

1 Information Processing Apparatus
 and Output Apparatus

BACKGROUND OF THE INVENTION

5 Field of the Invention

 The present invention relates to an information
processing apparatus for sending data to an output
apparatus, such as a printer, which is connected
through a bidirectional interface, and an output
10 apparatus for receiving data from an information
processing apparatus, such as a host computer, which is
connected through a bidirectional interface, and
performing output processing.

Related Background Art

15 Recently, a recording apparatus or a recording
system capable of executing processing of the above
sort is constructed by a host computer and a printer
which is connected to the host computer through an
interface (e.g., a Centronics interface). The
20 recording apparatus or the recording system analyzes
output information supplied from the host computer and
develops bit-map data as output data of, e.g., a laser
beam printer. The apparatus or the system then
scan-exposes a photosensitive drum with a laser beam
25 modulated on the basis of this developed data, thereby
performing image recording.

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REPLACED SHEETS		SG
☒	Description : paged ...1... to paged ...31...	
☒	Claim(s) : paged ...32... to paged ...34...	
☒	Drawing(s) : paged ...46... to paged ...176...	
☒	Abstract : paged ...35... to paged ...7...	
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1 In the case of a printer with an emulation
function, a plurality of printer control language
systems can be processed; the printer can execute
printing while switching between an emulation mode and
5 a native mode in accordance with applications that a
user executes. The printer of this type has switches
for switching the printer control languages and card
slots for giving switching designation.

 In addition, as the printing control functions of
10 a printer have been increased in number in recent
years, operations of an operation panel of a printer
main body have become complicated. Therefore, a
so-called "setup utility" by which a host computer
performs various settings of a printer connected to the
15 host computer generally has set items appearing in the
form of a menu on a display.

 Such a "setup utility" allows a host computer to
perform operations which are usually performed from an
operation panel of a printer. In many cases, however,
20 the host computer performs operations for selecting
items one-sidedly for the printer, so the status of the
printer is not reflected on the display in real time.
In addition, a real-time display of a paper feed
condition of the printer is often performed on only the
25 panel of the printer main body.

 Furthermore, if some error occurs in a printer
located apart from a host computer, an operator



1 operating the host computer moves to the installation
location of the printer to perform a recovery operation
for that error, checking an error code displaying on a
display panel of a printer operating unit while
5 referring to a manual, and executing a necessary error
recovery operation.

As described above, when the environment of a
printer system is constructed by a host computer and a
printer connected to the host computer through a
10 predetermined interface, an operator cannot visually
understand the settings, status, and error recovery of
the printer. This results in very poor operability due
to heavy loads of a printer environment setting
operation and an error recovery operation on the
15 operator.

SUMMARY OF THE INVENTION

The present invention has been made to solve the
above problems, and has as its object to provide an
information processing apparatus and an output
20 apparatus, in which the setting statuses of a printer
connected and a virtually displayed printer are
monitored and set to correspond to each other,
operation designation for the printer can be realized
by operation designation on the virtual printer by
25 simulating the printing status and the printer panel
display status of the printer on the virtual printer,



1 and the status of a printing sequence of the printer
can be visually checked on the virtual printer.

In order to achieve the above object of the
present invention, there is provided an information
5 processing apparatus comprising acquiring means for
acquiring information from a printer connected through
a bidirectional interface, and control means for
controlling a display status of a virtual printer,
which is displayed on a display screen and represents
10 the printer, on the basis of the information acquired
by the acquiring means.

In order to achieve the above object of the
present invention, there is provided an output
apparatus comprising setting means for setting an
15 operating environment, and changing means for changing
operating environment information set by the setting
means on the basis of information acquired from an
information processing apparatus connected through a
bidirectional interface.

20 As described above, the operating environmental
status information of a printer connected to a host
computer via a bidirectional interface is acquired, and
the simulated operation display status of a virtual
printer displayed on the display screen of the host
25 computer is controlled on the basis of the acquired
operating environmental status information. In
addition, designation information for the virtual



1 printer is acquired from the host computer, and the
operating environmental status of the printer is set to
correspond to that of the virtual printer on the basis
of the acquired designation information. Therefore,
5 the connected printer can be displayed as a visual
cubic image on the screen of the host computer by means
of the virtual printer. It is also possible to display
the status and settings of the printer on the virtual
printer and reflect the settings of the virtual printer
10 on the connected printer.

Furthermore, the panel setting status information
of a printer connected to a host computer through a
bidirectional interface is acquired, and the simulated
operation display status of a virtual panel displayed
15 on the display screen of the host computer is
controlled on the basis of the acquired panel setting
status information. The designation information for
the virtual panel is also acquired from the host
computer, and the panel setting status of the printer
20 is set to correspond to that of the virtual panel on
the basis of the acquired designation information.
This makes it possible to display the panel status and
settings of the printer on the virtual panel and
reflect the settings of the virtual panel on the panel
25 of the printer.

