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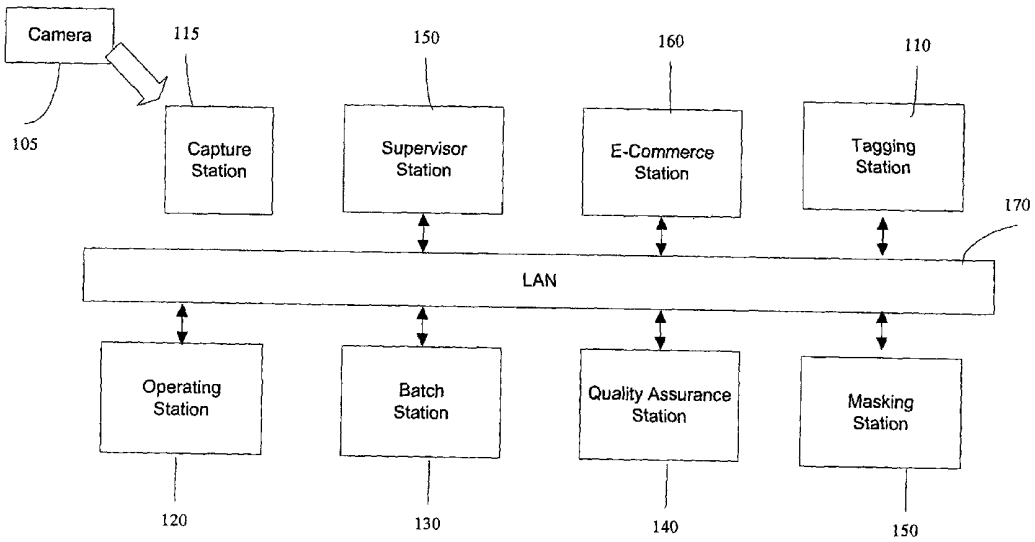
(54) Title: HIGH-VOLUME IMAGE PRODUCTION



(57) Abstract: A scalable system and method for high-volume image production for creating image files for use with Internet sales and distribution, which comprises a plurality of substantially identical mannequins, a mounting device, an operating substation (120), a camera (105), and an imaging system. One or more articles of clothing may be disposed upon each respective mannequin, which may, in turn, be supported in a predetermined, calibrated position by the mounting device. With the camera directed toward the mannequin, the operating substation rotates the mounting table at one or more preselected angles relative to the camera. At each preselected angle, the camera captures at least one image of the mannequin and articles. The imaging system then removes any undesired indicia and/or background from each image and stores the resultant image.

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DESCRIPTION

HIGH-VOLUME IMAGE PRODUCTION

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates generally to high volume image production and, more particularly, to a scalable system and method for creating image files for use with the sale and distribution of articles of clothing over the Internet.

Background of the Invention

In the new economy, significant numbers of goods are sold on-line through the Internet. Typically, a seller of goods places photographs of these goods on a web site, so that shoppers can view them and make a purchasing decision. It is often desirable to provide shoppers with the ability to view the goods from a number of angles. This is particularly important in the area of clothing sales, where aesthetics are as important or more important than function, and those aesthetics can easily vary as the clothing item is viewed from different angles. In order to show the clothing item from a variety of angles, it must be photographed from a variety of angles. Further, it may be desired to provide the shopper with the ability to rotate the clothing item in three dimensions, increasing the number of angles at which that clothing item must be photographed to provide a reasonably smooth rotation. Typically, to show a clothing item from several angles, it is photographed on a model or a mannequin in order to provide a realistic idea of how the item will look when worn.

However, there are a number of problems associated with the photography of clothing items for use in on-line catalogs. The first is the sheer number of goods that must be photographed. A typical retailer selling clothing items over the Internet may sell hundreds, if not thousands, of separate clothing items and accessories for men, women and children. A retailer would prefer that each of these items is visible on its web page, necessitating a large volume of photographs

to capture all of these items. Of course, not every photograph may be used, requiring an even larger volume of shots to obtain a number of usable photographs. A second problem is the number of shots required to obtain a variety of photographs of each clothing item at a number of different angles. To shoot each item a number of times at a number of separate times requires an enormous volume of photographs and a correspondingly-large amount of time to take those photographs. The time of a professional photographer is valuable and expensive, so obtaining the requisite number of photographs to allow a shopper to view a clothing item from a variety of angles is a significant cost for the retailer to absorb. A third problem is the lack of consistency that necessarily results from certain human involvement in the photographic process. For example, a photographer cannot obtain a series of shots at the same height relative to a clothing item without using a tripod. Even if the photographer uses a tripod, a human model being photographed wearing a clothing item cannot realistically maintain the same pose as he or she rotates full circle in front of the camera or as the camera rotates around him or her, thereby causing discontinuities between the different views of the clothing items and causing a discontinuity in a three-dimensional rotation of the clothing item.

To facilitate on-line shopping over the Internet, increase sales and increase customer satisfaction, it would be desirable to provide a "virtual mannequin" onto which different clothing items could be placed, alone or in combination. For example, customer confidence in a purchase of a shirt and a pair of pants could be increased by placing both the shirt and the pants on a virtual mannequin to determine whether they match and how they look together. To implement a virtual mannequin, photographs of the clothing items must be taken, then digitized, or instead may be taken with a digital camera for direct input into a computer. However, many of the same difficulties described above also arise in attempting to implement a virtual mannequin concept, including nonstandardized human models and of physical mannequins, and nonstandardized photographic methods.

Thus, there is no simple or standard way to photograph clothing items to allow those clothing items to be viewed from a plurality of angles or to be rotated in three dimensions.

SUMMARY OF THE INVENTION

The present invention is directed to a scalable system and method for creating a high volume of image files for use with the sale and distribution of articles of clothing over the Internet. A high volume of image files may be created for a plurality of articles through the use of a plurality of substantially identical mannequins and a rig assembly as described in a copending application, Serial No. _____, entitled "Rig Assemblies For Use In High-Volume Image Production," filed simultaneously herewith in the name of Lorentzen et al., the disclosure of which is incorporated herein by reference. The present invention thereby provides the advantages of high volume production of image files and consistency among the image files created for the plurality of articles.

A scalable system for creating a high volume of image files in accordance with the present invention may comprise a mounting device, a camera, an operating substation, an imaging system, an image storage database, and a plurality of mannequins. The mounting device, the camera, and/or the imaging system each may be coupled to, and capable of communicating with, the operating substation, preferably via an information network. The plurality of mannequins each may be substantially identical to all other mannequins of a similar gender and are preferably are precision machined. One or more articles to be imaged may be disposed on each respective mannequin, which may, in turn, be placed substantially in a predetermined, calibrated position on the mounting device. Each respective mannequin of a similar gender preferably is secured to the mounting device by, for example, providing at least one opening in each foot of the mannequin for receiving one or more pins extending substantially upwardly from the mounting device. Very preferably, the openings are substantially uniformly formed among the respective mannequins such that each mannequin

may be repeatedly and interchangeably positioned relative to the camera when the mounting device is oriented in a first predetermined position.

Once a mannequin has been secured to a mounting device, the mannequin preferably is manually oriented on the mounting device relative to the camera to a first predetermined position, and the initial operating parameters for the camera may be set. Preferably, the first predetermined position for the male mannequins and the first predetermined position for the female mannequins each are indicated on the mounting device. The mounting device may be manually adjusted to deviate from the first predetermined position, and, very preferably, the plurality of articles for each gender share substantially the same first predetermined position.

The camera preferably is directed substantially toward the mannequin on the mounting device, and parameters for the camera also may be initialized. The camera may capture images of the article in the first predetermined position and/or at one or more predetermined angles relative to the first predetermined position as the operating substation rotates the mannequin relative to the camera. The rotation of the mannequin preferably is divided into a plurality of substantially equal angles, and the operating substation preferably momentarily stops the rotation as the camera is instructed to capture at least one image of the article at each respective position. Each image may be captured in a digitized image file, which may be communicated by the camera to the operating substation. The operating substation may retain each digitized image file. After the last desired image of the article has been created, the mannequin may be removed from the mounting device, and another mannequin with another article from the plurality of articles may be secured to the mounting device and imaged. Each mannequin may, in turn, be secured to the mounting device until each article in the plurality of articles has been imaged.

After the last desired image of the article has been created, the digitized image files for each image of the article may be communicated by the operating substation to the imaging system. Masked image files may be created by removing from the digitized image files any undesired indicia such as any artifacts

that may result from securing the mannequin to the mounting device or to the rig assembly or any distortion resulting from the imaging process. The background behind the mannequin also be removed from each image. The masked image files may include, for example, small "thumbnail" images of the article and/or "3D Spin" images of the article. "Thumbnail" images may be created by isolating the article from the remainder of the masked image and by restoring any obscured features of the article that may have been concealed by the mannequin and/or another article in the masked image. "3D Spin" images may comprise a sequence of masked image files that may give an appearance that the imaged article is being physically rotated on, for example, a computer screen.

The masked image files may be stored on the masking substation and may be inspected for defects. Any unacceptable images may be reworked, or a replacement image may need to be created for each unacceptable image. After each masked image of the article has been determined to be acceptable, the masked image files preferably are communicated to an archival system and may be associated with the plurality of articles. The masked image files may disposed on a physical medium or may be transmitted electronically.

It will be appreciated that scalable systems and methods for image production in accordance with the present invention may facilitate high volume creation of image files. A plurality of substantially identical mannequins preferably will be available for each gender; thereby, while articles on one mannequin are being imaged, other articles may be disposed upon the remaining mannequins. Each mannequin may, in turn, be quickly secured to the mounting device, and the maximum capacity of the rig assembly may be fully realized. The volume of images produced may be further increased by employing a plurality of rig assemblies.

