

CAMERA WITH SWIPE PRINTER**FIELD OF THE INVENTION**

The following invention relates to digital camera technology. More particularly, though not
 5 exclusively, the invention relates to a digital camera having a built-in printer. Such a printer might be a drop-on-demand printer utilizing a fixed printhead system.

BACKGROUND

Known digital cameras have some form of removable memory storage device such as a floppy disk
 or memory card. In order to print an image from the camera, the data in such storage devices must be
 10 uploaded to a computer to which there might be attached a peripheral printer.

Known digital cameras have no means of providing an "instant" print-out of an image photographed
 thereby.

The mere incorporation into a camera body of a known printer device would not result in a compact,
 easily portable camera. This is because prior art printers incorporate a supply of print media and employ a
 15 print media feed mechanism to transport the print media past the printheads to effect printing onto the print
 media. As such, known printers, having a supply of print media, are larger and heavier than would be
 desirable in a portable camera.

CO-PENDING APPLICATIONS

Various methods, systems and apparatus relating to the present invention are disclosed in the
 20 following co-pending applications filed by the applicant or assignee of the present invention on 12 February
 2003:

PCT/AU03/00154	PCT/AU03/00151	PCT/AU03/00150	PCT/AU03/00145
PCT/AU03/00153	PCT/AU03/00152	PCT/AU03/00168	PCT/AU03/00169
PCT/AU03/00170	PCT/AU03/00162	PCT/AU03/00146	PCT/AU03/00159
25 PCT/AU03/00171	PCT/AU03/00149	PCT/AU03/00167	PCT/AU03/00158
PCT/AU03/00147	PCT/AU03/00166	PCT/AU03/00164	PCT/AU03/00163
PCT/AU03/00165	PCT/AU03/00160	PCT/AU03/00157	PCT/AU03/00148
PCT/AU03/00156	PCT/AU03/00155		

The disclosures of these co-pending applications are incorporated herein by cross-reference.

30

RELATED PATENT APPLICATIONS AND PATENTS

US6,227,652	US6,213,588	US6,213,589	US6,231,163
US6,247,795	US6,394,581	US6,244,691	US6,257,704
US6,416,168	US6,220,694	US6,257,705	US6,247,794
35 US6,234,610	US6,247,793	US6,264,306	US6,241,342
US6,247,792	US6,264,307	US6,254,220	US6,234,611
US6,302,528	US6,283,582	US6,239,821	US6,338,547

WO 03/069892

2

PCT/AU03/00153

	US6,247,796	US09/113,122	US6,390,603	US6,362,843
	US6,293,653	US6,312,107	US6,227,653	US6,234,609
	US6,238,040	US6,188,415	US6,227,654	US6,209,989
	US6,247,791	US6,336,710	US6,217,153	US6,416,167
5	US6,243,113	US6,283,581	US6,247,790	US6,260,953
	US6,267,469	US6,273,544	US6,309,048	US6,420,196
	US6,443,558	US09/422,892	US6,378,989	US09/425,420
	US09/422,893	US09/609,140	US6,409,323	US6,281,912
	US09/575,113	US6,318,920	US6,488,422	US09/693,644
10	US6,457,810	US6,485,135	US09/112,763,	US6,331,946
	US6,246,970	US6,442,525	US09/505,951	US09/505,147
	US09/505,952	US09/575,108	US09/575,109	US09/575,110
	US09/607,985	US6,398,332	US6,394,573	US09/606,999
	US6,238,044	US6,425,661	US6,390,605	US6,322,195
15	US09/504,221	US6,480,089	US6,460,778	US6,305,788
	US6,426,014	US6,364,453	US6,457,795	US09/556,219
	US09/556,218	US6,315,399	US6,338,548	US09/575,190
	US6,328,431	US6,328,425	US09/575,127	US6,383,833
	US6,464,332	US6,390,591	US09/575,152	US6,328,417
20	US6,322,194	US09/575,177	US09/575,175	US6,417,757
	US09/608,780	US6,428,139	US09/607,498	US09/693,079
	US09/693,135	US6,428,142	US09/692,813	US09/693,319
	US09/693,311	US6,439,908	US09/693,735	PCT/AU98/00550
	PCT/AU00/00516	PCT/AU00/00517	PCT/AU00/00511	PCT/AU00/00754
25	PCT/AU00/00755	PCT/AU00/00756	PCT/AU00/00757	PCT/AU00/00095
	PCT/AU00/00172	PCT/AU00/00338	PCT/AU00/00339	PCT/AU00/00340
	PCT/AU00/00341	PCT/AU00/00581	PCT/AU00/00580	PCT/AU00/00582
	PCT/AU00/00587	PCT/AU00/00588	PCT/AU00/00589	PCT/AU00/00583
	PCT/AU00/00593	PCT/AU00/00590	PCT/AU00/00591	PCT/AU00/00592
30	PCT/AU00/00584	PCT/AU00/00585	PCT/AU00/00586	PCT/AU00/00749
	PCT/AU00/00750	PCT/AU00/00751	PCT/AU00/00752	PCT/AU01/01332
	PCT/AU01/01318	PCT/AU00/01513	PCT/AU00/01514	PCT/AU00/01515
	PCT/AU00/01516	PCT/AU00/01517	PCT/AU00/01512	PCT/AU01/00502
	PCT/AU02/01120	PCT/AU00/00333	PCT/AU01/00141	PCT/AU01/00139
35	PCT/AU01/00140	PCT/AU00/00753	PCT/AU01/01321	PCT/AU01/01322
	PCT/AU01/01323	PCT/AU00/00594	PCT/AU00/00595	PCT/AU00/00596
	PCT/AU00/00597	PCT/AU00/00598	PCT/AU00/00741	PCT/AU00/00742

