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(54) Printer consumables service management system.

(57) An apparatus and method for monitoring and managing printer/copier consumables and maintenance status items, in which sensors, print counters and/or monitoring devices warn users of impending exhaustion of consumables and of maintenance and service requirements. Users are instructed on how to perform corrective actions by display screens detailing the status on selected items and graphically illustrating the showing the location and technique for performing the required corrective action. Toner/dry ink levels, fuser modules/oil levels, developer cartridge performance, cleaning and waste systems, photoreceptor modules and other aspects of printers may be included in the managed status items. An audible signal and/or instructions may supplement the visual information provided to the user to indicate the need to service the printer, on how to replenish supplies and maintain components, and to otherwise assist in the execution of the actions taken according to the consumables and maintenance system of the present invention.

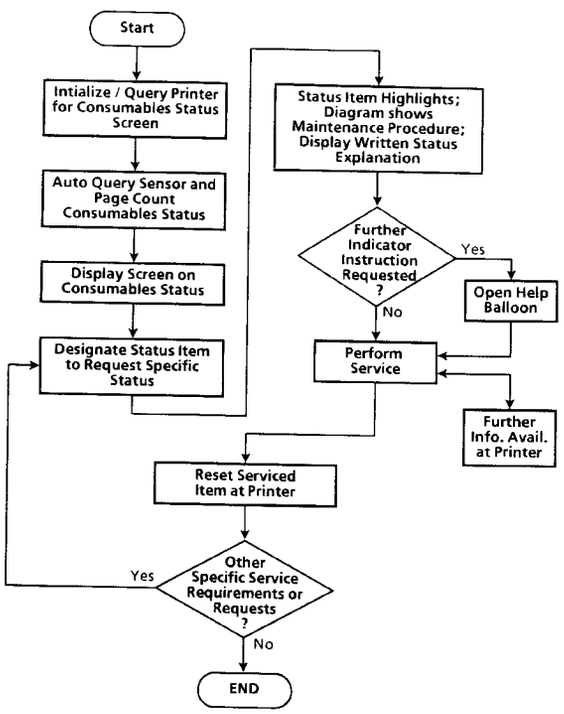

FIG. 1

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The present invention relates to a consumables and service status system for electrophotographic printers and copiers, and more particularly, to an apparatus and method for monitoring and managing printer/copier consumables and maintenance status warning users of impending exhaustion of supplies and service requirements and for instructing users on the performance of corrective actions.

US-A-5,218,409 discloses an image forming apparatus loaded with a developing device capable of being easily exchanged, and a toner sensor for detecting a toner density provided in association with the developing device. An output signal of the toner sensor approaches 0 as a weight of a developer becomes small. Therefore, when the output signal from the toner sensor is detected prior to an agitating screw is operated when a power source is turned-on, it is possible to determine whether a developing device attached at that time is an unused or used one in accordance with the output signal. The output of the toner sensor when the developing device is an unused one is stored in a backed-up memory as a reference value for controlling a toner density during an actual operation.

US-A-5,095,331 discloses a density of a toner in a developing device detected by a magnetic sensor if the density is lower than a reference value, a toner-empty state is indicated on a control panel. When a copy key is operated in this toner-empty state, the number of copies in the toner-empty state is counted by means of a counter. If the count value is not larger than a preset value, the copying operation is allowed. If the count value exceeds the predetermined value the copying operation is prohibited.

US-A-4,571,068 discloses a toner supply controlling device in which the toner supply rate is a altered according to information from a monitoring device. The supply is altered when the supply of toner is continuously monitored to be beyond a prescribed level. The monitoring device also monitors the status of continued stoppages of the supply of toner. When the stoppage continues beyond a prescribed period of time, the changed rate of supply of toner is returned to the original rate.

US-A-4,551,000 discloses a detachable consumables process kit. The process kit is a mechanically activated device indicates when the useful life is about to expire, as well as when the life of the kit is completely expired.

US-A-4,332,464 and US Reissue 32,253 thereof disclose a user interface device used for machine control. The user interface includes a video display capable of presenting desired images to the machine operator and a touch sensitive device capable of detecting operator requests by means of the operator touching the surface of the video display. A keyboard may used to enter responses as required of the operator or other purposes. The device is controlled by a general purpose computer, which also controls the on-line machine. Visual elements presented to the user on the user interface display include text instructions and images such as log status indicators, meters, thermometers. The displayed images change so that only relevant indicators and valid controls are shown.

Xerox Disclosure Journal, Vol. 17, No. 4, pp. 259-260, July, 1992 to L. C. Barron and Sarsfield McNult entitled "Xerographic Copy Cartridge Life Optimization" describes a means for indication and/or transmission of toner supply status information (a low or out of toner condition) after its prediction by a copy count and processor system.

In accordance with one aspect of the present invention, there is provided an apparatus for managing maintenance operations of a printer providing a status indicator thereof, including a processor, responsive to the status indicator, for generating a signal including a set of printer service instructions for performing user maintenance corresponding to the status indicator; a display; and a controller adapted to transmit set of printer service instructions to the display.

In accordance with another aspect of the present invention, there is provided a printing system adapted to print indicia on sheets, including a printer adapted to provide a status indicator; a processor, responsive to the status indicator, for generating a signal including a set of printer service instructions for performing user maintenance corresponding to the status indicator; a display; and a controller adapted to transmit set of printer service instructions to the display.

In accordance with another aspect of the present invention, there is provided a method for managing printer operational status, including the step of generating a signal in response to a status indicator of a printer, the signal including a set of printer service instructions for performing user maintenance corresponding to the status indicator and the step of transmitting the signal including the set of printer service instructions to a display.