It also will be appreciated that, through the use of a scalable systems and methods in accordance with the present invention, substantially identical images among the plurality of articles may be generated. Since each respective mannequin preferably is precision machined, each mannequin may be

substantially identical to all other mannequins of a similar gender. Each mannequin further may be substantially identically secured to the mounting device and oriented substantially in a predetermined, calibrated position relative to the camera. Thereby, each mannequin may be repeatedly and interchangeably positioned on the mounting device relative to the camera. Preferably resulting in an ability to create substantially identical images among the plurality of articles.

Finally, it will be appreciated that, because systems and methods in accordance with the present invention are scalable, such systems and methods may be configured according to the specific needs of a given client or production requirement without sacrificing image quality.

BRIEF DESCRIPTION OF THE DRAWINGS

Figs. 1(a)-(d) comprise a flow chart illustrating a conventional programmable logic control architecture for use in industrial operating substations.

Fig. 2 is a block diagram illustrating a typical image manufacturing cell in accordance with a preferred embodiment of the present invention.

Fig. 3 is a block diagram illustration of an e-commerce server in accordance with a preferred form of the present invention.

Figs. 4(a)-(f) comprise a spreadsheet setting forth operating specifications for a image manufacturing cell in accordance with one embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

General Process Flow

High-volume image production may be achieved, according to one embodiment of the present invention, by employing a scalable method 10 for creating image files for use with the sale and distribution of articles of clothing over the Internet, as shown in Figs. 1(a)-(d). As shown in Fig. 1(a), the scalable method 10 preferably commences when a plurality of articles to be imaged are received from a client [step 12]. The articles may comprise clothing, such as shirts

and pants, footwear, such as shoes or boots, and/or accessories, such as belts or handbags. Upon receipt, the plurality of articles each may be initially inspected for, for example, damage [step 14]. If one or more of the articles do not pass the initial inspection, the client may be notified. The client then may waive the initial inspection [step 15], may cancel the imaging of the one or more articles that did not pass the initial inspection [step 17], and/or may replace the one or more articles [step 19]. The one or more articles that did not pass the initial inspection may be returned to the client [step 13].

After the initial inspection, identifying data regarding the plurality of articles may be entered into an inventory system comprising, for example, a database [step 16]. The identifying data may include information such as such as a name of the client, a client number, a quantity of articles, a receipt date, a target imaging completion date, and/or any other information regarding the plurality of articles. Preferably, the identifying data is entered according to a client number, and a new client may be assigned a new client identifier [step 18]. Once the identifying data has been entered, an identification tag may be affixed to the plurality of articles [step 20], which then may be moved to an inventory area [step 22]. The identification tag may contain information regarding the plurality of articles, including some or all of the identifying data. Upon review of the entries in the inventory system, a production plan may be established [step 24], as shown in Fig. 1(b). The plurality of articles may be moved from the inventory area to a production staging area according to the production plan [step 26].

In the production staging area, the plurality of articles may undergo a pre-imaging inspection for, for example, damage and/or size [step 28]. If one or more articles do not pass the pre-imaging inspection, the client may be notified [step 29]. The client then may cancel the imaging of the one or more articles that did not pass the pre-imaging inspection [step 27], may replace the one or more articles [step 25], and/or may waive the pre-imaging inspection [step 23]. Once the disposition of the plurality of articles has been determined, the plurality of articles may be returned to the inventory area, and/or the imaging of the plurality of

articles may be rescheduled. The one or more articles that did not pass the pre-imaging inspection may be returned to the client.

After the pre-imaging inspection, the plurality of articles preferably are prepared for imaging [step 30]. Preparation of the plurality of articles may include, for example, disposing and arranging the plurality of articles, individually or in combination, on a respective mannequin. The articles may be disposed in combination on the mannequin when the articles comprise, for example, a shirt and a tie. Supplemental items, that are not associated with the plurality of articles, also may be disposed on the mannequin. Each mannequin, which very preferably is precision machined, may be substantially identical to all other mannequins of a similar gender used in the process 10 and may be placed substantially in a predetermined, calibrated position on a mounting device prior to imaging. Preferably, the plurality of articles are placed upon mannequins of the appropriate gender. Once prepared, the plurality of articles, disposed upon respective mannequins, each may be moved to a production buffer zone [step 32].

As shown in Fig. 1(c), each respective mannequin in the production buffer zone may be placed within a rig assembly. The rig assembly preferably includes a camera, a lighting system, an operating substation, an imaging system, and a mounting device, such as a turntable, upon which each respective mannequin may be placed [step 34]. Very preferably, the mounting device may comprise a Kaidan Model MD-19 turntable. The camera, the lighting system, the imaging system, and/or the mounting device each may be coupled to, and capable of communicating with, the operating substation, preferably communications may occur via an information network. The information network preferably couples the inventory system to the operating substation and may comprise, for example, a local area network, a wide area network, the Internet, or any other type of information system. Very preferably, the inventory system also is coupled to the information network. The camera may comprise a digital camera such as, for example, a Sony Model No. DKC-St5 with a CPU drive. Very preferably, the camera may be equipped with a zoom lens such as a Pentax-D 12.5-63m zoom

lens, Model No. VCL-1205bys. The lighting system may include one or more lamps. The lamps each preferably may comprise Kino Flo lamps, Model No. Fix-480-4, and may be connected to one or more ballasts such as Kino Flo ballasts, Model No. Bal-400s.

Each respective mannequin preferably is secured to the mounting device. For example, each respective mannequin may have a base in which at least one opening has been formed, and one or more pins may extend substantially upwardly from the mounting device. When the base of each respective mannequin is placed on the mounting device, the pins extending from the mounting device preferably are received by the openings in the respective mannequin. Very preferably, the openings in the base of each respective mannequin are formed in each foot of the mannequin and are substantially uniformly formed among the respective mannequins. A top of each respective mannequin may also be rotatably secured to the rig assembly to further support the mannequin. The top of each respective mannequin, for example, may have an opening formed therein for receiving a pin that may extend substantially downwardly from the rig assembly. Very preferably, the opening in the top of each respective mannequin is substantially uniformly formed among the respective mannequins.

After a mannequin has been secured to a mounting device, the information from the information tag may be entered into the operating substation, and the article may undergo final preparations, including confirming that the article is disposed properly on the mannequin and/or obscuring, or removal of, the identification tag. The mannequin preferably is manually oriented on the mounting device relative to the camera to a first predetermined position, and the initial operating parameters for the camera may be set. The first predetermined position for male mannequins may differ from the first predetermined position for female mannequins. The first predetermined position for the male mannequins and the first predetermined position for the female mannequins each preferably are indicated on the mounting device. The mounting device may be manually

adjusted to deviate from the first predetermined position based upon, for example, the type of article to be imaged. Very preferably, for each gender, the plurality of articles share substantially the same first predetermined position. Since the openings in the base of each respective mannequin very preferably are substantially uniformly formed among the respective mannequins, each mannequin may be repeatedly and interchangeably positioned relative to the camera when the mounting device is oriented in the first predetermined position. The advantage of the repeatability and interchangeability of the positioning of the mannequins may include an ability to create substantially identical images among the plurality of articles.

The camera preferably is directed substantially toward a midpoint of each respective mannequin. Other operating parameters, such as distance from the mannequin, focus, zoom, and aperture for the camera also may be initialized and may depend upon one or more characteristics of the plurality of articles and the gender of the mannequins.

With the lighting system preferably warmed up and preferably substantially directed at the mannequin, at least one image of the article then may be captured [step 36]. The camera may capture images of the article in the first predetermined position and/or at one or more predetermined angles relative to the first predetermined position as the operating substation rotates the mannequin relative to the camera. The rotation of the mannequin preferably is divided into a plurality of substantially equal angles. Very preferably, the rotation of the mannequin is divided into fourteen substantially equal angles. The mannequin may be rotated substantially clockwise and/or substantially counter-clockwise relative to the camera, and the operating substation preferably momentarily stops the rotation as the camera captures at least one image of the article at each respective position. Very preferably, two images are captured at each respective position: a first image of the article using a substantially normal exposure; and a second image with the exposure adjusted such that the mannequin appears substantially black and a background surrounding the mannequin appears substantially white.

Alternatively, the lighting system may include one or more strobe lights, the strobe lights being coupled to, and controlled by, the operating substation. In this embodiment, the mannequin may be disposed between the strobe lights and the camera. and the strobe lights may be activated when capturing the second image. Thereby, the exposure setting of the camera may be substantially maintained while each image is captured.

Each image may comprise any form of digitized image file, such as .BMP, .GIF, .JPEG or .TIF files. The image preferably is contained in a progressive .JPEG file or in a transparent non-interlaced .GIF file with adaptive colors and diffusion dithering. The digitized image file may be communicated to, and may be retained within, the operating substation. After the last desired image of the article has been created, the mannequin may be removed from the mounting device [step 38], and another mannequin with another article from the plurality of articles may be secured to the mounting device and imaged. Preferably, a plurality of substantially identical mannequins will be available for each gender; thereby, while articles on one mannequin are being imaged, other articles may be disposed upon the remaining mannequins. Each mannequin may, in turn, be secured to the mounting device until each article in the plurality of articles has been imaged.

Once each mannequin has been removed from the mounting device, the information tag, if previously removed, may be replaced, and the information tag may be provided with a notation that the respective article has been imaged. The inventory system also may be updated to reflect that the article has been imaged. The mannequin then may be returned to the production staging area [step 40], and the article may be removed from the mannequin [step 42]. The plurality of articles preferably are returned to the inventory area after each article of the plurality of articles has been imaged [step 44]. The plurality of articles may be retained for a predetermined period of time in case re-imaging of one or more of the articles may be desired [step 46], and, when the predetermined period of time has elapsed, the plurality of articles may be made available to the client [step 48], as shown in Fig. 1(d).

