

Sept. 25, 1945.

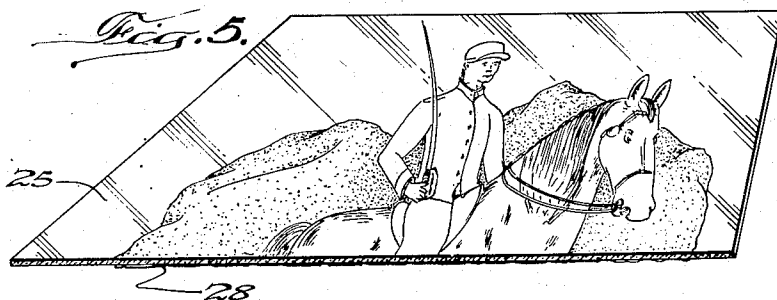
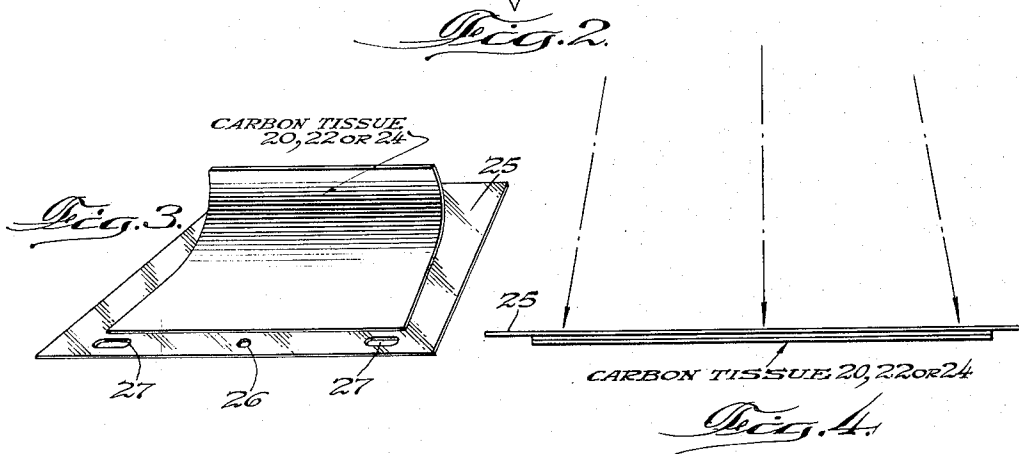
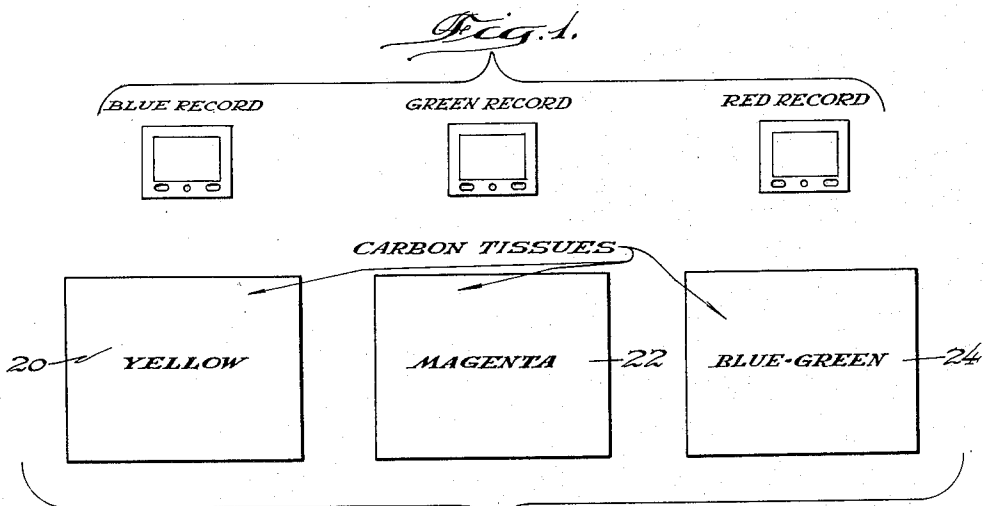
J. A. BALL ET AL

2,385,599

COLOR PHOTOGRAPHY

Filed March 15, 1943

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 6.