The present invention will be described further, by way of examples, with reference to the accompanying drawings, in which:

Figure 1 is a block diagram showing one embodiment of a service/consumables management system of the present invention;

Figure 2 is an elevational view showing a service/consumables management display in accordance with the present invention;

Figure 3 is an elevational view showing another aspect of a service/consumables management display of Figure 2;

Figure 4 is an elevational view showing another aspect of a service/consumables management display of Figure 2;

Figure 5 is an elevational view showing showing still another aspect of a service/consumables

management display of Figure 2;

Figure 6 is is a block diagram showing another embodiment of a service/consumables management system of the present invention;

Figure 7 is is a block diagram showing another embodiment of a service/consumables management system of the present invention; and

Figure 8 is is a block diagram showing another embodiment of a service/consumables management system of the present invention; and

Figure 1 shows a block diagram of a consumables/maintenance management system (the "system") of the present invention. The system may be executed by the processors and controllers of a printer IPS, such as described in association with the printer of in Figure 9, or be carried out by a separate processors and controllers, such as with networked terminal or computer coupled with a printer. According to the system of Figure 1, a user may initialize/query the printer or copier (hereinafter, printer) requesting a consumables, service and maintenance management status update, such as represented by the "Initialize/Query Printer for Consumables Status Screen" block of Figure 1. Such a status request or query may also be automatically initiated by an IPS, PC 5 or otherwise, at system start up, after a certain period of operation or number of prints, as required by a service/consumables low request generated by an IPS, or otherwise. As shown in Figure 1, an IPS or processor automatically relays a request to all relevant sensors, page counters and components of the printer when a status query is initialized, so as to obtain for display a current update on the status of each aspect of printer operation. (See "Auto Query Sensor and Page Count Consumables Status" block.) Thereafter, upon appearance of the "Display Screen for Consumables Status," the current status for each relevant item is displayed on a UI or network PC display screen. This status display, such as shown in Figure 2 on a PC, permits a user to readily obtain relevant information remote from the printer. The IPS or other processor carrying out the system thus displays the updated status of each item on the consumables screen, along side a diagram or visual representation of the printer itself as shown in Figure 2.

A user is thereafter according to Figure 1 system permitted to select particular status indicators from a screen (Figure 2) according to the "Designate Status Item to Request Specific Status" block of Figure 1 so as to receive more detailed information and instructions on that particular item. Upon designation, the item is "highlighted;" Figure 3 shows the "Black Dry Ink" status having been selected on the consumable status display; a user is (as an example) informed that this consumable item has been "recently installed" such that nor service is necessary. At the same time, and the diagram of the printer automatically changes so as to show the location of the black dry ink cartridge, thus indication from where and how the black dry ink cartridge is to be removed for refilling. (See Figure 3, in which the diagram shows the black dry ink cartridge partially removed from the printer.)

By way of further example, Figure 4 shows "Oil Bottle/Cleaning Pad" having been selected on the consumable item status display; a user is informed "Reorder now Replacement needed soon" by the screen display due to the imminent need to service the item without delay, and to obtain replacement part(s) to complete this consumable replenishment task. The diagram of the printer automatically changes so as to show the location of the black dry ink cartridge, thus indication from where and how the Oil Bottle/Cleaning Pad cartridge is to be removed for replenishment. Should the user desire further instruction or information on the meaning of a particular consumable or maintenance item, according to the Figure 1 "Further Indicator Instructions Requested" selection block of Figure 1, an instructional window or "help balloon" can be opened over the designated item as shown in Figure 5 by further designating a "help" button, icon or window (not shown in Figure 5) while the status item is designated, so as to provide greater detail to the user, such as may relate to the urgency and necessity of performing a particular service.

Figure 5 shows the "Fuser Module" item help balloon opened on the display screen following a help request by a user. In another embodiment, the user may be warned by an audible signal generated by the IPS and transmitted to an amplifier (not shown in Figure 9) in communication with the UI and/or PC for audible broadcast by a speaker (also not shown in Figure 9) when consumable replenishment or maintenance is required. In each case, instructions on service and printer component/consumable status may be printed out on the printer (or another operational printer in a network) for use by an operator while the required procedures are being performed, a feature that is particularly useful when the printer to be serviced is powered down for servicing. Further, signals generated by the IPS and broadcast by a speaker may instruct the user on displayed or additional information, such as information on the method for performing the required corrective actions. Audible warnings and information have the advantage of not interrupting the screen display (or for that matter, the user) from other ongoing tasks. The service instructions and consumables requirements may also be provided to a remote computer which monitors the status of a network of printers.

Continuing with the system shown in Figure 1, after obtaining full information on one or more status items, the user may perform the particular service indicated at the printer. Further information which can include information of greater detail or specificity may be optionally made available as to the status of the

item on a UI display at the printer. After the service is performed, the status of the item may be reset at the printer so as to update the consumables screen when it is next initialized. (In another embodiment, the status of the item may alternatively or optionally be reset at the PC after the service is performed.) Should other specific service requirements or requests be desired, the operator may again designate the specific status item at the PC, and again proceed as outlined above. Once all service requirements or requests are completed or the user wishes to terminate the use of the system, the status display and related functions may be deselected and terminated.

Figure 6 shows another embodiment of a consumables status check system that may be performed by an IPS or processor of the present invention. This consumable status check is sensor driven, in that without request by a user, the check is automatically performed and presented to the user on a PC or UI screen when printer service is eminent or immediately required. As with the system displays shown in Figures 3-5, information on performing the required actions and the location of the relevant part(s) are thereafter automatically displayed on the PC screen. In this embodiment, each electronic sensor (or print count indicator, etc.) can initiate the display of a status display. For example, when a dry ink level sensor indicates a dry ink level is low in the printer, after a print request is sent to the printer, the user is informed of the low dry ink level. A user may replenish the required dry ink, and then reset and the IPS/processor to indicate that the dry toner has been replenished. Alternatively, a user may override the low dry ink request by the dry ink sensor and IPS/processor, and proceed to print despite the need to replenish dry ink. In one embodiment, (not shown), the IPS/processor may refuse to permit the service request to be overridden when continued printing might cause damage to the printer. In another embodiment, (also not shown), the IPS/processor may refuse to permit the service request to be overridden when a previous printing failure caused by the condition has been sensed by the printer.

With continued reference to Figure 6, once the dry ink status of the printer is corrected and reset or overridden, any print count driven requests are processed. For example, as shown in Figure 6, a print cartridge (developer) service request may signal the need to replace magnetic brush-forming carrier particles in the developer housing. If a status check indicates corrective actions are required, a display screen is automatically initialized, such that as in the display screens shown in Figures 3-5, a user is informed of the nature of the service, the means to affect that corrective action, as well as further details on the status item. Once the corrective action has been completed, the particular status item may be reset or automatically overridden so as to proceed with all print count driven status requests. For example, a print cartridge use counter status request is made, again in which corrective actions required are displayed on a screen if such status check so requires. Again, the corrective action is taken and the item is reset, or the request is overridden. When the sensor-driven statusing of all items requiring service and not overridden is finished, the consumable status check sequence is completed.