Returning to Fig. 1(c), after the last desired image of the article has been created, the digitized image files for each image of the article may be communicated by the operating substation to the imaging system [step 50]. Masked image files may be created by removing from the digitized image files any undesired indicia such as any artifacts that may result from securing the mannequin to the mounting device or to the rig assembly or any distortion resulting from the imaging process [step 52]. The background behind the mannequin also be removed from each image. Very preferably, the image files, for each respective position, may comprise a first image of the article using a substantially normal exposure; and a second image with the exposure adjusted such that the mannequin appears substantially black and the background surrounding the mannequin appears substantially white. The second image may be used to create an "alpha channel," which may be applied to the first image to remove the background behind the mannequin.

The masked image files may include, for example, small "thumbnail" images of the article and/or "3D Spin" images of the article. The "thumbnail" image may comprise a substantially small image of the article that preferably is presented on, for example, a computer screen with a plurality of other "thumbnail" images to permit a consumer to quickly compare color, style, and/or other attributes of similar articles. After the undesired indicia preferably has been removed, the "thumbnail" image preferably is created by isolating the article from the remainder of the masked image and by restoring any obscured features of the article that may have been concealed by the mannequin and/or another article in the masked image. The article may be isolated from the remainder of the masked image by selecting an isolation color that preferably is substantially different from any color used in the article. The background then may be modified to comprise the isolation color, and the article may be outlined in the isolation color. By deleting any features of the masked image outside of the outline, the article may be isolated. The obscured features of the article may be restored, for example, by sampling a feature color within the article and by manually redrawing the

obscured features in the feature color. Since the "thumbnail" image preferably comprises a substantially small image, substantial leeway may be afforded when the obscured features are restored. The "thumbnail" image may be stored on the masking substation.

The "3D Spin" images of the article may comprise a sequence of masked image files. The sequence of masked image files preferably comprise the images created at the predetermined positions as the article was rotated on the mounting device relative to the camera. As the sequence of images are individually presented, for example, on a computer screen, an appearance may result that the imaged article is being physically rotated. A consumer may, through the use of software, present the sequence of masked image files in a forward order and/or a reverse order, or the sequence may be stopped, and an individual masked image file from the sequence may be examined in detail. Very preferably, the sequence of masked image files may be stored on the masking substation as a "flash movie."

The masked image files may be communicated from the masking substation to a quality operating substation, [step 54] which may be coupled to the information network. Since masked images, such as the "thumbnail" image and each individual image of the "3D spin," may be examined in detail, each individual masked image preferably is inspected for defects [step 56]. If one or more of the individual masked images comprise unacceptable images that do not pass a quality control inspection [step 58], each unacceptable image may be reworked, or a replacement image may need to be created. The unacceptable image may be transmitted to the imaging system for additional processing if the unacceptable image is to be reworked [step 60]. To create the replacement image, the article that was the subject of the unacceptable image may need to be recalled from the inventory area [step 62] and prepared for imaging [30], as shown in Fig. 1(b). Once the article has been prepared, a replacement image for the unacceptable image may be created and/or an entirely new set of images may be created for the article.

As shown in Fig. 1(d), if each masked image of the article is acceptable, the masked image files preferably are communicated to an archival system [step 64] and may be associated with the client and/or any of the identifying data regarding the plurality of articles from the inventory system. The masked image files received by the archival system may be reviewed after a predetermined interval of time [step 66] and may be provided to the client [step 70]. The masked image files may disposed on a physical medium, such as a floppy disk, a CD ROM, a ZIP Disk, and/or a tape cartridge, for delivery to the client [step 68], or the masked image files may be transmitted to the client via, for example, a modem or email.

Hardware and Software Used Within a Typical Image Manufacturing Cell

As shown in Figs. 2 and 3, a typical image manufacturing cell 100 in accordance with the present invention may comprise a plurality of substations or subsystems 110-160. Each substation 110-160 preferably is configured on an Apple Power MacIntosh® G3 computer or an equivalent personal computer (PC) or server-based system. The software applications that are preferably provided at each substation 110-160 are set forth below along with a brief description of the functions provided by the respective applications. The substations 110-160 preferably are interconnected using a local area network (LAN) 170, such as a 100 base T network, and each substation 110-160 preferably operates on a MacIntosh® OS 8.6 or OS 9.0 operating system.

In one presently preferred embodiment, a typical image manufacturing cell 100 may include the following substations: a tagging substation 110, an image capture substation 115, an operating substation 120, a masking substation 125, a batch substation 130, a quality assurance substation 140, a supervisor substation 150, and an e-commerce server substation 160. Each of these substations is discussed separately below, and those skilled in the art will appreciate that by using a plurality of image manufacturing cells 100 in accordance with the present invention is it possible to achieve very high volume image manufacturing throughput with consistent image quality.

The Tagging Substation

The tagging substation 110 preferably has the following software applications configured thereon: AppleScript, DropRename, FileMaker Pro 4.1+, Microsoft Internet Explorer 4.0+, Microsoft Office 98, Microsoft Outlook Express 4.5+, Netscape Communicator 4.0+, and SimpleText.

The tagging substation 110 may be used, for example, for article intake and tagging such that a separate file for each garment, or other item, delivered by a client may be created and tracked through an image generation process in accordance with the present invention. Use of the tagging substation also enables inventory management. Preferably, each manufacturing cell 100 may share one tagging substation 110.

The Operating Substation

The operating substation 120 preferably has the following software applications configured thereon: Adobe Photoshop 5.0+, AppleScript, DropRename, FileMaker Pro 4.1+, SimpleText, and Teps 2000.

The operating substation 120 preferably controls all camera 105 settings, all camera positions, all image generation functions, and all rig operations, such as mount rotation. Thus, the operator of the operating substation preferably is responsible for all initial image generation, mannequin positioning, and rig operation. When using the operating substation 120, garment tag numbers are entered into the FileMaker™ database to initiate an imaging session. The Teps 2000 software may then be utilized to set any necessary initial camera settings and to control any necessary camera 105 or rig (not shown) operations.

The Masking Substation

The masking substation 125 preferably has the following software applications configured thereon: Adobe Photoshop 5.0+, AppleScript, DropRename, and SimpleText.

The masking substation 125 preferably is used to perform all masking operations as described above. The masking substation 125 receives images from

the image capture substation 115 or operating substation 120 and is used for color correction and background removal as described above. Preferably, the masking actions and color correction functions are loaded for processing simultaneously. The PhotoShop™ application provides the basic mechanism for all masking and color correction functions.

The Batch Station

The batch substation 130 preferably has the following software applications configured thereon: Adobe Photoshop 5.0+, AppleScript, DropRename, MacroMedia Flash 3+, and SimpleText.

The Quality Assurance Station

The quality assurance substation 140 preferably has the following software applications configured thereon: Adobe Photoshop 5.0+, AppleScript, DropRename, FileMaker Pro 4.1+, Macromedia Flash 3+, Microsoft Internet Explorer 4.0+, Netscape Communicator 4.0+, and SimpleText.

The quality assurance substation 140 preferably is utilized to ensure that all masking and color correction functions have been properly completed. The quality assurance substation 140 may receive one or more image files from the masking substation 125.

The Supervisor Station

The supervisor substation 150 preferably has the following software applications configured thereon: Adaptec Toast 3.5.5+, Adobe Photoshop 5.0+, AppleScript, DropRename, FileMaker Pro 4.1+, Macromedia Flash 3+, Microsoft Internet Explorer 4.0+, Microsoft Office 98, Microsoft Outlook Express 4.5+, Netscape Communicator 4.0+, and SimpleText.

The supervisor substation 150 preferably is utilized for overall process supervision and monitoring for the manufacturing cells 100. One supervisor substation 150 preferably supervises a plurality of manufacturing cells 100.

The E-Commerce Server

The e-commerce server 160 preferably includes a CD ROM drive 200, a DVD RAM drive 210, a Zip drive 220, a RAID drive 230, a plurality of FireWire drives 240, a USB drive 250, and a plurality of network switches (not shown). The CD ROM drive 200 preferably comprises a Lacie 4X/12X drive. The DVD drive 210 preferably comprises a Lacie LFD-101 drive. The Zip drive 220 preferably comprises an Omega USB Zip drive. The RAID drive 230 preferably comprises a Micronet DataDock 7000 RAID Array, and the USB drive 240 preferably comprises a Lacie USB 10GB drive. The network switches (not shown) may comprise, for example, Cisco 2900 Switches and/or Netgear 10/100 Switches.

The e-commerce server 160 serves as the main image repository of the system 100 and provides a means for forwarding completed image files to customers via FTP Internet protocols or alternatively as CD ROMs, DVDs, or Zip disks. Very preferably, one e-commerce server 160 may serve a plurality of manufacturing cells 100.

Preferred Settings for Garment Image Generation

The following tables illustrate preferred settings and specifications for typical garment image generation processes in accordance with the present invention.

Table 1

Female or Male Full Garment shooting and post production process.
The Full garments are shot on a garment station. Using the Female or Male Mannequin.
Note: Unlike other garment shots, the Full Garment is shot using the virtual

mannequin (VM) camera for the 3D spin and the 2D zoom image. In addition to the VM image. ONLY the VM camera is used, and the operator has to move the turntable cable from the printer port on one capture computer to another.

