

A PRINTER FOR A DRIVE BAY

Background of the Invention

The present invention relates to a printer which fits within a conventional personal computer housing and, more particularly, to a small format printer which fits within the dimensions of a conventional accessible drive bay in a personal computer housing.

Conventionally, with few exceptions, unlike many personal computer accessories such as disc drives, modems, and the like, computer printers have been stand alone accessories that have not been housed within the personal computer itself. While printer technology has developed in recent years to the point that faster, higher resolution, and full color printers are now widely available at affordable prices, there are certain applications in which it would be desirable to house a printer within a personal computer housing. In particular, it would be desirable if a printer could fit within the dimensions of the conventional accessible disc drive bay in this housing. While the size of this printer would limit the size of the media that it would employ and the size of the image it would produce, such a printer could be an optional accessory that is assembled with the computer chassis similar to a CD ROM drive, a floppy drive, or an additional hard drive and used to print documents, facsimiles, image files (e.g., bitmaps), or graphics analogous to a conventional printer, or such a printer could be dedicated to printing facsimiles or printing photographic quality images downloaded from a TV or video file in a reduced size or format. The conventional stand alone printer might be used for text document preparation whereas the drive bay housed printer might be used to reproduce full color near photographic quality images having a size comparable to a standard photograph.

A drive bay housed full color, near photographic quality printer would be useful in a variety of applications currently available or rapidly moving towards market introduction. Kodak Corporation currently provides a service in which films and negatives can be placed on photo CD discs and photo CD access software allows the user to load the images into the personal computer memory, view the images, edit the displayed image by cropping or changing the size, color settings and orientation, and copy the original or edited image as a bitmap. In addition, while not widely used, electronic digital cameras are commercially available currently. These cameras photograph an image, but the image is stored in digital memory such as random access memory instead of on film. These stored images can be downloaded from the camera to a personal computer for viewing and editing in a manner analogous to the photo CD images discussed previously. In still another application, personal computers are now available commercially with television cards. With a TV card, the user can download images directly from the television network or from a video recorder for viewing and editing. Alternatively, the drive bay housed printer might be used to print images from a source such as the Internet.

In summary, there is a need for a printer that can be housed within a personal computer accessible drive bay. In particular, as the capabilities of the personal computer expand in the video and photographic field, the need for printers which can reproduce near or photographic quality images will increase and it would be desirable if such a printer could be housed within a conventional personal computer disc drive bay. Such a printer could reproduce images approximately the size of a conventional photograph, for example, about 3 inches wide and 5 inches long. Such a printer would not replace the stand alone printer but it would provide a low cost



alternative which would enable the personal computer to be used for additional applications.

Summary of the Invention

The present invention provides a printer which fits within the dimensional confines of a personal computer disc drive bay, such as a half high 5¼ inch accessible drive bay.

The printer can be designed to form text or graphic images on any of the media used in conventional stand alone printers or facsimile machines such as plain paper, thermal transfer paper, ink jet recording paper, or thermosensitive paper, or the printer can be designed to form images on a photosensitive material.

The printer includes a printhead, access for a media supply cartridge, a communication port for receiving print signals and image information, and a media conveyor for transporting the media through the printer for printing or dispensing or ejecting the media from the printer. Where the media requires a latent image to be developed, the printer may also include a developer such as a pressure head or pressure roller or a means to heat the media. Examples of printing methodologies which can be used in the printer include dot matrix, ink jet, pen plotter, dye diffusion thermal transfer (D2T2) and photosensitive methodologies such as, conventional photographic film, the diffusion transfer color photographic or "instant" film unit (e.g., a POLAROID film unit), a film unit employing photohardenable microcapsules such as the CYCOLOR media developed by The Mead Corporation or photographic systems such as those described in U.S. Patent 5,091,280 and 5,198,468 to Fuji Photo Film Company Limited.



The invention will be specifically illustrated with reference to the photosensitive media developed by The Mead Corporation which employs a developer and microcapsules containing a color precursor and a photohardenable composition. This media is designed to be image-wise exposed to actinic radiation to form a latent image in the form of hardened, partially hardened, and unhardened microcapsules. By applying pressure to a layer of the microcapsules, the microcapsules rupture and differentially release the color precursor. The released color precursor is free to react with a solid acidic developer material which is provided within the media. The color precursor migrates to the developer where it reacts to form a full color image. This photographic system is described in more detail in commonly assigned U.S. Patents 4,399,209; 4,416,966; 4,440,846; 4,751,165; 4,766,050; 4,842,981; 4,842,976; and 4,912,014. A photosensitive media that is specifically designed for use in conjunction with the printer disclosed herein is described in co-pending U.S. Application Serial Number 08/258,329 filed June 10, 1994.

The design of the printer and the selection of the media and the printhead can vary depending on the type of image the printer is designed to reproduce and the resolution and color quality desired in the image. For printing text a thermal printhead or an ink jet printhead may be used. For producing full color photographic images using a photosensitive media, the printhead includes exposure elements such as light emitting diodes (LED), a liquid crystal display (LCD) panel or a cathode ray tube such as a fiber optic cathode ray tube or a similar source of modulated radiation. The printhead may scan the media by moving the media with respect to the printhead or moving the printhead with respect to the media in an X and/or Y direction or, in certain embodiments, the printhead may be a stationary



panel such as an LCD the size of which corresponds to the area of the image to be reproduced. With certain photosensitive media, such as Polaroid or Mead film units the printer also includes a developer unit for converting latent images formed in the media by the exposure to the printhead into visible images. The developer unit may be a pressure roller to rupture the microcapsules in the case of Mead's photographic system or a device to rupture a pod containing developer solution in the case of a Polaroid material.

Brief Description of the Drawings

Fig. 1 is a perspective view of a conventional personal computer housing sometimes referred to as a "tower".

Fig. 2 is a perspective view of a computer printer in accordance with the present invention which fits within a conventional disc drive bay.

Fig. 3 shows the printer of Fig. 2 with an associated media pack wherein a print is shown in the process of being dispensed from the printer.

Fig. 4 is a cross-sectional view of the printer of Fig. 2 showing the path through which the media is transported in forming an image.

Fig. 5 is a side view of the printer of Fig. 2 showing the gear train.

Fig. 6 is a top view of the printer of Fig. 2.

Fig. 7 is a cross-sectional schematic view of the printer shown in Fig. 6 along the line 7-7.



Fig. 8 is a side cross-sectional view of a printer for use with diffusion transfer photographic film, such as the Polaroid film product.

Fig. 9 is a side cross-sectional view of a printer employing dye diffusion thermal transfer media.

Fig. 10 is a side cross-sectional view of a printer employing an ink jet printhead.

Fig. 11 is a side cross-sectional view of a printer for thermal autochrome media.

Fig. 12 is a side cross-sectional view of a printer for 35mm photographic film.

Definitions

The term "personal computer" or "PC" as used herein means a general-use computer created for a single user in an office or home which executes user-written or user-designated programs, performs user-designated data manipulation including arithmetic operations and logic operations. The term includes tower, desktop and laptop computers.

Detailed Description of the Invention

The invention will be illustrated in more detail by reference to the following specific embodiments. Those skilled in the art will readily appreciate that modifications and variations on these embodiments are possible without departing from the scope of the invention defined herein. Fig. 1 illustrates a conventional personal computer tower showing a printer 10

housed in one of the disc drive bays. The printer 10 includes a doored opening 12 through which the media cartridge 14 can be inserted as shown in Fig. 3 and a slot 16 from which the print 18 is dispensed from the printer. The printer shown in Fig 1 includes an industry standard half high accessible drive bay. Threaded mounting holes 17 are provided on each side of the printer 10. These holes align with slots in the computer chassis so that the printer can be fixed in the accessory bay by means of a threaded fastener. The media cartridge 14 is designed to supply the media in the form of individual sheets, but the media could easily be supplied in roll form if the printer included a slit for separating the prints 18 from the roll before they were dispensed from the printer. The media supplied by cartridge 14 can be any of the previously mentioned media used in conventional stand alone printers, video printers or facsimile machines. It will also be recognized that it is not necessary to feed the media into the printer from a cartridge. Single sheets can be manually inserted into a slot in the printer from which they are taken up by the feed rollers.

A tower style personal computer having a half high drive bay has been selected to illustrate the invention. Other style housings such as desk top housings and laptop housings having full size or quarter size 3 1/2 inch drive bays can also be used. One of the essential attributes of the invention is that the printer is designed to be housed within the personal computer drive bay. Personal computer housings are distinguished by their single-user purpose. This restricts the size of any printer that can be housed in the computer. The present invention provides a printer which fits within a space about 1 to 4 inches high, 4 to 12 inches deep, and 3 to 7 inches wide. More particularly, the printer of the present invention is designed to fit with a space 1

to 2 inches high, 7 to 9 inches deep and 5.5 to 6.5 inches wide.

Currently, a typical personal computer housing contains within it a central processing unit (CPU) , memory (RAM), a data retrieval and storage device such as a hard disc drive, connections for input/output (I/O) devices (e.g., a keyboard, mouse and monitor) and a power supply. As the cost of memory continues to decrease, in future personal computers the hard drive may be replaced by RAM. Optionally, the PC may include a modem, a device for retrieving externally stored data such as a "floppy" drive or a CD ROM drive, a sound card and the like. In the case of a laptop, the housing also includes the input/output devices. For convenience the printer may be supplied with an expansion board which would be connected by a communication bus to the microprocessor board and to the printer. The printer would be powered by the computer's power supply but it is also envisioned that the printer could be powered by a battery pack carried in the media cartridge similar to a the way Polaroid film packs include battery packs to power instant cameras.