Figure 7 shows another embodiment of the present invention in which a status check of consumables (and service/maintenance) is performed in a particular predetermined order. The status check proceeds until any particular sequenced "Status OK" query indicates a corrective action ("Display C/A") is required (see Figures 3-5). (Figure 7 shows, by way of example only, a sequence in which the "Dry Ink Sensor," "Waste Pack Sensor," Black Cartridge Count," "Color Cartridge Count," "Fuser Hours of Operation" and "Maintenance Kit Hours of Operation" status items are requested in the order shown.) In each case when a status request indicates a corrective action is required, the corrective actions required are displayed on the PC screen. In the Figure 7 embodiment, to prevent copy quality deterioration, damage to the printer or other undesirable consequence of continued printing without completion of the necessary corrective action, the status item can only be reset after the corrective action is performed. Other sequences and /or status items beyond those shown in Figure 7 may be established and followed without departing from the spirit and scope of the present invention.

Figure 8 shows an embodiment of the present invention such as may be incorporated into any of the processor systems/status checks shown in Figures 1, 6 or 7. Supplies may be automatically reordered by according to the Figure 8 subroutine shown once a particular consumable, service item or maintenance item is indicated as being required. Alternatively, after the corrective action is performed and the status of the that item is reset automatically or by a user, the required consumables, service items or maintenance items are automatically reordered. A modem or other electronically generated order request may be displayed on an instruction or information screen on a PC, such that a user is informed of the particular supplies ordered, cost, expected delivery date and other pertinent information on the automatic order. Thereafter, the particular item resupply order sequence is reset and the automatic supplies reorder subroutine is completed.

Claims

1. An apparatus for managing maintenance operations of a printer providing a status indicator

thereof, comprising:

a processor, responsive to the status indicator, for generating a signal including a set of printer service instructions for performing user maintenance corresponding to the status indicator;

a display; and

a controller adapted to transmit set of printer service instructions to said display.

2. An apparatus as claimed in claim 1, further comprising:

a sensor for providing the status indicator to said processor.

3. An apparatus as claimed in claim 2, wherein said sensor detects a condition of a printer item selected from the group consisting of a printer ink container status, a fuser oil level status, a cleaning device status, and a waste container status.

4. An apparatus as claimed in any one of claims 1 to 3, wherein said processor comprises a print counter for providing the status indicator thereof to said processor.

5. An apparatus as claimed in claim 4, wherein said print counter monitors a printed sheet total of a printer component selected from the group consisting of a developer cartridge, a photoreceptor module and a fuser module.

6. An apparatus as claimed in any one of claims 1 to 5, wherein said display comprises a user interface having a screen and being adapted to display the set of printer service instructions from the controller on the screen thereof.

7. An apparatus as claimed in any one of claims 1 to 6, wherein said display comprises a computer having a screen and being adapted to display the set of printer service instructions from said controller on the screen thereof.

8. An apparatus as claimed in any one of claims 1 to 7, further comprising:

an audio system in communication with said processor and said controller, to audibly broadcast the set of printer service instructions from the controller.

9. A method for managing printer operational status, comprising:

generating a signal in response to a status indicator of a printer, the signal including a set of printer service instructions for performing user maintenance corresponding to said status indicator; and

transmitting the signal including the set of printer service instructions to a display.

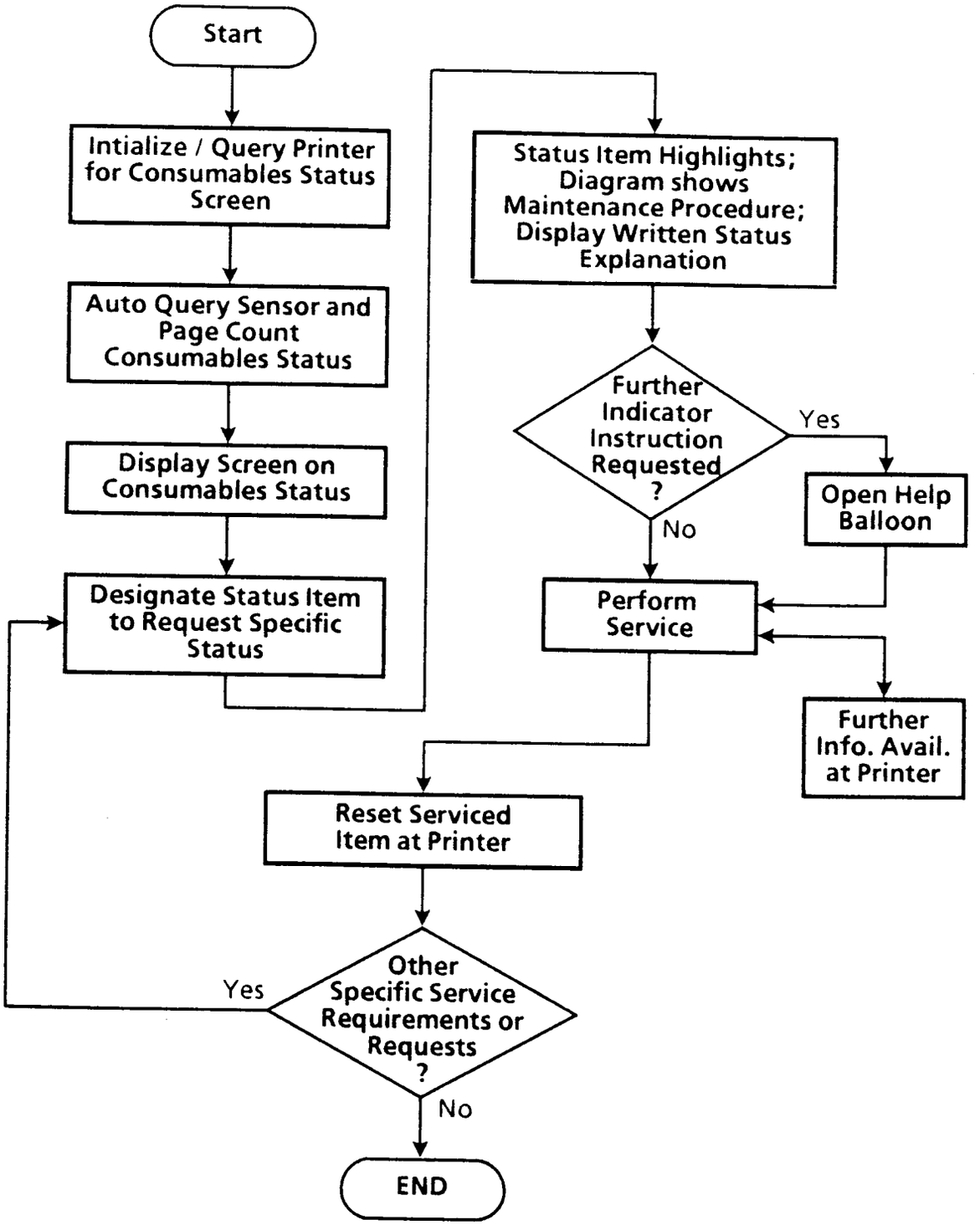
Start
Intialize / Query Printer for Consumables Status Screen
Auto Query Sensor and Page Count Consumables Status
Display Screen on Consumables Status
Designate Status Item to Request Specific Status
Status Item Highlights; Diagram shows Maintenance Procedure; Display Written Status Explanation
Further Indicator Instruction Requested ?
Yes
No
Open Help Balloon
Perform Service
Further Info. Avail. at Printer
Reset Serviced Item at Printer
Other Specific Service Requirements or Requests ?
Yes
No
END

