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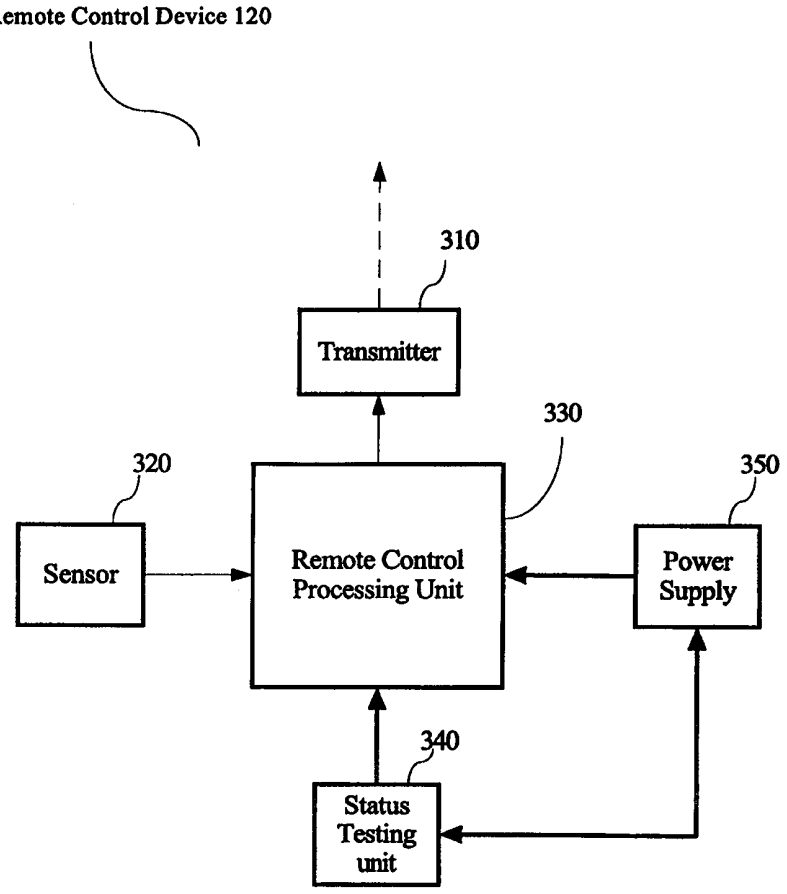
(54) Title: SYSTEM FOR MONITORING REMOTE DEVICE STATUS

(57) Abstract

A remote control device (120) includes a status testing unit (340) for testing or measuring at least one aspect of device operational status, such as battery voltage. The status testing unit generates status information in accordance with the test results, and the information is processed and transmitted to a media system (110), such as a videoconferencing system. The status information is received by the media system, and messages alerting the user as to a potential malfunction of the remote control device and directing the user to take corrective action may be presented on an audiovisual output device (130). The media system may also be provided with a network interface (270) enabling the conveyance of device status messages to other devices coupled to the network.



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SYSTEM FOR MONITORING REMOTE DEVICE STATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to remote control devices and more particularly to remote control devices having a status monitoring feature.

2. Description of the Background Art

Media systems, such as videoconferencing units, have become increasingly important business communications tools. These media systems are typically operated by user manipulation of one or more remote control devices. The remote control devices provide a user-friendly operational interface and further enable the user to be relatively mobile while operating the associated media system.

Because remote control devices have developed into an essential component of many media systems, the reliable operation of the remote control devices is key to the successful and efficient utilization of the associated media system. Unfortunately, remote control devices in the prior art do not possess a self-monitoring capability, and are consequently prone to fail without warning, in turn rendering the controlled media system inconvenient or impossible to use. For example, remote control units are typically powered by one or more dry-cell batteries, which experience a drop in output voltage over time. Once the output voltage drops below a threshold value, the remote control unit becomes partially or fully inoperative. This lack of sufficient power is only recognized, however, after the user attempts to use the remote control device. The user is then presented with the choice of operating the system by manipulating controls located on the media system console, which substantially reduces the user's

mobility and may reduce the media system functionality, or of attempting to secure suitable replacement batteries. Remedying the problem will often require temporarily suspending or postponing the business activity for which the media system is being employed. If, for example, the media system is being used for a sales presentation or a videoconference with clients, an interruption in the operation of the media system to locate new batteries may compromise the professional image of the user and may in turn result in lost business opportunities or have similar adverse effects.