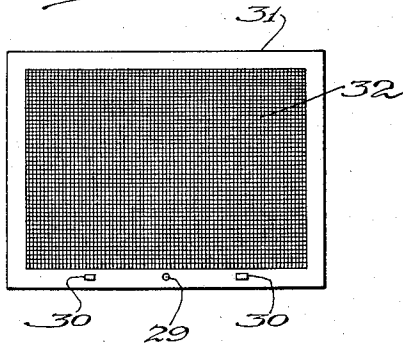


Fig. 7.

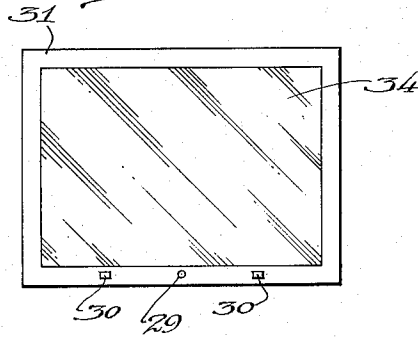


Fig. 8.

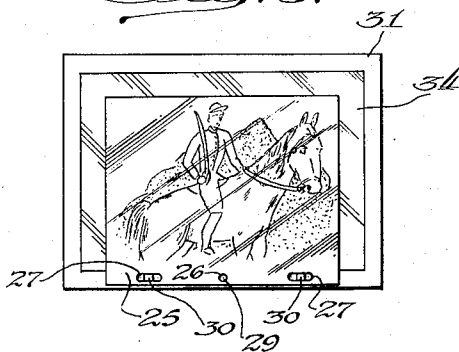


Fig. 9.

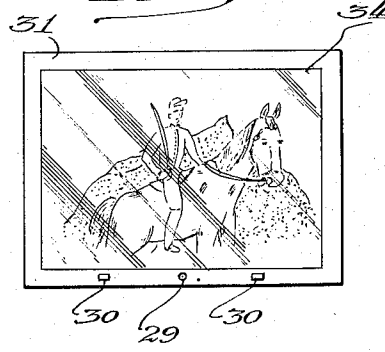
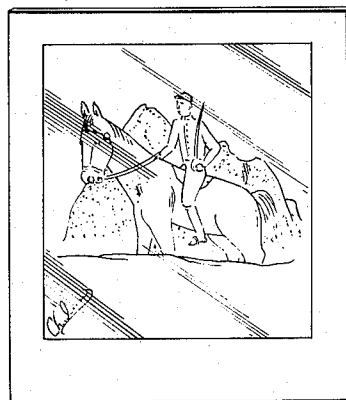


Fig. 10.



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UNITED STATES PATENT OFFICE

2,385,599

COLOR PHOTOGRAPHY

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Application March 15, 1943, Serial No. 479,210.

4 Claims. (Cl. 95—2)

The present invention relates to color photography and more particularly to a method for forming color prints from color separation negatives. Although the present process is concerned primarily with the production of color prints, it will be apparent that essentially the same process, with minor variations, may be used for producing transparencies to be viewed by transmitted light.

One of the objects of the present invention is to provide an improved process for forming photographic color prints which is particularly well adapted for the production of commercial portraits.

Still another object is to provide an improved process for producing permanent color prints photographically.

Yet another object of the present invention is to provide a novel photographic color print process by the use of which natural color prints can be produced at extremely low cost while maintaining high standards as to quality of reproduction.

Another additional object of the present invention is to provide a low cost color print process which retains the advantages associated with color separation negatives.

Still another object of the present invention is to provide a process for forming color prints from color separation negatives which does not require manipulation by a skilled operator.

Still another object of the present invention is to provide a color printing process for forming color prints of the carbon type which is particularly well adapted for use with mechanical registration schemes. The term "carbon" as here used will be explained presently.

Yet another object of the present invention is to provide an improved carbon type color print process.

Another object of the present invention is to provide a novel method for practicing a carbon type color process which insures the registration of the finally assembled images without the necessity for skilled manual manipulation as ordinarily practiced.