FIG. 1

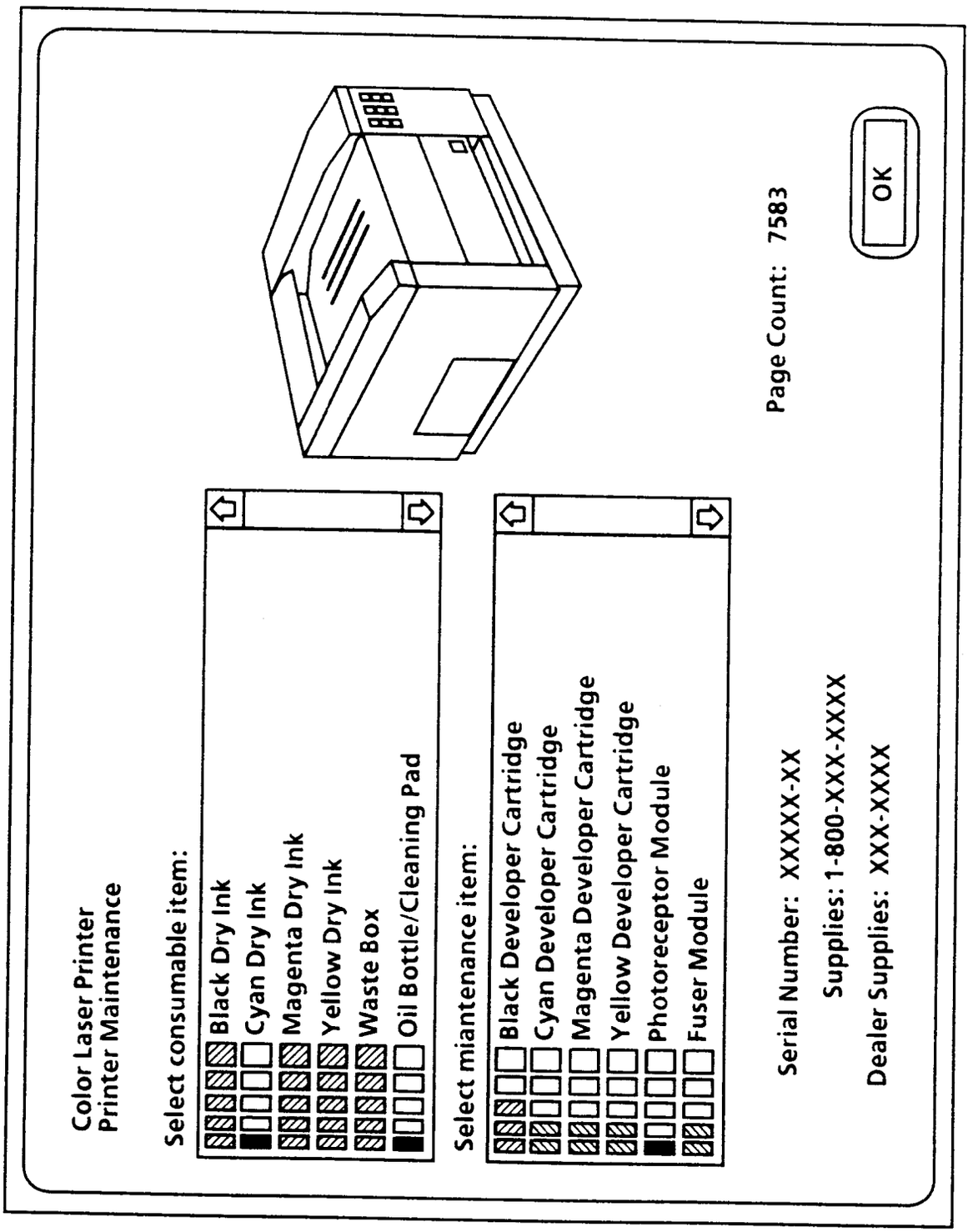
Color Laser Printer
Printer Maintenance
Select consumable item:
Black Dry Ink
Cyan Dry Ink
Magenta Dry Ink
Yellow Dry Ink
Waste Box
Oil Bottle/Cleaning Pad
Select miantenance item:
Black Developer Cartridge
Cyan Developer Cartridge
Magenta Developer Cartridge
Yellow Developer Cartridge
Photoreceptor Module
Fuser Module
Page Count: 7583
Serial Number: XXXXX-XX
Supplies: 1-800-XXX-XXXX
Dealer Supplies: XXX-XXXX
OK