The VM camera is typically set to 13, however for the 3D spin it may be set to 12 on the zoom setting.
The completed file consists of the following images:
VM Image
VM Thumbnail
3D spin
2D Zoom
Large Product Shot

Full Garment specs:
VM image Full Garment (Shot from the regular starting position)
Window Size: 215 wide by 385 high @ 72 dpi
File Type: Transparent non Interlaced GIF 216 Adaptive Colors with diffusion Dithering.
File name: EVXOxxx-M-000-E.gif
App File size: 8k
Backup file: Unscaled RGI3 file, with alpha channel saved as a tiff with lwz compression

VM Thumbnail image Full Garment (Shot from the regular starting position)
Window Size: 39 wide by 51 high @ 72 dpi
File Type: Transparent non Interlaced GIF 216 Adaptive Colors with diffusion Dithering.
File name: EVXOxxx-M-000-D.gif
App File size: 4k

Backup file: Unscaled RGB file, with alpha channel saved as a tiff with lwz compression

3D Spin Flash Movie Garment (Shot from the regular starting position)
Window Size: 200 wide by 262 high @ 72 dpi
File Type: Interactive Flash Movie based on template supplied by Organic.
Saved out from PhotoShop as RGB 100% quality JPEG image.
File name: EVXOxxx-M-000-C.swf
App File size: 60-80k
Backup file: We are keeping a copy of the unscaled RGB files for backup with a white garment also keep the resized jpeg file, this is needed to process the white garment.

Notice that the garments 3D movie rotate around a vertical axis.

Order of frames in Flash Template:
VR01 = 08.jpg
VR02 = 07.jpg
VR03 = 06.jpg
VR04 = 05.jpg
VR05 = 04.jpg
VR06 = 03.jpg
VR07 = 02.jpg
VR08 = 01jpg
VR09 = 14.jpg
VR10 = 13.jpg
VR11 = 12.jpg
VR12 = 1 l.jpg
VR13 = 10.jpg

VR14 = 09.jpg

2D Zoom image Garment (Shot from the regular starting position)
Window Size: 794 wide by 1040 high @ 72 dpi
File Type: Interactive Flash Movie based on template supplied by Organic.
Saved out from PhotoShop as RGB 100% quality JPEG image.
File name: EVXOxxx-M-000-A.swf
App File size: 124k
Backup file: We are keeping a copy of the unscaled RGB files for backup with a white garment also keep the resized jpeg file, this is needed to process the white garment.

2D Zoom Notes:
HTML will constrain the image to 200x262 in the web interface
Cropping is the same ratio (1:1.31) as the 3D spin images, so that the 2D movie will play seamlessly in the same popup window as the 3D spin.

Large Product Shot Garment (Shot from the regular starting position)

Window Size: 165 wide by 215 high @ 72 dpi
File Type: jpeg
File name: EVXOxxx-M-000-B.gif
Compression JPEG 90% Compression
App. File size: 56k
Backup file: Unscaled RGB file, with alpha channel saved as a tiff with .lwz compression

Large Product Shot Notes:
This is the same image as the first frame of the 3D spin.

Styling.

The Full Garment is styled and approved by the stylist.

Capture Station Setup.

The VM shot is captured from the regular starting position of the male or female mannequin using the VM camera at a height, which is the precise half point of the mannequin.

Notice that the starting position for the turntable is determined by mounting the correct male or female foot plate to the turntable, align the plate so that the left foot pin is in front, and the two pins is perfectly aligned to each other, then using the Kaidan turntable control software press the "SET" button. Then turn the turntable clockwise using the Kaidan software. Make sure that the right calibration value is in the preferences. It should be 14164. This is the calibration value for the MC19 turntables we are using for the e-commerce capture stations. Turn the Male XXXXX degrees, turn the Female XXXXX degrees.

Post Production.

Full Figure Garment

3D Spin movie files are dropped on the "Full garment" inbox, and let it go through the system as any other garment.

The batch processing should color correct, scale, save jpeg, and create 3D VR movie.

2D Zoom movie is based on the same frame as the first 3D frame, it is post produced by applying color correction, rotating the image, create a alpha channel, save the image as a tiff file, then using the alpha channel delete the

background and scale the image to 7941040 pixels. Then save it out as a max. quality JPEG, and create a FLASH movie using the regular garment template.

Large Product Shot, this is the same image as the 2D Zoom image, open the tiff file, delete the background, then scale the image to 165x215 high, and save the image as a 90% JPG.

Virtual mannequin image is created from the VM file, first objective is to rotate the image so it stands up, then color correct the image, using the profile to profile color correction, there should be one created for the camera which have captured the image. Next bring up the full-size mannequin template, and align the image over the mannequin. (It is important that the images are aligned over the full-size mannequin, because, adjusting it after: it has been scaled causes loss of quality.) After the image is aligned create an alpha mask, the garment is the only thing visible in the alpha mask, save it as a tiff file with LZW compression. Then delete the background, and using the proper action to scale the image to fit on the scaled mannequin, check the image against the scaled -, mannequin template to make sure it fits perfectly. If needed you may move the image after it have been scaled, do NOT distort, or rotate the image, if it need to be distorted you have to do that ONLY on the full-size image, this is to prevent quality loss. Finally save the image as a 216 color adaptive palette non-interlace GIF with transparent background.

VM Thumbnail image is created from the saved VM tiff, delete the background and crop the image to a thumbnail image, take care to crop closely so that you get the object as big as possible in the thumbnail. Save the image as a 216 color adaptive palette non-interlace GIF with transparent background.

Table 2

Shoe Station Shooting Process

The shoes are shot on the custom shoe station, which offers some unique posing options.

The completed file consists of the following images:
VM Image
VM Thumbnail
3D Spin
2D Zoom
Large Product Shot
Heel and Toe Shot

Camera Height: 46.25 inches

V.M: Z: 12
F: 39

3D: Z: 29
F: 39

HT(2D): Z: 33
F: 38

Iris: 20
Shutter: 10

Shoe specs:

VM image shoes (Shot on the male or female VM shoe poser)
Window Size: 215 wide by 385 high @ 72 dpi
File Type: Transparent Interlaced GIF 64 bit Adaptive Colors with Diffusion Dithering.

File name: EVXOxxx-M-000-E.gif
App File size: 8k
Backup file: Unscaled RGB file, with alpha channel saved as a tiff with lwz compression
This tiff file is moved to backup by the masker.

VM Thumbnail image Shoes (Shot on the male or female VM shoe poser)
Window Size: 25 wide by 44 high @ 72 dpi
File Type: Transparent Interlaced GIF 64 bit Adaptive Colors with diffusion Dithering.
File name: EVXOxxx-M-000-D.gif
App File size: 4K
Backup file: Unscaled RGB file, with alpha channel saved as a tiff with lwz compression
This tiff file is moved to backup by the masker.

3D Spin Flash Movie for shoes (Shot using the BBQ rotating shoe poser)
Window Size: 200 wide by 262 high @ 72 dpi
File Type: Interactive Flash Movie based on template supplied by Organic.
Saved out from PhotoShop as RGB 100% quality JPEG image.
File name: EVXOxxx-M-000-C.swf
App File size: 60-80k

Backup file: We are keeping a copy of the unscaled RGB files for backup with a white garment also keep the resized jpeg file, this is needed to process the white garment.
These files are backed up by the capture station operator.

Order of frames in Flash Template:
VR01 = 08.jpg
VR02 = 07.jpg
VR03 = 06.jpg
VR04 = 05.jpg
VR05 = 04.jpg
VR06 = 03.jpg
VR07 = 02.jpg
VR08 = 01.jpg
VR09 = 14.jpg
VR10 = 13.jpg
VR11 = 12.jpg
VR12 = 11.jpg
VR13 = 10.jpg
VR14 = 09.jpg

2D Zoom image of Shoes (First frame of VR movie using the BBQ rotating shoe poser)
Window Size: 794 wide by 1040 high @ 72 dpi
File Type: Interactive Flash Movie based on template supplied by Organic.
Saved out from PhotoShop as RGB 100% quality JPEG image.
File name: EVXOxxx-M-000-A.swf
App File size: 124k

Backup file: Unscaled RGB file, with alpha channel saved as a tiff with lwz compression
This tiff file is moved to backup by the masker. with a white garment also keep the resized jpeg file, this is needed to process the white garment.
2D Zoom Notes:
HTML will constrain the image to 220x260 in the web interface
Cropping is the same ratio (1:1.31) as the 3D spin images, so that the 2D movie will play seamlessly in the same pop-up window as the 3D spin.

Large Product Shot of Shoes (First frame of VR movie using the BBQ rotating shoe poser)
Window Size: 165 wide by 215 high @ 72 dpi File Type: Progressive jpeg.
File name: EVXOxxx-M-000-B.gif
Compression: Progressive jpeg level 6 (3 scans)
App File size: 56k
Backup file: Unscaled RGB file, with alpha channel saved as a tiff with lwz compression
This tiff file is moved to backup by the masker.

Large Product Shot Notes:
This is the same image as the first frame of the 3D spin.

Styling.
The shoes are first prepared and styled by the stylists before they are brought to the BBQ poser, after the operator have mounted the shoes, the supervising stylist need to review the shoe before it can be shot.
The VR shot of the shoe is aligned so that the camera looks slightly into the shoe from VERY slightly above, check test shots for this position and talk to a supervisor.

The objective of the BBQ poser is to center the "mass" of the shoe, so that the sole is level and the shoe rotates around its mass, not the sole. After the 3D shot is captured both shoes is shot together for the heel and toe shot, using the side by side shoe poser, which is placed on the turntable after the shoe is removed from the BBQ poser.

Then the shoes are shot on the VM feet poser, by CAREFULLY pulling them on the feet of the poser, it is important to NOT pull or push on the poser as this will change the angle the shoe is displayed at. After the shoes are installed on the VM poser the stylist need to let the operator know they are ready and OK.

Note this is repeated twice for unisex shoes, the operator shoots the entire set of files and images as Male, then changes the product number to female and shoots the female VM shot. later the QA will put together the complete female file by copying the images from the male shoe files and renaming the images to the correct names

Capture Station Setup.

There is only one camera on the shoe station, it is shooting both the VM and all of other shots.

