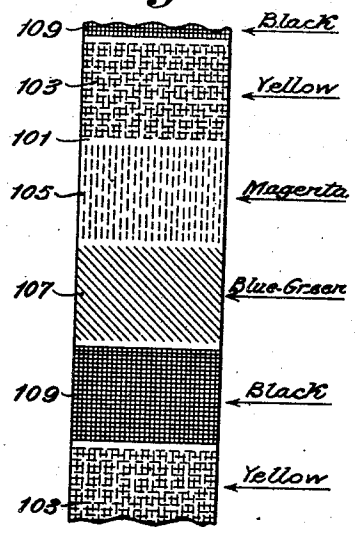
Oct. 14, 1947. K. SINGER 2,428,945

COLOR FACSIMILE

Original Filed Dec. 27, 1940

Fig. 2.



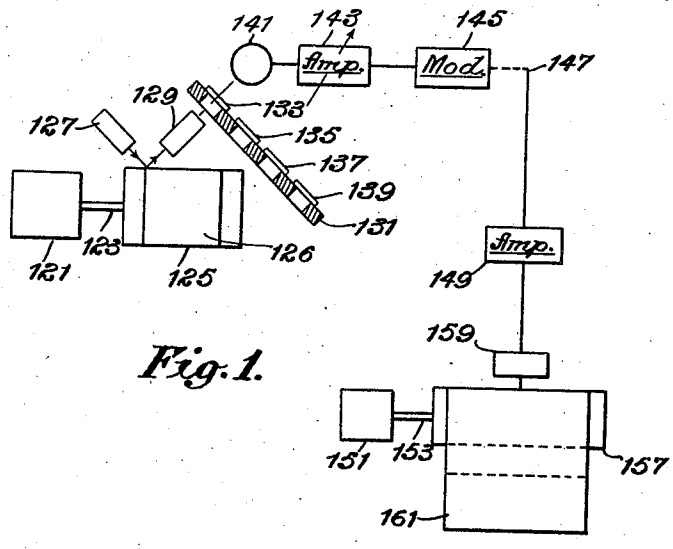


Fig. 1.

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COLOR FACSIMILE

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Original application December 27, 1940, Serial No. 371,852. Divided and this application September 23, 1944, Serial No. 555,533

3 Claims. (Cl. 178—5.4)

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This invention relates to signalling systems for receiving colored facsimiles of pictures, records, and the like, and more particularly, to a novel recording means. This invention is a division of my copending application, Serial No. 371,852, which was filed December 27, 1940.

Systems for transmitting and receiving colored facsimiles in the past have utilized the transmission and reception of color separation negatives or the color separation transmission and spraying of colored inks at the receiving end. In the first method above named, the preparation of the separation negatives involves considerable labor, and further, considerable actual difficulties are experienced because of the high requirements for carefully controlled photographic processes, in order to obtain suitable reproductions. The second method above named is also burdened with certain practical difficulties and suffers the inability to produce a number of copies from one transmission.

By my invention, I overcome the previous difficulties incurred by photographic processes, and at the same time, achieve the desirable result of obtaining a number of copies from one transmission.

Moreover, my invention also provides improved reproduction qualities by automatically providing a black or masking printer record as well.

These benefits are derived directly by providing in accordance with my invention, a simplified tri-colored separation method of transmission and by obtaining "carbon" transfer records in a novel manner at the receiving end. The "black printer" signal at the transmitter may be obtained directly and automatically from the tri-color separation signals as disclosed in the above noted patent application, and a "black printer" record is obtained in a novel manner. By a suitable choice of the color transfer material in the nature of water soluble dyes, such as hectograph inks, for example, the separate color records obtained at the receiving end may be used for striking a large number of copies. Alternatively, at the receiving end, I may provide stencil-cut separation records, and in forming the finished picture, I may use appropriate inks with each of the stencils to provide a large number of facsimiles of the transmitted picture, object, or other subject matter.

Use of the so-called tri-colored method of transmission is suitable, in which the complex colors of the elemental areas of the object to be transmitted are resolved into three color components, such as blue, green, and red at the transmitter. At the receiver, a record corresponding to each of these resolved components is reproduced in appropriate complementary colors, such as yellow, magenta, and blue-green, respectively. Superpositioning of the three received records will then reproduce the original colors of the object in accordance with the well known principles of subtractive color reproduction. Due to the fact that the means available for deriving the component colors at the transmitter does not provide pure spectral components, and that at the receiver the colors used in making the records do not have idealized spectral response, it is desirable to provide a "masking" or "black printer," as it is known in the art, to control saturation properties of the color.