FIG.2

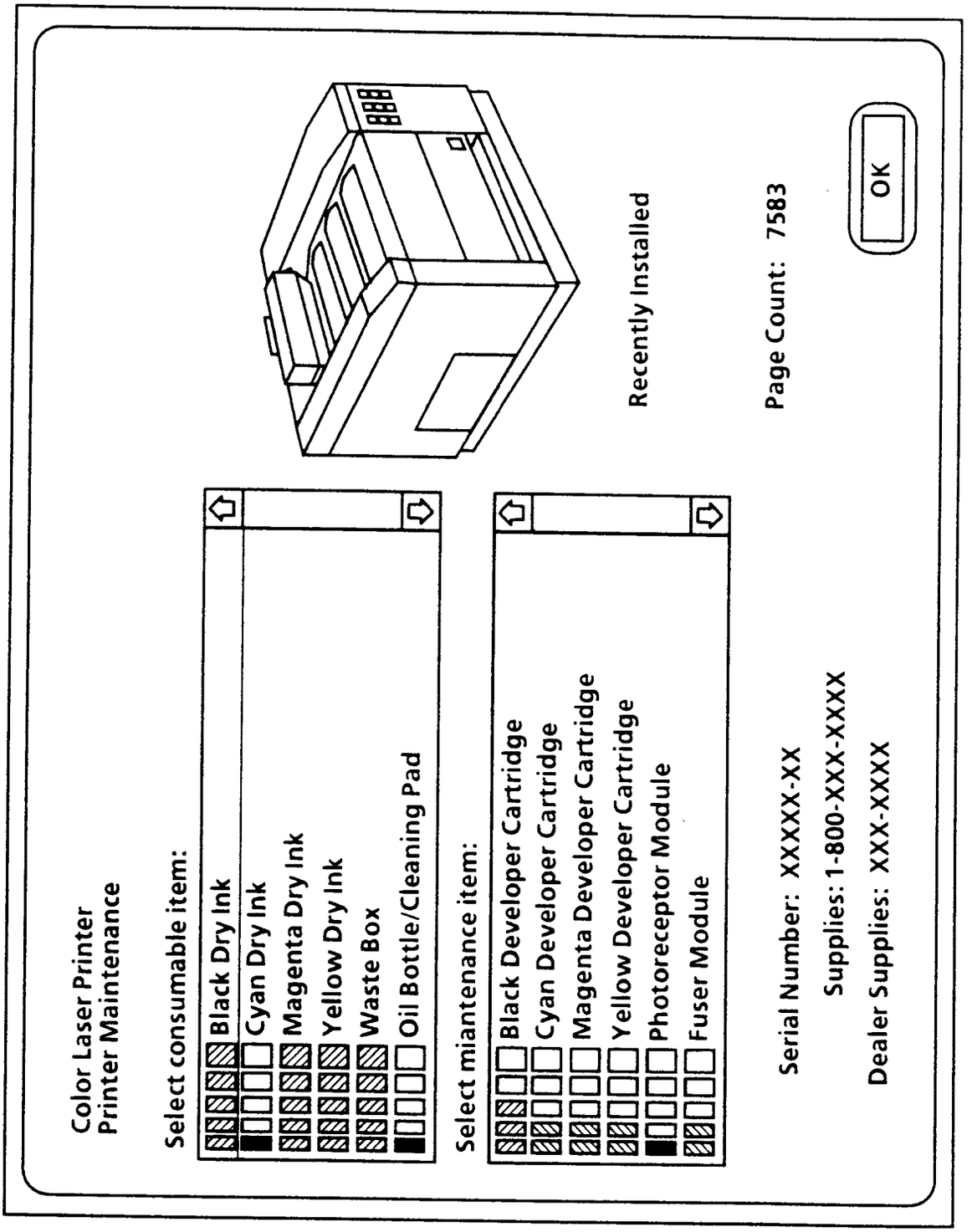
Color Laser Printer
Printer Maintenance
Select consumable item:
Black Dry Ink
Cyan Dry Ink
Magenta Dry Ink
Yellow Dry Ink
Waste Box
Oil Bottle/Cleaning Pad
Select miantenance item:
Black Developer Cartridge
Cyan Developer Cartridge
Magenta Developer Cartridge
Yellow Developer Cartridge
Photoreceptor Module
Fuser Module
Recently Installed
Page Count: 7583
OK
Serial Number: XXXXX-XX
Supplies: 1-800-XXX-XXXX
Dealer Supplies: XXX-XXXX

FIG.3

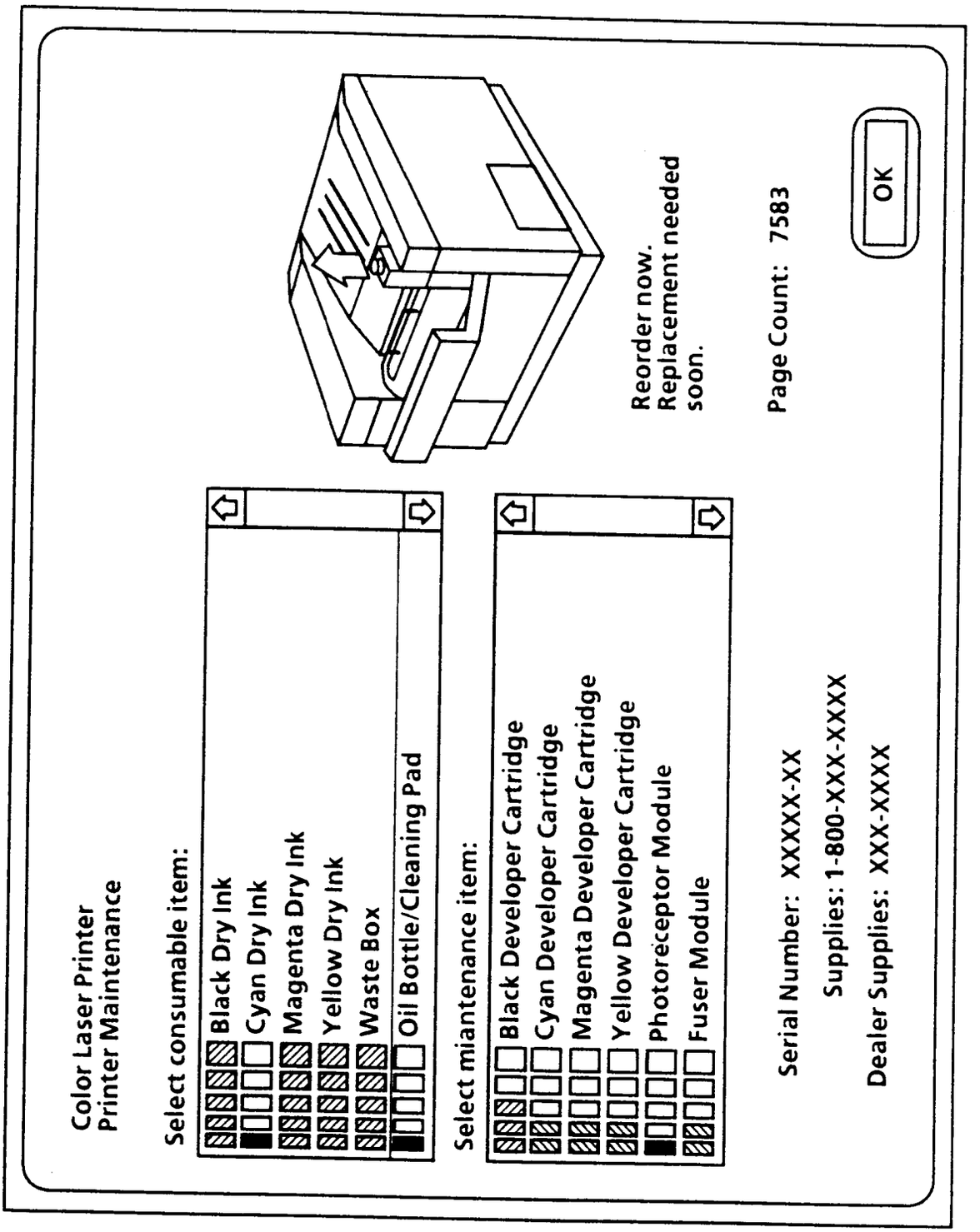
Color Laser Printer
Printer Maintenance
Select consumable item:
Black Dry Ink
Cyan Dry Ink
Magenta Dry Ink
Yellow Dry Ink
Waste Box
Oil Bottle/Cleaning Pad
Select miantenance item:
Black Developer Cartridge
Cyan Developer Cartridge
Magenta Developer Cartridge
Yellow Developer Cartridge
Photoreceptor Module
Fuser Module
Reorder now.
Replacement needed
soon.
Page Count: 7583
Serial Number: XXXXX-XX
Supplies: 1-800-XXX-XXXX
Dealer Supplies: XXX-XXXX
OK

