EXHIBIT D

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Patton et al.

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(54) **METHOD AND APPARATUS FOR MODIFYING A PORTION OF AN IMAGE IN ACCORDANCE WITH COLORIMETRIC PARAMETERS**

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(73) Assignee: **Eastman Kodak Company**, Rochester, NY (US)

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(51) **Int. Cl.**[7] **G06K 15/00**
(52) **U.S. Cl.** **359/1.9**; 358/518; 382/164
(58) **Field of Search** 382/164, 118, 382/190; 358/1.9, 500, 518, 530

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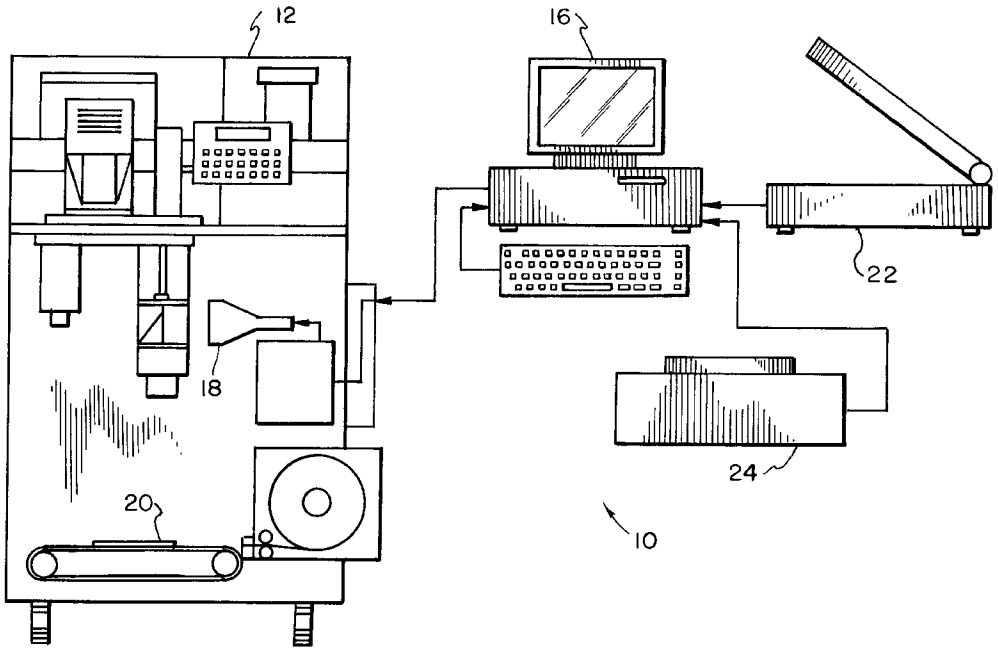
(57) **ABSTRACT**

A method and apparatus for modifying images. The method includes the steps of analyzing a digital image file of an image so as to identify at least one predetermined colorimetric parameter; and automatically modifying that portion of said image having said at least one predetermined colorimetric parameter to a second predetermined colormetric parameter so as to produce a modified digital image.

