EXHIBIT C

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Bryniarski et al.

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(54) **IMAGE QUEING IN PHOTOFINISHING**

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(52) **U.S. Cl.** **358/1.15**; 358/1.16

(58) **Field of Search** 710/54; 399/80, 399/82; 358/1.16, 1.9, 1.15, 448, 444; 382/112

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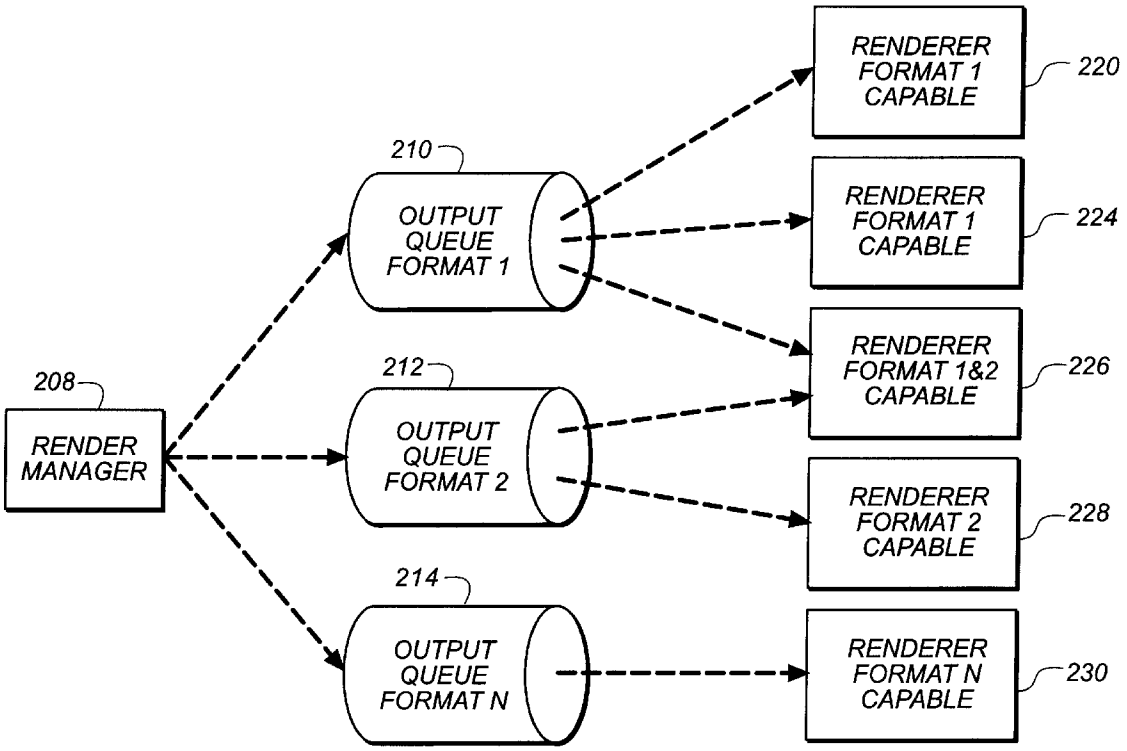
(57) **ABSTRACT**

A method of processing customer images in a photofinishing apparatus. The method includes obtaining customer image signals and associated requests for image products or services incorporating respective images. The images signals are directed into image queues having different associated formats, based on the associated product or service requested for each. The image signals are communicated from the queues to respective image renderers which render the image signals into the different formats associated with each queue. An apparatus which can execute such a method is also provided.