A user, therefore, can activate the panel
simulation or the setup utility of the printer by a



1 simple operation of designating a desired portion of
the printer virtually displayed on the screen of the
host computer. This enables the user to confirm the
printer status and perform environmental setting of the
5 printer without making any mistakes while visually
monitoring the printer virtually displayed on the host
computer.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sectional view showing the arrangement
10 of a first recording apparatus to which the present
invention is applicable;

Fig. 2 is a perspective view showing the outer
appearance of a second recording apparatus to which the
present invention is applicable;

15 Fig. 3 is a block diagram for explaining the
control system of the second recording apparatus shown
in Fig. 2;

Fig. 4 is a block diagram for explaining the
arrangement of a printer control system according to
20 one embodiment of the present invention;

Fig. 5 is a flow chart showing a virtual printer
display sequence in the printer control system
according to the present invention;

Fig. 6 is a view showing a virtual printer display
25 transition status in the printer control system
according to the present invention;



1 Fig. 7 is a view showing a virtual printer display
transition status in the printer control system
according to the present invention;

 Fig. 8 is a view showing a virtual printer display
5 transition status in the printer control system
according to the present invention;

 Fig. 9 is a view showing a virtual printer display
transition status in the printer control system
according to the present invention;

10 Fig. 10 is a flow chart showing a virtual panel
simulation sequence shown in Fig. 5;

 Fig. 11 is a flow chart showing a printer panel
locking sequence shown in Fig. 5;

 Fig. 12 is a flow chart showing another printer
15 panel locking sequence different from that shown in
Fig. 5;

 Fig. 13 is a flow chart showing a power switch
(P/S) simulation sequence shown in Fig. 5;

 Fig. 14 is a flow chart showing an attached card
20 simulation sequence shown in Fig. 5;

 Fig. 15 is a flow chart showing an interface
simulation sequence shown in Fig. 5;

 Fig. 16 is a flow chart showing a paper feed
cassette simulation sequence shown in Fig. 5;

25 Fig. 17 is a flow chart showing a paper feed tray
simulation sequence shown in Fig. 5;



1 Fig. 18 is a flow chart showing an option slot
simulation sequence shown in Fig. 5;

 Fig. 19 is a flow chart showing a paper delivery
tray simulation sequence shown in Fig. 5; and

5 Fig. 20 is a view showing contents in a cross
section display mode of a virtual printer in the
printer control system according to the present
invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

10 Before an explanation of the arrangement of this
embodiment, the arrangements of a laser beam printer
and an ink jet printer suitable for this embodiment
will be described below with reference to Figs. 1 to 3.
Note that a printer to which this embodiment is applied
15 is not limited to the laser beam printer and the ink
jet printer but may be a printer of another printing
system.

 Fig. 1 is a sectional view showing the arrangement
of a first recording apparatus, for example, a laser
20 beam printer (LBP), to which the present invention is
applicable.

 Referring to Fig. 1, an LBP main body 1500
receives and stores print information (e.g., character
codes), form information, or macro instructions
25 supplied from an externally connected host computer.
The LBP main body 1500 forms character patterns or form
patterns corresponding to the input information and



1 forms images on recording paper as a recording medium.
The LBP main body 1500 includes an operation panel
1501, on which switches and LED indicators for
operations are arranged, and a printer control unit
5 1000 for controlling the overall LBP main body 1500 and
analyzing character information and the like supplied
from the host computer. The printer control unit 1000
primarily converts character information into a video
signal with the corresponding character pattern and
10 applies the signal to a laser driver 1502. The laser
driver 1502 is a circuit for driving a semiconductor
laser 1503; the laser driver 1502 switches on and off a
laser beam 1504 emitted from the semiconductor laser
1503 in accordance with the input video signal. The
15 laser beam 1504 scan-exposes an electrostatic drum 1506
while being oscillated sideways by a rotary polygon
mirror 1505. As a result, an electrostatic latent
image of the character pattern is formed on the
electrostatic drum 1506. This latent image is
20 developed by a developing unit 1507 arranged around the
electrostatic drum 1506 and transferred onto recording
paper. Cut sheets are used as the recording paper, and
these cut sheets are housed in a paper cassette 1508
attached to the LBP main body 1500. The cut sheets are
25 fed into the printer and supplied to the electrostatic
drum 1506 by a paper supply roller 1509 and paper feed
rollers 1510 and 1511.