19 Claims, 2 Drawing Sheets



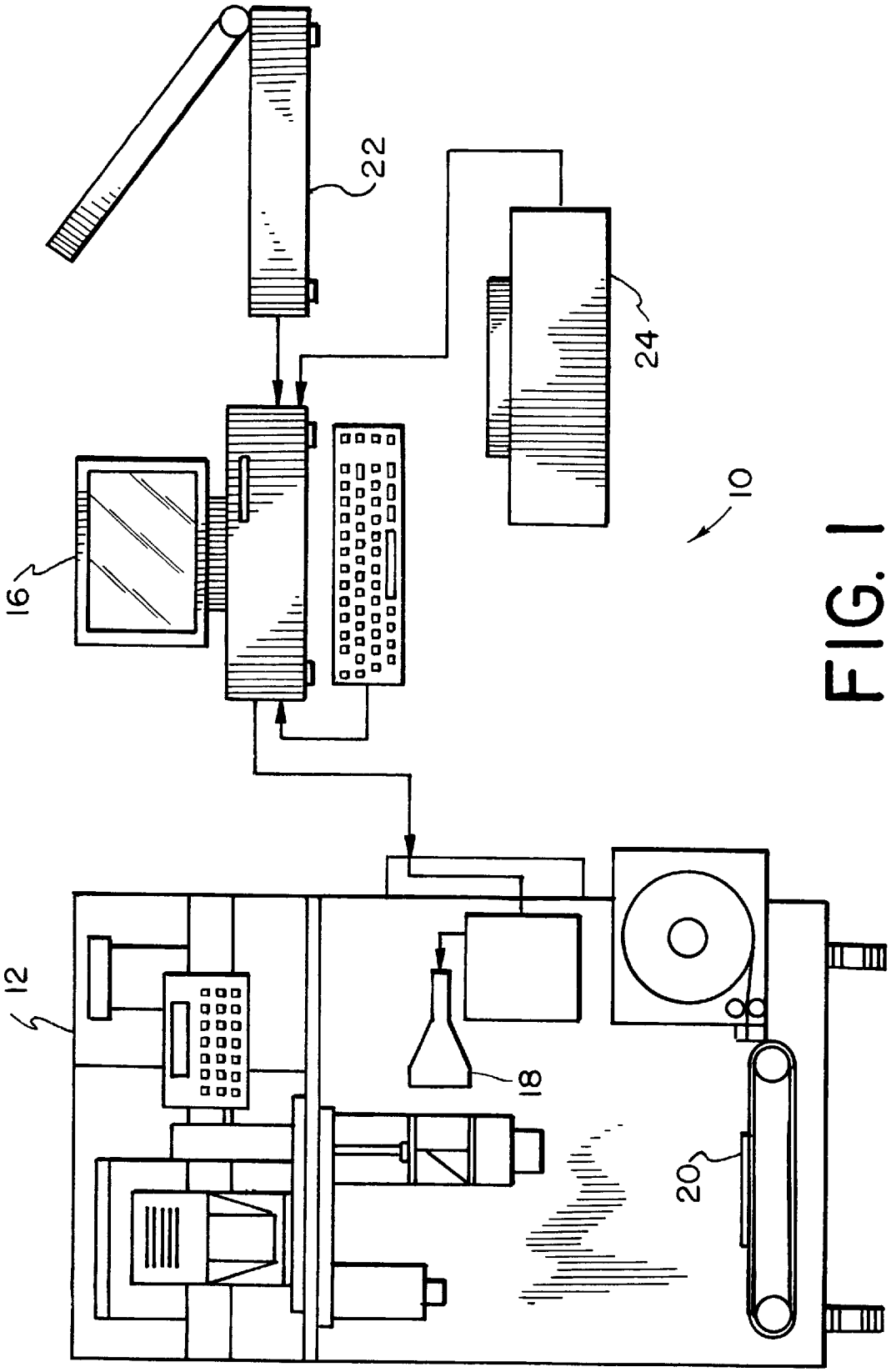


FIG. 1

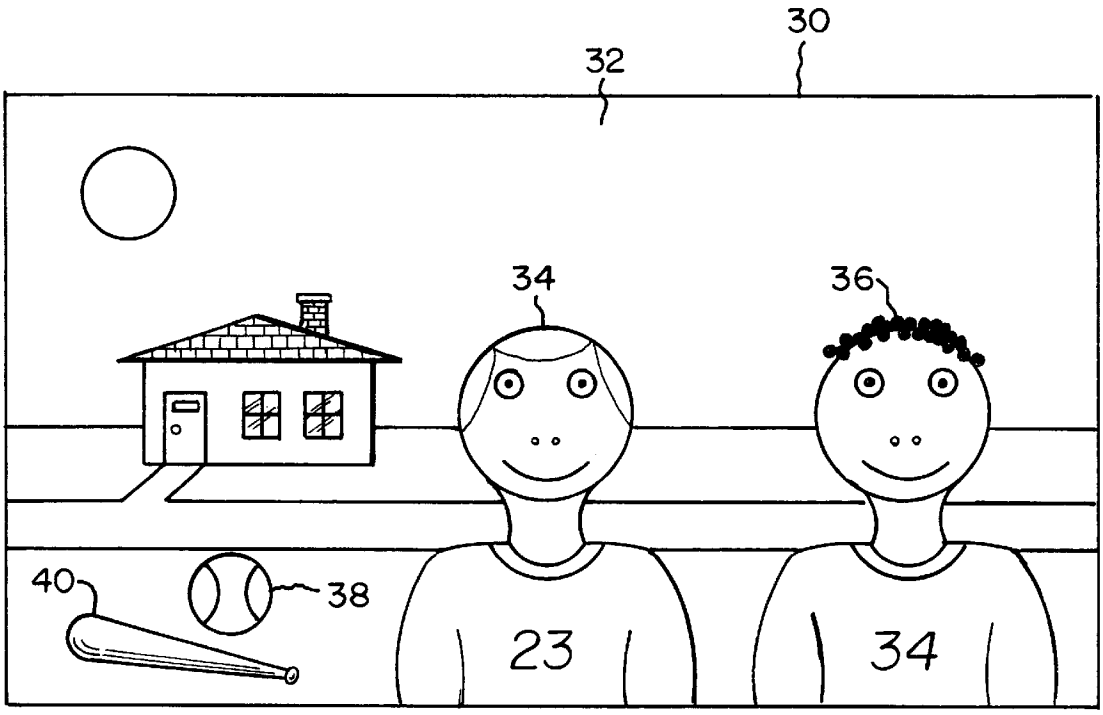


FIG. 2

METHOD AND APPARATUS FOR MODIFYING A PORTION OF AN IMAGE IN ACCORDANCE WITH COLORIMETRIC PARAMETERS

FIELD OF THE INVENTION

The present invention relates to adjusting the skin tone in a reproduction of an image, and more particularly, to a photographic color imaging system that selectively adjusts the skin tone of individuals in images in accordance with customer preferences.