Check the written specs for the accurate positions of all the shoe capture station parts. Make sure that the right calibration value is in the preferences. it should be 14164. This is the calibration value for the MC19 turntables we are using for the e-commerce capture stations.

Shoe Post Production.

3D Spin movie files are dropped on the inbox, note that there are several

versions of the inbox, it is important that the operator measures the OVERALL length of the shoe and drops the shoe in the matching inbox. The batch processing should color correct, scale, save jpeg, and create 3D VR movie.

2D Zoom movie is based on the same frame as the first 3D frame, it is post produced by applying color correction, rotating the image, create a alpha channel, save the image as a tiff file, then using the alpha channel delete the background and scale the image to 220x260 pixies. Then save it out as a max quality JPEG, and create a FLASH movie using the regular garment template.

Virtual mannequin image is created from the VM file, first objective is to rotate the image so it stands up, then color correct the image using the color profile correction, Create an alpha mask of the shoe, Next bring up the full size mannequin template, and align the image over the mannequin. (it is important that the images is aligned over the full size mannequin, because adjusting it after it have been scaled causes loss of quality.) Save it as a tiff file with LZW compression. then delete the background, and using the proper action scale the image to fit on the scaled mannequin, check the image against the scaled mannequin template and move it to make sure it fits perfectly, do only move the image after it have been scaled, do not distort the image, if it need to be distorted you have to do that ONLY on the full size image. Finally save the image as a 64 bit color adaptive palette interlaced GIF with transparent background.

VM Thumbnail image is created by reverting to the saved VM tiff, delete the background and crop the image to a thumbnail image, take care to crop closely so that you get the object as big as possible in the thumbnail. Save the image as a 64 bit color adaptive palette interlaced GIF with transparent

background.

Large Product Shot, this is the same image as the 2D Zoom image, open the tiff file, delete the background, then scale the image to 165x215 high, and save the image as a progressive jpeg level 6 (3 scans).

Heel and toe shot. This shot is showing the shoe front and rear, run the profile color correction and create an alpha mask, then save the image as a Tiff file. Next crop the image to 215x165 and export it as progressive jpeg level 6 (3 scans).

While the invention is susceptible to various modifications and alternative forms, specific examples thereof have been shown by way of example in the drawings and are herein described in detail. It should be understood, however, that the invention is not to be limited to the particular forms or methods disclosed, but to the contrary, the invention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the appended claims.

What is Claimed is:

1. A method of image production, said method comprising the steps of:

placing an article to be imaged on a mannequin;

placing said mannequin on a mounting device;

orienting said mounting device in a first predetermined position;

setting initial operating parameters for a camera to capture at least one image of said article;

rotating said mounting device relative to said camera to at least one preselected angle;

capturing said at least one image of said article at each of said at least one preselected angle;

creating a masked image for each of said at least one image by removing undesired indicia from each of said at least one image; and

storing each of said masked image.

2. The method of claim 1, wherein said step of orienting said mounting device in a first predetermined position includes the step of manually adjusting the orientation of said mounting device to account for an aesthetic appearance of said article.

3. A system for image production, comprising:

a mounting device for supporting a mannequin in a predetermined, calibrated position;

a lighting system;

a camera for capturing at least one image of an article placed on said mannequin, said camera being disposed a preselected distance from said mounting device and being directed substantially toward said mounting device;

an operating substation being connected to said mounting device, said lighting system, and said camera, said operating substation being capable of rotating said mounting device at a preselected angle relative to said camera and being capable of setting initial operating parameters for said camera for capturing said at least one image; and

a imaging system coupled to said camera, said imaging system being capable of receiving said at least one image from said camera, being capable of creating a masked image for said at least one image, and being capable of storing said each of masked image.

4. A method of image production, said method comprising the steps of: receiving a plurality of articles to be imaged;

inspecting said plurality of articles for damage;

tagging said plurality of articles;

moving said plurality of articles to an inventory area;

moving said plurality of articles from said inventory area to a production staging area;

inspecting said plurality of articles for size and damage;

placing said plurality of articles on respective mannequins;

preparing said plurality of articles for being imaged;

placing each of said respective mannequins on a mounting device;

orienting said mounting device in a first predetermined position;

setting initial operating parameters for said camera;

rotating said mounting device relative to said camera to at least one preselected angle;

capturing said at least one image of each of said plurality of articles at each of said at least one preselected angle;

creating a masked images for said at least one image by removing undesired indicia from said at least one image; and

storing each of said masked images.

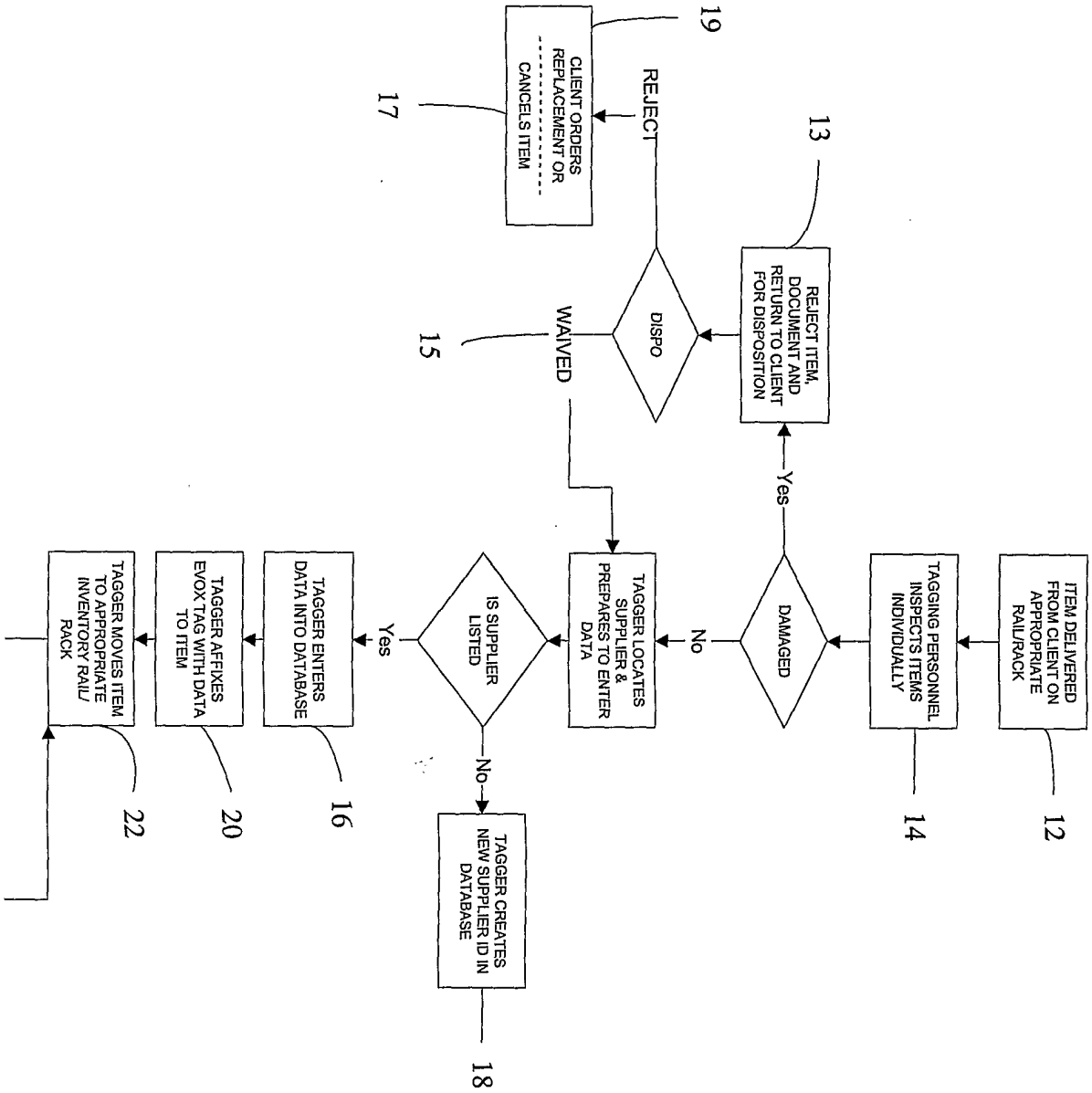
ITEM DELIVERED FROM CLIENT ON APPROPRIATE RAIL/RACK
12
TAGGING PERSONNEL INSPECTS ITEMS INDIVIDUALLY
14
DAMAGED
Yes
REJECT ITEM, DOCUMENT AND RETURN TO CLIENT FOR DISPOSITION
13
DISPO
REJECT
19
CLIENT ORDERS REPLACEMENT OR CANCELS ITEM
17
WAIVED
15
No
TAGGER LOCATES SUPPLIER & PREPARES TO ENTER DATA
IS SUPPLIER LISTED
No
TAGGER CREATES NEW SUPPLIER ID IN DATABASE
18
Yes
TAGGER ENTERS DATA INTO DATABASE
16
TAGGER AFFIXES EVOX TAG WITH DATA TO ITEM
20
TAGGER MOVES ITEM TO APPROPRIATE INVENTORY RAIL/ RACK
22

Fig. 1(a)