1 Fig. 2 is a perspective view showing the outer
appearance of a second recording apparatus, for
example, an ink jet recording apparatus (IJRA), to
which the present invention is applicable.

5 Referring to Fig. 2, a carriage HC engaging with a
spiral groove 5004 of a lead screw 5005 which is
rotated in association with the forward and backward
rotations of a drive motor 5013 via driving force
transmission gears 5011 and 5009 has a pin (not shown)
10 and is therefore reciprocated in directions indicated
by arrows a and b. An ink jet cartridge IJC is mounted
on the carriage HC. A paper holding plate 5002 urges
paper against a platen 5000 over the full width in the
carriage moving direction. Photocouplers 5007 and 5008
15 function as home position detecting means for checking
the presence of a lever 5006 of the carriage in this
area and performing switching between the rotational
directions of the motor 5013. A support member 5016
supports a cap member 5022 for capping the entire
20 surface of a recording head, and a sucking means 5015
for sucking the interior of the cap to perform
suction-recovery for the recording head through an
opening 5023 inside the cap. A cleaning blade 5017 can
be moved forward and backward by a member 5019. A main
25 body support plate 5018 supports the members 5017 and
5019. A lever 5012 for starting suction of the
suction-recovery moves in association with the movement



1 of a cam 5020 which engages with the carriage,
controlling the driving force from the drive motor
through a known transmitting means, such as clutch
switching.

5 The apparatus is arranged such that capping,
cleaning, and suction-recovery can be performed at
their respective positions by the action of the lead
screw 5005 when the carriage moves to an area on the
home position side; that is, a desired operation need
10 only be performed at a timing known to those skilled in
the art.

Fig. 3 is a block diagram for explaining the
control system of the second recording apparatus shown
in Fig. 2.

15 Referring to Fig. 3, this control system includes
an interface 1700 for applying recording signals, an
MPU 1701, a program ROM 1702 for storing, e.g., control
programs to be executed by the MPU 1701, and a DRAM
1703 for storing various data (such as the recording
20 signals and recording data to be supplied to a head).
A gate array 1704 controls the supply of the recording
data to a recording head 1708 and also controls the
transfer of data between the interface 1700, the MPU
1701, and the DRAM 1703. A carriage motor 1710 carries
25 the recording head 1708, and a paper feed motor 1709
feeds recording paper. A head driver 1705 drives the
recording head, a motor driver 1706 drives the paper



1 feed motor 1709, and a motor driver 1707 drives the carriage motor 1710.

In the recording apparatus with the above arrangement, when a recording signal is applied from a host computer 100 (to be described later) through the interface 1700, this recording signal is converted into recording data for printing by the gate array 1704 and the MPU 1701. Then the motor drivers 1706 and 1707 are driven, and the recording head is also driven by the recording data supplied to the head driver 1705, thereby executing printing.

The MPU 1701 can perform communications with the host computer 100 (to be described later) through the interface 1700; the MPU 1701 can inform the host computer 100 (to be described later) of memory information related to the DRAM 1703 and resource data (including operating environmental status information and panel setting status information to be described later).

20 [Embodiment]

Fig. 4 is a block diagram for explaining the arrangement of a printer control system according to one embodiment of the present invention. The first embodiment will be described below by taking the laser beam printer (Fig. 1) as an example. Note that the present invention can be applied to any of a single apparatus, a system comprising a plurality of



1 apparatuses, and a system in which processing is
executed via a network, such as a LAN, provided that
the functions of the present invention are executed.

Referring to Fig. 4, the host computer 100 has a
5 CPU 1 for executing processing for documents consisting
of graphics, images, characters, tables (including
spreadsheets), and the like on the basis of document
processing programs stored in a ROM 2. The CPU 1
systematically controls individual devices connected to
10 a system bus 4.

The ROM 2 stores the control programs of the CPU 1
shown in the flow charts of Fig. 5 and the like. A RAM
3 serves as a main memory and a work area for the CPU
1. A keyboard controller (KBC) 5 controls key inputs
15 from a keyboard 9. A CRT controller (CRTC) 6 controls
a display on a CRT display (CRT) 10. A disk controller
(DKC) 7 controls access to a hard disk (HD) 11 and a
floppy disk (FD) 12 which store boot programs, various
applications, font data, user files, edit files, and
20 virtual printer image data (to be described later). A
printer controller (PRTC) 8 is connected to the printer
1500 through a predetermined bidirectional interface
(interface) 13 and executes processing for controlling
communications with the printer 1500. Interface
25 circuits 8a and 18a control command communication
processing and recording information processing



1 executed between the printer 1500 and the host computer
100 through the interface 13.