In view of the foregoing discussion, there exists a need for a remote control device having a self-monitoring capability, wherein aspects of the device status are tested periodically and the user is forewarned of any potential malfunction, such as a low-battery condition. In this manner, a potential remote control device malfunction may be remedied prior to use of the device in a business setting.

SUMMARY OF THE INVENTION

The present invention provides a system and method for monitoring the status of a remote control device employed to remotely operate another device or system, such as a videoconferencing system. The remote control device includes a status testing unit for testing or measuring at least one aspect of the remote control device operational status. In a first embodiment of the invention, the status testing unit is configured to test the output voltage of the power supply of the remote control device.

The status testing unit generates a status testing signal in accordance with a test result or measured quantity. Testing of the operational status of the remote control device may be performed at predetermined intervals, which may comprise time intervals or a certain number of operations. The status testing signal is received by a remote control device processing unit coupled to the status testing unit. The remote control device processing unit then sends a characteristic signal

to a transmitter incorporated into the remote control device and coupled to the remote control device for transmission to a receiving unit. The transmitter may comprise an infrared light emitting diode configured to transmit signals to a corresponding photodiode disposed on the receiving unit.

According to the first embodiment of the invention, the receiving unit is incorporated into an audiovisual control unit, which processes the received signal and conveys appropriate audiovisual signals to an audiovisual output device for presentation to the user. For example, the audiovisual output unit may display an icon indicating to the user that the power supply voltage is low and that corrective action should be taken.

In accordance with another aspect of the invention, the audiovisual control unit may be connected to a network via a network interface. The audiovisual control unit may then direct messages regarding the status of the remote control device, for example in the form of electronic mail messages, to other devices connected to the network.

BRIEF DESCRIPTIONS OF THE DRAWINGS

FIG. 1 is a block diagram of a media system according to the present invention;

FIG. 2 is a block diagram illustrating in more detail the audiovisual control unit of the media system of FIG. 1;

FIG. 3 is a block diagram of an exemplary remote control device according to the present invention;

FIG. 4 is a circuit diagram of an exemplary status testing unit for testing power supply output voltage;

FIG. 5 is a flowchart illustrating the method of monitoring a device;

FIG. 6 is an example of a visual status alert icon presented to the user.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention provides a novel remote control device capable of monitoring aspects of its status and alerting the user as to potential device malfunction. Numerous details are set forth below to illustrate the invention, but it is appreciated that the invention may be practiced apart from those specific details. In other instances, details of well-known systems and devices are omitted for the purposes of brevity and clarity.

FIG. 1 is a block diagram of a media system 100 according to a first embodiment of the invention. In the first embodiment, the media system 100 comprises an audiovisual conferencing system of the type employed to facilitate meetings of persons or groups of persons located remotely from each other. The media system 100 includes a media device 110 for processing and presenting audiovisual information and a remote control device 120 for controlling various functions of the media device. The media device 110 includes an audiovisual control unit 140 which conveys signals to an audiovisual output device 130 according to the desired audiovisual information to be presented. The audiovisual information may comprise, for example, video or still images, recorded or live sound signals, computer output and the like. Although the audiovisual control unit 140 is depicted as distinct from the audiovisual output device 130 in the preferred embodiment, the audiovisual control unit 140 may alternatively be integrated with the audiovisual output device 130.

The audiovisual output device 130 may comprise any suitable device or combination of devices capable of presenting audiovisual information in accordance with signals received thereby. For example, the audiovisual output device 130 may comprise a television monitor, a cathode ray tube (CRT) type computer monitor, or a flat screen monitor such as a liquid crystal display (LCD) monitor, each coupled to one or more speakers for presenting the audio component of the audiovisual information.

The remote control device 120 is configured to transmit control signals to be received by the audiovisual control unit 140. Control signals may be transmitted in response to user input, such as engaging a button on the remote control device 120. Additionally, the remote control device 120 may be configured to transmit control signals at predetermined event or time intervals, such as after a certain number of operations 300 uses or at predetermined periods of time. In response to control signals transmitted thereto by the remote control device 120, the audiovisual control unit 140 conveys audiovisual signals to the audiovisual output device 130. The audiovisual output device 130 receives the audiovisual signals from the audiovisual control unit 140 and, in response to such signals, presents visual images and audio output.