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The "black printer" is one in which the corresponding areas to the original object are reproduced in accordance with substantially only the luminosity of the color, but without regard to the color itself. The use of this printer is well known in the printing art, as well as photographic art, in making color reproduction. My invention also provides for obtaining such a "black printer." Thus, the inherent limitations of filters, dyes, and photosensitive cells utilized by my invention, which would produce unfaithfulness in reproduction of the colors, can be substantially overcome by the provision of the "black printer" obtained in a simple fashion by my invention.

To keep the receiving apparatus components at a minimum, the invention contemplates the provision of a special transfer medium which enables simple and rapid transmission of the printing records.

It will be understood, of course, that it is not necessary to use a three color separation system, but that a two-color separation system can also be utilized, although ordinarily, reproduction by the two color separation method is inferior to that obtained by the three color separation method.

An important object of the invention herein claimed as divisional subject matter is to provide a novel recording medium for obtaining a reproduction in color of a colored original.

Another object of my invention is to provide a novel transfer medium for simplifying the reception of color printer records.

Still another object of my invention is to provide a novel recording medium in the form of a stencil for obtaining a reproduction of a plurality of reproductions in color of a colored original.

A further object of my invention is to provide

a color facsimile system which insures complete registration of the received printer records.

A still further object of my invention is to provide a simple system for reproducing images from colored transparencies and colored pictures.

Other important objects of my invention will be perceived upon a reading of the following specification, taken together with the drawing, in which:

Fig. 1 shows schematically a transmitting and receiving system embodying the method and apparatus of my invention in which a special transfer medium is used; and

Fig. 2 shows in detail, schematically, the formation of a special recording medium used in conjunction with the receiving apparatus shown in Fig. 1.

In Fig. 1, at the transmitting end, a conventional facsimile scanner incorporating a drum 125, on which the colored object 126 to be transmitted is mounted, is driven by a motor 121 through the shaft 123. A light source and optical system 127 projects a very fine spot of light upon the material 126 to be transmitted, and the reflected light from the surface is picked up by the optical system 129 and focused on the photocell 141. Suitable means are provided, as well known in the art, to provide relative movement between the systems 127—129 and the object 125 to scan the area of the object along a spiral path, elemental area by elemental area.

Interposed between the optical system 129 and the photocell 141, is a set of filters for analyzing the colors of the object 126 into its component values of blue, green, and red. The filter holder 131 mounts the blue filter 133, the green filter 135, and the red filter 137. To obtain the "black printer," there is provided an infra-red filter 139. As pointed out above, the signal for the "black printer" may be obtained in other ways, for example, as shown in Fig. 3 of the parent application. Suitable filters may be those available commercially, such as the Wratten filters A, B, C, and No. 88, corresponding to red, green, blue, and infra-red, respectively. The light picked up by the optical system 129 and transmitted through the appropriate filter, for example, 133, falls on the photocell 141 to provide a signal whose intensity is determined by the intensity of the impinging light. The produced signal may be suitably amplified by methods well known in the art, or may be used to produce an amplitude modulated carrier wave directly, also well known in the art, as typified by the circuit arrangement shown in the Artzt Patent No. 1,988,472. While the drawing shows an amplifier 143 for amplifying the output of the photoelectric cell 141, which amplified output then is used to modulate a carrier wave at the modulator 145, it will be understood, of course, that the circuit arrangement shown in the above identified Artzt patent may be used in place of the two separate units 143 and 145. The modulated carrier wave is then transmitted over the transmitting medium 147, which may, for example, be a transmission line or a radio transmitter to the receiving point. At the receiving point, the received signal is amplified by the amplifier 149 and serves to actuate the recorder 159. A motor 151 running in synchronism with the transmitting motor 121, drives the receiving scanning apparatus, which may embody a drum 157 through the shaft 153. A transfer medium 161 placed between the recording mechanism 159 and the drum 157 transfers appropriate colored inks in dry form onto a suitable record member positioned between the carbon or inked paper 161 and the drum 157. In Fig. 2, I have shown the carbon or inked paper 161 in detail. The paper 101 is successively coated by appropriately colored ink, such as yellow, magenta, blue-green, and black, each area being somewhat larger than the area of the record surface, which is to receive the ink.

It is, of course, understood that the receiving drum rotates in synchronism and in frame with the transmitting drum. For maintaining synchronism, any of the methods and means well known in the art may be used, and since these are so well understood, no description of a specific means of synchronizing and framing is included in the specification.