 The CPU 1 executes processing for developing
(rasterizing) an outline font into a display
5 information RAM set in the RAM 3, allowing WYSIWYG on
the CRT 10. The CPU 1 also opens various registered
windows on the basis of commands designated by a mouse
cursor (not shown) or the like on the CRT 10, executing
various tasks of data processing. In addition, the CPU
10 1 manages the virtual printer image data or the virtual
panel image data stored in the hard disk 11. That is,
the CPU 1 controls the setting of a printer mode on the
basis of designation by a pointing device (not shown)
for the virtual printer displayed on the CRT 10 and
15 displays the setting status on the virtual display
unit. The CPU 1 then transfers the mode setting
information to the printer 1500, and the CPU 14
controls the setting of the display status on the
operation panel 1501 so that the printer setting
20 statuses of the actual and virtual printers correspond
to each other. The setting information (stored in the
RAM 16) on the operation panel 1501 is also informed to
the host computer 100. The CPU 1 controls the display
of the virtual printer so that the display status of
25 the virtual printer also corresponds to the mode
setting status of the printer.

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1 In the printer 1500, a printer CPU 14
systematically controls access to various devices
connected to a system bus 17 on the basis of control
programs and the like (indicated by the flow chart
5 shown in Fig. 11) stored in a ROM 15 and outputs image
signals as print data to a printer mechanism (printer
engine) 20 connected through a printer interface 19.
The memory capacity of a RAM 16 can be extended by an
optional RAM connected to an expansion port. Note that
10 the RAM 16 stores operating environmental status
information and panel set status information (to be
described later), and the information is sequentially
updated by the CPU 14.

 The printer control system also includes at least
15 one card slot (not shown) so that optional font cards
and cards (emulation cards) storing programs for
interpreting printer control languages of different
language systems can be connected and used, in addition
to internally stored fonts. Note that the
20 above-mentioned panel setting status information and
the like may be stored in an NVRAM (not shown).

 In the printer control system with the above
arrangement, when the CPU 1 acquires operating
environmental status information from the RAM 16 in the
printer connected to the host computer 100 through the
25 bidirectional interface 13, the CPU 1 controls the
simulated operation display status of the virtual



1 printer displayed on the display screen (CRT 10) of the
host computer 100. In addition, when the CPU 14
acquires designation information for the virtual
printer from the host computer 100, the CPU 14 sets the
5 matching between the operating environmental statuses
of the printer and the virtual printer on the basis of
the acquired designation information. Therefore, the
connected printer can be displayed as a visual cubic
image on the screen of the host computer by means of
10 the virtual printer. It is also possible to display
the status and settings of the printer on the virtual
printer and reflect the settings of the virtual printer
on the printer.

The virtual printer control operation will be
15 described below with reference to the flow chart shown
in Fig. 5 and the virtual display statuses shown in
Figs. 6 to 9.

Fig. 5 is a flow chart showing a virtual printer
display sequence performed by the CPU 1 in the printer
20 control system according to the present invention, in
which processing steps (1) to (15) are illustrated.

In step (1), the CPU 1 checks whether a display of
the virtual printer is requested by designation by the
pointing device (not shown) or the keyboard 9 of the
25 host computer 100. If YES in step (1), the flow
advances to step (2), and, as shown in Fig. 6, the CPU
1 displays a 3D image (three-dimensional image) of the



1 virtual printer corresponding to the connected printer
1500 in a window W1 on the CRT 10.

Subsequently, in step (3), the CPU 1 checks
whether a viewpoint and scroll bars SB1 and SB2 are
5 designated by a cursor K through the use of the
pointing device (not shown). If YES in step (3), the
CPU 1 rotates the cubic image of the virtual printer in
the directions designated by the scroll bars SB1 and
SB2 in step (6), and the flow returns to step (2).

10 In step (4), the CPU 1 checks whether any of
desired positions P1 to P6 in virtual printer images
PIM1 to PIM3 shown in Figs. 6 to 8 is designated by the
cursor. If NO in step (4), the CPU 1 executes other
corresponding processes in step (5). If YES in step
15 (4), the CPU 1 determines the position designated by
the cursor K, activating one of simulators (to be
described in detail later) corresponding to the
designated position (steps (8) to (15)), and ending the
processing.

20 As described above, the operating environmental
status information (stored in the RAM 16) of the
printer 1500 connected to the host computer 100 through
the bidirectional interface (e.g., RS232C) 13 is
acquired, and the simulated operation display status of
25 the virtual printer displayed on the display screen of
the host computer 100 is controlled on the basis of the
acquired operating environmental status information.