23 Claims, 2 Drawing Sheets



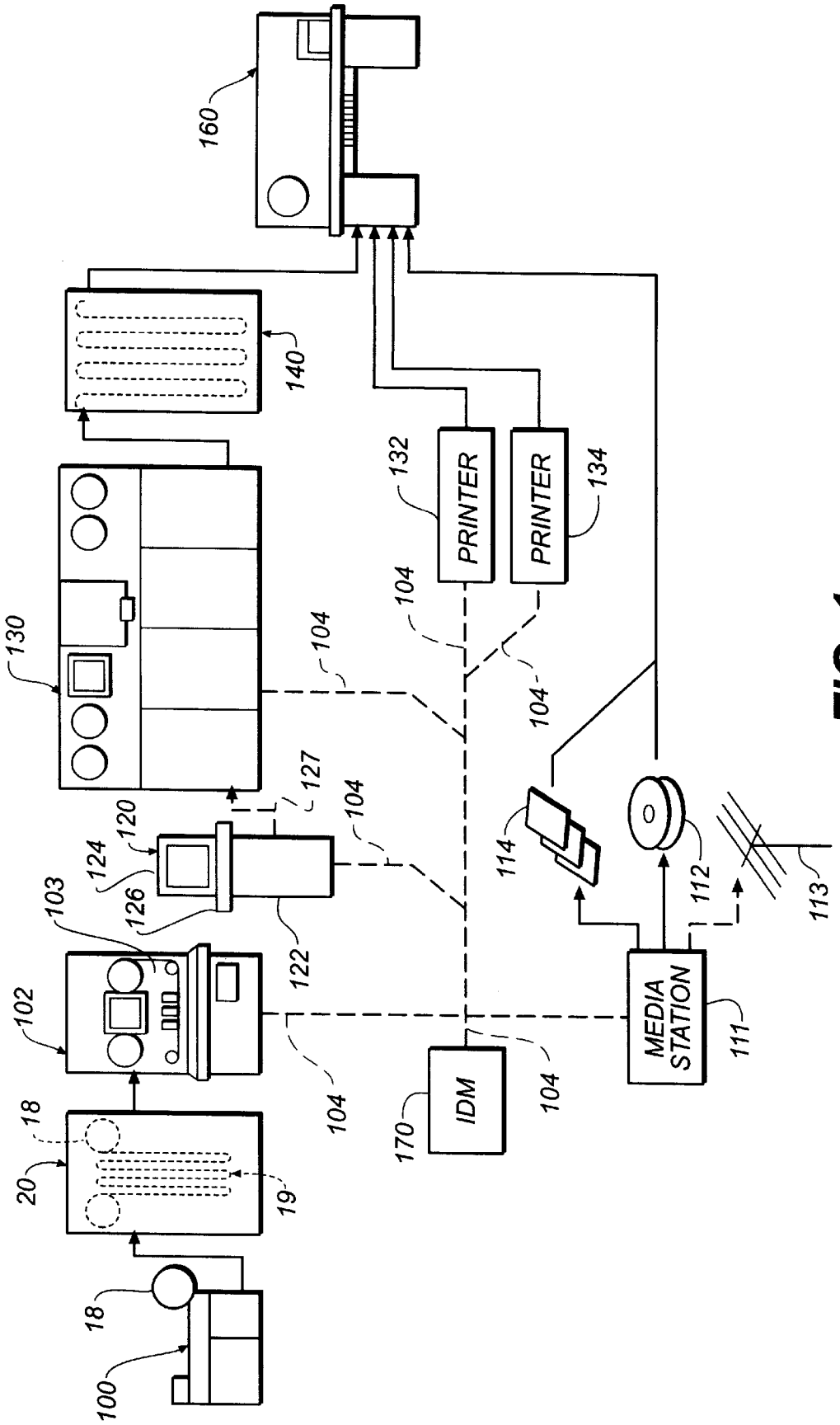


FIG. 1

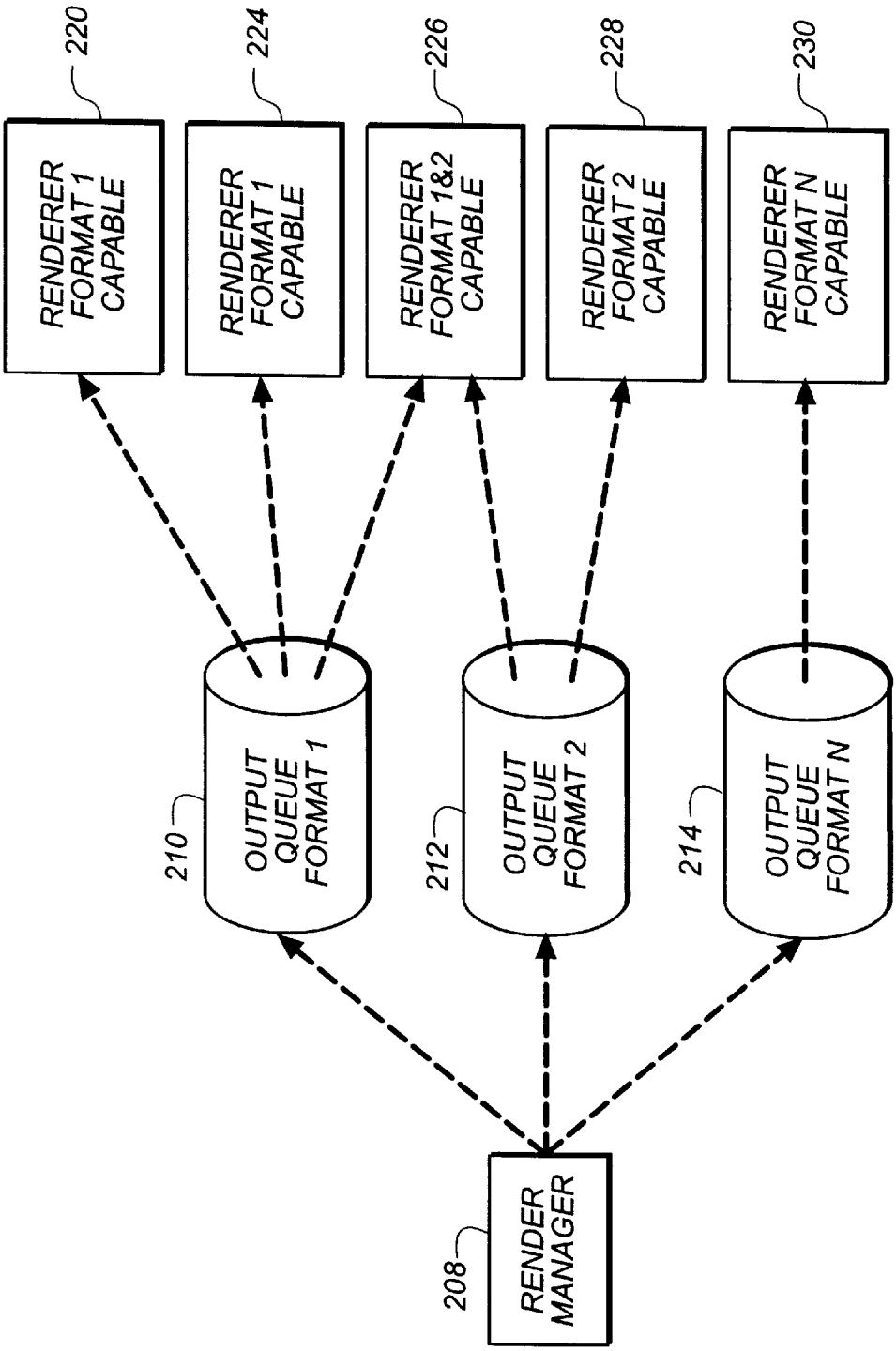


FIG. 2

IMAGE QUEING IN PHOTOFINISHING

FIELD OF THE INVENTION

This invention relates to images, and in particular to the printing or other output of images in a photofinishing apparatus.

BACKGROUND OF THE INVENTION

In conventional photofinishing laboratories a user (sometimes referenced as a customer), delivers one or more film rolls carrying corresponding exposed films, to a processing laboratory to have them chemically developed and hardcopies of the images (such as paper prints or slides) prepared. A "photofinishing laboratory" will be understood to include a "photofinishing apparatus". The user can include an individual or a retail store. Individual films are often spliced together end to end to form a larger roll which is easily handled by automated equipment. Following chemical processing of the roll to yield permanent images from the latent images on the films, each image is scanned at high speed to obtain image characteristics, such as color and density. These characteristics are passed to an optical printer which uses the characteristic data to adjust exposure conditions (such as exposure time, color balance, and the like) of an image frame on the developed film which is optically projected onto a photosensitive paper. The exposed photosensitive paper is then chemically developed to yield the final hardcopy prints. When the customer order is completed, each film is cut into strips (for 35 mm film) or reattached to a film cassette (for Advanced Photo System films), the exposed paper (when prints are made) is cut into individual prints, and the film, completed prints and any other media (such as a disk bearing scanned images, or mounted slides) are packaged at a finishing station and the order is then complete.