BACKGROUND OF THE INVENTION

Color negative/positive photographic systems in use today are designed to produce pleasing prints for most of the people in a target population. The print appearance includes both pleasing tone and color reproduction to produce colorful prints with good contrast, and particularly excellent skin tone reproduction. Typically, existing photo systems are designed to be optimized for a particular skin type and preference, for example, Caucasian, Oriental, Asian, Indian, and/or Black. Photographic film, paper, and printer sets-ups are generally designed for providing pleasing color for a particular market segment. In taking photographs of an individual of a first skin tone type with a system designed for a second skin tone type, the skin tones of the first skin tone type will appear undesirable. For example, in a system designed for Caucasians, individuals having a darker skin tone will result in the darker skin tones appearing compressed. This often results in the facial features being lost in an overly dark representation.

It is possible to design a photographic system that is optimized for dark-tone skin tone reproduction. This can be done by adjusting the photographic film, paper, and/or printer set-ups. However, this kind of system would not produce optimum light-tone skin tone reproductions. Solving the problem in this manner would still result in the inability of a single system to produce pleasing skin tone reproduction, regardless of the lightness of the skin tones in the scene. Marketing two different films would increase marketing and inventory costs, and potentially lead to confusion in the customer's mind about the circumstances for use of the different systems.

With current photo systems, the only option available for improving the reproduction of skin tones, which the system is not designed for, is to adjust the print density and color balance during printing. Neither of these adjustments produces preferred prints because they alter the reproduction of portions of the scene that are not skin tones.

U.S. Pat. No. 5,300,974 to Stephenson discloses a system that allows the camera user to record the color balance preference.

U.S. Pat. No. 5,710,954 to Inoue discloses a system involving a video image in which the customer selects a preferred color balance.

U.S. Pat. No. 5,726,737 to Fredlund et al describes a system for controlling photofinishing of photosensitive material.

U.S. Pat. Nos. 5,488,429 and 5,638,136 to Kazuaki et al describes a method and apparatus that detects skin tones in an image.

Thus, there is a need to provide an economical photographic system that can be adjusted to compensate for different skin tones in accordance with customer preferences without concern as to the tone characteristics of the originating film or providing a plurality of different film types, each being directed to a different skin type. There is also a need to provide a system wherein the customer and/or photo lab can select manually or automatically the desired skin tone characteristics.

In a system made in accordance with the present invention, a solution is provided for eliminating and/or minimizing the problems of the prior art that can improve images provided on conventional photosensitive media, or in digital format. Print algorithms are provided in a digital photofinishing system, which changes the appearance of the skin tones in a print to a selected preference. The preference may be obtained by a selection option provided detected on the film processing order, encoded on the film itself, or carried out automatically by the photofinisher providing a specific skin tone preference is desired in a region of a country and/or world. The skin tone adjustment can be one of one or more selections available in the algorithm, or accessed from a customer profile.

SUMMARY OF THE INVENTION

The present invention is directed to overcoming one or more of the problems set forth above. Briefly summarized, according to one aspect of the resent invention, there is provided a method of modifying images, comprising the steps of:

a) analyzing a digital image file of an image so as to identify at least one predetermined calorimetric parameter; and

b) modifying that portion of the image having the at least one predetermined calorimetric parameter to a second predetermined colormetric parameter so as to produce a modified digital image.

In accordance with another aspect of the present invention, there is provided an apparatus for modifying digital images, comprising:

a) an analyzer for analyzing a digital image file of an image so as to identify at least one predetermined colorimetric parameter; and

b) means for automatically modifying that portion of the image having the at least one predetermined calorimetric parameter to a second predetermined colormetric parameter so as to produce a modified digital image.

The above, and other objects, advantages and novel features of the present invention will become more apparent from the accompanying detailed description thereof when considered in conjunction with the following drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the detailed description of the preferred embodiments of the invention presented below, reference is made to the accompanying drawings in which:

FIG. **1** is a schematic diagram of a photographic printing apparatus made in accordance with the present invention; and

FIG. **2** illustrates a photograph that is to be reproduced by the apparatus of FIG. **1**.

DETAILED DESCRIPTION OF THE DRAWINGS

The present description will be directed in particular to elements forming part of, or in cooperation more directly with, the apparatus in accordance with the present invention. It is understood that elements not specifically shown or described may take various forms well known to those skilled in the art.

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