1 In addition, the designation information for the
virtual printer (virtual printer images PIM1 to PIM3)
is acquired from the host computer 100, and the
operating environmental status of the printer 1500 is
5 set to correspond to that of the virtual printer on the
basis of the acquired designation information.
Therefore, the printer 1500 connected can be displayed
as a visual cubic image on the screen of the host
computer 100 by means of the virtual printer. It is
10 also possible to display the status and settings of the
printer 1500 on the virtual printer and reflect the
settings of the virtual printer on the printer 1500.

Furthermore, the panel setting status information
stored in the RAM 16 of the printer 1500 connected to
15 the host computer 100 through the bidirectional
interface 13 is acquired, and the simulated operation
display status of the virtual panel (the panel image PI
shown in Fig. 9) displayed on the display screen of the
host computer is controlled on the basis of the
20 acquired panel setting status information. The
designation information for the virtual panel is also
acquired from the host computer 100, and the setting
status of the operation panel 1501 of the printer 1500
is set to correspond to that of the virtual panel on
25 the basis of the acquired designation information.
This makes it possible to display the panel status and
the panel settings of the printer 1500 on the virtual



1 panel and reflect the settings of the virtual panel on
the panel of the printer 1500.

Fig. 10 is a flow chart showing a virtual panel
simulation sequence shown in Fig. 5 that is performed
5 by the CPU 1, in which processing steps (1) to (10) are
illustrated.

First, in step (1), the CPU 1 of the host computer
100 waits until current panel setting status
information (stored in the RAM 16) set in the printer
10 1500 is transferred. In step (2), in accordance with
the input panel setting data, the CPU 1 displays the
virtual panel by using the virtual panel image PI such
that the display on a display D and indications of
indicators L1 to L5 shown in Fig. 9 correspond to those
15 of the operation panel 1501 of the printer 1500.

Subsequently, in step (3), the CPU 1 checks
whether key-lock for disabling depression of all keys
or keys except that for releasing errors of the printer
1500 is designated. If YES in step (3), the CPU 1
20 executes the routine of a printer panel locking process
(to be described later) in step (10) and ends the
processing.

If NO in step (3), the CPU 1 checks in step (4)
whether any of virtual keys KEY1 to KEY8 on the virtual
25 panel image IP is designated. If NO in step (4), the
flow returns to step (2). If YES in step (4), the CPU
1 displays items corresponding to the virtual keys KEY1



1 to KEY8 in a window or pulldown in step (5). In step
(6), the CPU 1 updates the virtual panel mode display
currently being set in accordance with the selected
item. In step (7), the CPU 1 transfers the key setting
5 status file corresponding to the settings of the keys
KEY1 to KEY8 to the printer 1500. The CPU 1 then
updates the setting status of the operation panel 1501
of the printer 1500 in step (8) and waits until the
display status of the operation panel 1501 of the 1500
10 is updated in step (9), thereby ending the processing.
This enables the display status of the operation panel
1501 of the printer 1500 to correspond to that of the
virtual panel in accordance with the key operations and
the mode display on the virtual panel image PI.

15 As described above, since the display status of
the virtual panel image IP on the CRT 10 of the host
computer 100 changes in association with the operations
on the operation panel 1501 of the printer 1500, the
operating environmental status of the printer 1500 can
20 be easily confirmed on the screen of the host computer
100. In addition, in operating the virtual keys KEY1
to KEY8 corresponding to the virtual panel image PI on
the CRT 10 of the host computer 100, an operator can
perform the key operation while monitoring all items
25 that can be set, and this key operation is reflected on
the set result on the operation panel 1501 of the
printer 1500. Note that in transferring data between

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1 the host computer 100 and the printer 1500, information
may be exchanged between the host computer 100 and the
printer 1500 whenever the key operation is performed.
Furthermore, in this embodiment, the reaction (change
5 in menu display or the like) for each key operation is
simulated by the host computer 100, and, after the
setting is completed by the host computer 100, the set
contents are transferred to the printer 1500. However,
the processing for selecting and displaying set items
10 may also be executed by receiving information from the
printer 1500. Consequently, a user can set the printer
1500 from the host computer 100 and can also check the
environmental setting status of the printer 1500
without moving to the installation location of the
15 printer.

Fig. 11 is a flow chart showing a printer panel
locking sequence shown in Fig. 5 that is performed by
the CPU 14, in which processing steps (1) to (11) are
illustrated.

20 First, in step (1), the CPU 14 of the printer 1500
checks whether some command is input from the host
computer 100. If NO in step (1), the CPU 14 checks in
step (5) whether a flag for permitting inputs from the
keys arranged on the operation panel 1501 of the
25 printer 1500 is currently permissible. If NO in step
(5), the flow returns to step (1). If YES in step (5),
the CPU 14 waits until a key input is supplied from the



1 keys arranged on the operation panel 1501 of the
printer 1500. If the key input is obtained in step
(6), the CPU 14 executes a key input process in step
(7), and the flow returns to step (1).