An additional object of the present invention is to provide a novel process for sensitizing, exposing, washing, and assembling a plurality of bichromated gelatin images which insures the final registration of the several images even though the images are repeatedly passed through soaking and drying steps.

Other objects and advantages will become apparent from the following description of a pre-

ferred embodiment of our invention illustrated in the accompanying drawings.

In the drawings in which similar characters of reference refer to similar parts throughout the several views:

Fig. 1 diagrammatically illustrates a set of color separation negatives, from which a color print is to be prepared;

Fig. 2 is a diagrammatic illustration of three sheets of carbon tissue upon which color images are to be prepared corresponding to the negatives of Fig. 1;

Fig. 3 illustrates the act of placing one of the sheets of carbon tissue upon a transparent base prior to its exposure;

Fig. 4 may be considered as an illustration of the step of exposing the carbon tissue;

Fig. 5 is a perspective view of a portion of a transparent support with a relief color image adhering thereto;

Fig. 6 is a plan view of a screen-covered frame upon which a temporary image-supporting surface is formed;

Fig. 7 illustrates in plan the temporary support as formed from the screen-covered frame illustrated in Fig. 6;

Fig. 8 illustrates a step in the process wherein one of the relief images mounted upon a plastic sheet is secured to the temporary support illustrated in Fig. 7;

Fig. 9 illustrates the temporary support with a relief image thereon after removal of the plastic sheet; and

Fig. 10 may be considered as a plan view of the final product of the present process.

Most color printing processes of a photographic nature fall into one of four general classifications. One of these consists in preparing a special printing paper upon which a color print may be formed by a single exposure, dyes being formed or destroyed in the print by subsequent chemical treatment. Another process comprises the preparation of separate pigmented gelatin images in a manner to be described in greater detail presently, these images being later assembled upon a support to produce the final print. A third, or dye imbibition process, consists in forming separate dye absorbing printers from which dyes are transferred one at a time to a print surface. In the fourth process, dyed images are formed in thin sheets of Cellophane or collodion, these sheets later being stacked upon a support to produce the print.

The formation of color prints by the first above

mentioned type of process, that is, by a single exposure, is subject to several rather serious disadvantages which render this process unacceptable for portrait use. One of these disadvantages is that the dyes used in the print must necessarily be comparatively unstable, since they must be easily formed or destroyed chemically. Thus a print produced by such a process has a comparatively short life before bleaching of one or more of the dyes upsets the color balance. Portraits therefore cannot be made which will last a generation, this period generally being considered to be the minimum satisfactory life of a commercial portrait.

Prints made by the inhibition process, or the dyed Cellophane or collodion processes, also bleach, since no soluble dyes are permanent.

On the other hand, printing processes which produce the final product by superposing a plurality of color images formed by the selective hardening of pigmented gelatin can have great permanence. This is because the pigments used in pigmented gelatin need not be soluble or chemically active, and thus can be chosen with great permanence in mind. Color portraits therefore can be produced by pigmented gelatin processes which will last for many years without noticeable change.

In addition to the above considerations directed to the printing processes per se, it is an axiom of portrait photography that portraits must be retouched, and frequently such retouching must be carried out rather extensively. Therefore, any photographic process which does not lend itself well to retouching cannot be used for forming commercially acceptable portraits. For this reason a portrait process should use color separation negatives, since a set of separation negatives can quite easily be retouched without disturbing its balance. This is largely because necessary retouching consists usually in the removal of blemishes which show up as lines or spots on all of the negatives in the set. In most instances the retouching can be considered satisfactory if the density of each of the negatives where the blemishes appear is reduced or increased to that of the adjacent negative area. As a rule, most retouchers who are skilled in black and white work have little difficulty in adequately retouching color separation negatives.

In view of the above, it is evident that a color process, especially when used for producing portraits, should start with color separation negatives and should preferably be of the pigmented gelatin type or at least of some type which permits the use of permanent pigments which are not required to enter into the process chemically and which need not be soluble.

With the above considerations in mind, the present process, which although it is universally applicable has nevertheless been developed especially for the low-cost production of color portraits, starts with color separation negatives and uses pigmented gelatin images. In general the present process may be considered as a Carbon type process, in that separate color images are formed by washing exposed bichromated pigmented gelatin in hot water, these images later being superposed to produce the final print.