By inserting the media cartridge 14 into the slot 12, door panel 20 is rotated to an open position. The cartridge is positioned in the printer with the aid of a guide plate 11 and a spring element 13, which urges the cartridge into alignment with that plate. With the cartridge 14 in place in the printer, the pick up roller 22 begins to rotate when the printer 10 receives a print signal from the computer. If the cartridge 14 has not previously been opened, the roller 22 may open the unit by unfolding a closure flap 23. The pick up roller 22 is cam driven by a gear 21a in the gear train 19. With rotation of the roller 22, the first sheet of media is moved by roller 22 into the nip between the roller 22 and a roller 26. Roller 26 is designed to provide a slight

rotational drag on the media. In this way if two or more sheets of media are fed at one time, roller 26 will scrape the additional sheets from the back side of the intended sheet to assist in preventing double feeding. With continued rotation of roller 22, the media sheet is removed from the media cartridge 14 and moved upwardly (as shown in Fig. 4) along ramp 18 where it is directed by baffle 27 and support plate 29 into the nip between line feed roller 32 and idle rollers 30.

Rollers 22 and 32 are driven by a motor 35, which is conveniently but not necessarily a step motor, via gear train 19, as shown in Fig. 5. While roller 22 is cam driven, roller 32 is directly driven by gear 21. As a result of the different drives used in rollers 22 and 32, roller 32 transports the media faster than the roller 22.

In the illustrated embodiment, the printer 10 includes an optical detector 40 which senses the trailing edge of the media as it travels in the printer. The step motor 35 is programmed to transport the media sheet a predetermined number of steps corresponding to a predefined position in the printer upon receiving a signal triggered by a signal from the detector 40 indicating the trailing edge of the media sheet. The feed roller 32 in conjunction with a plurality of idle rollers 30 transport the sheet a fixed number of steps as programmed by the step motor 35 to the guide plate 34 at the back 36 of the printer. The guide plate 34 is curved in order to direct the leading edge of the media sheet into the open space 37 in the back of the printer. When the media reaches this predefined position, the step motor 35 is programmed to reverse and the counter in the step motor controls the advancement of the media through the printer. Advancement of the media from this point in the operation of the printer is coordinated with the

programming and operation of the printhead 52 such that upon completing each scan of the media by the printhead, the media is advanced. When the motor 35 reverses direction, the direction of rotation of roller 22 is also reversed by switching the drive for the roller 22 to the gear train 23 on the opposite side of the printer. By reversing the direction of the roller 22 in this manner, the roller 22 can urge any media sheet which may have been double fed and detained by roller 26 back into the media supply cartridge unit thereby preventing double feeds.

While the invention is illustrated using pick up and feed rollers to convey the media through the printer, other sheet conveyance means conventionally employed in printers or copiers such as belt conveyors may also be useful.

The printhead used to illustrate this particular embodiment of the invention is also described in U.S. Application Serial No. 08/418,431 (Attorney Docket 300150-2023) filed April 5, 1995. In the embodiment illustrated in Figs. 4-6, the printhead 52 includes a single carriage element on which both an exposure head 53 and a developing head 54 are carried. These two elements can be divided and deployed on separately driven carriages if desirable. The exposure head 53 image-wise exposes the media. In this case, as previously indicated the printer is designed to print on a photosensitive media employing photohardenable microcapsules but other photosensitive media could be exposed in a similar manner as has also been previously described. The developer head 54 ruptures the microcapsules after exposure. The exposure head 53 incorporates a plurality of modulated radiation (light) emitting elements 55 which may be in the form of light emitting diodes (LED), liquid crystal display (LCD)

panels, lasers, fiber optics, etc. Preferably the radiation emitting elements 55 are red, green and blue LED's mounted in the exposure head 53. The radiation emitting elements are modulated by an electronic signal provided from the computer and, more particularly from an expansion board supplied with the printer and assembled with the computer. The expansion board may include a print buffer or interface circuitry in a manner known in the art. The radiation emitted by elements 55 can be directed to the media sheet through a beam-forming aperatured plate 56 positioned adjacent to the LED's whereby the radiation is projected onto the media sheet with good resolution.

The printhead 52 travels back and forth across the media on the carriage rail 58. The printhead is clamped to and driven by a cog belt 60 which runs parallel the rail 58 on a pair of rollers 62 and 64 oriented such that their center axes are horizontal. Roller 62 is indirectly driven by a step motor 66. This step motor is programmed such that at the end of each stroke or traverse of the media by the printhead 52 the motor reverses direction. Immediately before the step motor 66 reverses the direction of the printhead, the media is incrementally advanced by the line motor 35.

As the media is step-wise exposed and incrementally advanced, the media passes between an overhead pressure plate 29 and the developer head 54. The developer head 54 includes a pressure applicator 70 including at least one and preferably a plurality of ball elements 72. In Fig. 6, the pressure applicator includes four ball elements which are arranged on a line which runs at an oblique angle with respect to the direction of travel of the printhead such that the elements travel along a plurality of overlapping paths as they cross the media. The ball elements are preferably arranged so as

to avoid forming raster lines in the image. The ball elements are each mounted in a cylindrical bore 75 with a compression spring 74 which urges each ball into pressure contact with the media. The developer unit 54 is supported on a rail member 78 as it traverses the media. The media is compressed between the ball elements and the upper pressure plate 29. This causes the microcapsules to rupture whereupon the color precursor contacts the developer material and produces an image.

There are occasions during the operation of the printer when it is not desired to have the pressure balls contact the media such as when the media is transported to the back of the printer prior to printing and as the border regions (which are optional) such as the areas immediately adjacent and parallel the leading and trailing edges of the media, passes over the developer head 54. To prevent such contact the rail 78 is rotatable about its center axis and has a noncircular cross-section including a flat 79 over a portion of its length adjacent one or both sides of the printer. By moving the printhead to a side location and rotating the flat into position beneath the printhead, the ball elements do not contact the media.

The printer is programmed such that the media continues to be advanced, exposed and developed until the image is complete. The printer may optionally include a heating element such as a heated bar which extends across the media path to heat the media as it exits the printer and thereby accelerate development if desired. Completion of the image may be indicated by a signal from the computer, or by a signal generated directly or indirectly in response to the detection of the leading or trailing edge of the media by optical detector 40. Upon completing the image, the printhead is positioned to the side of the printer, the pressure head is disabled by

rotating rail 78 as described above and the media is advanced along table 42 to roller 44 which is driven by the gear train shown in Fig. 5 and which advances the media out of exit slot 16. The media is held in contact with roller 44 by the spring baffle 46. Once the print has been ejected through slot 16, the line motor 35 is reversed and upon receiving the next print signal, the printer is ready to remove another sheet of media from the media pack 14 and to repeat the printing operation.

While the printer discussed above is designed for use with a photosensitive media employing microencapsulated color formers, the teachings herein and the invention go well beyond the specific printer illustrated or processing this particular media. As illustrated below, through the use of other printheads other media may be processed within the personal computer housing to provide images based on the teachings herein.

Fig. 8 illustrates a printer 200 in accordance with another embodiment of the invention which is designed to print on a Polaroid film pack 202. The printer 200 extends forwardly from the front face of the computer to permit a door 204 to swing downwardly to load the film pack. In this embodiment, the media is not moved with respect to the printhead as was the case for the previous embodiment. Instead each film unit is exposed as it sits in the film pack using an exposure head 206 which scans the film in both an X and Y direction. An exposure head 206 carrying LED's (not shown) is mounted on a carriage 208. The carriage is moved in the X direction (i.e., right and left as shown in Fig. 8) by a ball screw 210 which is driven by a step motor 212. The ball screw passes through a threaded aperture in a carriage support member 213. A second carriage support member is located on the opposite side of the printer and travels on an unthreaded guide rail

running parallel to and in alignment with the screw 212. The Y scan of the exposure head 206 is provided in a manner analogous to that shown in Fig. 5. The carriage 208 extends across the printer and includes a carriage rod 214 on which the exposure head 206 is moved by belt drive 216 which is also carried on the carriage 208. The belt drive is driven by a separate step motor which is not shown. When the film unit has been completely scanned, the film unit can be pushed out of the film pack by a pic in manner known in the art into the pressure nip between the developer rollers 220 and 222 which are mounted on the printer door 225. Roller 222 is driven by gear 223 which intermeshes with the line gear train in the printer when the door 225 is closed. As the film unit is dispensed through slot 224, a developer pod in the film unit is ruptured. If the film unit 202 includes a battery pack, contacts can be provided on the floor of the printer so that the step motor 212 for the X-drive and the unshown step motor for the belt drive can be powered by the battery pack. Alternatively, the motor can be powered by D.C. current from the computer's power supply.

Fig. 9 illustrates a printer 300 which is useful in imaging by dye diffusion thermal transfer (D2T2). This system employs sublimable dyes carried on a ribbon. The printer 300 is mounted in the printer on drawer carriage 302 so that the printer 300 can be pulled from the front of the computer to replace the thermal transfer ribbon 304 which is installed in the printer on a cassette 306. Media 308 is supplied from a cartridge, which is inserted into the printer through door 310, using a pick up roll 312 in a manner analogous to that shown in Fig. 5. The media is fed by rollers 314 and 320 across a thermal printhead 316. Printhead 316 scans the media back and forth in one direction perpendicular to the media path. A back up roll 318 is provided to keep

the media in proximate contact with the ribbon 304 as it is scanned by the thermal printhead. The ribbon 304 advances with the media during the printing process. The ribbon typically includes fields or panels which are cyan, magenta, yellow and black and correspond in length and width to the length and width of the area in the media in which the image is formed. One pass through the printhead is required for each color. Thus, to form a full color image using a four color ribbon, the printhead must scan the media four times.

In one embodiment of the invention, the media is transported by rollers 314 and 320 to the back of the printer whereupon the direction of rollers 314 and 320 is reversed. The media is printed as it passes from right to left in Fig. 9. As the media moves past the printhead 316, the thermal transfer ribbon moves in register with the media from the feed roll 322 to the take up roll 324 in the cassette 306. After each color is printed, rollers 314 and 320 are reversed, the media is translated to the back of the printer, the direction of the rollers is again reversed and the next color is printed as the media again moves from right to left in Fig. 9 in register with the print ribbon. After all of the colors have been printed, the media is advanced out of the printer through slot 330.

