L. DUFAY.

SELECTING SCREEN FOR COLOR PHOTOGRAPHY.

APPLICATION FILED JUNE 29, 1912.

1,155,900. Patented Oct. 5, 1915.

Fig. 1.

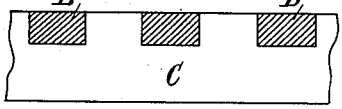


Fig. 2.

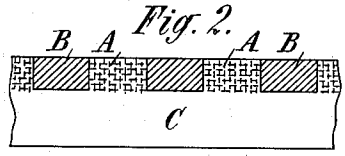


Fig. 3.

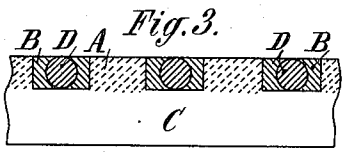


Fig. 4.

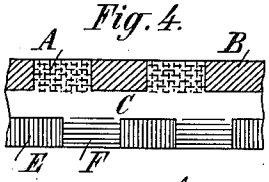


Fig. 6.

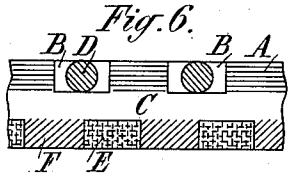


Fig. 5.

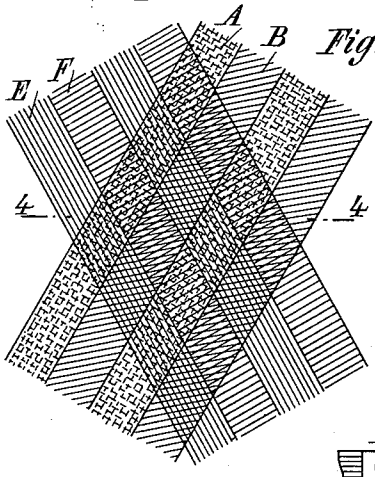


Fig. 7.

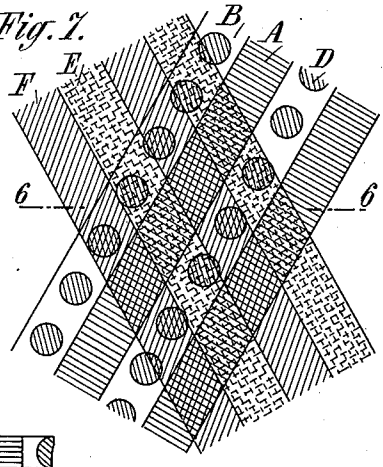


Fig. 8.

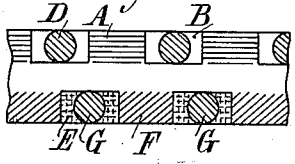
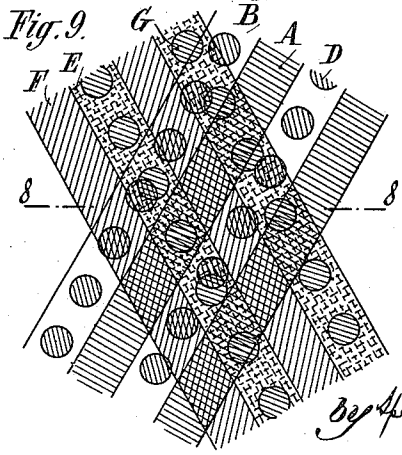


Fig. 9.



Attest:

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UNITED STATES PATENT OFFICE.

LOUIS DUFAY, OF CHANTILLY, FRANCE.

SELECTING-SCREEN FOR COLOR PHOTOGRAPHY.

1,155,900. Specification of Letters Patent. Patented Oct. 5, 1915.

Application filed June 29, 1912. Serial No. 706,658.

To all whom it may concern:

Be it known that I, LOUIS DUFAY, a citizen of the French Republic, residing at Chantilly, Oise, France, have invented certain new and useful Improvements in Selecting-Screens for Color Photography, of which the following is a specification.

This invention relates to a polychrome selecting screen with selector elements of any pattern, arranged side by side, without overlapping or gaps, and distributed in the body of the support (film or the like), on the back and front faces, of permeable transparent material (celluloid, gelatin, etc.) for color photography, more particularly for obtaining cinematographic films in natural colors, after coating the screen with an emulsion.

The intaglio engraving process, known as the half tone process, enables very fine and absolutely sharp impressions to be obtained. The essential feature of the said engraving process consists in filling the recesses or hollows made in a suitable support with printing ink.

In printing effected in accordance with this process, the ink employed is generally opaque, and the support is made of metal.

