substance with at least one selected color.

5. The method of producing colored photographs which comprises, providing a thin transparent base, coating one side of said base with a clear dye absorbing layer, coating said dye absorbing layer with a multiplicity of minute substantially white translucent areas of a substance in which a dye is not absorbed, dyeing said dye absorbing layer between said translucent areas with a dye adapted to filter out a substantial portion of light, to which a light sensitive emulsion is sensitive, coating the other side of said transparent base with a light sensitive emulsion, exposing said emulsion through said base, developing, fixing and washing said emulsion and removing said dye and finally coloring said dye absorbing layer between said translucent areas with at least one substantially opaque color, said photograph adapted to be viewed from the side having the light sensitive emulsion thereon.

6. The method of preparing photographic films particularly adapted for use in producing colored photographs with opaque colors which comprises, providing a thin transparent base, coating one side of said base with a clear dye absorbing layer, coating said dye absorbing layer with a multiplicity of minute substantially white translucent areas of a substance in which a dye is not absorbed, dyeing said dye absorbing layer between said translucent areas with a dye adapted to filter out a substantial portion of the light to which a light sensitive emulsion is sensitive, and coating the other side of said transparent base with a light sensitive emulsion.

7. An article of manufacture comprising, a thin transparent base coated on one side with a clear dye absorbing layer, said dye absorbing layer having superposed thereon a multiplicity of minute substantially white translucent areas of a substance in which a dye is not absorbed, the portion of said dye absorbing layer between said minute areas being dyed with a dye adapted to filter out a substantial portion of light to which a light sensitive emulsion is sensitive, and the other side of said base being coated with a light sensitive emulsion.

8. The method of preparing photographic films particularly adapted for use in producing colored transparencies which comprises, providing a transparent emulsion support, coating said support on one side with a multiplicity of minute spaced areas of dye absorbing substance having therein a soluble dye adapted to filter out a substantial portion of light to which a photographic emulsion is sensitive, and coating the other side of said support with a light sensitive emulsion.

9. An article of manufacture comprising, a transparent emulsion support coated on one side with a multiplicity of minute spaced areas of dye absorbing substance having therein a soluble dye adapted to filter out a substantial portion of light to which a photographic emulsion is sensitive, the other side of said support being coated with a light sensitive emulsion.

10. The method of producing photographic papers particularly adapted for use in producing colored photographs which comprises, providing a support paper which is readily permeable to photographic emulsion processing solutions, coating said paper with a light sensitive emulsion, coating said emulsion with a dye impermeable layer, coating said dye impermeable layer with a multiplicity of minute spaced areas of dye absorbing substance, said dye absorbing substance having therein a soluble dye adapted to filter out a substantial portion of light to which said emulsion is sensitive.

11. An article of manufacture comprising, an emulsion support paper which is readily permeable to photographic emulsion processing solutions, said paper being coated on one side with a light sensitive emulsion, said emulsion being coated with a dye impermeable layer, said dye impermeable layer being coated with a multiplicity of minute spaced areas of dye absorbing substance and said dye absorbing substance having therein a soluble dye adapted to filter out a substantial portion of light to which said emulsion is sensitive.

12. The method of producing a colored photographic image which comprises producing upon a support a monochromatic image made up of a multiplicity of minute spaced areas lying beneath a substance to which a coloring agent will not adhere substantially coextensive with said areas, interspersing said areas with light tone areas of juxtaposed portions of said monochromatic image lying beneath a surface to which a coloring agent will adhere, applying color to the face of said images so as to color the areas to which the coloring agent will adhere, whereby the resulting image will be composed of a multiplicity of spaced minute clear monochromatic areas interspersed with a multiplicity of spaced minute clear colored areas.

13. The method of producing colored photo-

graphic prints which comprises producing a developed, fixed and washed photographic image on a sheet of gelatin emulsion photographic paper, covering said emulsion with a multiplicity of minute areas of grease ink, bleaching the image between said minute areas, subjecting the entire print to a dye absorbable in said gelatin emulsion, whereby said dye affects only said bleached areas, and finally removing said grease ink.

14. A method of producing a colored photographic image which comprises, applying a resist to minute spaced areas in an image support, treating the space between said spaced areas whereby the intensity of the photographic image will be reduced, producing a photographic image in said minute areas and juxtaposed portions of the photographic image of lesser intensity in the space between said minute areas, and dipping said image into coloring whereby the coloring adheres to the spaces unprotected by said resist.

15. A method of producing a colored photographic image which comprises, applying a resist to minute spaced areas on an image support, treating the spaces between said minute spaced areas whereby the intensity of the photographic image will be reduced, producing a monochromatic photographic image in said minute areas and juxtaposed portions of the monochromatic photographic image of less intensity in the space between said minute areas, and subjecting the entire image to coloring whereby the color affects only said image of less intensity.

JOSE LUIS MARIANI PIAZZA.