Fig. 10 illustrates a printer 400 which is designed to print images using an ink jet printhead 402. The media supply, pick up and line feed is similar to that shown in Fig. 4. As shown in Fig. 10, the media 404 is inserted into the printer through door 406, the media is removed from the cartridge by pick up roll 408 and fed by feed rollers 410 and 412 to a position in the printer from which it is scanned by the printhead 402. Printhead 402 can be a conventional single color, three color or four color ink jet printhead which scans the media across

its direction of travel. The ink is supplied to the printhead 402 in a cartridge (not shown). To permit replacement of the ink cartridge, the printer 400 is mounted in the printer on a drawer mechanism 414 which enables the printer to be slid out of the drive bay to a position at which the user can replace the ink cartridge and then slide the printer on the drawer carriage back into the drive bay.

Fig. 12 illustrates a printer 500 which is useful in printing 35mm film. The printer 500 extends forwardly from the front face of the computer and includes a door 502 which swings downward to an open position to permit insertion of a 35mm film cartridge 504. Film 506 is pulled out of the film cartridge 504 by a driven reel 510 in a manner analogous to conventional cameras having an automatic film advance. In this embodiment, the printer is provided with an full frame LCD panel 514. This panel is controlled by a signal received from the computer. Images are formed on the film 506 as it stops in front of the panel 514. A white light source 512 is provided in the printer with a color filter wheel 516. Imaging information is downloaded to the LCD panel 514 in red, green, and blue fields. As each field of information is provided to the panel 514, the panel is illuminated by light source 512 through the corresponding filter on wheel 516. When the three exposures are complete, the film 506 is advanced and the next image can be formed. When all of the film has been paid out of the cartridge 504 or the user desires to interrupt imaging the film, the spool 508 can be actuated to wind the film back into the cartridge in a conventional manner. The cartridge can then be removed from the printer through door 502 and replaced.

Fig. 11 illustrates a printer 600 which is useful in printing thermal autochrome media, as described

in U.S. Patent 5,091,280 to Fuji Photo Film Company Limited. In this printer, a photosensitive media is supplied from a cartridge 602 which is inserted into the printer 600 through a door 604. Again, the media is advanced to the printhead using a pick up roller, as previously described. The thermal autochrome media requires exposure at three different wavelengths to expose the media which are typically in the ultraviolet or blue region. After exposure, the media is heated to develop the full color image. In the embodiment illustrated, a unit of the film is advanced by rollers 608 and 610. The printer includes a printhead 612 including modulated sources of radiation and a heating unit 614. In the embodiment illustrated in Fig. 11, the film unit is exposed as it moves from left to right in the figure and passes over the printhead 612. The printhead 612 carries light or UV radiation sources which correspond to the sensitivity of the media. After the media is exposed, it is heated to develop the image.

Having described the invention in detail and by reference to preferred embodiments thereof, it will be apparent that modifications and variations are possible without departing from the scope of the invention defined in the appended claims.

What is claimed is:

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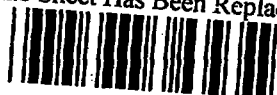
1. A personal computer comprising a housing, an accessible drive bay in the housing, a central processing unit, memory, a data retrieval and storage device, at least one connection for an input/output device, a power supply, and a printer, wherein said printer is housed within said drive bay.
2. The personal computer of claim 1 wherein the printer includes a media access for inserting media to be printed into said printer, a communication link for receiving image data, and a printhead for printing said media.
3. The personal computer of claim 2 wherein the printhead is an ink jet printhead.
4. The personal computer of claim 2 wherein the printhead is a thermal printhead.
5. The personal computer of claim 2 wherein the printhead includes a modulated source of radiation.
6. The personal computer of claim 5 wherein the printhead includes a liquid crystal display.
7. The personal computer of claim 5 wherein the printhead includes a light emitting diode.
8. The personal computer of claim 5 wherein the printhead includes a cathode ray tube.
9. The personal computer of claim 1 wherein the printer is mounted on a drawer carriage such that it can be moved slidably into and out of the bay.

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10. The personal computer of claim 7 wherein the printer further includes a cartridge for a thermal transfer ribbon.
11. The personal computer of claim 5 wherein the printer further includes a heating element for heating the media uniformly and developing an image.
12. The personal computer of claim 2 wherein the printhead scans the media in at least one direction and the printhead is driven by a motor.
13. The personal computer of claim 2 wherein the printer includes a plurality of rollers for conveying said media, a gear train, and a motor, said motor driving said rollers via said gear train.
14. The personal computer of claim 2 wherein said printer includes mounting holes for mounting said printer in the bay, said holes being aligned with mounting slots in the bay.
15. The personal computer of claim 2 wherein said printer includes a front face which faces forward in the drive bay and the access includes a slot in the front face of the printer for receiving a media supply cartridge.
16. The personal computer of claim 2 wherein said accessible drive bay is about 1 to 4 inches high, about 4 to 12 inches deep, and about 3 to 7 inches wide.
17. The personal computer of claim 16 wherein said accessible drive bay is a quarter high 3 1/2 inch disc drive bay.



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18. The personal computer of claim 16 wherein said accessible drive bay is a half high 5 1/4 inch disc drive bay.
19. The personal computer of claim 16 wherein the printhead includes a modulated source of radiation.
20. The personal computer of claim 19 wherein the printhead includes a liquid crystal display.
21. The personal computer of claim 19 wherein the printhead includes a light emitting diode.
22. A printer which can be housed within an accessible drive bay comprising a media access for inserting media to be printed into said printer, a communication link for receiving image data, a printhead for printing said media, and means for mounting said printer in said bay.
23. The printer of claim 22 wherein said printhead scans said media in at least one direction and said printer includes a motor for driving said printhead.
24. The printer of claim 22 wherein said printhead includes a modulated source of radiation for exposing said media.
25. The printer of claim 22 wherein said printhead is an ink jet printhead.
26. The printer of claim 22 wherein said printhead is a thermal printhead.
27. The printer of claim 26 wherein said printer includes a cassette for a thermal transfer ribbon.





28. The printer of claim 24 wherein said printhead includes a liquid crystal display panel.
29. The printer of claim 28 wherein a color filter and a source of white light are associated with the liquid crystal display panel.
30. The printer of claim 24 wherein said source of radiation is a plurality of light emitting diodes.
31. The printer of claim 22 wherein said media is a diffusion transfer photographic film.
32. The printer of claim 23 wherein said printhead scans said film in two orthogonal directions.
33. The printer of claim 22 wherein said printer includes mounting holes for mounting said printer to the bay, said holes being aligned with the mounting slots in the bay.
34. The printer of claim 22 wherein the printer includes a front wall have a slot therein for receiving a media cartridge and a pick up roll which contacts the media and removes a unit of media from the cartridge.
35. The printer of claim 22 wherein the printer includes a first motor for driving said printhead and a second motor for driving a conveyor for moving said media with respect to said printhead.
36. The printer of claim 22 wherein said accessible drive bay is about 1 to 4 inches high, about 4 to 12 inches deep, and about 3 to 7 inches wide.
37. The printer of claim 36 wherein said accessible drive bay is a half high 5 1/4 inch disc drive bay.



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38. The personal computer of claim 36 wherein the printhead includes a liquid crystal display.
39. The personal computer of claim 36 wherein the printhead includes a light emitting diode.
40. The personal computer of claim 6 wherein the printhead includes a modulated source of radiation.
41. The printer of claim 36 wherein said accessible drive bay is a quarter high 3 1/2 inch disc drive bay.
42. The printer of claim 36 wherein said accessible drive bay is about 1 to 2 inches high, about 7 to 9 inches deep and about 5.5 to 6.5 inches wide.
43. A printer which can be housed within an accessible drive bay comprising a media access for inserting media to be printed into said printer, a communication link for receiving image data, a printhead for printing said media, and means for mounting said printer in said bay, said bay being about 1 to 4 inches high, about 4 to 12 inches deep, and about 3 to 7 inches wide.
44. The personal computer of claim 43 wherein said accessible drive bay is a half high 5 1/4 inch disc drive bay.
45. The personal computer of claim 43 wherein said bay is a quarter high 3 1/2 inch disc drive bay.