For manufacturing transparent screens employed in photo-engraving, the same process of filling the recesses is used, but in that case the support used is transparent glass, and the ink in the recesses provided in the said glass, is of black opaque color. Instead however of filling the recesses or incisions of the said transparent glass with a black opaque color, the said recesses could also be filled with a transparent impermeable material of any color, such as for instance a greasy colored varnish.

If instead of using glass as a support, is utilized an impermeable transparent material such as for instance a gelatin or celluloid film capable of being colored by imbibition of suitable coloring solutions, it is obvious that if this dyeing is effected only after the impermeable material is placed into the recesses, the color or dye will be unable to penetrate into the support except in the parts which have not been rendered impermeable; and if the impermeable material and the dye used are transparent selection colors, for instance one green, and the other orange, there will thus be obtained a screen colored in two colors arranged in a perfect manner side by side, without black or white intervals, capable of being utilized for color photography.

The invention is illustrated by way of example in the accompanying drawing.

Figure 1 shows in section the film support, the recesses of which are filled with impermeable transparent colored material. Fig. 2 shows the same support after the recesses are filled and after the non-impermeable spaces (which are between the said recesses) are dyed. Fig. 3 shows the support after the recesses are filled by means of an impermeable transparent colored material containing grains or pigments of a different color, and after the non-impermeable spaces which are between the said recesses are dyed. Fig. 4 is a section, taken on the line 4—4 in Fig. 5, of a film having packed recesses and dyed intermediate areas on both sides; Fig. 5 is a diagrammatic face view of the film shown in Fig. 4, showing the manner in which four-color mosaics are obtained by arranging the grooves on one side at an angle to those on the other side; Figs. 6 and 7 are views similar to Figs. 4 and 5 of a film having crossed recesses, those on one side having colored grains embedded in the impermeable material, and Figs. 8 and 9 are similar views of a film having colored grains in the recesses on both sides of the film.

The recesses could be produced in the support by any desired process, for instance engraved or molded, according to the nature or chemical composition of the said support. These recesses can be in the form of parallel lines or of elements of any kind, regular or irregular, geometrical or not; they can also be different for the two faces of the film support.

The special method of manufacture hereinafter described is given merely by way of example for carrying out the process on a celluloid support.

The back of a very thin transparent celluloid support is softened by the action of a suitable solvent, such as for instance amyl acetate, until the support has lost its consistency. It is then placed into thorough contact with a hard surface on which had been previously engraved either very fine grooves, or regular or irregular grains, and pressed in such a manner that the celluloid takes the impression of the said surface, this being attained with the greatest facility by

means of an energetic pressure and without heating. After the support C has become hardened, the recesses B thus obtained by molding, are filled, by a process similar to that used for half-tone engraving, with a very consistent, perfectly transparent, impermeable material colored in one of the colors which are to constitute the colored mosaics, for instance violet (Fig. 1), and then the side of the film thus treated, is submitted to the action of a yellow alcoholic solution which penetrates into and dyes the celluloid only at the portions A not provided with impermeable violet material (Fig. 2). It is obvious that it would also be possible to use a yellow impermeable material and a violet alcoholic solution. The same series of operation can then be carried out on the other side of the support, this time a red transparent impermeable material with which the recesses E are filled and a blue alcoholic solution being used which dyes the spaces F, or conversely a blue impermeable material and a red alcoholic solution (Fig. 4). The screen is then ready, and the support shows by transparence mosaics with four colors, perfectly dyed at every point of its surface, without black or white spaces which unfavorably affect the photographic result. When the recesses are in the forms of grooves those on one side are arranged at an angle to those on the other side as shown in Figs. 5, 7 and 9 as otherwise if they were parallel only two colors would be seen by transparence. It is then merely necessary to coat the support with emulsion by the ordinary means, either on the front or on the back, as desired. In fact, at the points where the yellow is superposed on the blue, it produces green, the green color being produced by transparency, and not by actual mixture; at the places where it coincides with the red, it produces the orange; in the portions where the violet is superposed on the red, it produces a violet-red, and everywhere where the same violet is superposed on the blue, it forms a violet-blue. The four colors constituting the colored mosaics, will be therefore, in the above example, the violet-red, the orange, the green and the violet-blue. In the same way, it is possible to obtain mosaics, the four colors of which will be for instance—1. Violet, orange, yellow-green, greenish-blue; it is sufficient, in order to obtain that result, to superpose, on the front of a group of red and green elements, a second blue and yellow group. 2. Orange-red, green, yellow-orange and violet; in this case it is necessary to superpose on the front of a group of blue and orange elements, a group of red and yellow elements.

In order to obtain the desired results with the chromatic system, it is sufficient that each of the composite or binary colors which enters into the selected composition, should be exactly complementary of the primary color with which it is arranged side by side and paired. The proportion of surfaces occupied respectively by each of the selector elements, is regulated so that the screen when finished, should produce a neutral gray impression without any predominant color.