The color separation negatives used as the starting point in the present process may be formed in any of a number of ways, the best for commercial purposes probably being to expose the negatives in a so-called one-shot camera in which the light beam is split within the camera into

three parts, each of these parts passing to a separate negative through color separation filters.

Another method for forming color separation negatives is by the so-called tri-pack process, in which images are formed in the emulsions of three separate films placed together as a pack in a camera, the emulsion in the foremost film being sensitive to blue light only, while the second film's emulsion is sensitive to blue and green, a filter layer being interposed between the first and second emulsions to filter out the blue light. After passing through the first and second films, the remaining light passes through a third filter layer which takes out all but the red light, and into a panchromatic emulsion which forms the red color record. The three films after development therefore serve as color separation negatives, the foremost or colorblind emulsion serving as the blue record, the intermediate orthochromatic emulsion forming the green record, while the rearward or panchromatic emulsion serves as the red record. One serious disadvantage of this process for the formation of color separation negatives is that some diffusion will be found in the orthochromatic emulsion and considerable diffusion in the panchromatic emulsion. This is noticeable in the final print, not only by a general softening of the image, but also by a colored haze where lightly and strongly colored areas adjoin.

A third method which may be used for forming color separation negatives is to expose three films successively in a sliding back camera with filters placed in front of the films or before the camera lens. This method is comparatively simple in operation, its principal disadvantage being that the subject may move between successive exposures, thus throwing the color records out of register.

Another commonly used method is to take the picture originally upon a special film which is processed to produce a colored transparency, and then form color separation negatives from the transparency.

By whatever manner the color separation negatives are formed, such a set of negatives is used in producing a print by the present process, the particular method of forming the color separation negatives not being a feature of the present invention.

Carbon processes for producing color prints from color separation negatives depend upon the phenomenon that soft gelatin, if it is sensitized in a bichromate solution and subsequently dried, is proportionately hardened by light. As an example, if a sheet of paper coated with dried bichromated soft gelatin is exposed beneath a negative, the gelatin will be hardened in the lighter negative areas whereas less hardening will take place in the darker negative areas. If the gelatin surface is subsequently supported upon a Celluloid sheet and is washed in hot water, the soft gelatin will be washed away while the hard gelatin will remain. If the gelatin has been evenly pigmented, it will be apparent that the resulting distribution of pigment will be the same as the distribution of the remaining gelatin. This process acquired the name "Carbon" during the early history of photography because it was first used with finely divided carbon as the pigment for producing black and white prints of great permanence, some examples of this early work still being in good condition at the present time.

The classic Carbon color process as heretofore practiced is carried out in the following manner: Each of three different colored sheets of carbon tissue, which are made up of a paper backing

coated with soft gelatin containing the appropriate pigment mixed therewith, is sensitized in the dark or nonactinic light in a bichromate sensitizing bath. After the sheets have become thoroughly soaked they are squeegeed with their gelatin surfaces in contact with ferrotype tins and are set aside to dry. After the sheets have dried and have popped off the tins, the drying taking place in the dark or in nonactinic light, each of the sheets is exposed beneath its appropriate color separation negative, the yellow sheet being printed through the blue record, the magenta sheet through the green record, and the blue-green sheet through the red record.

The hardening brought about by exposure to light takes place upon the surface of the gelatin farthest removed from the paper backing, since this is the surface where the light enters. Therefore the sheets cannot be washed in hot water until some support has been provided for the hardened image. Such a support is provided in the following manner: Each of the sheets is soaked in cold water and is then squeegeed with its gelatin surface in contact with a sheet of Celluloid. The paper backing and soft gelatin are then washed away with hot water so as to leave the three pigmented relief images each attached to a Celluloid support.

These separate images are then assembled upon a temporary support. The temporary support comprises a sheet of porous paper coated with soft gelatin. Usually this sheet is made quite pliable to aid in registry, as will become apparent presently. The temporary support is soaked in cold water, as is one of the Celluloids bearing a hardened gelatin image. The Celluloid sheet is then placed with the image in contact with the gelatin surface of the temporary support, and the two sheets are squeegeed together. The assembly is then set aside to dry, the water evaporating from the back surface of the porous paper sheet, so as to establish a firm bond between the soft gelatin of the temporary support and the hard gelatin of the relief image. After the assembly has become dry the sheet of Celluloid is peeled away from the temporary support, thus leaving the relief image attached to the soft gelatin surface of the temporary support.