In accordance with the present invention, the remote control device 120 advantageously includes a status testing unit 340 for measuring or testing one or more aspects of the status of the remote control device 120. In the first embodiment of the invention described and depicted herein, the status testing unit 340 measures the output voltage of the remote control device power supply 350 (typically, one or more dry-cell batteries). If the measured voltage is less than a predetermined value, the remote control device 120 transmits a status signal to the audiovisual control unit 140 characterizing the present status of the remote control device 120. This status signal is received by the audiovisual control unit 140, which in turn conveys information to the audiovisual output device 130 such that an image or sound message is presented to the user alerting the user as to the imminent malfunction of the remote control device 120. Alternatively or additionally, the audiovisual control unit 140 may convey status information via a network interface 270 to one or more persons responsible for maintaining the media system 100.

Referring now to FIG. 2, the audiovisual control unit 140 is represented in further detail. The audiovisual control unit 140 includes a processing unit 210

coupled to a read only memory (ROM) 220, random access memory (RAM) 240, a signal receiver 230, audiovisual input ports 250, audiovisual output ports 260, and a network interface 270. The signal receiver 230 is configured to receive control signals transmitted by the remote control device 120 and translate the control signals into digital form for use by the processing unit 210. As is well known in the art, the signal receiver 230 may comprise a photodiode for receiving infrared signals transmitted by a corresponding light-emitting diode located on the remote control device 120. Alternatively, communication between the remote control device 120 and the audiovisual control unit 140 may be implemented using radio-frequency signals or acoustic signals.

The audiovisual control unit 140 may be coupled to one or more input devices via the input ports. The input devices may comprise, for example, a microphone, a video camera, or a personal computer. The signals received from these devices may be processed by the processing unit 210 in accordance with instructions stored in ROM 220 or RAM 240, and the processed signals conveyed to the audiovisual output device130 for presentation thereby.

As will be discussed further in connection with FIGS. 5 and 6, the processing unit 210 may also selectively output information to the network interface 270. The network interface 270 sends this output information to a network or network device such as a local area network (LAN), wide-area network (WAN), integrated services digital network (ISDN), or a plain old telephone service (POTS). This information may then be distributed to selected devices coupled to the network. For example, the output information may comprise instructions for transmitting text to a user on the network, such as an e-mail message to a network administrator. Alternatively, the information may comprise instructions in a network management protocol, such as Simple Network Management Protocol (SNMP), which can use agents to monitor the activity of the various devices on the network and report to the network console workstation.

A second alternative includes the use of instructions or messages sent over the internet using attached network devices. The output information may also include instructions for receiving digital input from another source attached to the network or network device, such as an image stored on a computer on the network.

Referring now to FIG. 3, a block diagram of the remote control device 120 is shown. The remote control device 120 includes a remote control processing unit 330 coupled to one or more sensors 320, a transmitter 310, a power supply 350 and a status testing unit 340. The processing unit 330, transmitter 310, and status testing unit 340 are powered by the power supply 350 which preferably comprises one or more batteries. Alternatively, the power supply 350 may comprise a solar cell. The remote control device 120 may optionally include a switch or motion sensor coupled to the processing unit to detect that the remote control device 120 has been picked up or moved from a rest position.

The sensors 320, which may comprise buttons, multiposition switches, joysticks, touchpads and the like, are engaged by the user to selectively effect various functions. In response to user manipulation of one or more of the sensors 320, a characteristic signal is conveyed to the remote control processing unit 330. The processing unit 330 processes the signal and relays the processed signals to the transmitter 310, which in turn communicates the signal to the audiovisual control unit 140 to achieve the desired operation. As alluded to above, the transmitter 310 is preferably of the infrared type and comprises a light emitting diode configured to transmit signals to be received by the audiovisual control unit 140 receiver.

