March 31, 1936. F. H. MÜLLER 2,035,825

PROCESS OF PRODUCING COLORED PICTURES

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Fig.1.

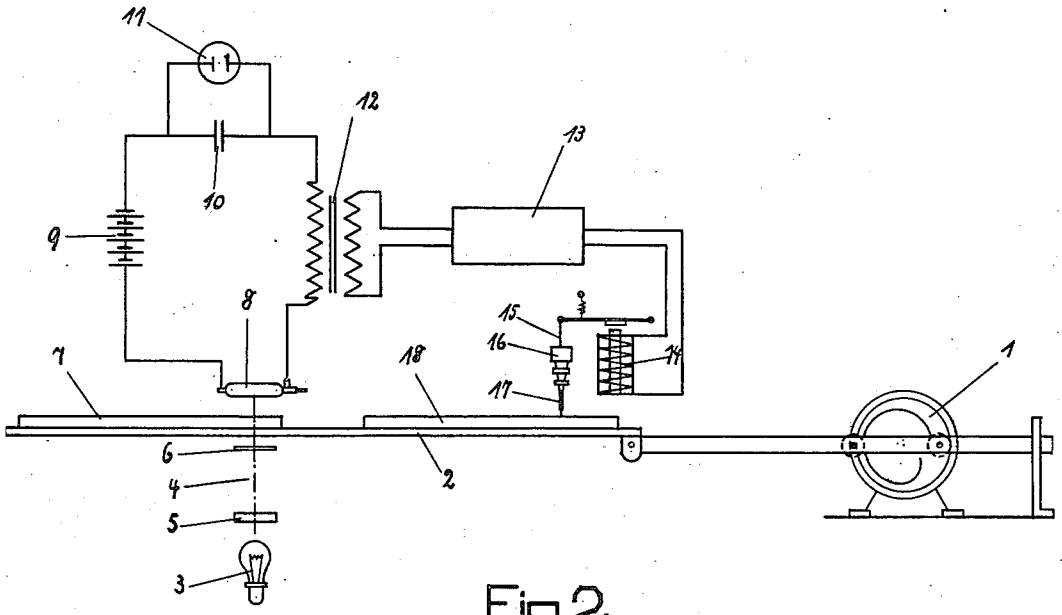
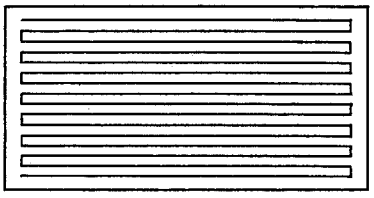


Fig.2.



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PROCESS OF PRODUCING COLORED PICTURES

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2 Claims. (Cl. 178—5)

Many processes have been tried for the production of colored pictures no perfect result having however been attained. The subtractive process of the regular three color printing according to the pinatype principle is known in many modified forms; further the so-called bleaching process and the additive screen process are likewise known. The three color printing process, if a perfect result is to be obtained, requires not only a considerable amount of time but also a great deal of experience.

Satisfactory paper pictures have not hitherto been obtained by the bleaching process. The additive screen process seems to be the most promising of the known processes for producing colored pictures but in this process, however, the production of a satisfactory picture is also dependent upon an absolutely correctly exposed negative, the correct exposure of the positive being also very important in order to bring out the colors properly in the finished picture.

The invention avoids the inconveniences of the known processes and also allows the advantages of the three color printing to be combined in an excellent manner with those of the screen process, the special knowledge of the three color printing being however not at all necessary, it being even possible to mechanically produce colored pictures. The process according to the invention consists in that the colors of a negative of any colored picture are felt off by means of a source of light in the smallest portions, these fine rays acting then on photocells which, with interposition of an amplifying unit, actuate relays which reproduce the light impressions in the photo cells in the form of colored printed dots on paper or other support.

Apparatus for carrying out the process is illustrated by way of example in the accompanying drawing in which:—

Fig. 1 shows a diagram of the whole apparatus.

Fig. 2 shows the movement made by the original and the copy during the carrying out of the process.