In making the colored print, the steps are as follows:

The object 126 to be transmitted is scanned first through the blue filter 133 at the transmitter, while at the receiver, the yellow inked surface is under the recording mechanism, yellow being complementary to blue to form a yellow printing record. Following the scanning of the object 126 through the blue filter, the object 126 is rescanned through the green filter 135 at the transmitter. At the receiver, the inked support surface is advanced so that the magenta ink 105 is transferred to the record surface to form the minus-green portion of the record. Following the completion of scanning of the object 126 through the green filter, the object is once more rescanned through the red filter 137 at the transmitter, while the blue-green ink surface 107 is in register with the support surface to form the "cyan" or blue-green portion of the record. Finally, the object 126 is rescanned through the infra-red filter 139 with the black ink surface 109 in register with the support surface at the receiver to form the black portion of the record.

The caesium activated type of photocell, such as that known in the art as the RCA–922, has considerable response to infra-red, and enables a signal to be produced when light is directed through an infra-red filter from the object 126, which is proportional to the luminous intensity of the color, without, however, being influenced by the actual hue of the color. There is thus produced at the receiver, on the record surface, the superimposed colors of yellow, magenta, blue-green and black, to reproduce in color a facsimile of the object 126 in accordance with the well-known subtractive color method.

Where it is desired to reproduce a number of copies from a single transmission, the transfer of color from the carbon 101 may be made on a transparent sheet member, such as Cellophane, for example, in the form of separate images. That is to say, that the Cellophane advances at the same rate as the linear scanning speed of the object 126, so that four separate color images, as the yellow, magenta, cyan and "black printers" would be reproduced. By using a suitable ink, such as "Hectograph" or "Ditto" inks, transfers may be made from the Cellophane sheet onto a white record surface, and by superimposing the magenta on the yellow and the blue-green or cyan on the magenta, and the black on the blue-green, substantially accurate color reproductions may be effected.

Alternatively, the paper 161, instead of being a carbon paper, may be in the form of that used in making mimeograph stencils, and four stencils, corresponding to the yellow, magenta, blue-green,

and "black printers," may be cut in succession with appropriate colored inks on a single support surface, with superpositioning of the images to produce colored reproductions. That is to say, the first stencil would be printed with yellow ink on the record surface. Then, in the order named, others would be printed on top of each other, the second with magenta, the third with blue-green, and the last with black ink. It will be appreciated that suitable registration marks may be made on the original object to aid in registering the individual images to be superimposed. As a suitable type of recorder mechanism for transferring ink either to the single support surface or to the Cellophane, a carbon recorder of the type shown in the Young Patent Reissue No. 20,152 may be used.

Where it is desired to utilize a stencil, then a recording mechanism of the type disclosed in Weinberger No. 1,927,428, may be used. Any of the suitable well known methods of synchronizing the motor 121 with the motor 151 may be used. Alternatively, each motor may be controlled to a high degree of accuracy by primary frequency standards located at both the receiving and the transmitting station.

While, for purposes of explaining the invention, the transmitting scanner has been illustrated and described for reproduction of pictures by using reflected light, it will be appreciated that both the method and apparatus may be used to make colored reproductions from colored transparencies, such as those known in the art as "Kodachrome," for example. Where representations of transparencies are to be transmitted, the scanner is modified so that the light of the scanning spot is transmitted through the transparency instead of being reflected from the surface of the picture, as described in connection with Fig. 1. A suitable form of scanner may be that of the type shown at page 14—05 of the "Electrical Engineers' Handbook," volume IV and volume V, by Pender and MacIlwain, it being understood that the light transmitted through the transparency is analyzed as to its component colors, as described in connection with Fig. 1.

Having now described the invention, what is claimed and desired to be secured by Letters Patent is the following:

1. A printing strip for use in a multi-color facsimile signal recorder having color recording means, said strip comprising a web, adjacent areas of which bear recordings in accordance with received facsimile signals representing a single color component of a scanned original whereby said web is in the form of a printing strip having a plurality of adjacent areas, each area representing a component color, said printing strip thereby constituting means from which reproductions in colors of the scanned original may be printed.

2. A printing strip for use in a multi-color facsimile signal recorder comprising a mimeograph stencil sheet in the form of a web, adjacent areas of which exhibit recordings in accordance with received facsimile signals representing a single color component of a scanned original said web is in the form to produce a mimeograph stencil strip conditioned in adjacent areas to provide ink impressions which may be superimposed on a record sheet to provide inked reproductions in colors of the scanned original.

3. A transparent printing strip for use in a multi-color facsimile signal recorder having color recording means, said strip comprising a web, adjacent areas of which are impressed with colored transfer ink in accordance with received facsimile signals representing a single color component of a scanned original whereby to produce an ink transfer printing strip, said printing strip thereby constituting means from which reproductions in colors of the scanned original may be printed upon a record sheet by successive printing operations from adjacent areas of said printing strip.

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