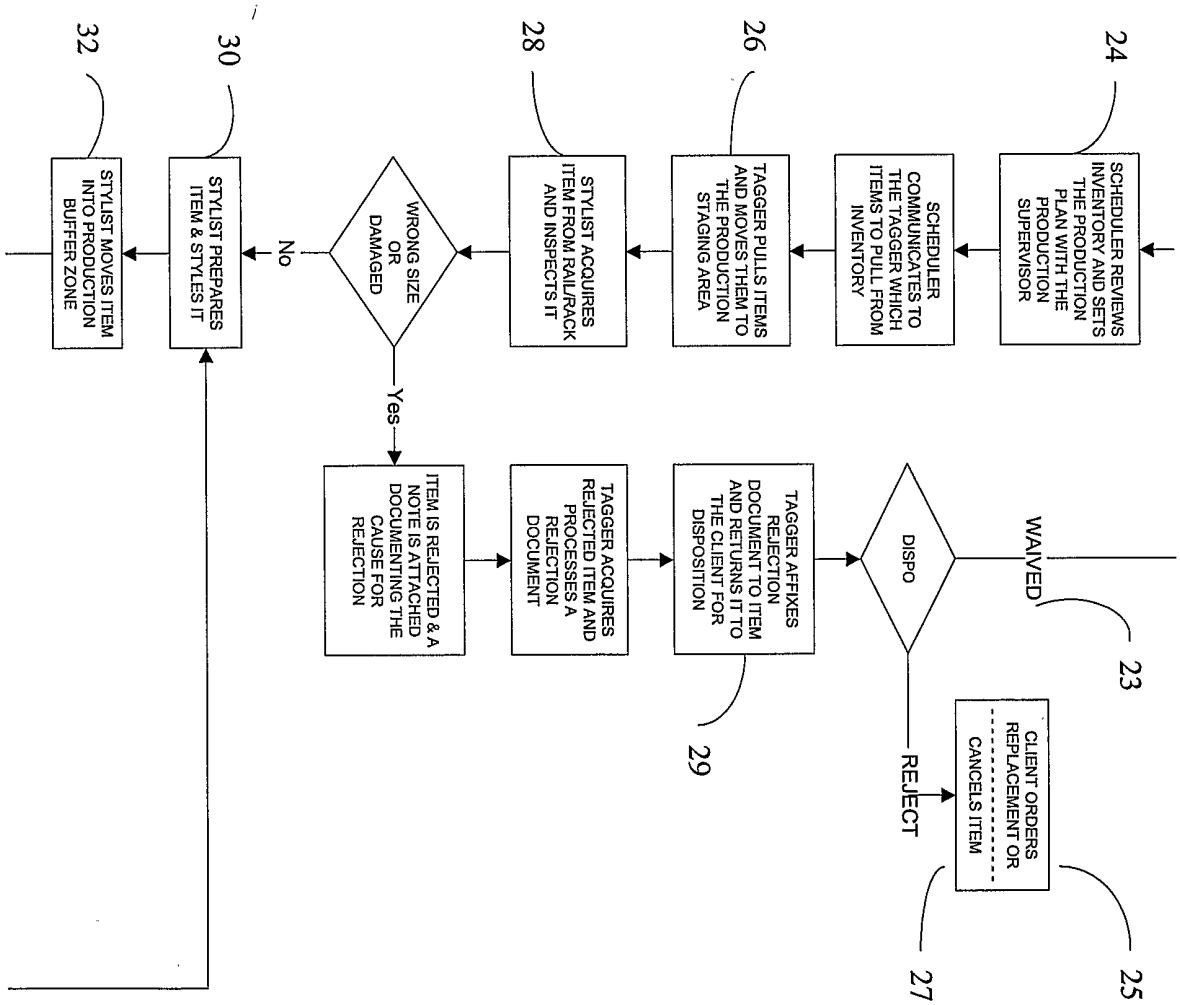
SCHEDULER REVIEWS INVENTORY AND SETS THE PRODUCTION PLAN WITH THE PRODUCTION SUPERVISOR
SCHEDULER COMMUNICATES TO THE TAGGER WHICH ITEMS TO PULL FROM INVENTORY
TAGGER PULLS ITEMS AND MOVES THEM TO THE PRODUCTION STAGING AREA
STYLIST ACQUIRES ITEM FROM RAIL/RACK AND INSPECTS IT
WRONG SIZE OR DAMAGED
Yes
No
STYLIST PREPARES ITEM & STYLES IT
STYLIST MOVES ITEM INTO PRODUCTION BUFFER ZONE
ITEM IS REJECTED & A NOTE IS ATTACHED DOCUMENTING THE CAUSE FOR REJECTION
TAGGER ACQUIRES REJECTED ITEM AND PROCESSES A REJECTION DOCUMENT
TAGGER AFFIXES REJECTION DOCUMENT TO ITEM AND RETURNS IT TO THE CLIENT FOR DISPOSITION
DISPO
WAIVED
REJECT
CLIENT ORDERS REPLACEMENT OR CANCELS ITEM
24
26
28
30
32
29
23
27
25

Fig. 1(b)

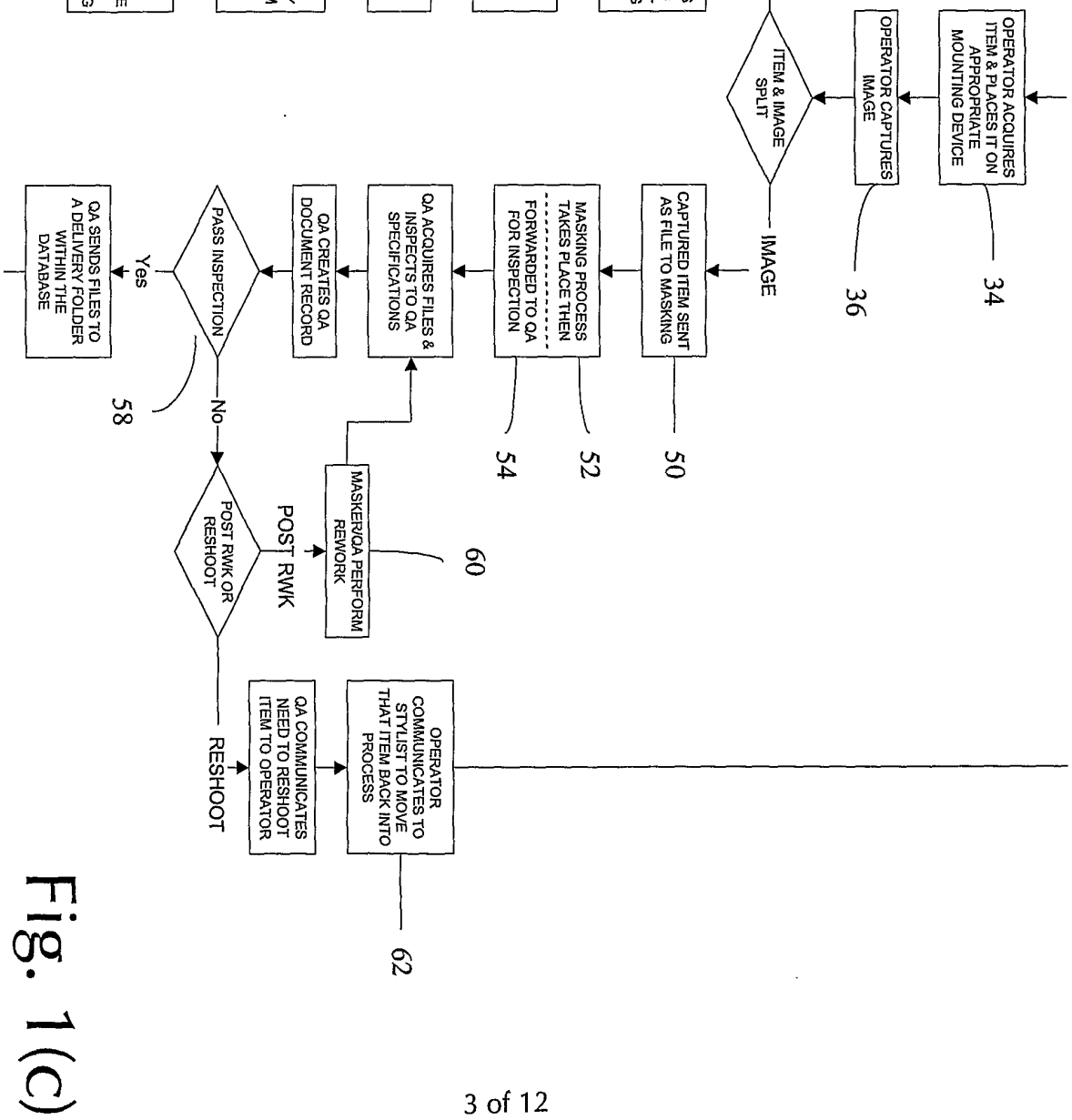
OPERATOR ACQUIRES ITEM & PLACES IT ON APPROPRIATE MOUNTING DEVICE
34
OPERATOR CAPTURES IMAGE
36
ITEM & IMAGE SPLIT
ITEM
IMAGE
OPERATOR REMOVES ITEM FROM MOUNT & RETURNS TO STYLING AREA
38
STYLIST REMOVES ITEM & PLACES ITEM ON OUT BOUND RAIL/RACK
40
TAGGER ACQUIRES SHOT ITEMS FROM OUT BOUND AREA
42
TAGGER MOVES ITEMS TO INVENTORY AREA & PLACES THEM ON APPROPRIATE RESHELF RAIL/RACK
44
ITEMS ROTATE IN RESHELF FOR 10 BUSINESS DAYS & ARE MOVED INTO CLIENT AREA FOR PACKAGING
46
CAPTURED ITEM SENT AS FILE TO MASKING
50
MASKING PROCESS TAKES PLACE THEN FORWARDED TO QA FOR INSPECTION
52
QA ACQUIRES FILES & INSPECTS TO QA SPECIFICATIONS
54
QA CREATES QA DOCUMENT RECORD
PASS INSPECTION
Yes
58
No
QA SENDS FILES TO A DELIVERY FOLDER WITHIN THE DATABASE
MASKER/QA PERFORM REWORK
60
POST RWK OR RESHOOT
POST RWK
RESHOOT
OPERATOR COMMUNICATES TO STYLIST TO MOVE THAT ITEM BACK INTO PROCESS
62
QA COMMUNICATES NEED TO RESHOOT ITEM TO OPERATOR