In a modern photofinishing laboratory, images may optionally also be scanned to provide an image signal corresponding to each image on the film. These image signals are usually stored on a medium such as a magnetic or optical disk and provided to the customer, or made available to the customer over a network such as the Internet, and may be used then or at a later time to provide a hardcopy output. Recently it has been described that in the foregoing type of photofinishing operation, the optical printer can be replaced with a digital printer which will print the images directly from the scanned data, following enhancements or other manipulations to the scanned images.

Photofinishing laboratories using scanners and digital printers provide more versatility in correcting or enhancing (either automatically or in accordance with customer requests) customer images. Furthermore, they allow for the possibility of multiple products, and/or services, incorporating one or more images from a customer order (such products or services are sometimes referenced as "image products" and "image services"). Such image products can include, for example, prints of different sizes, T-shirts incorporating images, or cups, plates or other items carrying one or more customer images, as well as magnetic or optical discs carrying the images (in this case, in the form of image signals). Such image services can include, for example, uploading the images to a specified location through a network, such a the Internet. However, different image products or image services may require different image processing (sometimes referenced as image "rendering" in this application) of the image signals so that the processed image signals are in a format suitable for the different output

devices required to provide the image product or image service (for example, different type and size of printers, or modems). For example, an ink jet printer may not produce the same colors from a given image signal as a laser printer using photosensitive paper. Consequently, different image rendering may be required for different output devices (in the foregoing example, different color correction algorithms may be applied). Any necessary rendering can be done in accordance with appropriate algorithms operating in one or more parallel programmed general purpose image processors.

However, for such digital photofinishing laboratories to produce outputs which are comparable to conventional optical prints can require resolutions of at about 2000 by 2000 pixels or more. Thus, each uncompressed consumer image can readily result in a file of about 12 or more megabytes in size. In photofinishing laboratories, images can readily be scanned from customer orders at a rate of 200 images per minute or greater. This means that the laboratory must be able to route image data rates from scanners to image renderers and to output devices, in the multiple gigabyte or higher per minute rate. Clearly, efficiency of image rendering and cost become important factors at such high data rates. When multiple general purpose image renderers are required to switch from one format of image rendering to the next, this can slow the overall process down unless.

It would be desirable then, to provide in a photofinishing apparatus and method, a means by which multiple different image formats can be rapidly and efficiently obtained, without undue cost.

SUMMARY OF THE INVENTION

The present invention then, provides in one aspect, a method of processing customer images in a photofinishing apparatus. The method includes obtaining customer image signals and associated requests for image products or services incorporating respective images. The images signals are directed into image queues having different associated formats, based on the associated product or service requested for each. The image signals are communicated from the queues to respective image renderers which render the image signals into the different formats associated with each queue. The method may additionally include forwarding the rendered images, from the renderers to respective output devices. Another aspect of the method of the invention may additionally include communicating some of the image signals from multiple queues to the same rendering device which renders the image signals from the different queues into the different formats associated with each queue. In this case, the same rendering device can receive image signals from different ones of the queues according to various methods, such as from the queues in a sequential manner (that is, one image from one queue with which it communicates, then a next image from a next queue, and so on), or from one of the queues until that queue is empty then from a next queue until that queue is empty and so on. Optionally, image signals from at least one of the queues are communicated to multiple rendering devices each of which receives image signals from only the at least one queue, and each of which renders the image signals into the format associated with the at least one queue.

A renderer can obtain images from a corresponding queue according to various routines, but preferably by "pulling" an image from the queue. That is, an image renderer may retrieve images from respective queues as the renderer becomes available to render a next image.

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