FIG.4

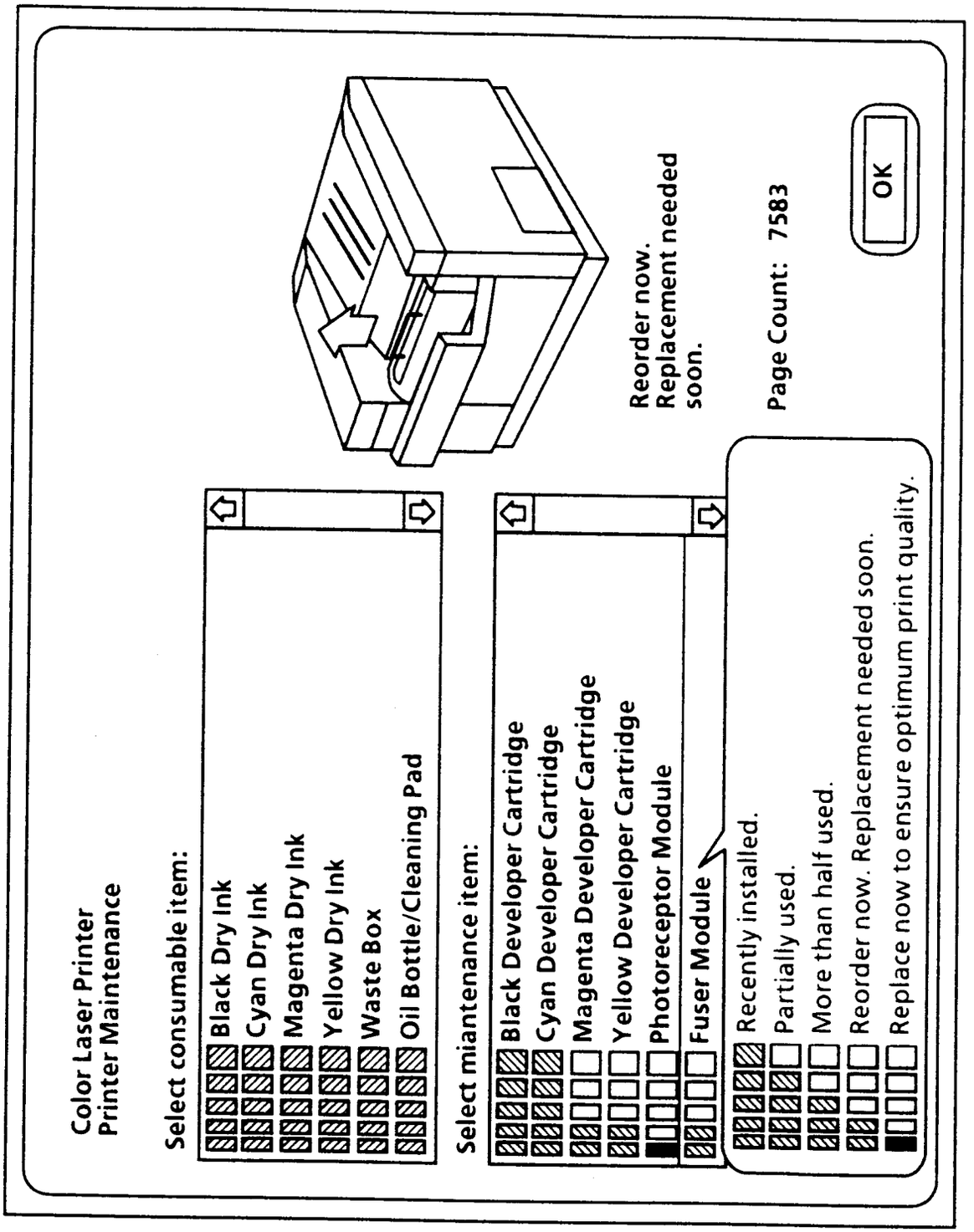
Color Laser Printer
Printer Maintenance
Select consumable item:
Black Dry Ink
Cyan Dry Ink
Magenta Dry Ink
Yellow Dry Ink
Waste Box
Oil Bottle/Cleaning Pad
Select miantenance item:
Black Developer Cartridge
Cyan Developer Cartridge
Magenta Developer Cartridge
Yellow Developer Cartridge
Photoreceptor Module
Fuser Module
Recently installed.
Partially used.
More than half used.
Reorder now. Replacement needed soon.
Replace now to ensure optimum print quality.
Reorder now.
Replacement needed
soon.
Page Count: 7583
OK