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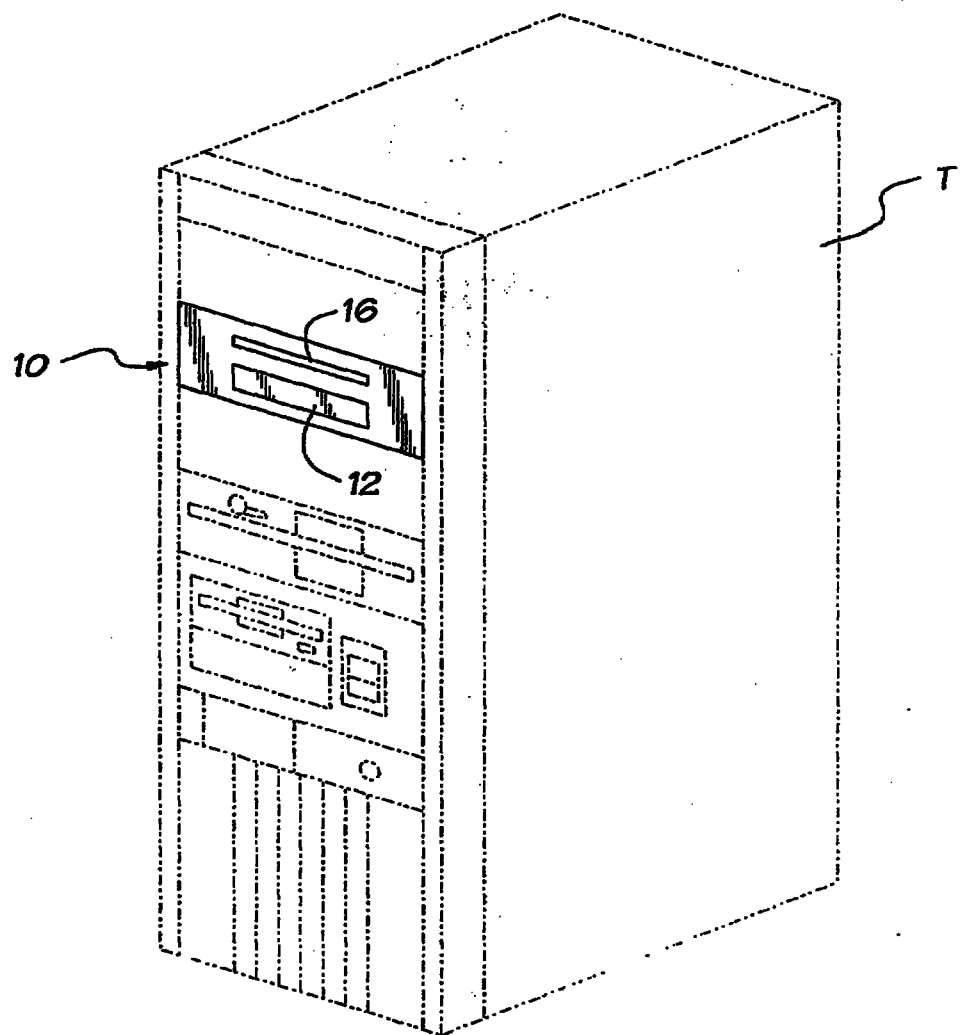


FIG. 1

2 / 11

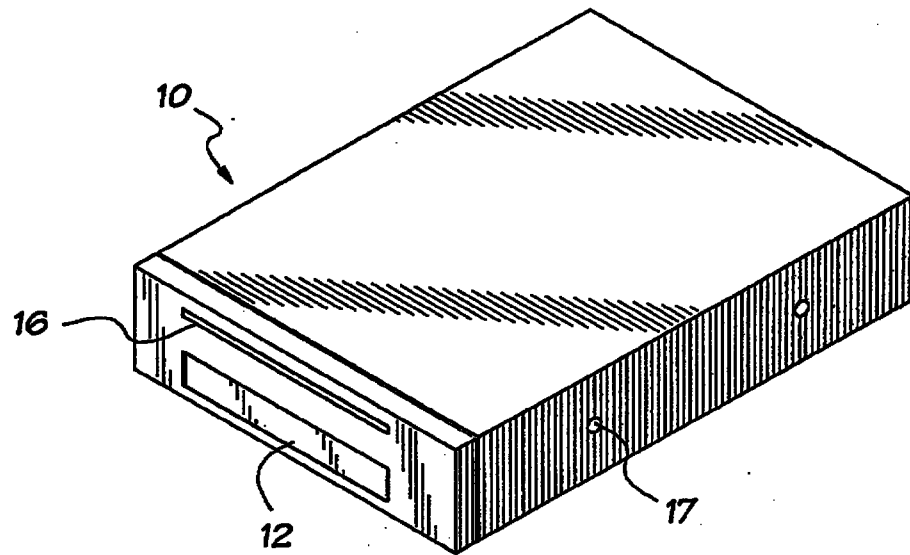


FIG. 2

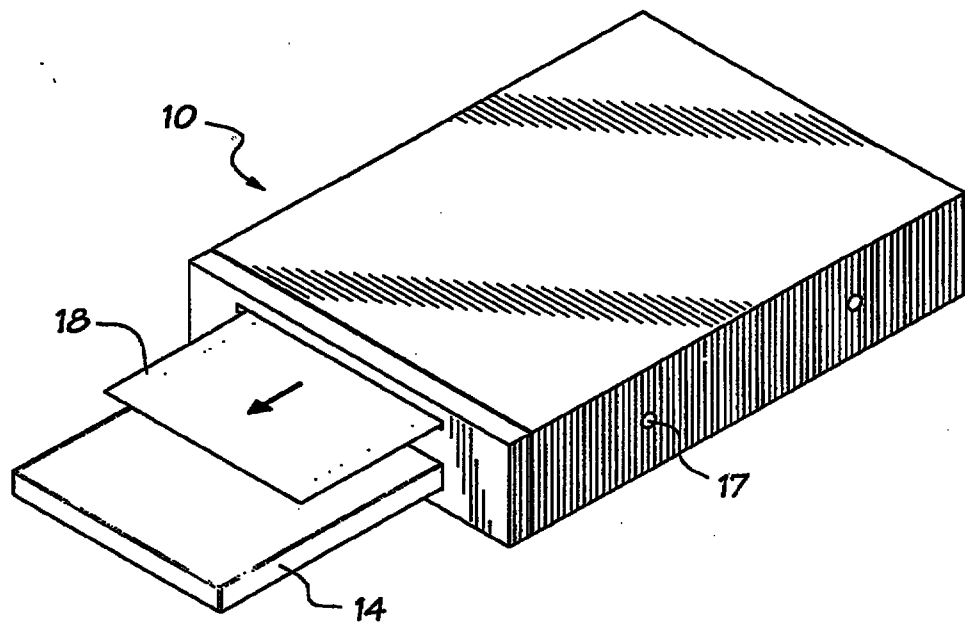
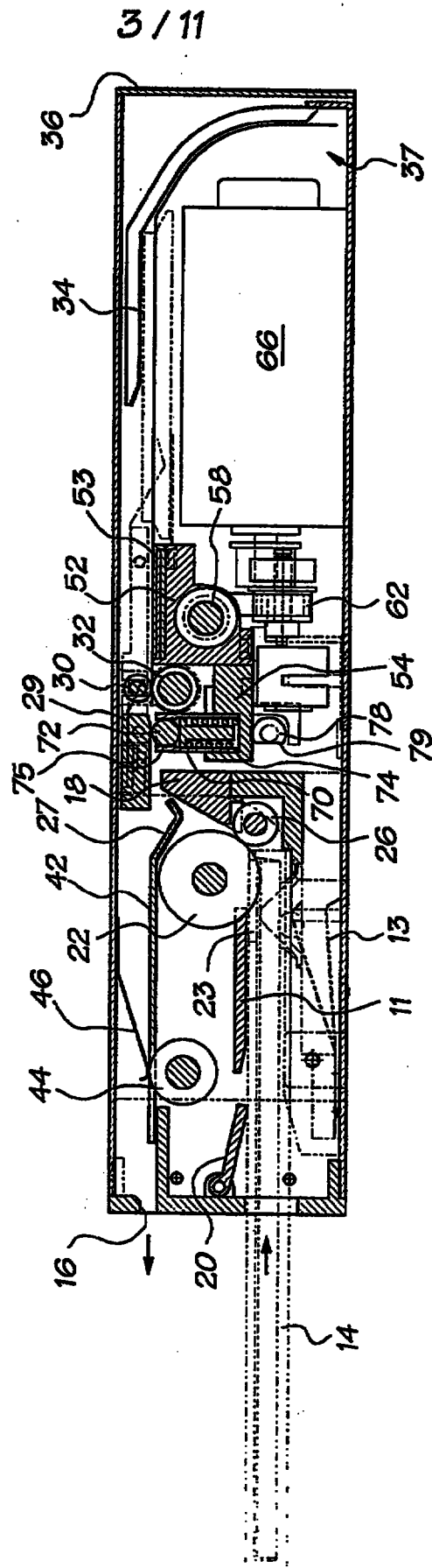


FIG. 3



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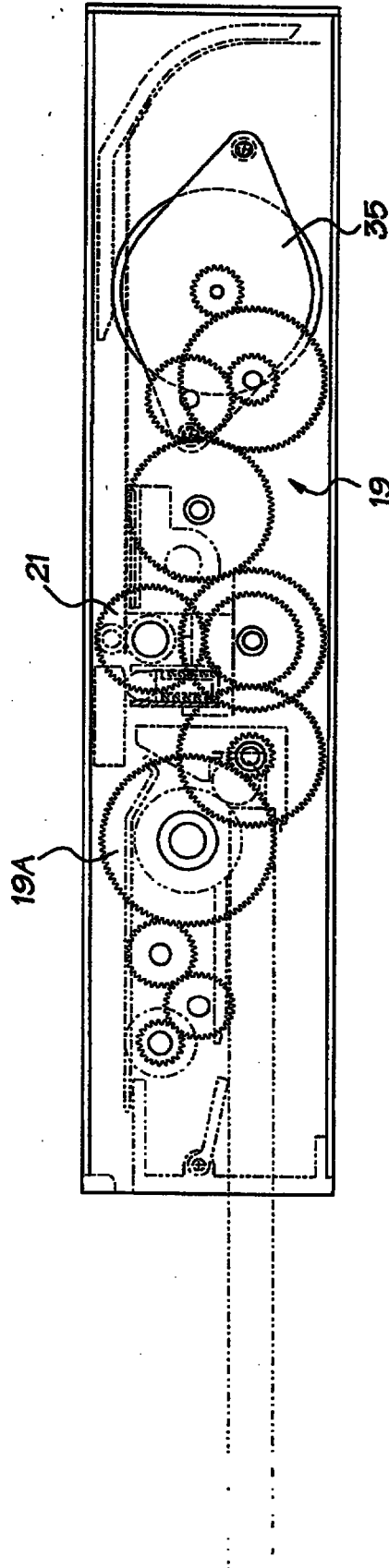