The temporary support with one of the relief images thereon is then soaked in cold water as is a second of the relief images upon its Celluloid support. The relief image upon the Celluloid support is then placed over the relief image upon the temporary support in proper registry, registry being obtained visually by the operator looking through the Celluloid sheet while stretching the temporary support differentially so as to bring the two images into proper relation. After the two images are in proper registry the sheets are squeegeed together and set aside to dry. After drying, the second sheet of Celluloid is peeled away from its relief image, thus leaving the temporary support with two color images thereon.

The temporary support is once more soaked in cold water, as is the third relief image, and the third relief image is placed upon the temporary support in proper registry with the two images thereon by again differentially stretching the temporary support to produce proper registry. The assembly is once more dried, and the third sheet of Celluloid is peeled away to leave the temporary support with the three images thereon.

A permanent support is then provided, the

permanent support comprising a sheet of paper or other material coated with a layer of hard gelatin. This permanent support is soaked in water, as is the temporary support, and the two supports are then squeegeed together with their gelatin surfaces in contact, thus establishing an adhesive bond between the gelatin images and the permanent support. The temporary support paper and its soft gelatin coating are then washed away in hot water to leave the relief image upon the permanent support. The permanent support is then dried to produce the final picture.

Prints produced by the above described Carbon process are comparatively expensive, principally because the carbon tissues shrink and expand differentially after they have been exposed and before they are attached to the Celluloid supports. That is, after the carbon tissue has been exposed it is soaked in water and squeegeed in contact with the Celluloid support. The water-soaking step softens the paper and produces uncontrollable distortion of the image thereon. When it is subsequently desired to register three of these images, it is apparent that this registry cannot be accomplished excepting by differentially stretching the images relative to each other. This registration step must be accomplished visually by a skilled operator who sees the images while looking through the Celluloid sheet. It is an extremely painstaking and expensive operation. This difficulty cannot be overcome by the use of a mechanical registration expedient, because the problem is not one of registering identical images but is one of registering three images which are distorted relative to each other.

In carrying out the present process the three color separation negatives illustrated in Fig. 1 are not printed directly upon the carbon tissues illustrated in Fig. 2 and indicated by the numerals 20, 22 and 24 which indicate respectively the yellow, or as it is sometimes termed, the minus blue tissue, the magenta or minus green tissue, and the blue-green or minus red tissue. Instead, each of these tissues is taken into non-actinic light where it is soaked in a bichromate sensitizing bath, which may be considered as identical to that used in carrying out the classic Carbon process excepting that a small amount of glycerin or diethyleneglycol is added to the sensitizing solution as a tackiness producing agent. A typical sensitizing bath may comprise potassium bichromate 3 to 6%, glycerin or diethyleneglycol about 5%, the balance water. After soaking, each of the tissues is squeegeed with its gelatin surface in contact with a sheet of smooth, clear, transparent plastic material 25, as seen in Fig. 3. "Vinylite" has been found to be well adapted to this purpose.

The sheets are then dried to remove excessive moisture, but instead of being dried to the point where they will pop off a ferrotype tin as is done in performing the Carbon process by prior known methods, they are permitted to retain a slight amount of moisture. We have found that good results are obtained by drying to equilibrium in an atmosphere of approximately 70% to 75% relative humidity. When dried in such an atmosphere when a small amount of glycerin has been added to the sensitizing bath, the soft gelatin adheres to the plastic sheet sufficiently to maintain good optical contact between these surfaces and avoid accidental separation. Further, we have found that at this humidity, bi-

chromated gelatin reaches approximately its optimum optical sensitivity.

Each of the carbon tissues is then exposed beneath its appropriate negative, Fig. 4, either by contact or projection printing, in such manner that the light which exposes the sensitized gelatin passes through the plastic sheet. The gelatin is therefore selectively hardened upon the surface which is already in contact with the plastic support sheet. The assemblies are then washed in hot water to remove the paper backing and the unhardened gelatin, thus leaving the pigmented relief images 28 upon the three plastic sheets as shown in Fig. 5.