Fig. 1(C)

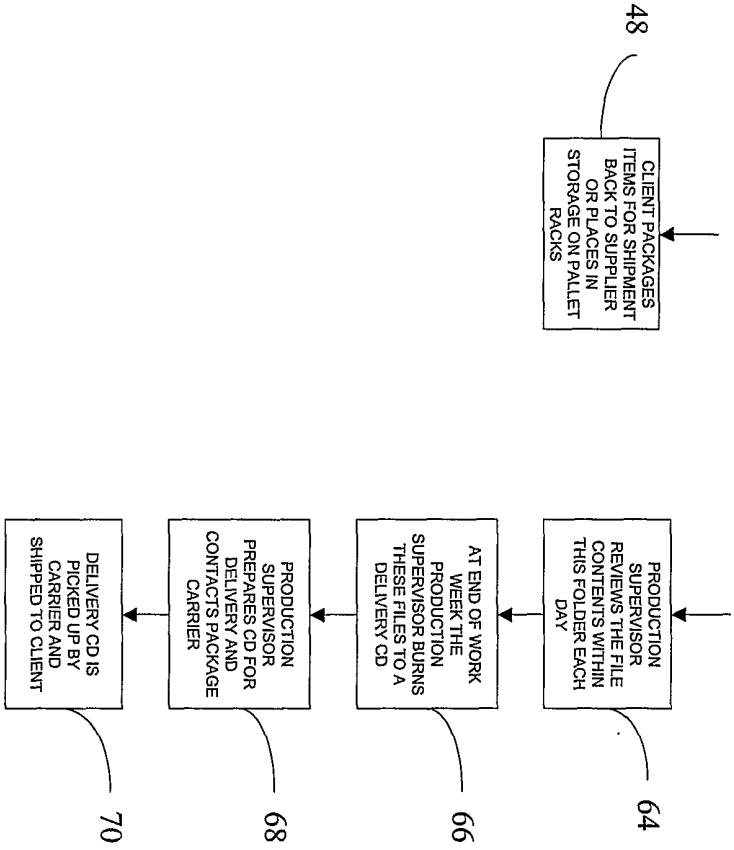
48
CLIENT PACKAGES ITEMS FOR SHIPMENT BACK TO SUPPLIER OR PLACES IN STORAGE ON PALLET RACKS
PRODUCTION SUPERVISOR REVIEWS THE FILE CONTENTS WITHIN THIS FOLDER EACH DAY
64
AT END OF WORK WEEK THE PRODUCTION SUPERVISOR BURNS THESE FILES TO A DELIVERY CD
66
PRODUCTION SUPERVISOR PREPARES CD FOR DELIVERY AND CONTACTS PACKAGE CARRIER
68
DELIVERY CD IS PICKED UP BY CARRIER AND SHIPPED TO CLIENT
70

Fig. 1(d)

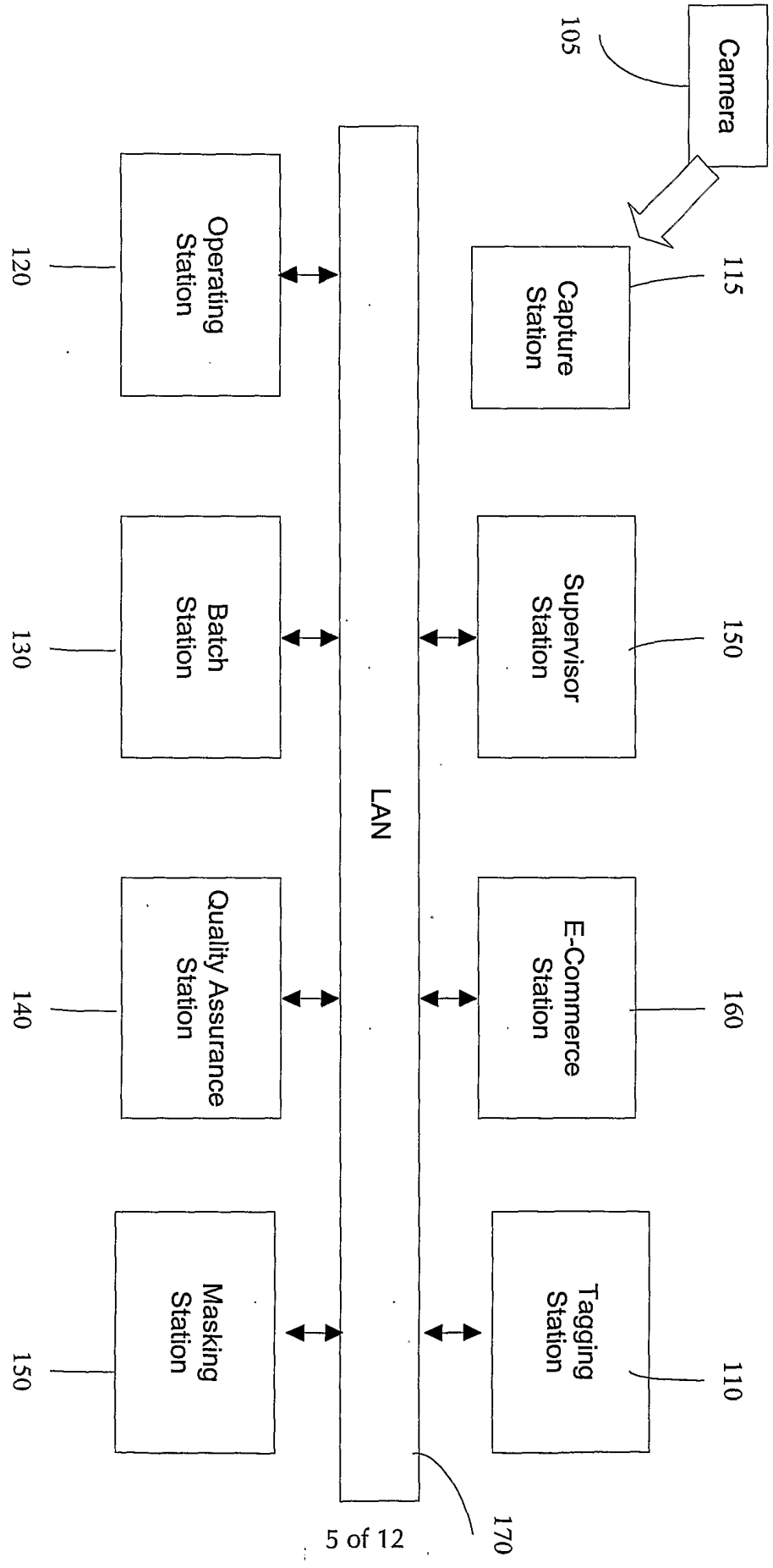
Camera
105
Capture Station
115
Operating Station
120
Batch Station
130
Supervisor Station
150
Quality Assurance Station
140
E-Commerce Station
160
Masking Station
150
Tagging Station
110
LAN
170