FIG. 5

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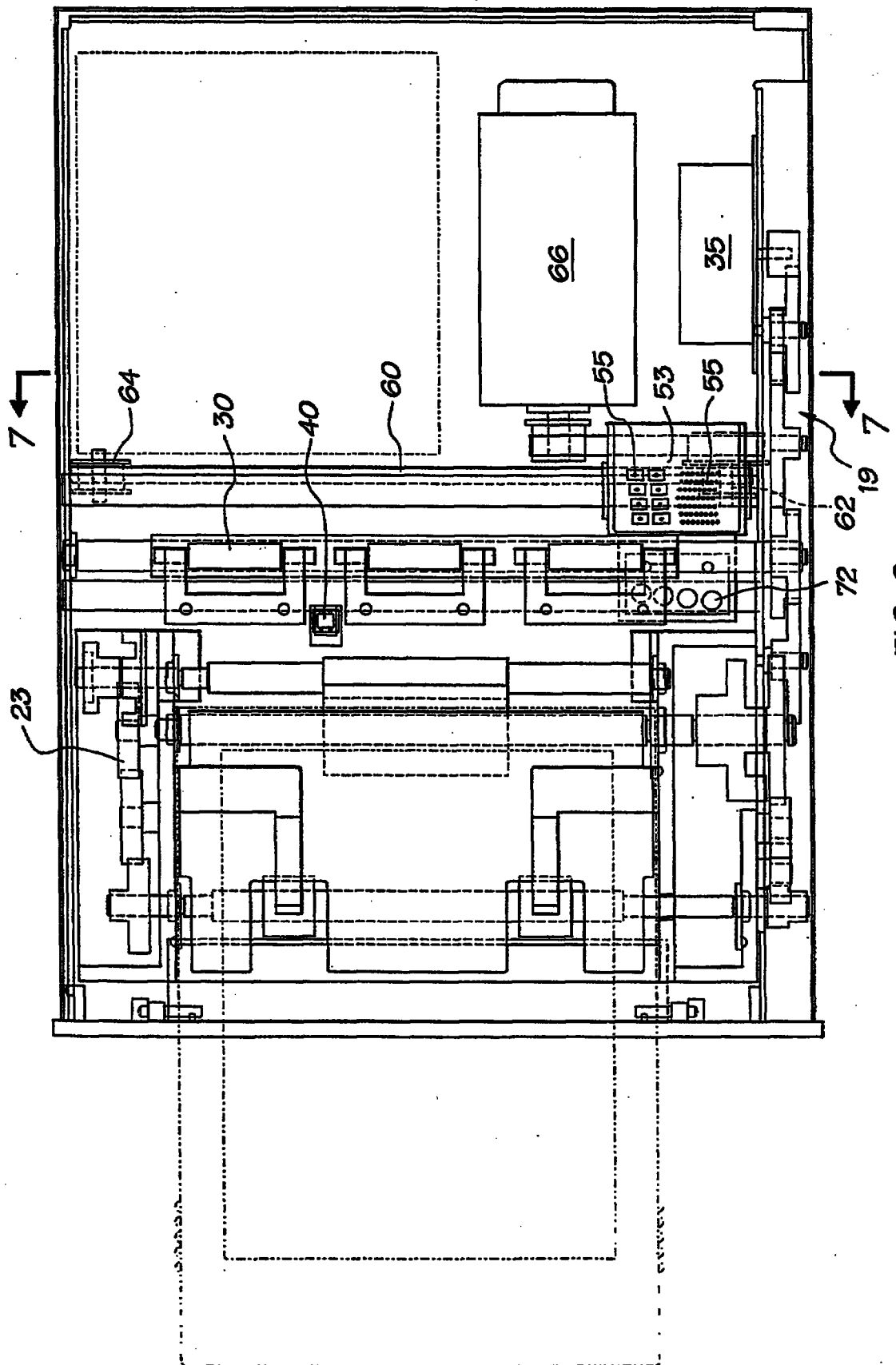
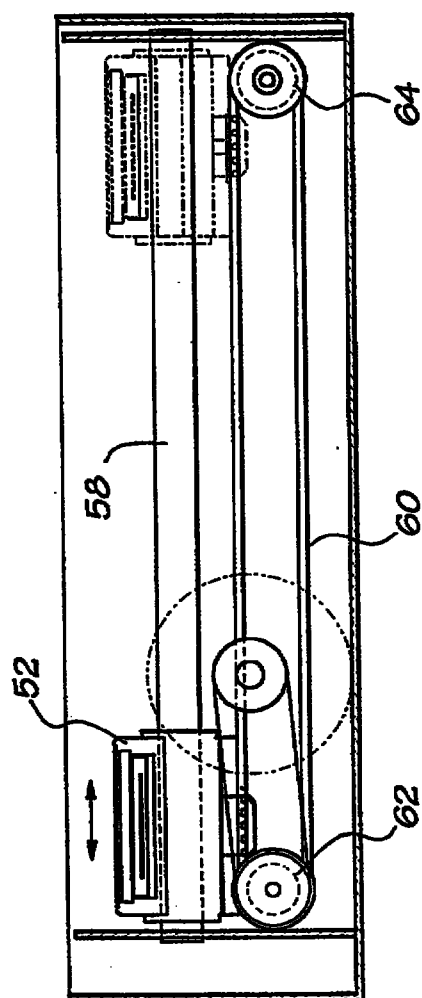
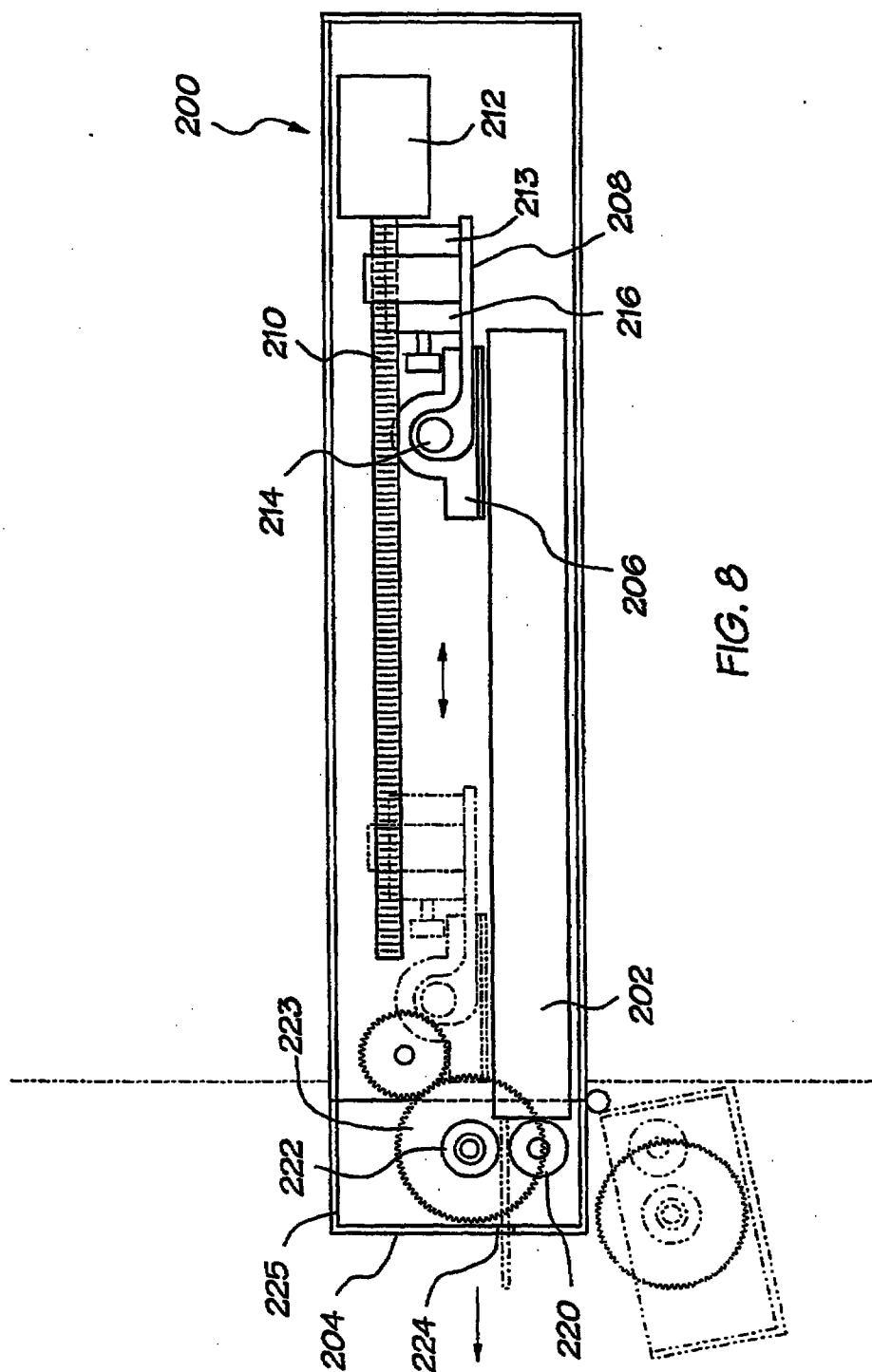