FIG.5

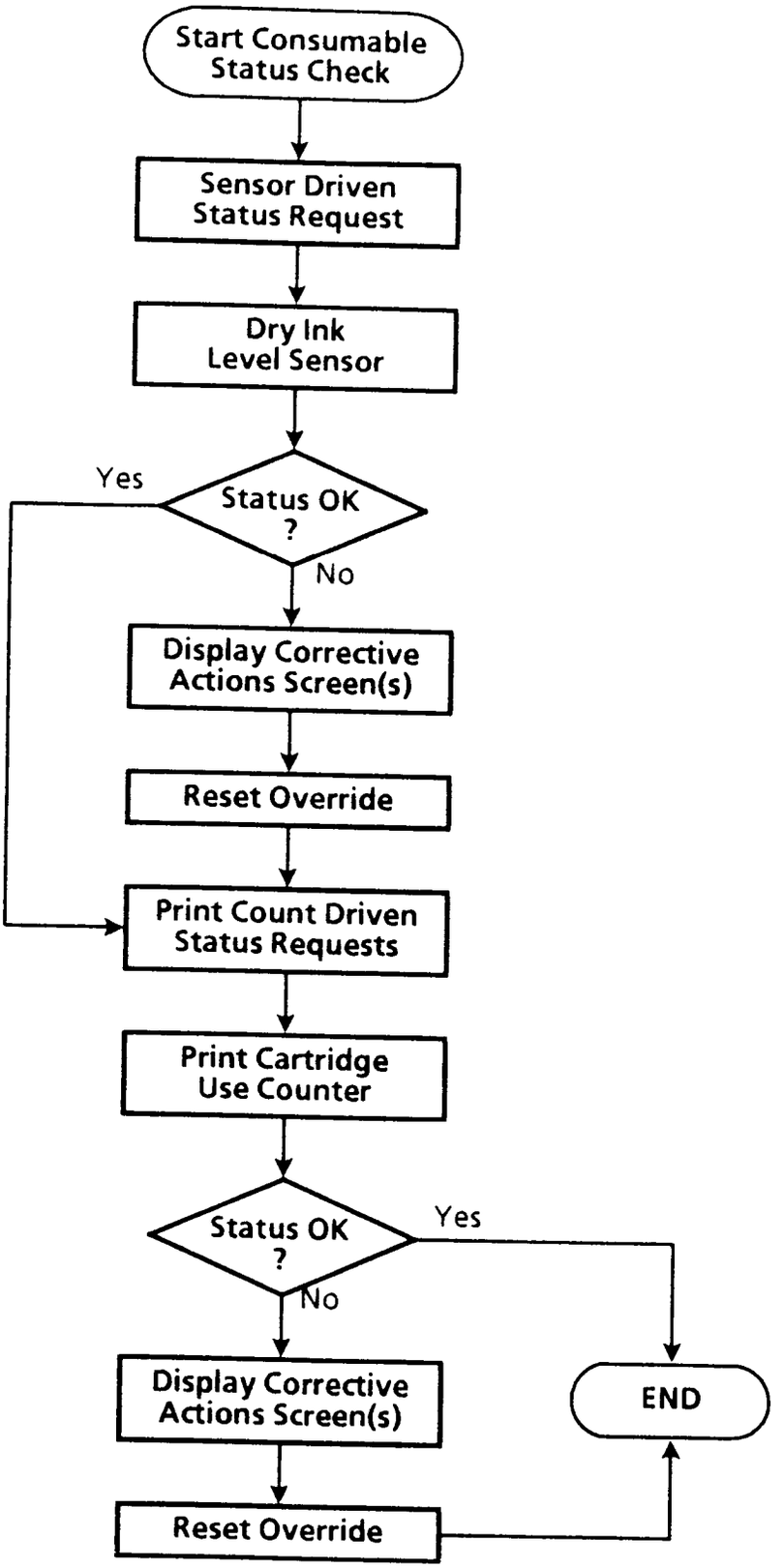
Start Consumable Status Check
Sensor Driven Status Request
Dry Ink Level Sensor
Status OK ?
Yes
No
Display Corrective Actions Screen(s)
Reset Override
Print Count Driven Status Requests
Print Cartridge Use Counter
Status OK ?
Yes
No
Display Corrective Actions Screen(s)
Reset Override
END