5 If YES in step (1), on the other hand, the CPU 14
checks in step (2) whether the input command is a
command for permitting the panel operation on the
operation panel 1501 of the printer 1500. If YES in
step (2), the CPU 14 sets the state "permissible" for
10 the flag for permitting inputs from the keys arranged
on the operation panel 1501 of the printer 1500 in step
(3) and turns a panel lamp on in step (4), thereby
ending the processing.

If NO in step (2), the CPU 14 checks in step (8)
15 whether the input command is a command for inhibiting
the panel operation on the operation panel 1501 of the
printer 1500. If NO in step (8), the CPU 14 executes
other corresponding processes in step (11) and ends the
processing.

20 If YES in step (8), the CPU 14 sets the state
"inhibited" for a flag for inhibiting inputs from the
keys arranged on the operation panel 1501 of the
printer 1500 in step (9) and turns the panel lamp off
in step (10), thereby ending the processing.

25 As described above, while the printer operating
environment is being set from the virtual panel, the
settings on the virtual panel are given priority by



1 disabling the designation for the panel setting
operation of the printer. Therefore, in a system in
which the environment of the printer 1500 can be set
from the setup utility, the panel simulation, or the
5 like of the host computer 100, the operation on the
operation panel of the printer 1500 can be temporarily
inhibited by a command from the host computer 100.
This effectively avoids an undesirable event in which
another user carelessly changes the environmental
10 settings of the printer 1500 in situations where the
host computer and the printer 1500 are located apart
from each other, i.e., where the printer functions as a
so-called shared printer, thereby obtaining desired
printing results. If, however, the panel operation
15 inhibited state set in the printer 1500 continues for a
long period of time, the function of the shared printer
may be impaired. Therefore, as shown in Fig. 12, the
system may be modified such that the inhibition time is
managed by the counter function of the CPU 14, and, if
20 a predetermined inhibition release time has elapsed,
operations of the keys of the printer 1500 are enabled.

Fig. 12 is a flow chart showing another printer
panel locking sequence different from that shown in
Fig. 5 that is performed by the CPU 14, in which
25 processing steps (1) to (15) are illustrated.

First, in step (1), the CPU 14 of the printer 1500
checks whether some command is input from the host



1 computer 100. If NO in step (1), the CPU 14 activates
its internal counter in step (12) and checks in step
(13) whether the value of the counter is equal to or
larger than a count value which is set to release the
5 panel operation inhibition. If NO in step (13), the
flow advances to step (5) and the subsequent steps. If
YES in step (13), the CPU 14 sets the state
"permissible" for the flag for permitting inputs from
the keys arranged on the operation panel 1501 of the
10 printer 1500 in step (14) and turns the panel lamp on
(15).

Subsequently, in step (5), the CPU 14 checks
whether the flag for permitting inputs from the keys
arranged on the operation panel 1501 of the printer
15 1500 is currently permissible. If NO in step (5), the
flow returns to step (1). If YES in step (5), the CPU
14 waits until a key input is supplied from the keys
arranged on the operation panel 1501 of the printer
1500 in step (6). If the key input is obtained in step
20 (6), the CPU 14 executes a key input process in step
(7), and the flow returns to step (1).

If YES in step (1), the CPU 14 checks in step (2)
whether the input command is a command for permitting
the panel operation on the operation panel 1501 of the
25 printer 1500. If YES in step (2), the CPU 14 sets the
state "permissible" for the flag for permitting inputs
from the keys arranged on the operation panel 1501 of



1 the printer 1500 in step (3) and turns the panel lamp
on in step (4), thereby ending the processing.

If NO in step (2), the CPU 14 checks in step (8)
whether the input command is a command for inhibiting
5 the panel operation on the operation panel 1501 of the
printer 1500. If NO in step (8), the CPU 14 executes
other corresponding processes in step (11) and ends the
processing.

If YES in step (8), the CPU 14 sets the state
10 "inhibited" for the flag for inhibiting inputs from the
keys arranged on the operation panel 1501 of the
printer 1500 in step (9) and turns the panel lamp off
in step (10), thereby ending the processing.

With the above arrangement, even when the key
15 operation on the operation panel 1501 of the printer
1500 is disabled by the command designation from the
host computer 100, the key operation enable state can
be automatically restored. Note that the control may
be performed to enable the error release key operation
20 on the operation panel 1501 of the printer 1500 if a
paper feed jam or the like occurs during execution of
the printer sequence by the printer mechanism 20 of the
printer 1500.