FIG. 6

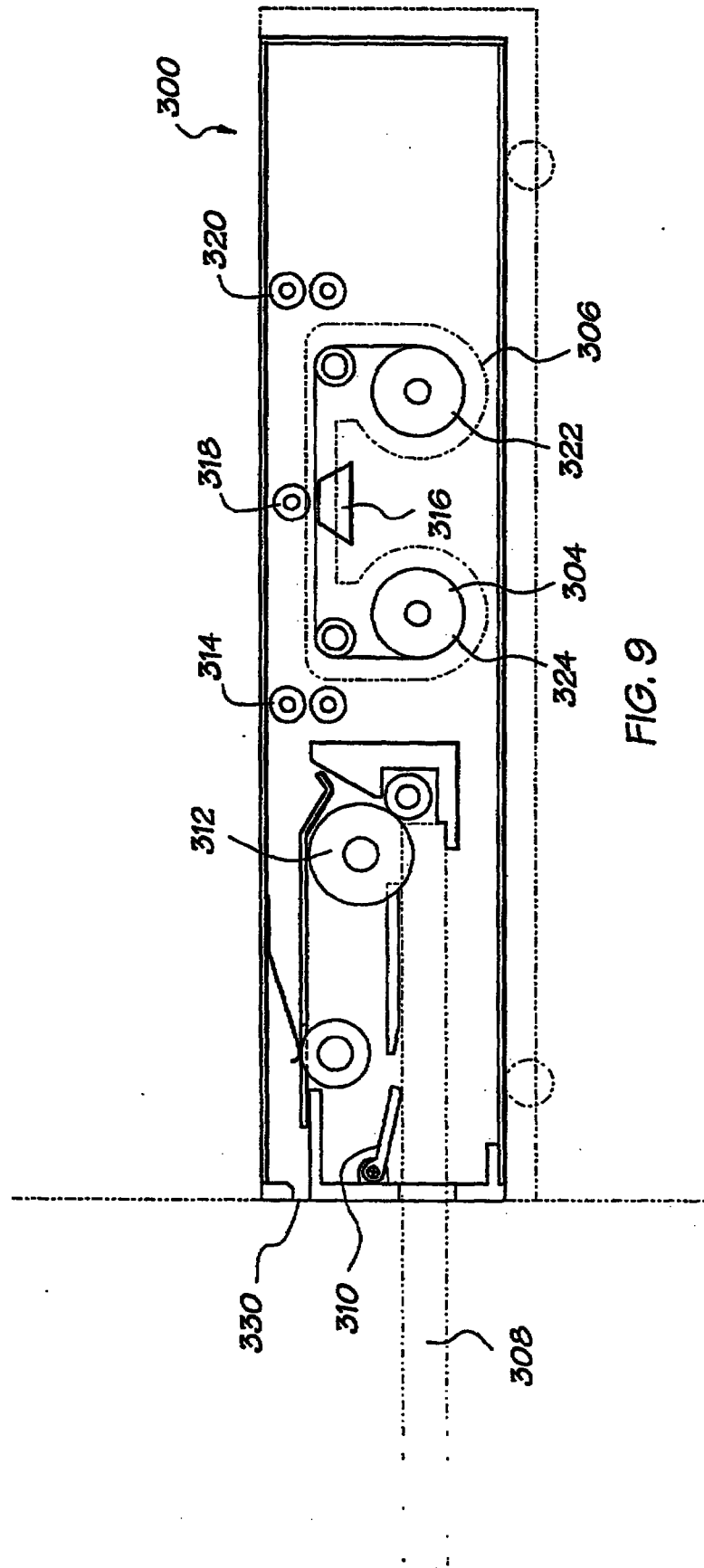
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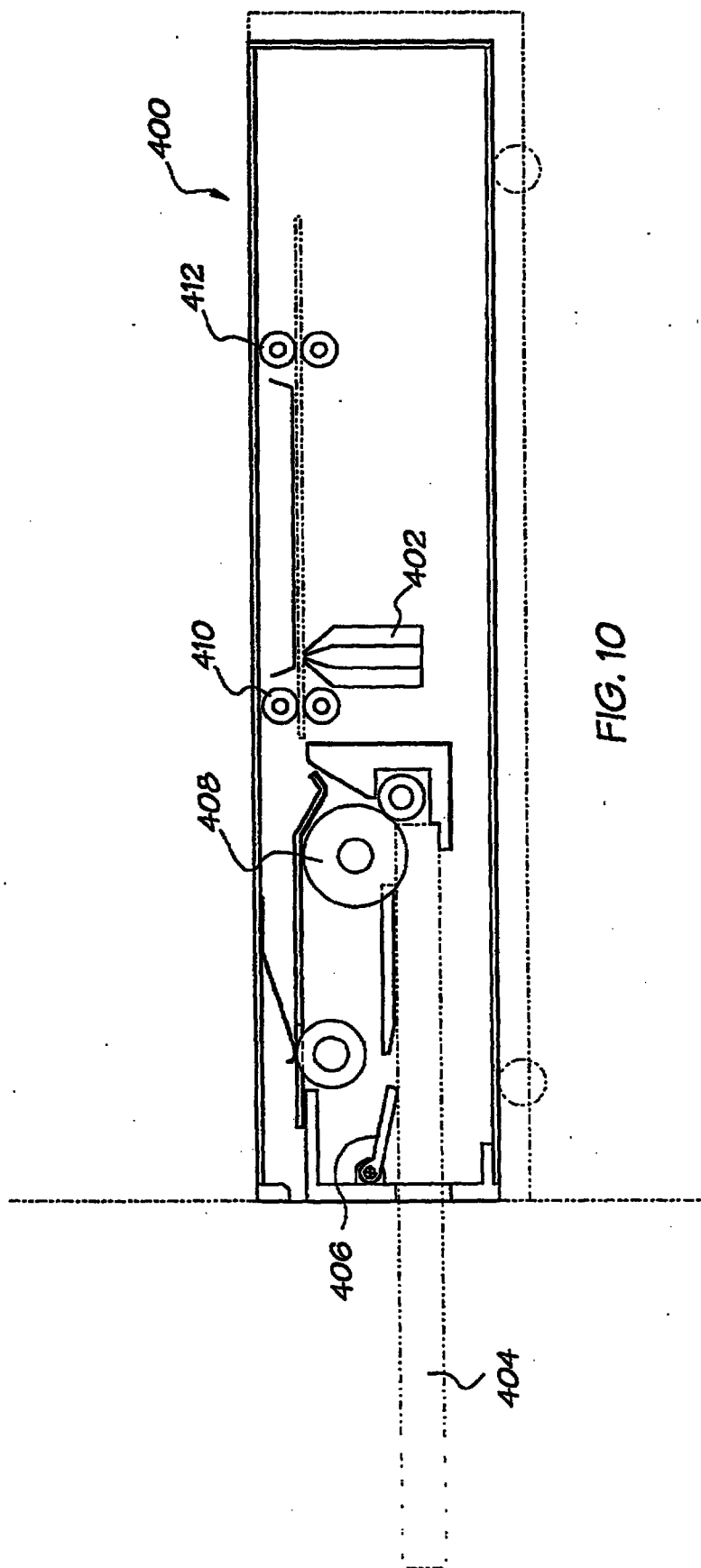
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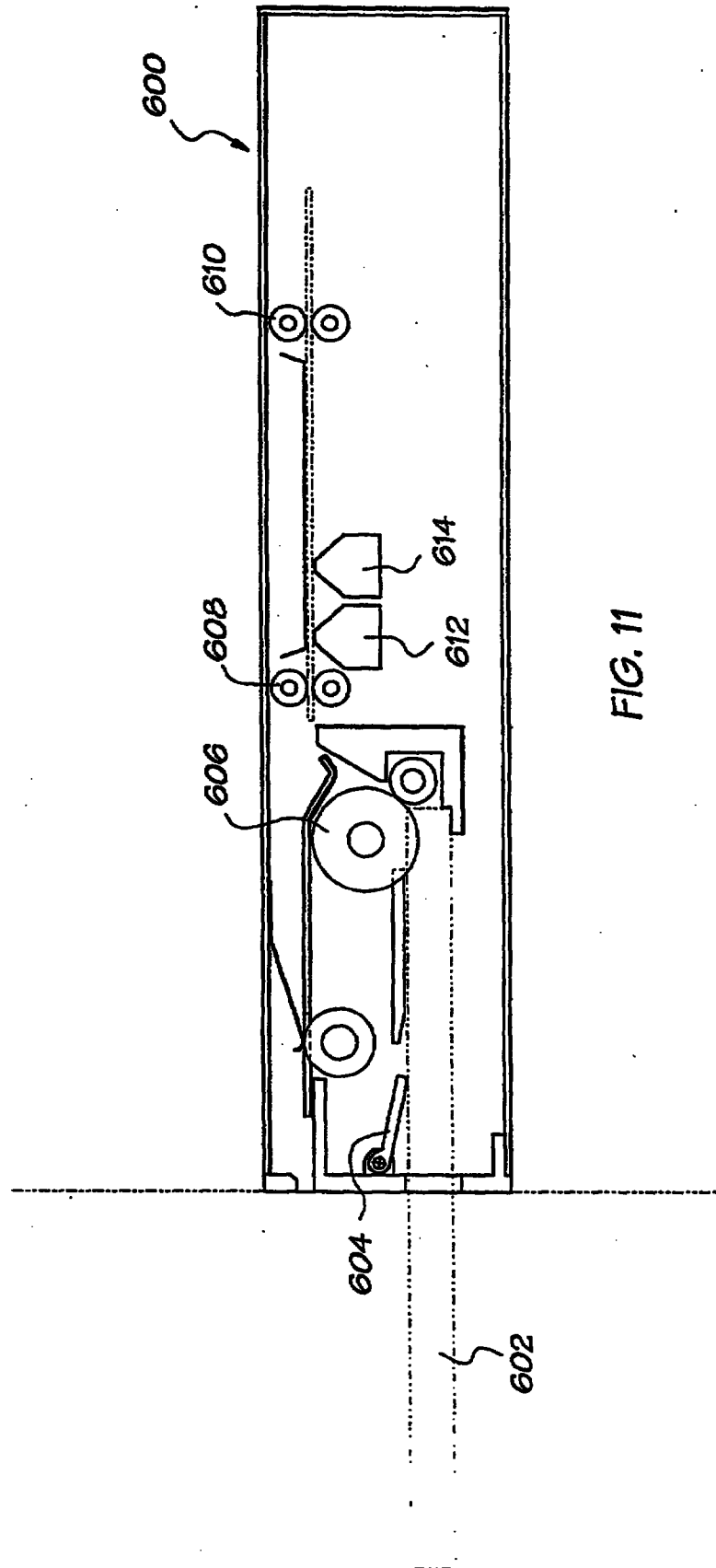
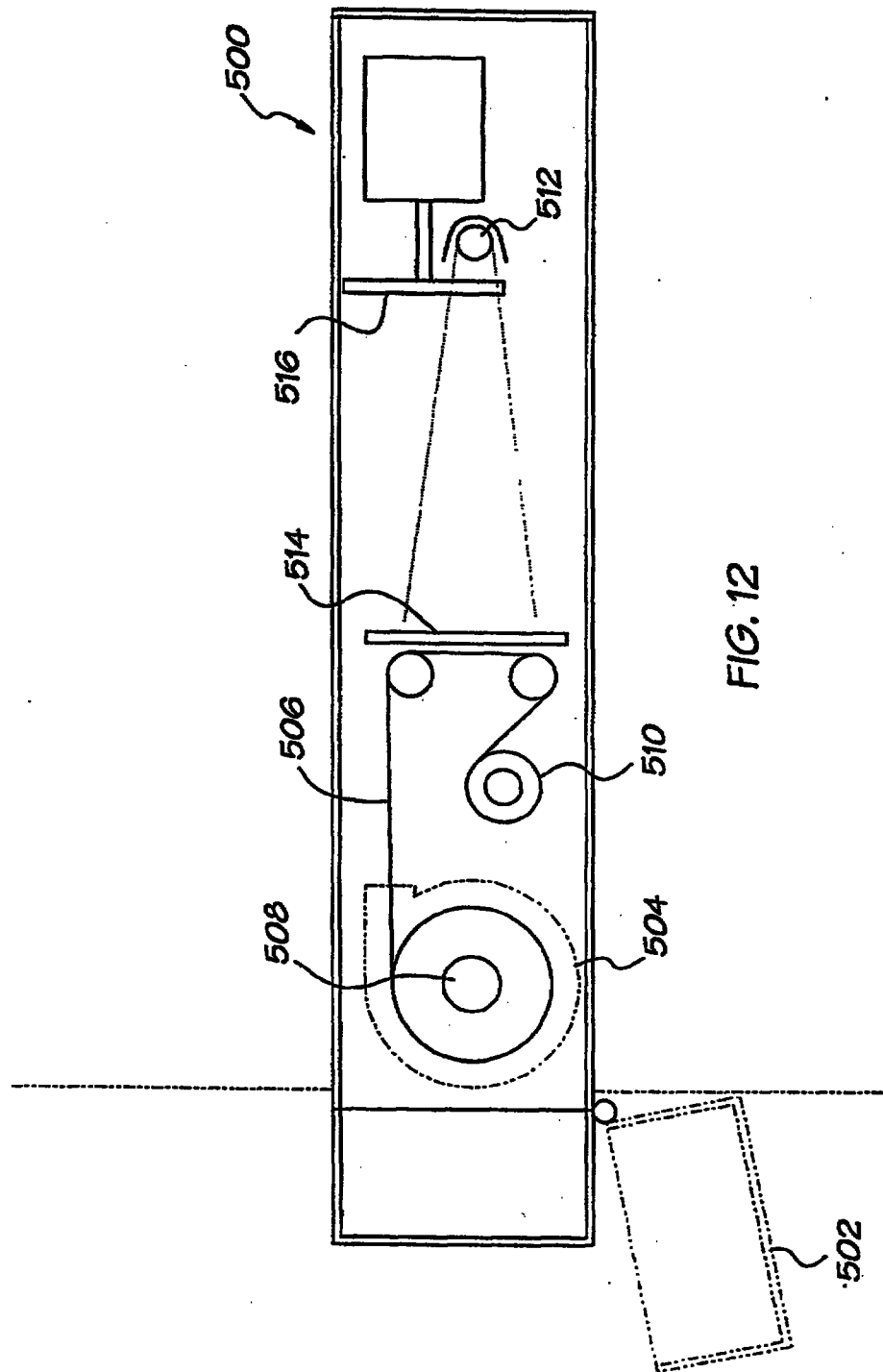