The three color images have therefore been obtained upon three plastic sheets without the possibility of differential shrinkage or expansion of the carbon tissues bringing about distortion of the images. Further, these images can be located relative to each other upon a definite portion of the plastic sheets by any suitable mechanical registration scheme which will insure the three negatives always having the same location in the projector or contact printing frame, and which further will insure that the three plastic sheets will be properly registered during the printing step. If such a mechanical registration scheme is used, it is a simple step to insure the three images being properly registered relative to each other upon the three plastic sheets. Any suitable mechanical registration scheme may be used for this purpose. For the purpose of completeness, one such arrangement will be discussed subsequently.

The next step in any carbon process is to assemble the three relief images upon a soft gelatin temporary support. If this step is carried out in the manner described previously in the discussion of the classic Carbon process, it will be apparent that the repeated soakings and dryings of the temporary support paper necessary to accomplish the transfer of the three images to such a temporary support may cause considerable dislocation of the images because of differential shrinkage and expansion of the temporary support paper between successive registration steps. Therefore, registering the relief images relative to a temporary support of this type by mechanical means will not insure registration of the images, unless the picture is so small that differential dimensional changes do not become apparent. Therefore a novel temporary support is used which does not stretch or contract with repeated wettings and dryings but which nevertheless permits water to be evaporated from the back surface, such evaporation being necessary to permit drying of the assembly, since drying cannot take place through the plastic sheet either in the classic Carbon process or in the present process.

This temporary support is illustrated in Figs. 6 and 7, and is described in greater detail in the co-pending application of Joseph Arthur Ball, Serial No. 479,212, filed March 15, 1943, for Adhesive temporary supports. As shown in Fig. 6, this temporary support comprises a rectangular open frame 31, much like a picture frame. The opening in this frame is covered by a fine mesh, of the order of 230 mesh, stainless steel screen 32, stretched in place and permanently attached to the frame. Such a screen is unaffected by moisture and will retain its same dimensions and shape regardless of whether it is dry or wet. Preferably the frame 31 should be formed of metal which is similarly unaffected by moisture. To prepare this screen for use, a warm solution of

soft gelatin is flowed over its surface, the soft gelatin being indicated by the numeral 34 in Fig. 7. The soft gelatin will not pass through the screen, and upon standing will level itself and after cooling will provide a smooth upper surface of the same character as the surface provided when a gelatin layer is placed upon the ordinarily used paper temporary support.

After the temporary support shown in Fig. 7 has cooled and the gelatin has hardened, one of the plastic sheets is soaked in cold water, as is the temporary support, and the plastic sheet is squeezed with its relief image in contact with the gelatin surface of the temporary support, a mechanical registration arrangement being used to insure a definite location of the image upon the soft gelatin layer 34. If desired, this registration arrangement can use the same set of holes or other registration elements in the plastic sheet as are used in properly locating this sheet during the printing step.

The assembly is then set aside to dry, after which the plastic sheet is peeled from the temporary support, the hardened gelatin image remaining upon the gelatin surface 34. We have found that if the carbon tissue is originally sensitized in a bath containing a small amount of glycerin, this peeling step can be easily accomplished even though the adhesion between the carbon tissue and the plastic sheet is sufficient to provide good optical contact and mechanical support prior to the peeling operation.

The second plastic sheet is then soaked in cold water, as is the temporary support, and after the second plastic sheet has been registered relative to the frame 31 with its relief image in contact with the gelatin surface 34, the plastic sheet is squeezed against the gelatin surface and the assembly is again set aside to dry, after which the second plastic sheet is peeled from the temporary support leaving its relief image properly registered relative to the first relief image.

The temporary support is again immersed in water, as is the third plastic sheet, and the third relief image is transferred to the support surface 34 in the same manner as the first and second relief images. The appearance of the temporary support with a plastic sheet and relief image thereon prior to the step of peeling the plastic sheet from the support, is shown in Fig. 8, while Fig. 9 illustrates the same support with the relief image thereon after the plastic sheet has been peeled away.