By using long continuous celluloid bands, it is possible to produce by this process, film surfaces with sensitive screens for cinematographic photography in colors, by using rapid emulsions for the purpose of obtaining negatives in colors, the small thickness of the films enabling positive proofs of the said images to be subsequently obtained by ordinary photographic means, namely by contact, in an indefinite number of copies, on other films covered with emulsions and produced by the same process, but provided with screens of different microscopic shapes, in order to avoid the "watered" effect. For producing screens of that kind very thin supports are used, so as to avoid any parallax which could be produced by an excessive distance between the two groups constituting by their superposition the colored mosaics. Experience has shown moreover that the depth of the hollows filled with impermeable material, greatly contributes to obtaining the result in question. Screens of that kind, once finished, are produced in the very mass of the support, without any relief, they are very strong, successfully resist even energetic friction, and are completely impermeable to water.

In the process described hereinbefore by way of example, the back and the front of the permeable support are "gauffered" by means of an energetic pressure, without heating, after softening by the action of a suitable solvent. It is obvious that the gauffering of the support can be effected by any well known means, either one face, or simultaneously or successively on the two faces, namely by pressure, stamping or rolling, at any suitable temperature. It is also possible by means of the colored support to obtain three-color screens with elements of any pattern, by using a support gauffered on one side only, and by proceeding in the following manner (Fig. 3). Instead of filling the hollows B of one of the sides of the support, with a homogeneous impermeable material dyed in one of the three colors of the screen, for instance green, it is sufficient to mix the said impermeable material with perfectly transparent elements of any shape D, but having a slightly smaller diameter than the width and the depth of the hollows to be filled. These elements, before their incorporation into the impermeable material, are dyed with a selection color, for instance violet. These colored particles, when filling

the recesses are introduced into the hollows, and only the parts of the hollows unoccupied by the particles are filled with the homogeneous impermeable matter, which will alternate with the said colored particles in the recesses. In that state, the support shows a ruled or striped surface of two transparent colors; it is therefore merely necessary for finishing the screen, to dye the non-filled surface with the third selector color, that is to say with orange in the parts A comprised between the receiver B. In that way, on a single side of the support has been produced a three color screen with elements arranged side by side, without any white or black space, and consequently highly suitable for making a correct selection of photographic images. The emulsion is then spread on the screen in the usual manner. Such screens can be obtained on thick and rigid supports by means of only two industrial operations, namely filling and dyeing. A screen can also be produced on a transparent permeable support by the application, by means of the first process of two colors E, F on the back face of the support, and of three colors A, B, D by means of the second process on the front face of the support Figs. 6 and 7. A screen could also be manufactured on a transparent permeable support by the application, by means of the second process, of three colors E, F, G on the back face of the support of three colors A, B, D on the front face, Figs. 8 and 9. It is obvious that the manufacture of these new film screens can be carried out not only by the process hereinbefore described by way of example, but also by any kind of process.

The arrangements hereinbefore described are given merely by way of example, the shapes, materials, dimensions, detail-arrangements and applications can be varied without departing from the spirit of this invention.

What I claim as my invention and desire to secure by Letters Patent is:—

1. A selecting screen for color photography comprising a transparent support having a plurality of closely arranged recesses therein, a filling in said recesses composed of a transparent impermeable colored material, and areas intermediate said recesses and coterminous therewith, containing imbibed coloring matter.

2. A selecting screen for color photography comprising a transparent support having a plurality of narrow closely arranged linear recesses therein, transparent grains arranged in spaced relation in said recesses, and colored in one selecting color, a filling composed of an impermeable transparent material colored in a second selecting color and arranged in said recesses between said grains, and areas intermediate said recesses and coterminous therewith, dyed with a third selecting color.

3. A selecting screen for color photography comprising a transparent support having a plurality of closely arranged recesses in both sides thereof, a filling in said recesses composed of a transparent impermeable colored material, and areas intermediate said recesses and coterminous therewith containing imbibed coloring matter.

4. A selecting screen for color photography comprising a transparent support having a plurality of closely arranged recesses in both sides thereof, a filling in the recesses on one side composed of a transparent impermeable colored material, a filling in the recesses on the other side composed of transparent colored grains embedded in a transparent impermeable colored material, and areas intermediate said recesses and coterminous therewith containing imbibed coloring matter.

5. A selecting screen for color photography comprising a transparent support having a plurality of closely arranged recesses in both sides thereof, a filling in said recesses comprising transparent colored grains embedded in transparent impermeable colored material and areas intermediate said recesses and coterminous therewith containing imbibed coloring matter.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

LOUIS DUFAY.

Witnesses:

H. C. COXE,

GEORGES BONNERRIL.