DISCLOSURE OF THE INVENTION

According to one aspect of the invention there is disclosed a digital camera comprising:

- a housing;
 an image sensor adapted to capture an image;
 a digital storage device adapted to store digitally the image captured by the image sensor;
 a printer located within the housing, the printer having a printhead and is adapted to receive digital
 5 information corresponding to the captured image from the digital storage device;
 a replaceable ink cartridge for location in the housing and detachable connection to the printer;
 wherein,
 the printer is adapted to print the captured image on media external to the camera as the camera
 traverses the media.
- 10 Preferably, the camera further comprises a lens and wherein the image is captured by the image
 sensor via the lens.
- Preferably, the printer comprises a drop-on-demand color inkjet printhead.
- Preferably, the housing includes a receptacle having resilient collars and into which the ink cartridge
 is received, the cartridge including ink outlets adapted to engage with the collars.
- 15 Preferably, the digital storage device comprises a removable memory card.
- Preferably, the memory card is stored within a chassis having an integrally formed battery housing
 adapted to receive and retain a battery for powering the camera.
- Preferably, the camera further comprises a speed sensor adapted to sense the speed at which the
 camera traverses the media.
- 20 Preferably, the printer is adapted to be synchronised with the speed sensor such that the printer ejects
 ink onto the media at rate which is proportional to the speed at which the camera traverses the media in order
 to produce a faithful reproduction of the captured image.
- Preferably, the speed sensor comprises:
- 25 an optical encoder wheel having a plurality of markings disposed circumferentially thereon; and
 an optical sensor adapted to sense the markings as the optical encoder wheel is rotated in contact
 with the media.

BRIEF DESCRIPTION OF THE DRAWINGS

- A preferred form of the present invention will now be described by way of example only with
 reference to the accompanying drawings, wherein:
- 30 Figure 1 is a perspective illustration of a camera having a built-in printer, in use traversing a print
 media to print an image thereon;
- Figure 2 is a perspective view of the front of the camera;
- Figure 3 is a perspective view of the rear of the camera;
- Figure 4 is an exploded perspective illustration of the base of the camera;
- 35 Figure 5 is a plan view of the camera;
- Figure 6 is a front elevational view of the camera;
- Figure 7 is a right side elevational view of the camera;
- Figure 8 is a rear elevational view of the camera;
- Figure 9 is an inverted plan view of the camera;
- 40 Figure 10 is a left side elevational view of the camera;

Figure 11 is a cross-sectional side elevational view of the camera taken at XI-XI in Figure 5;

Figure 12 is a perspective view of the rear of the camera showing an ink cartridge removed therefrom; and

5 Figure 13 is a further perspective view of the rear of the camera showing a memory card removed from a memory card chassis in the camera.