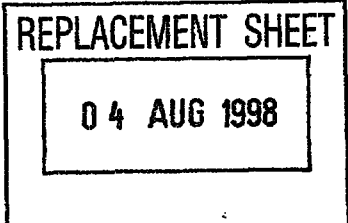
FIG. 11

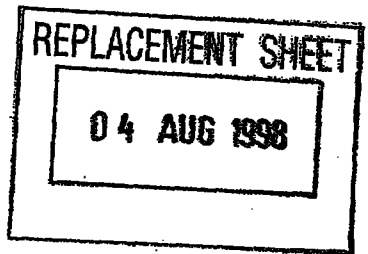




What is claimed is:

1. A personal computer which is useful in reproducing full color, photographic quality images with a photosensitive media comprising a housing, an accessible drive bay in the housing, a supply of photosensitive media, and a printer, wherein said printer includes a printhead which employs a modulated source of radiation for exposing said photosensitive media, said printer being housed within said drive bay.
2. The personal computer of claim 1 wherein the printer includes a media access for inserting media to be printed into said printer, a communication link for receiving image data, and a printhead for printing said media.
3. The personal computer of claim 1 wherein the printhead includes a liquid crystal display.
4. The personal computer of claim 1 wherein the printhead includes a light emitting diode.
5. The personal computer of claim 1 wherein the printhead includes a cathode ray tube.
6. The personal computer of claim 1 wherein the printer is mounted on a drawer carriage such that it can be moved slidably into and out of the bay.





7. The personal computer of claim 1 wherein the printer further includes a heating element for heating the media uniformly and developing an image.

8. The personal computer of claim 2 wherein the printhead scans the media in at least one direction and the printhead is driven by a motor.

9. The personal computer of claim 2 wherein the printer includes a plurality of rollers for conveying said media, a gear train, and a motor, said motor driving said rollers via said gear train.

10. The personal computer of claim 2 wherein said printer includes mounting holes for mounting said printer in the bay, said holes being aligned with mounting slots in the bay.

11. The personal computer of claim 2 wherein said printer includes a front face which faces forward in the drive bay and the access includes a slot in the front face of the printer for receiving a media supply cartridge.

12. The personal computer of claim 2 wherein said accessible drive bay is about 1 to 4 inches high, about 4 to 12 inches deep, and about 3 to 7 inches wide.

13. The personal computer of claim 12 wherein said



accessible drive bay is a quarter high 3 1/4 inch disc drive bay.

14. The personal computer of claim 12 wherein said accessible drive bay is a half high 5 1/4 inch disc drive bay.

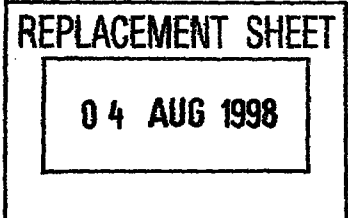
15. A printer which is adapted to be housed within an accessible drive bay comprising a media access for inserting photosensitive media to be exposed into said printer, a communication link for receiving image data, a printhead for printing said media, and means for mounting said printer in said bay, said printhead including a modulated source of radiation for exposing said photosensitive media and useful in producing full color, photographic quality images therein.

16. The printer of claim 15 wherein said printhead scans said media in at least one direction and said printer includes a motor for driving said printhead.

17. The printer of claim 15 wherein said printhead includes a liquid crystal display panel.

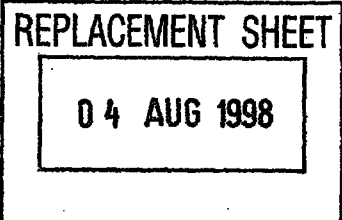
18. The printer of claim 17 wherein a color filter and a source of white light are associated with the liquid crystal display panel.

19. The printer of claim 15 wherein said source of radiation is a plurality of light emitting diodes.





20. The printer of claim 15 wherein said media is a diffusion transfer photographic film.
21. The printer of claim 16 wherein said printhead scans said film in two orthogonal directions.
22. The printer of claim 15 wherein said printer includes mounting holes for mounting said printer to the bay, said holes being aligned with the mounting slots in the bay.
23. The printer of claim 15 wherein the printer includes a front wall have a slot therein for receiving a media cartridge and a pick up roll which contacts the media and removes a unit of media from the cartridge.
24. The printer of claim 15 wherein the printer includes a first motor for driving said printhead and a second motor for driving a conveyor for moving said media with respect to said printhead.
25. The printer of claim 15 wherein said accessible drive bay is about 1 to 4 inches high, about 4 to 12 inches deep, and about 3 to 7 inches wide.
26. The printer of claim 25 wherein said accessible drive bay is a half high 5 ¼ inch disc drive bay.
27. The printer of claim 25 wherein the printhead includes a liquid crystal display.





28. The printer of claim 25 wherein the printhead includes a light emitting diode.

29. The printer of claim 25 wherein said accessible drive bay is a quarter high 3 1/4 inch disc drive bay.

30. The printer of claim 25 wherein said accessible drive bay is about 1 to 2 inches high, about 7 to 9 inches deep and about 5.5 to 6.5 inches wide.

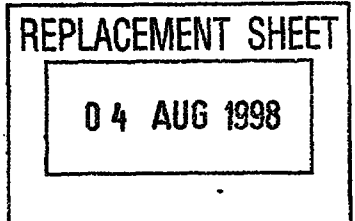
31. The personal computer of claim 1 wherein said photosensitive media is an instant photosensitive media and said printer includes means for developing images in said instant photosensitive media.

32. The personal computer of claim 31 wherein said means for developing images in said instant photosensitive media includes means for applying pressure to said media.

33. The printer of claim 15 wherein said photosensitive media is an instant photosensitive media and said printer includes means for developing images in said instant photosensitive media.

34. The printer of claim 33 wherein said means for developing images in said instant photosensitive media includes means for applying pressure to said media.

35. The personal computer of claim 31 wherein said photosensitive media includes a developer and





microcapsules containing a color precursor and a photohardenable composition.

36. The printer of claim 33 wherein said photosensitive media includes a developer and microcapsules containing a color precursor and a photohardenable composition.