Fig. 13 is a flow chart showing a power source
25 switch simulation sequence shown in Fig. 5 that is
performed by the CPU 1 and the CPU 14, in which
processing steps (1) to (5) are illustrated.



1 This sequence is started when, for example, the
position P2 is designated by the pointing device (not
shown) on the display screen shown in Fig. 6. First,
in step (1), the CPU 1 checks the ON/OFF state
5 designated by the virtual switch. If ON is determined
in step (1) and the printer is the laser beam printer
shown in Fig. 1, power supply to H.V. is started and
the printer mechanism 20 is warmed up in step (2). If
the printer is the bubble jet printer as shown in
10 Fig. 2, power supply to various drivers is started in
order to activate the cleaning mechanism of the printer
head.

Subsequently, when printing becomes possible in
step (3), the CPU 14 transfers a printer status signal
15 indicating a printer enable status to the host computer
100 in step (4) and ends the processing.

If OFF is determined in step (1), power supply to
parts except a communication unit for performing
communications with the host computer 100 is stopped,
20 setting an apparent off-line status.

Fig. 14 is a flow chart showing an attached card
simulation sequence shown in Fig. 5 that is performed
by the CPU 1 and the CPU 14, in which processing steps
(1) to (9) are illustrated.

25 First, in step (1), the CPU 14 waits until card
attachment data is acquired from the printer 1500. In
step (2), the CPU 14 analyzes the card attachment data



1 acquired to determine the card type. After this
determination, in step (3), the CPU 14 checks whether
the card is attached to or detached from the printer
1500. If YES in step (3), the CPU 14 waits until the
5 card attachment data is again acquired in step (8).
When the card attachment data is acquired, the CPU 1
updates the virtual card display status on the CRT 10
of the host computer 100 in step (9), and the flow
returns to step (2).

10 If NO in step (3), the CPU 14 checks in step (4)
whether the attached card is a font card (style font
card for determining, e.g., the printed style or the
Gothic type). If YES in step (4), the CPU 1 displays
the type and contents of the font together with the
15 virtual printer image PIM1 in step (7) and ends the
processing.

If NO in step (4), the CPU 14 checks in step (5)
whether the attached card is a control card for, e.g.,
emulation. If NO in step (5), the flow returns to step
20 (3). If YES in step (5), the CPU 1 displays the type
and contents of the card together with the virtual
printer image PIM1 in step (6) and ends the processing.

Fig. 15 is a flow chart showing an interface
simulation sequence shown in Fig. 5 that is performed
25 by the CPU 1, in which processing steps (1) and (2) are
illustrated.



1 First, in step (1), the CPU 1 of the host computer
100 acquires interface status data from the printer
1500. Subsequently, in step (2), the CPU 1 displays,
e.g., the interface type, the communication protocol,
5 and the buffer capacity allocated to that interface
together with the printer image PIM1 in step (2) and
ends the processing.

Fig. 16 is a flow chart showing a paper feed
cassette simulation sequence shown in Fig. 5 that is
10 performed by the CPU 1, in which processing steps (1)
and (2) are illustrated.

First, in step (1), the CPU 1 of the host computer
100 acquires paper feed cassette status data from the
printer 1500. Subsequently, in step (2), the CPU
15 displays the paper size and the number of remaining
papers or paper sheets of the paper feed cassette which
is enabled to perform paper feed, together with the
virtual printer image PIM1, and ends the processing.
If a plurality of paper feed cassettes can be stacked
20 in a stack, the paper size and the number of remaining
paper sheets of a paper feed cassette that is given
priority for paper feed may be displayed together with
the virtual printer image PIM1.

Fig. 17 is a flow chart showing a paper feed tray
25 simulation sequence shown in Fig. 5 that is performed
by the CPU 1, in which processing steps (1) and (2) are
illustrated.



1 First, in step (1), the CPU 1 of the host computer
100 acquires paper feed tray status data from the
printer 1500. Subsequently, in step (2), the CPU 1
displays the paper size and the number of remaining
5 paper sheets of a paper feed tray which is enabled to
perform paper feed, together with the virtual printer
image PIM1, and ends the processing.

Fig. 18 is a flow chart showing an option slot
simulation sequence shown in Fig. 5 that is performed
10 by the CPU 1, in which processing steps (1) and (2) are
illustrated.

First, in step (1), the CPU 1 of the host computer
100 acquires paper feed tray status data from the
printer 1500. Subsequently, in step (2), the CPU 1
15 displays the contents of an optional ROM board and/or
an optional RAM board attached to the option slot,
together with the virtual printer image PIM3, in the
message window MW as shown in Fig. 8, and ends the
processing.