DESCRIPTION OF THE PREFERRED EMBODIMENT

10 In Figure 1 of the accompanying drawings there is shown a camera 10 being moved across blank print media 20 to print an image 22 thereon. The image is printed by a printer within the camera housing. The camera 10 is moved by a user in the direction indicated by arrow 21 after pressing a print enable button 14. The printer may comprise internal components similar to those disclosed in co-pending application filed concurrently herewith and entitled "Manually moveable printer with speed sensor" (Attorney Docket No. AP43) referred to above.

15 As shown in Figure 2, the camera 10 includes a view finder 11, a flash unit 12 and a zoom lens 13. Operation of the zoom lens 13 is by means of zoom button 15. Alongside the lens 13, there is a pair of auto-focus infra-red lenses 42 which serve to automatically focus the lens 13 in a conventional manner.

Digital images are captured by the camera by activation of take button 24. Available memory and other data is displayed on a liquid crystal display 26 and the camera 10 is provided with programming buttons 25 for various functional settings as is known in the art.

20 The camera incorporates a memory card behind memory card door 16, and a battery such as a CR2 battery behind battery cover 19. The memory card can be ejected from behind the memory card door 16 upon depressing card eject button 23.

25 As shown in Figure 3, the camera body also houses a removable ink cartridge 27. Figure 3 also shows the external features of the camera's printer. At the transition between the back and the base of the camera, there is an inclined surface 51. During a printing operation, this surface 51 is designed to be presented substantially parallel to the sheet of blank media 20. At one end, an optical encoder wheel 29 protrudes from the surface. At the other end, an idler wheel 28, protrudes from the surface. The optical encoder wheel has a plurality of circumferentially spaced markings thereon and an associated optical sensor adapted to sense those markings. As the camera is moved across the print media, the optical encoder wheel rolls across the print media and the optical sensor detects the speed at which the camera is being moved so that ink can be ejected from the printhead 30 at an appropriate rate to produce a faithful reproduction of the image captured by the camera. The idler wheel 28 has the same axis of rotation as the optical encoder wheel to help the camera to move in a straight line. Further details of the operation of the optical encoder wheel 29 and idler wheel 28 can be found in co-pending application entitled "Manually moveable printer with speed sensor" (Attorney Docket No AP43) referred to above.

30
35 Between the optical encoder wheel 29 and the idler wheel 28, there is disposed a printhead 30. This is preferably a photographic-width monolithic unit such as the "Memjet" printhead described in the cross-referenced patent applications.

An exploded perspective view of the camera assembly is shown in Figure 4. The assembly incorporates a front plastics molding 17 and a rear plastics molding 18 between which the internal components of the camera and print engine are housed. As can be seen, the flash unit 12 is positioned adjacent a view finder molding 31 associated with view finder 11 (see Figure 6). A digital zoom unit 32 is associated with the lens 13 and receives signals and power from the main printed circuit board 40 upon which it is mounted. Behind the lens 13 and attached to the printed circuit board 40 is an image sensor 55 such as a charge coupled device (CCD) adapted to digitally capture an image, as is known in the art. Once captured, the digital information corresponding to the captured image is stored in the memory card 38.

The zoom activation buttons 15 are connected electrically to the main printed circuit board 40 as is a capacitor 41 which serves to energize the flash unit 12 when a picture is taken upon depression of the take button 24. The print button 14 is connected with the main printed circuit board. Data from the main printed circuit board is relayed to the printhead 30 via flexible printed circuit board 33.

Ink is delivered to the chip 34 of the printhead 30 via an ink connector 52 which receives ink from the ink cartridge 27.

A memory card chassis 39 serves to house the memory card 38. This card can be ejected from the chassis 39 by depression of an eject button 23. Molded integrally with the memory card chassis is a battery housing 53 which receives battery 37. The battery is covered by battery cover 19. The rear molding 18 has a receptacle 54 within which the ink cartridge 27 is received and retained. The ink cartridge 27 includes ink outlets 35 via which ink therefrom is communicated with the ink connector 52. Ink cartridge 27 also includes a quality assurance (QA) chip 36 communicating with the camera. In one form, the QA chip serves the dual purposes of authenticating the ink cartridge as being suitable for use with the camera as well as indicating the type or quantity of ink remaining in the cartridge.