Fig. 2

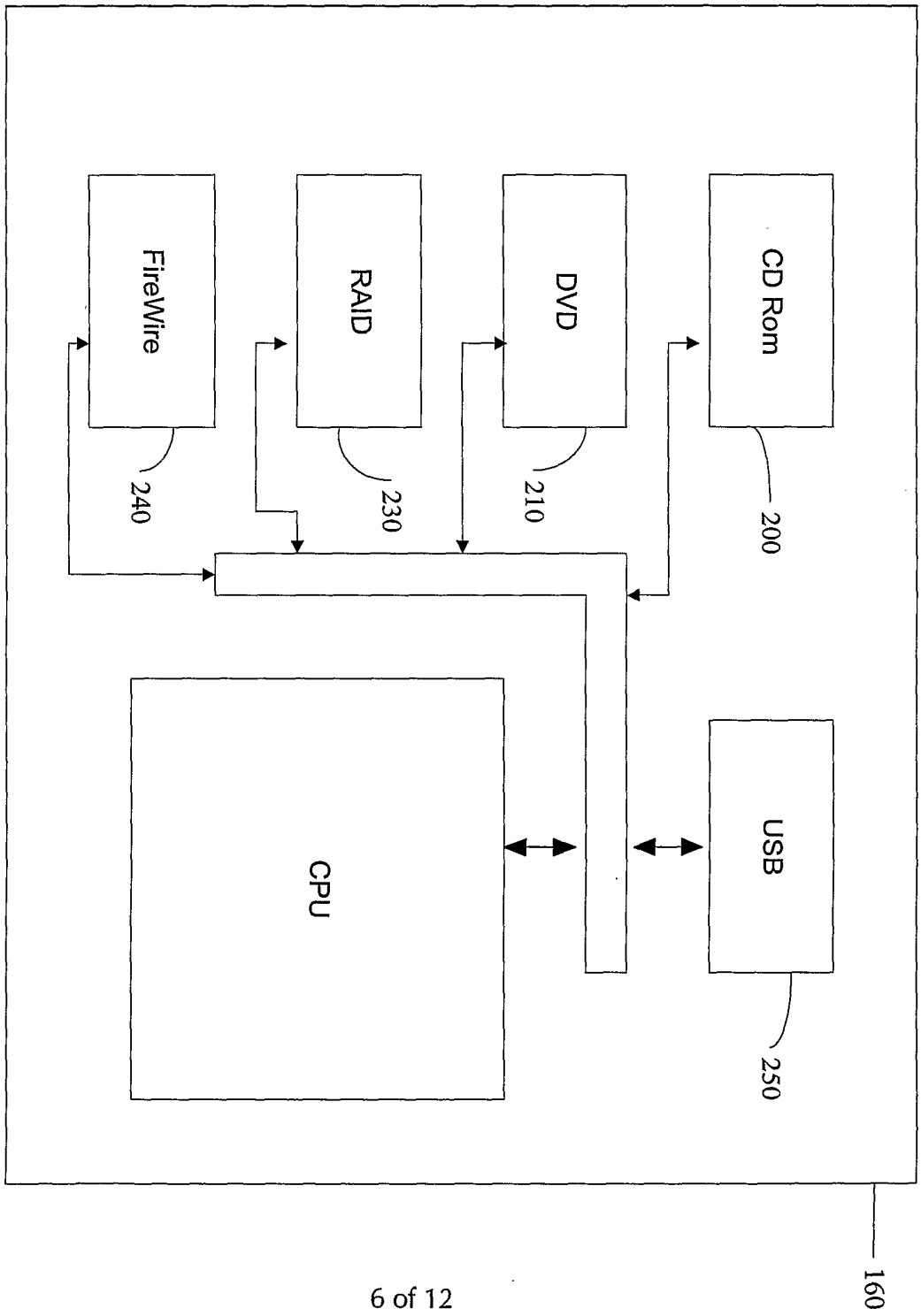

Fig. 3

Name	2nd Monitor Setting	2nd Monitor Size	AppleTalk Network #	AppleTalk Node #
A_Batch1	n/a	n/a	41201	19
A_Batch2	n/a	n/a	41201	81
A_PP2	n/a	n/a	41201	180
A_QA	millions of colors	1024 x 768	41201	203
A-Capture1	n/a	n/a	65280	246
A-Capture2	n/a	n/a	65280	185
Database	n/a	n/a	41201	85
Database-Admin	millions of colors	1024 x 768	41201	242
Development	n/a	n/a	65280	17
Lead-Photo	n/a	n/a	41201	51
Scheduler	millions of colors	1024 x 768	41201	4
Staff-iMac	n/a	n/a	65280	21
Supervisor	n/a	n/a	41201	124
Tagging1	n/a	n/a	41201	90
eCommerce Server	n/a	n/a	41201	97

Additional Hardware	CDR Drive	DVD RAM Drive	Zip Drive	RAID Drive
	Lacie 4x / 12x	Lacie LFD-101	omega USB Zip Drive	Micronet DataDock 7000 RAID Array

Additional Software	CDR Software	DVD Software	Database Software
	Adaptec Toast v. 3.57	Software Architects DVD RamTune Up	Filemaker Pro Server & Client Software

NOTE!!! All computers are Apple Power Macintosh G3 computers.

Fig. 4(a)

AppleTalk Version	Built-in Memory	Bus Clock Speed	Cache Size	File Sharing	Hardware Vendor	Keyboard Connected
60.0a6	256.0 MB	100 Mhz	7.9 MB	On	Not Supported	Connected
60.0a6	256.0 MB	100 Mhz	7.9 MB	On	Not Supported	Connected
60.0a6	256.0 MB	100 Mhz	7.9 MB	On	Not Supported	Connected
60.0a6	256.0 MB	100 Mhz	7.9 MB	On	Not Supported	Connected
60.0a6	256.0 MB	66 Mhz	2.5 MB	Off	Apple Computer, Inc.	Connected
60.0a6	160.0 MB	66 Mhz	2.5 MB	On	Apple Computer, Inc.	Connected
60.0a6	128.0 MB	100 Mhz	4.0 MB	On	Not Supported	Connected
60.0a6	256.0 MB	100 Mhz	7.9 MB	Off	Not Supported	Connected
61	320.0 MB	99 Mhz	7.9 MB	On	Not Supported	Connected
60.0a6	256.0 MB	100 Mhz	7.9 MB	On	Not Supported	Connected
60.0a6	256.0 MB	100 Mhz	7.9 MB	On	Not Supported	Connected
60.0a6	64.0 MB	66 Mhz	2.0 MB	Off	Not Supported	Connected
60.0a6	256.0 MB	100 Mhz	2.0 MB	Off	Not Supported	Connected
60.0a6	64.0 MB	66 Mhz	2.0 MB	On	Not Supported	Connected
60.0a6	384.0 MB	100 Mhz	7.9 MB	On	Not Supported	Connected

	FireWire Drives	USB Drives	Network Switches
	FirePower FireDrive HDD	Lacie USB 10gb Drive	Cisco 2900 Switches
			Netgear 10/100 Switches

Fig. 4(b)

Monitor Setting	Monitor Size	Mouse Connected	Network Type	Open Transport Version	Play and Record
millions of colors	1024 x 768	Missing	Ethernet	2.0.3	Yes
millions of colors	1024 x 768	Missing	Ethernet	2.0.3	Yes
millions of colors	1024 x 768	Missing	Ethernet	2.0.3	Yes
millions of colors	1024 x 768	Missing	Ethernet	2.0.2	Yes
thousands of colors	832 x 624	Connected	Ethernet	2.0.2	Yes
millions of colors	832 x 624	Connected	Ethernet	2.0.2	Yes
millions of colors	832 x 624	Missing	Ethernet	2.0.2	Yes
millions of colors	1024 x 768	Missing	Ethernet	2.0.3	Yes
millions of colors	1024 x 768	Missing	Ethernet	2.6	Yes
millions of colors	1024 x 768	Missing	Ethernet	2.0.3	Yes
millions of colors	1024 x 768	Missing	Ethernet	2.0.3	Yes
millions of colors	1024 x 768	Missing	Ethernet	2.0.3	Yes
millions of colors	1280 x 960	Missing	Ethernet	2.0.3	Yes
millions of colors	1024 x 768	Missing	Ethernet	2.0.1	Yes
millions of colors	832 x 624	Missing	Ethernet	2.0.3	Yes

Fig. 4(c)

Printer Type	Printer Version	Processor	Processor Clock Speed	RAM Disk Size	System SW Memory
LaserWriter 8	8.6.5	PowerPC 750	300 Mhz	Off	36.8 MB
ImageWriter	n/a	PowerPC 750	300 Mhz	Off	35.2 MB
LaserWriter 8	8.6.5	PowerPC 750	300 Mhz	Off	39.5 MB
LaserWriter 8	8.6	PowerPC 750	300 Mhz	Off	45.9 MB
LaserWriter 8	8.6	PowerPC 750	267 Mhz	Off	23.2 MB
LaserWriter 8	8.6	PowerPC 750	267 Mhz	Off	23.4 MB
LaserWriter 8	8.6	PowerPC 750	300 Mhz	Off	26.6 MB
LaserWriter 8	8.6.5	PowerPC 750	300 Mhz	Off	46.2 MB
LaserWriter 8	8.7	PowerPC 750	400 Mhz	Off	52.5 MB
LaserWriter 8	8.6.5	PowerPC 750	300 Mhz	Off	34.2 MB
LaserWriter 8	8.6.5	PowerPC 750	300 Mhz	Off	42.3 MB
LaserWriter 8	8.6.5	PowerPC 750	266 Mhz	Off	29.1 MB
LaserWriter 8	8.6.5	PowerPC 750	300 Mhz	Off	35.8 MB
LaserWriter 8	8.6	PowerPC 750	233 Mhz	Off	21.2 MB
LaserWriter 8	8.6.5	PowerPC 750	350 Mhz	Off	343.1 MB

Fig. 4(d)

System SW Version	TCP/IP Version	Total Disk Space	TV Tuner	Video Digitalizer	Virtual Memory
8.6	Open Transport 2.0.3	6,149.0 MB	No	No	Off
8.6	Open Transport 2.0.3	6,149.0 MB	No	No	Off
8.6	Open Transport 2.0.3	6,149.0 MB	No	No	Off
8.5.1	Open Transport 2.0.2	6,149.0 MB	No	No	Off
8.5.1	Open Transport 2.0.2	4,334.6 MB	No	No	Off
8.5.1	Open Transport 2.0.2	4,099.5 MB	No	No	Off
8.5.1	Open Transport 2.0.2	15,820.0 MB	No	No	Off
8.6	Open Transport 2.0.3	6,149.0 MB	No	No	Off
9	Open Transport 2.6	6,173.4 MB	No	Yes	Off
8.6	Open Transport 2.0.3	6,149.0 MB	No	No	262.0 MB
8.6	Open Transport 2.0.3	6,149.0 MB	No	No	Off
8.6	Open Transport 2.0.3	6,149.0 MB	No	No	132.1 MB
8.6	Open Transport 2.0.3	6,149.5 MB	No	No	Off
8.5	Open Transport 2.0.1	4,110.0 MB	No	No	68.8 MB
8.6	Open Transport 2.0.3	114,047.3 MB	No	No	Off

Fig. 4(e)

Workstation Info #1	Workstation Info #2
CPU000703	MON000604
CPU000717	MON000878
CPU000704	MON000484
CPU000709	MON000617, 001645
CPU000879	MON000618
CPU000417	MON000414
CPU000697	MON000613
CPU000710	MON000607, 000608
CPU000716	MON000613
CPU001169	MON001170
CPU000715	MON000418, 000022
CPU000594	n/a
CPU000716	MON000606
eVox 001553	n/a
CPU000696	MON001646

Fig. 4(f)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/05699

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :H04N 7/18
US CL : 348/77
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 348/77, 42, 50, 55, 61, 142; 345/435

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

None

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

None

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4,670,781 A (AUBERT et al) 02 June 1987, figure 1, col. 2, ln. 61 - col. 4, ln. 38.	1-4
Y	US 5,009,626 A (KATZ) 23 April 1991, figure 5, col. 8, ln. 1 - col. 10, ln. 33.	1-4
Y	US 4,158,487 A (COLLENDER) 19 June 1979, figure 4, col. 4, ln. 40-43.	1
Y	US 4,539,585 A (SPACKOVA et al) 03 September 1985, figs. 2A-2C.	1

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 21 APRIL 2001	Date of mailing of the international search report 08 MAY 2001
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer NHON T. DIEP Telephone No. (703) 305-4648