FIG. 6

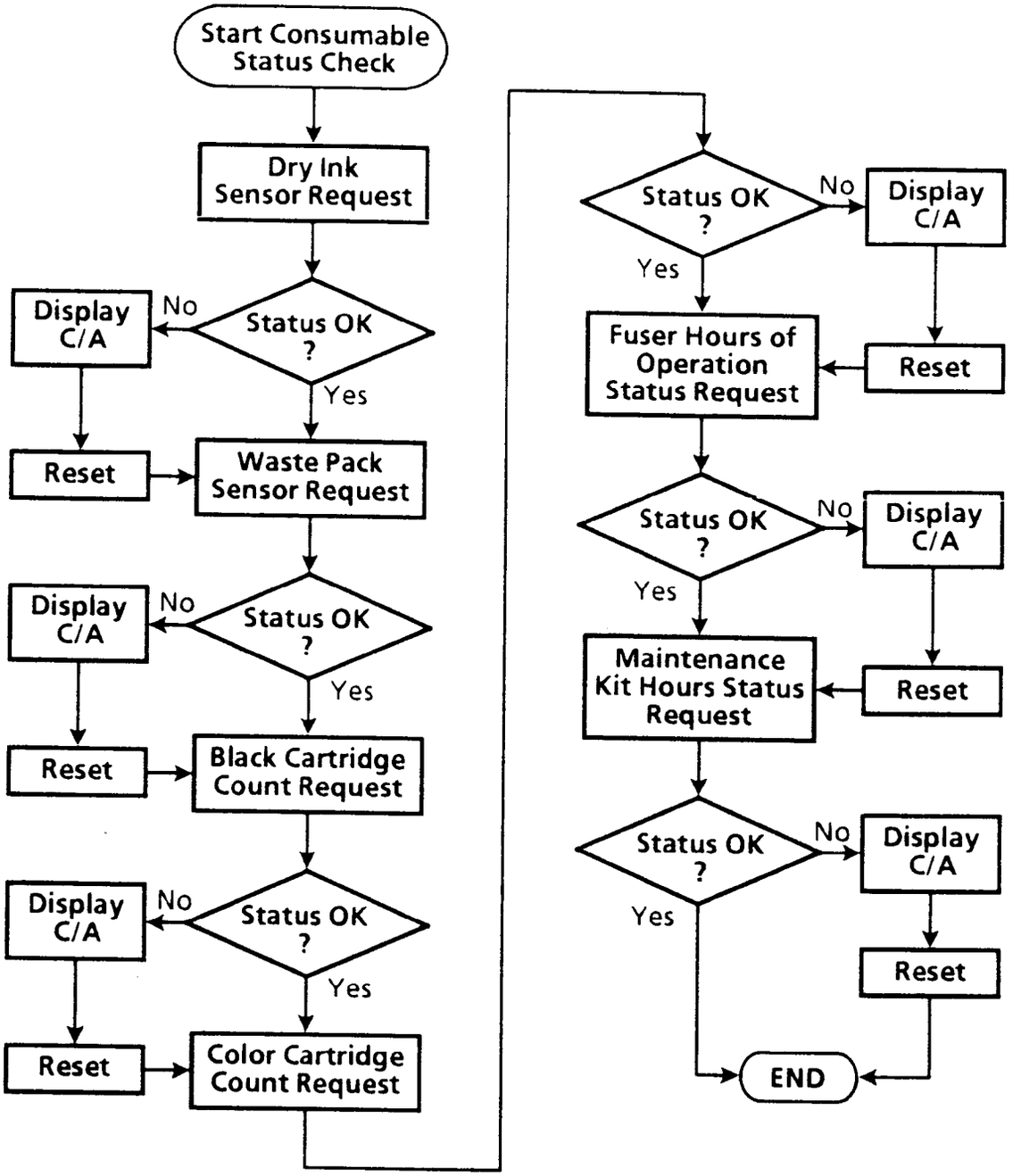
Start Consumable Status Check
Dry Ink Sensor Request
Status OK ?
No
Display C/A
Reset
Yes
Waste Pack Sensor Request
Status OK ?
No
Display C/A
Reset
Yes
Black Cartridge Count Request
Status OK ?
No
Display C/A
Reset
Yes
Color Cartridge Count Request
Status OK ?
No
Display C/A
Reset
Yes
Fuser Hours of Operation Status Request
Status OK ?
No
Display C/A
Reset
Yes
Maintenance Kit Hours Status Request
Status OK ?
No
Display C/A
Reset
Yes
END

FIG. 7

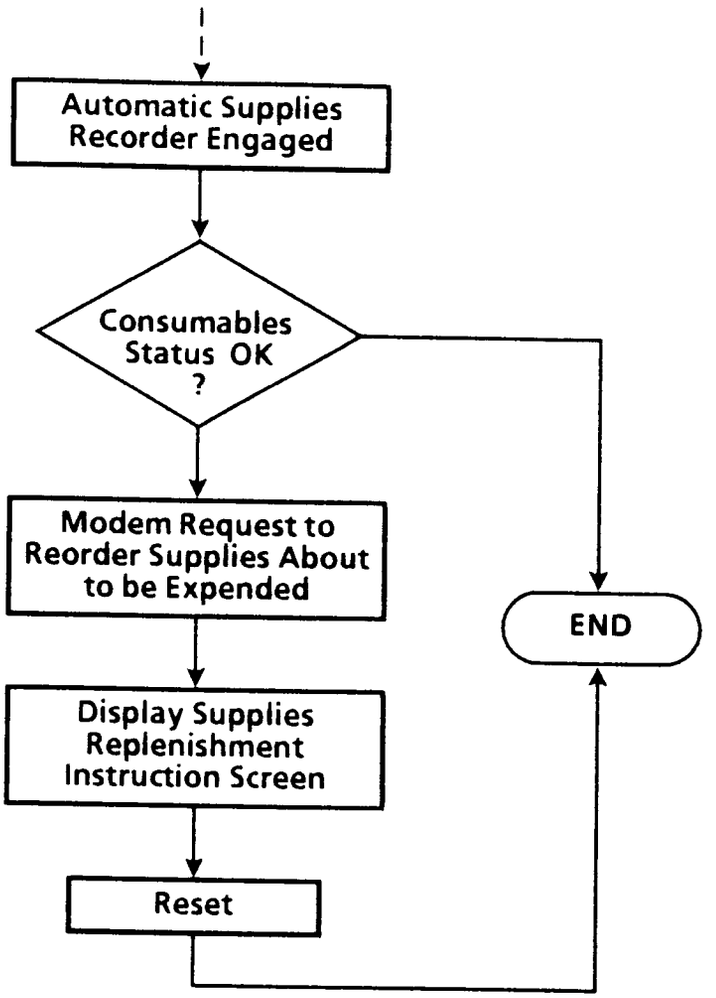
Automatic Supplies Recorder Engaged
Consumables Status OK ?
Modem Request to Reorder Supplies About to be Expended
Display Supplies Replenishment Instruction Screen
Reset
END

FIG. 8

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 30 3791

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	US-A-4 496 237 (SCHRON) * abstract; figures 1,2 * * column 1, paragraph 1 * * column 1, line 52 - column 2, line 9 * * column 5, line 24 - line 37 * * column 6, line 31 - line 38; table 1 * ---	1,4-6	G03G15/00
A	US-A-5 313 468 (HOSHI ET AL.) * abstract; figures 2,11 * * column 4, line 26 - line 64 * * column 20, line 12 - line 30 * ---	1-3,6,7	
A	US-A-5 208 626 (TANIMOTO ET AL.) * abstract * * column 9, line 19 - line 57; figure 9 * ---	4,5,7,9	
A	GB-A-2 218 378 (FUJI XEROX) * abstract; figures 1-9 * * page 1, paragraph 1 * * page 6, line 19 - page 7, line 25 * * page 19, line 1 - page 24, line 25 * ---	1-3	TECHNICAL FIELDS SEARCHED (Int.Cl.6)
A	US-A-5 204 968 (PARTHASARATHI) * column 1, paragraph 1 * * column 2, line 5 - line 64 * -----	6,9	G03G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	8 September 1995	Greiser, N

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)