Figure 11 shows a typical internal arrangement of components within the camera body. As can be seen, data and power to the printhead unit 30 are conveyed by the flexible printed circuit board 33 from the main printed circuit board 40.

The ink cartridge 27 incorporates four internal longitudinal channels within which separate inks are stored. In this embodiment, there is black ink 45, yellow ink 46, cyan ink 43 and magenta ink 44. These are conveyed to the printhead unit 30 via the ink connector 52 (see Figure 4).

As can be seen in Figure 12, the ink cartridge 27 has a spring catch 50 formed at one of its ends. This spring catch biases the cartridge 27 within the receptacle 54 so as to present the ink outlets 35 in sealing engagement with the resilient collars 47 located at the other end of the receptacle. These collars 47 surround individual perforated metal pins 49 which communicate with the ink outlets 35. A chip contact block 48 communicates with the QA chip 36 located at the end of the ink cartridge 27.

Figure 13 depicts the camera 10 with the memory card door 16 open and the memory card 38 removed from the memory card chassis 39.

In use, the digital camera 10 is used in a conventional manner to take photographs. These photographs can be stored on the memory card for use later or may be printed instantly using the built-in printing device. When printing of a particular image stored in the memory card is desired, the programming buttons 25 can be manipulated to make a selection prior to printing. A print enable button 14 can then be

depressed whereupon the user can swipe the camera across the blank print media 20 (as shown in Figure 1) to effect image printing thereon.

5 It should be appreciated that modifications and alterations obvious to those skilled in the art not to be considered as beyond the scope of the present invention. For example, many different internal configurations of the various components can be chosen without departing from the overall spirit and scope of the invention. For example, the camera body can be provided with four wheels (one at each corner of a rectangle extending substantially over one face of the camera body) instead of two. One of the four wheels can be an optical encoder wheel. This way, the camera might be presented in a configuration normal to the blank page during the page-traversing printing procedure. The ink cartridge might be located alongside or above the printhead or 10 in any other internal configuration depending upon the particular application.

WE CLAIM:

1. A digital camera comprising:

a housing;

an image sensor adapted to capture an image;

5 a digital storage device adapted to store digitally the image captured by the image sensor;

a printer located within the housing, the printer having a printhead and is adapted to receive digital information corresponding to the captured image from the digital storage device;

a replaceable ink cartridge for location in the housing and detachable connection to the printer; wherein,

10 the printer is adapted to print the captured image on media external to the camera as the camera traverses the media, the camera further comprising a speed sensor adapted to sense the speed at which the camera traverses the media.

2. The camera of claim 1 wherein the camera further comprises a lens and wherein the image is captured by the image sensor via the lens.

15 3. The camera of claim 1 wherein the printer comprises a drop-on-demand color inkjet printhead.

4. The printer of claim 1 wherein the housing includes a receptacle having resilient collars and into which the ink cartridge is received, the cartridge including ink outlets adapted to engage with the collars.

5. The camera of claim 1 wherein the digital storage device comprises a removable memory card.

20 6. The camera of claim 5 wherein the memory card is stored within a chassis having an integrally formed battery housing adapted to receive and retain a battery for powering the camera.

7. The camera of claim 1 wherein the printer is adapted to be synchronised with the speed sensor such that the printer ejects ink onto the media at rate which is proportional to the speed at which the camera traverses the media in order to produce a faithful reproduction of the captured image.

25 8. The camera of claim 1 wherein the speed sensor comprises:

an optical encoder wheel having a plurality of markings disposed circumferentially thereon; and

an optical sensor adapted to sense the markings as the optical encoder wheel is rotated in contact with the media.

ABSTRACT

5 A digital camera has a built-in printer to enable the printing of a stored image upon a page external to the camera as the camera traverses the page. The camera can be maintained compact and lightweight as no paper storage or paper feed mechanism need be provided. A replaceable ink cartridge that detachable connects to the printhead reduces the costs of ongoing consumables.

(Figure 1)