20 Fig. 19 is a flow chart showing a paper delivery
tray simulation sequence shown in Fig. 5 that is
performed by the CPU 1, in which processing steps (1)
to (11) are illustrated.

First, in step (1), the CPU 1 of the host computer
25 100 checks from printer status information acquired
whether the printer 1500 is executing paper delivery.
If NO in step (1), the CPU 1 checks whether the



1 position P6 corresponding to the paper delivery tray
shown in Fig. 6 has been designated by the cursor K
with the pointing device (not shown) for a predetermined
predetermined time. If YES in step (2), the CPU 1
5 switches the 3-dimensional display of the virtual
printer to a cross section display as shown in Fig. 20
in step (3), displaying paper feed paths PATH1 to
PATH3. If a paper feed jam occurs during the paper
feed, the CPU 1 cause a corresponding lamp to flicker
10 at the position of the jammed paper. Note that in
this printer cross section display mode, the condition
of paper being fed is displayed as graphics in real
time.

Subsequently, in the same printer cross section
15 display state, if the paper delivery unit is designated
by the cursor in step (4), and, if a predetermined time
has elapsed in this designation state in step (5), the
CPU 1 releases the printer cross section display mode
and acquires current printer status data of the printer
20 1500 in step (6). The CPU 1 then switches to the
3-dimensional display of the virtual printer in step
(7) and ends the processing. Note that the switching
between the printer cross section display mode and the
virtual printer need not be executed by the designation
25 described above but may be performed at any given
timing by another designation on the screen or



1 designation from the key board or by detecting the
change in designation status of the printer 1500.

If YES in step (1), the CPU 1 displays a paper
deliver simulation on the CRT 10 of the host computer
5 100 in step (8). In this case, if the top page of
virtual sheets of paper currently being delivered is
designated by the cursor K with the pointing device
(not shown), the CPU 1 displays the preview image of
that page on the CRT 10 of the host computer 100 in
10 step (10). The CPU 1 then waits until the paper
delivery is ended in step (11), and, when the paper
delivery is ended, ends the processing.

Although the printer 1500 and the host computer
100 are connected through an RS232C in the above
15 embodiment, the present invention is, of course,
applicable to any bidirectional interface regardless of
whether the interface is of a wired or radio type.

In some cases, a printer that is additionally
registered as a usable printer is present or the key
20 shape or the key position of a printer is changed by
changes in version or the like. Even in these
situations, however, the virtual display processing can
be realized for any such commercially available printer
by registering or updating virtual printer image data
25 or virtual panel image data from a floppy disk drive
(not shown) connectable to the host computer 100 or
from a network.

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1 WHAT IS CLAIMED IS:

1. An information processing apparatus
comprising:

5 acquiring means for acquiring information from a
printer connected through a bidirectional interface;
and

control means for controlling a display status of
a virtual printer, which is displayed on a display
screen and represents said printer, on the basis of the
10 information acquired by said acquiring means.

2. An apparatus according to claim 1, wherein the
information is stored in a memory of said printer and
indicates an operating environmental status of said
15 printer.

3. An apparatus according to claim 1, further
comprising:

displaying means for displaying said virtual
20 printer and designating means for designating portions
of said virtual printer, so that information concerning
a portion of said virtual printer designated by said
designating means is displayed on said display screen.

25 4. An apparatus according to claim 3, wherein
when the information concerning the portion of said
virtual printer designated by said designating means is





1 displayed on said display means, said designating means
changes the information concerning the portion, thereby
setting an operating environment corresponding to said
printer connected to said information processing
5 apparatus.

5. An apparatus according to claim 4, wherein the
information concerning the portion of said virtual
printer designated by said designating means indicates
10 an operation panel of said printer connected to said
information processing apparatus.

6. An apparatus according to claim 1, wherein
said information processing apparatus is a host
15 computer.

7. An output apparatus comprising:
setting means for setting an operating
environment; and
20 changing means for changing operating environment
information set by said setting means on the basis of
information acquired from an information processing
apparatus connected through a bidirectional interface.

25 8. An apparatus according to claim 7, wherein
said setting means is an operation panel of said output
apparatus.



1 9. An apparatus according to claim 7, further
comprising:

 inhibiting means for causing said setting means to
inhibit setting the operating environment information
5 performed said changing means changes the operating
environment information on the basis of the information
acquired.

 10. An apparatus according to claim 7, wherein
10 said information processing apparatus is a host
computer.

 11. An apparatus according to claim 7, wherein
said output apparatus is a laser beam printer.

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