37. A personal computer which is useful in reproducing full color, photographic quality images with a photosensitive media comprising a housing, a half high 5 ¼ inch accessible drive bay in the housing, a supply of photosensitive media and a printer, wherein said photosensitive media includes a developer and microcapsules containing a color precursor and a photohardenable composition, and wherein said printer includes a printhead which employs a modulated source of radiation for exposing said photosensitive media and means for developing images in said photosensitive media which includes means for applying pressure to said photosensitive media, said printer being housed within said drive bay.

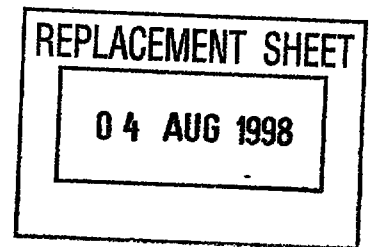
38. A printer which is adapted to be housed within a half high 5 ¼ accessible drive bay and to print full color, photographic quality images with a photosensitive media comprising a photosensitive media supply, access for inserting photosensitive media to be exposed into said printer, a communication link for receiving image data, a printhead for printing said media, means for developing images in said photosensitive media includes

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means for applying pressure to said photosensitive media, and means for mounting said printer in said bay, said printhead including a modulated source of radiation for exposing said photosensitive media, wherein said photosensitive media includes a developer and microcapsules containing a color precursor and a photohardenable composition.



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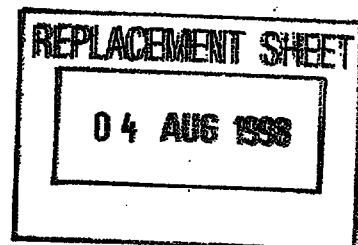
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(21) International Application Number: PCT/US96/08305 (22) International Filing Date: 3 June 1996 (03.06.96) (30) Priority Data: ① 08/470,921 ✓ 6 June 1995 (06.06.95) ✓ US ✓ (71) Applicant: CYCOLOR IMAGING, INC. [US/US]; 3385 Newmark Drive, Miamisburg, OH 45342 (US). ✓ (72) Inventors: CAMILLUS, Joseph, C.; Cycolor Imaging, Inc., 3385 Newmark Drive, Miamisburg, OH 45342 (US). ✓ ② WHITAKER, Tyson, B.; Cycolor Imaging, Inc., 3385 Newmark Drive, Miamisburg, OH 45342 (US). ✓ ③ GOMI, Masao; Cycolor Imaging, Inc., 3385 Newmark Drive, Miamisburg, OH 45342 (US). ✓ (74) Agents: LEVY, Mark, P. et al.; Thompson Hine & Flory P.L.L., 2000 Courthouse Plaza N.E., P.O. Box 8801, Dayton, OH 45401-8801 (US).	(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published With international search report. ✓ 1 PD 1 appl ⁿ . 3 Invs.	
(54) Title: A PRINTER FOR A DRIVE BAY ✓ (57) Abstract A printer (10) housed in an accessible drive bay of a computer. The computer including media access (12) for inserting media to be printed into the printer, a communication link for receiving image data, a printhead for printing on the media, and means for mounting the printer in the bay. Also, a personal computer includes a housing, an accessible drive bay in the housing, a central processing unit, memory, a data retrieval and storage device, at least one connection for an input/output device, a power supply, and a printer, wherein the printer is housed within the drive bay.		

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A drive bay housed full color, near photographic quality printer would be useful in a variety of applications currently available or rapidly moving towards market introduction. Kodak Corporation currently provides a service in which films and negatives can be placed on photo CD discs and photo CD access software allows the user to load the images into the personal computer memory, view the images, edit the displayed image by cropping or changing the size, color settings and orientation, and copy the original or edited image as a bitmap. In addition, while not widely used, electronic digital cameras are commercially available currently. These cameras photograph an image, but the image is stored in digital memory such as random access memory instead of on film. These stored images can be downloaded from the camera to a personal computer for viewing and editing in a manner analogous to the photo CD images discussed previously. In still another application, personal computers are now available commercially with television cards. With a TV card, the user can download images directly from the television network or from a video recorder for viewing and editing. Alternatively, the drive bay housed printer might be used to print images from a source such as the Internet.

In summary, there is a need for a printer that can be housed within a personal computer accessible drive bay. In particular, as the capabilities of the personal computer expand in the video and photographic field, the need for printers which can reproduce near or photographic quality images will increase and it would be desirable if such a printer could be housed within a conventional personal computer disc drive bay. Such a printer could reproduce images approximately the size of a conventional photograph, for example, about 3 inches wide and 5 inches long. Such a printer would not replace the stand alone printer but it would provide a low cost alternative which would enable the personal computer to be used for additional applications.



Summary of the Invention

According to the present invention there is provided a personal computer which is useful in reproducing full color, photographic quality images with a photosensitive media comprising a housing, an accessible drive bay in the housing, a supply of photosensitive media, and a printer, wherein the printer includes a printhead which employs a modulated source of radiation for exposing the photosensitive media, the printer being housed within the drive bay.

The printer may include a media access for inserting media to be printed into the printer, a communication link for receiving image data, and a printhead for printing the media.

The printhead may include a liquid crystal display.

The printhead may include a light emitting diode.

The printhead may include a cathode ray tube.

The printer may be mounted on a drawer carriage such that it can be moved slidably into and out of the bay.

The printer may further include a heating element for heating the media uniformly and developing an image.

The printhead may scan the media in at least one direction and the printhead may be driven by a motor.

The printer may include a plurality of rollers for conveying the media, a gear train, and a motor, the motor may drive the rollers via the gear train.

The printer may include mounting holes for mounting the printer in the bay, the holes may be aligned with mounting slots in the bay.

The printer may include a front face which faces forward in the drive bay and the access may include a slot in the front face of the printer for receiving a media supply cartridge.

According to another aspect of the present invention there is provided a printer which is adapted to be housed within an accessible drive bay comprising a media access for inserting photosensitive media to be exposed into the printer, a communication link for receiving image data, a printhead for printing the media, and means for mounting the printer in the bay, the printhead including a modulated source of radiation for exposing the photosensitive media and useful in producing full color, photographic quality images therein.

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The printhead may scan the media in at least one direction and the printer may include a motor for driving the printhead.

The printhead may include a liquid crystal display panel.

The color filter and the source of white light may be associated with the liquid crystal display panel.

The source of radiation may be a plurality of light emitting diodes.

The media may be a diffusion transfer photographic film.

The printhead may scan the film in two orthogonal directions.

The printer may include mounting holes for mounting the printer to the bay, the holes may be aligned with the mounting slots in the bay.

The printer may include a front wall having a slot therein for receiving a media cartridge and a pick up roll which contacts the media and removes a unit of media from the cartridge.

The printer may include a first motor for

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driving the printhead and a second motor for driving a conveyor for moving the media with respect to the printhead.

The printhead may include a liquid crystal display.

The printhead may include a light emitting diode.

The photosensitive media may be an instant photosensitive media and the printer may include means for developing images in the instant photosensitive media.

The means for developing images in the instant photosensitive media may include means for applying pressure to the media.

The photosensitive media may be an instant photosensitive media and the printer may include means for developing images in the instant photosensitive media.

The means for developing images in the instant photosensitive media may include means for applying pressure to the media.

The photosensitive media may include a developer and microcapsules containing a color precursor and a

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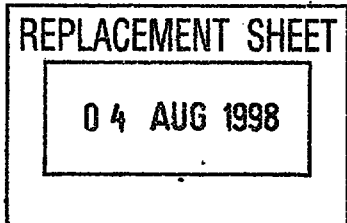
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photohardenable composition.

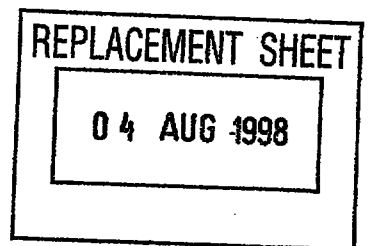
The photosensitive media may include a developer and microcapsules containing a color precursor and a photohardenable composition.

According to a further aspect of the present invention there is provided a personal computer which is useful in reproducing full color, photographic quality images with a photosensitive media comprising a housing, a half high 5 ¼ inch accessible drive bay in the housing, a supply of photosensitive media and a printer, wherein the photosensitive media includes a developer and microcapsules containing a color precursor and a photohardenable composition, and wherein the printer includes a printhead which employs a modulated source of radiation for exposing the photosensitive media and means for developing images in the photosensitive media which includes means for applying pressure to the photosensitive media, the printer being housed within the drive bay.

According to yet a further aspect of the invention there is provided a printer which is adapted to be housed within a half high 5 ¼ accessible drive bay and to print full color, photographic quality images with a photosensitive media comprising a photosensitive media supply, access for inserting photosensitive media to be exposed into the printer, a communication link for receiving image data, a printhead for printing the media,



means for developing images in the photosensitive media includes means for applying pressure to the photosensitive media, and means for mounting the printer in the bay, the printhead including a modulated source of radiation for exposing the photosensitive media, wherein the photosensitive media includes a developer and microcapsules containing a color precursor and a photohardenable composition.



Brief Description of the Drawings

Fig. 1 is a perspective view of a conventional personal computer housing sometimes referred to as a "tower".

Fig. 2 is a perspective view of a computer printer in accordance with the present invention which fits within a conventional disc drive bay.

Fig. 3 shows the printer of Fig. 2 with an associated media pack wherein a print is shown in the process of being dispensed from the printer.

Fig. 4 is a cross-sectional view of the printer of Fig. 2 showing the path through which the media is transported in forming an image.

Fig. 5 is a side view of the printer of Fig. 2 showing the gear train.

Fig. 6 is a top view of the printer of Fig. 2.

Fig. 7 is a cross-sectional schematic view of the printer shown in Fig. 6 along the line 7-7.