After the three images have been assembled upon the temporary support, the support is soaked in cold water, as is a sheet of permanent support material. This permanent support material may comprise a piece of paper, cloth, opaque white plastic, canvas or other similar base which should be white and which is coated with a layer of hard gelatin. After soaking, the permanent support is located with its hard gelatin surface in contact with the surface 34 of the temporary support and is squeezed in place to bring about adhesion between the hard gelatin of the permanent support and the relief image upon the temporary support. The temporary support is then turned over and is washed in hot water so as to remove the soft gelatin from the screen 32. The image is further washed in warm water to remove all of the soft gelatin adhering to the permanent support. The permanent support is then dried in any suitable manner to produce the final picture illustrated in Fig. 10.

In carrying out the above process it will be

noted that from the time the three exposures have been made through the three separation negatives until the final print has been produced, no image or latent image has at any time reposed upon any support which can shrink or expand. For this reason, the images have no opportunity to become distorted and can be registered mechanically, a step which is impossible if shrinkage or expansion of the images is permitted to take place at any point in the process. Further, the present process reduces the number of steps ordinarily necessary in the Carbon process, in that the sensitized tissues are dried upon plastic sheets and are exposed through the plastic sheets, whereas in the ordinary Carbon process it is necessary that these sheets be dried upon ferrotype tins, then exposed, then soaked in water, and then secured to the plastic sheets. The steps of removing the carbon tissues from the ferrotype tins, soaking them in water and drying them upon plastic sheets, are thus eliminated from the present process.

One method of producing mechanical registration of the images comprises punching holes in the negatives and plastic sheets, these holes being placed over pins to bring about proper registration. Such an arrangement is shown in Fig. 3, where it will be seen that a round hole 26 is provided at a central point in the lower margin of the plastic sheet 25. Toward each side edge, the lower margin is also provided with a substantially rectangular slot 27 arranged with its long dimension parallel to the lower edge of the plastic sheet. All three of the plastic sheets used in carrying out the process, and the three negatives, are similarly punched. If the negatives are to be printed by projection, then the holes 26 and 27 will probably for convenience be spaced more closely together in the small negatives than in the large plastic sheets 25.

In bringing about registration, the holes in the sheets are placed over pins of the type shown in Figs. 6, 7 and 8. As shown in these figures, a round pin 29 is centrally located along the lower margin of the temporary support. This pin is of such dimensions that it fits the round hole 26 in the plastic sheet snugly, thus preventing linear movement of the plastic sheet relative to the frame 30 in any direction. At each side of the pin 29, a rectangular pin 30 is placed. The pins 30 fit the slots 27 from top to bottom but are shorter than the slots. The pins 30 therefore prevent rotation of the plastic sheet 25 about the central pin 29.

When such a registration scheme is used, since each of the plastic sheets 25 has a set of registration openings 26 and 27, it is a simple matter to slip the openings 26 and 27 over the pins 29 and 30, and then squeegee the sheet across the surface of the temporary support. If such procedure is followed, the sheet can lie upon the temporary support in only one position. Also, since all three of the sheets are similarly punched, all three of the sheets will lie upon the surface of the temporary support in an identical manner. Further, if the printing frame in which the plastic sheets 25 are located during the printing step has registration pins identical to those shown in Fig. 6, so that all three of the plastic sheets will lie in the same position in the frame during printing, and if all three of the color separation negatives have been previously registered relative to each other and have been punched so as to have identically located registration openings, the images will be perfectly

registered if the negative carrier has a properly located set of registration pins.

If exposure of the carbon tissue is made by contact printing, the printing frame will have a set of pins 29 and 30 over which the openings in the negatives and plastic sheets will be slipped so as to locate each negative properly relative to the corresponding plastic sheet prior to printing. If the negatives are printed by projection, then the negative carrier will have a set of pins to locate the negatives, while the easel will have another set of pins to locate the plastic sheets 25. The enlarger should be of comparatively rigid construction so as to prevent movement of the negative carrier relative to the easel. If such rigidity is provided, printing can easily be accomplished while insuring that all of the images produced upon the carbon tissues will be identically located relative to the registration openings at the margins of the plastic sheets.