In the diagram it is assumed that a three color photographic print is to be produced from a colored negative taken for example by means of a three-colored screen plate. According to the process the negative is felt off with three different colored thin light rays, which light rays then impinge on three photo cells which, through the intermediary of an amplifying unit, operate three relays which reproduce the light impressions in colored printed dots. These colored printed dots, which follow one another more or less rapidly according to the density of the negative, compose the finished picture, each relay having to print a different base color. In the drawing for example a motor 1 drives a carriage 2 in such a manner that it always moves to and fro at uniform speed, the carriage 2 being shifted slightly laterally after each to and fro movement. Fig. 2 shows this travel of the carriage as continuous movement. A source of light 3 projects its rays 4 through a colored filter 5 and then through a very fine diaphragm 6. An optical system may be employed instead of the diaphragm and concentrate the beam of rays from the source of light to form a very fine light ray. The fine light ray emanating from the system impinges on a photo cell 8. When this light ray impinges on the photo cell this cell loses its dark resistance and the current of a battery 9 charges a condenser 10. As soon as this condenser is charged, it is discharged over a glow lamp 11. The resultant current impulse is conducted through the primary coil of a transformer 12, which induces this impulse on the secondary coil, whereupon the current passes into an amplifier 13. This amplifier 13 actuates a relay 4. A needle 15 is connected to this relay 14. This needle extends through a color containing vessel 16 through a cannula extending therefrom. In inoperative position the needle 15 is drawn back into the cannula, whereas each time the condenser 10 discharges the relay 14 pulls the needle 15 downwards on to the paper 18. As the cannula is likewise filled with color a minute color drop forms on the lower end of the needle 15 and is deposited on the surface of the paper 18. The individed color drop is so small that it is scarcely visible with the naked eyes. The needle marks follow very rapidly the one on the other, the rapidity depending upon the density of the negative. If the negative is dense, less current flows through the photo cell so that a longer time will elapse before the condenser 10 is charged and discharged. The needle will therefore carry out fewer movements. If the portion of the negative is clear, a stronger current flows through the photo cell, the charging and discharging of the condenser 10 takes place more rapidly and the needle will move quicker so that more color dots will be printed on the paper 18. At very dense portions of the negative the photo cell only receives so little current that for example the charging of the condenser takes longer, under certain circumstances occupies several seconds, and the relay 14 also responds very slowly and makes a col-

ored printed dot only every second or third second. The result is, that these portions appear absolutely white in the picture. As both the negative 7 and also the paper 18 rest on the same carriage, the movements of the two parts coincide.

The individual colors are separated by means of the filter 5 and as the color pots 16 also contain the three base colors, a finished picture with pure whites is obtained as final product. If for example there is red in the negative the interposed red filter will only allow the rays from the source of light 3 to pass through the negative where there are red portions and the photo cell 8 will only respond to these portions. As the colors in the negative are complementary blue must be pointed in the positive; the operation is similar in the case of the other colors.

To enable the process to be carried out properly, it is necessary to always maintain uniform the amplitude, that is the strength of the current. By employing the glow lamp as discharging means this solution is possible.

For the simultaneous production of a large number of pictures several relays can be connected to the amplifier 13 in series, so that any number of colored pictures can be copied from a negative in a single operation. It is also possible to produce pictures which are larger or smaller than the negative by varying the speed of movement between the negative and positive, in order to produce a larger or smaller picture in a simple manner. In this case thinner color needles are employed for smaller pictures and thicker color needles for larger pictures.

A further advantage is derived from the fact that the strength of the copy can be varied as desired by changing the frequency by adjusting the condenser. Thus, if for example a negative is weak, the condenser is adjusted towards the maximum side so that the chargings take slightly longer. If the negative is strong, the condenser is adjusted towards the minimum side so that the time for chargings is shortened. The needle movements are retarded or accelerated corresponding to the charging time. This possibility offers the extremely great advantage over all other processes that a satisfactory colored picture can be produced even from imperfect negatives.

The process also enables, besides the production of the multi-colored picture from a colored negative, colored positive pictures to be copied. In this instance, however, the photo cell must operate in inverse sense, as otherwise a negative picture would be produced. The process according to the invention offers the further advantage that, for producing a colored picture, any desired support can be employed and above all a cheap unprepared paper is suitable for producing large numbers of pictures.

I claim:—

1. A device for the production of multi-colored pictures by the scanning of a negative original with light, comprising in combination a carriage on which the original rests and shiftable in a continuous rectilineal movement, a source of light adapted to project rays on to the original on said carriage, a photo-cell on the opposite side of the carriage to said source of light adapted to actuate under the influence of the rays passing through the original, a condenser adapted to be charged by said photo cell, a glow lamp over which said condenser intermittently discharges, to produce a circuit impulse, a relay connected with said glow lamp, a transformer and an amplifier between said glow lamp and said relay adapted to intermittently actuate said relay by means of said current impulse, and a color printing device connected with said relay and adapted to be actuated by said relay to produce colored dots on a support to receive the reproduction moved correspondingly to the original.

2. A device as specified in claim 1 in which the printing device comprises an ink receptacle and a fine needle extending through said receptacle and adapted to be moved up and down by said relay to deposit small ink dots on the support to receive the reproduction.

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