Although we have described one mechanical registration scheme, it is contemplated that other suitable registration expedients may be used if desired. From the above it will be apparent that the present process is of the Carbon type, and is therefore adapted to the use of permanent pigments which can be selected upon the basis of their color and permanence alone, it not being necessary that they be produced or destroyed chemically, or be soluble. Further, it is apparent that the present process, because it never requires the placement of an image or latent image upon a stretchable or shrinkable surface, is well adapted to use with mechanical registration schemes, thereby eliminating completely the difficult, painstaking and highly skilled operation of visually registering several distorted images in producing the final picture. Portraits or other color pictures can therefore be produced by the present process at comparatively low cost.

Having thus described our invention, what we claim as new and useful and desire to secure by Letters Patent of the United States is:

1. A color printing process which comprises providing a set of color separation negatives, providing a set of sensitized, pigmented carbon tissues, providing a set of transparent plastic water impermeable sheets, securing each of said carbon tissues with its gelatin surface in contact with one of said plastic sheets, printing each of said carbon tissues from its corresponding negative by passing light from the negative through the plastic sheet and into the sensitized layer, developing relief images on said plastic sheets by washing, providing a temporary support consisting of a water-permeable, non-stretchable and non-shrinkable surface coated with soft gelatin, adhesively securing each of said relief images in turn to said soft gelatin, providing a hard gelatin-coated permanent support, adhesively securing the hard gelatin surface of said permanent support to the relief images upon said temporary support, and separating the permanent support and the relief image from the temporary support to produce the final product.

2. A color printing process which comprises providing a set of color separation negatives, providing a set of carbon tissues, providing a set of transparent water impermeable plastic sheets, providing a bichromate sensitizing bath containing glycerin or the like, soaking each of said carbon tissues in the sensitizing bath and securing it with its gelatin surface in contact with one of said transparent plastic sheets, drying the as-

semblies thus produced, printing each of said carbon tissues from its corresponding negative by passing light from the negative through the plastic sheet and into the sensitized layer, developing relief images on said plastic sheets by washing, providing a water-permeable, non-stretchable and non-shrinkable temporary support having a soft gelatin surface, adhesively securing each of said relief images in turn to the soft gelatin on said temporary support, providing a permanent support, and finally transferring the relief images from said temporary support to said permanent support.

3. The method of producing carbon type photographic color prints from mechanically registered color images, which comprises providing a set of color separation negatives having identically located registration apertures in the margins thereof, providing a set of clear transparent water impermeable plastic sheets having registration apertures located in the margins thereof, sensitizing a set of carbon tissues and securing each of these tissues with its face against each of said plastic sheets, printing each of said negatives upon the appropriate carbon tissue by means of light passed from the negative through the plastic sheet to the carbon tissue, using the registration apertures in the negatives and in the plastic sheets to register each of said negatives relative to its plastic sheet prior to the printing step, producing relief images on said plastic sheets by developing said carbon tissues without removing said carbon tissues from said plastic sheets, assembling the relief images upon a water-permeable, non-stretchable and non-shrinkable temporary support, using the registration

apertures in the margins of said plastic sheets for properly locating the several images relative to the temporary support during the assembly operation, and finally transferring the images from the temporary support to a permanent support.

4. The method of producing carbon type photographic color prints without resort to visual registration, which comprises providing a set of sensitized carbon tissues, providing a set of clear, transparent water impermeable plastic sheets, securing the sensitized carbon tissues with their faces against said plastic sheets to form a substantially non-stretchable and non-shrinkable support for said tissues during exposure and development of said tissues, printing said tissues while attached to said plastic sheets by means of light passed through the plastic sheets, developing images on said plastic sheets, mechanically registering said plastic sheets relative to said negatives prior to printing, providing a water-permeable, non-stretchable and non-shrinkable temporary support having an adhesive surface, transferring the images one at a time from the plastic sheets to the adhesive surface of the temporary support, mechanically registering said plastic sheets relative to said temporary support during the transferring step so that all of said images will be placed upon said temporary support in an identical location, adhesively securing a permanent support to the images on said temporary support, and finally releasing the adhesive bond between the temporary support and the images without disturbing the adhesive bond between the images and the permanent support.

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