The remote control device 120 further includes a status testing unit 340 to test or measure one or more aspects of the remote control device 120 status. According to the first embodiment of the invention, the status testing unit 340 is configured to measure the output voltage of the power supply 350. The status

testing unit 340 may perform the measurement at predetermined intervals of time, after a certain number of operations have been performed, or upon the occurrence of certain events. In the preferred embodiment, the status testing unit 340 performs the measurement when a sensor in the remote control device 120 senses that the remote control device is being moved from rest position. If the status testing unit 340 detects that the output voltage is below a predetermined minimum value (which is selected to exceed the value at which the remote control device 120 becomes inoperative by a sufficient amount so as to provide adequate warning of future malfunction), then the status testing unit 340 sends an alert signal to the remote control processing unit 330. In response to receiving the power alert signal, the remote control processing unit 330 transmits a characteristic signal to the audiovisual processing unit 210 indicating that power supply 350 is low. The audiovisual processing unit 210 may then send appropriate signals to the audiovisual output device 130 to present a warning to the user and alert the user to take corrective action (e.g., replace batteries in the remote control device 120).

Additionally or alternatively, it may be desirable to send a status alert message to one or more persons via the network interface 270 and network. For example, upon receiving the characteristic signal from the remote control device 120, the audiovisual processing unit 210 may convey a message, such as an electronic mail message, to a facilities manager or other responsible party identifying the location of the remote control device 120 and the corrective action required. This may further include transmitting information over the network comprising instructions in a network management protocol, such as Simple Network Management Protocol (SNMP), which can use agents to monitor the activity of the various devices on the network and report to the network console workstation. A second alternative includes the use of instructions or messages sent over the internet using attached network devices.

Referring now to FIG. 4, a power monitoring circuit 400 is shown for testing the voltage of the power supply 350 for the remote control device 120. The power monitoring circuit 400 is comprised of a power supply 350 and a status testing unit 340. Status testing unit 340 is further comprised of resistors 420 and a status testing microprocessor 410. In the preferred embodiment, the status testing microprocessor is a single chip microcontroller. In an alternative embodiment, the status testing microprocessor is a series of microcontrollers configured to transmit information when a specific power level is reached. The power supply 350 preferably comprises one or more dry cell batteries but could also be a solar cell or other source of battery power.

In the normal operation, remote control device 120 receives power from the power supply 350 and the power monitoring circuit 400 is circumvented. As described above, the status testing microprocessor 410 performs a power test at predetermined intervals of time, after a certain number of operations are performed, or upon occurrence of certain events. In the preferred embodiment, the status testing microprocessor 410 performs the measurement when a sensor in the remote control device 120 senses that the remote control device 120 is being moved from rest position. When the triggering event occurs, the status testing unit 340 is initiated and tests the power supply 350 of the remote control.

In the illustrated example, testing the power supply 350 may incorporate the use of resistors 420, in either a series or parallel circuit, or any other device which helps measure the current of a power supply 350 in a circuit. In the preferred embodiment, the status testing microprocessor 410 is configured to receive an indication of the current resistance at input 405. If the current at input 405 indicates that the battery is no longer functioning at the optimal level, the status testing unit 340 sends an alert signal to the processing unit 330 (not shown) of the remote control device 120. If the current at input 405 indicates that the battery is functioning at the optimal level, then the status testing microprocessor 410 is rest

and the status testing circuit 400 is closed to prevent additional loss of power. In an alternative embodiment, a series of microcontrollers receive information about the power supply 350 and transmit a unique signal based on a range of values. For instance, one micrcontroller may send a signal when the battery is at a capacity between one quarter and one half of optimal while another may only transmit signals once the power is less than one quarter capacity. This provides the user with detailed information about the status of the device 120 aiding in maintenance of the unit.

FIG. 5 depicts the steps of a method 500 for monitoring the status of the remote control device 120. The method begins in step 510 by initiating the status testing unit 340. In the first embodiment, the unit 340 may be initiated by detected movement from a rest position. Alternatively, the unit 340 is responsive to sensors 320 being engaged.

After the status testing unit 120 is initiated, the remote control processing unit 330 determines whether a predetermined interval has passed since the previous testing cycle. The interval may be based on a certain number of operations (e.g., sensor manipulations) or may be a fixed time period. If the remote control processing unit 330 determines that the predetermined interval has not passed, then the method 500 ends. If, however, the remote control processing unit 330 finds that the predetermined interval has passed since the previous test, then the operation of status testing unit 340 is initiated.

In step 520, the status testing unit 340 is directed to perform tests or measurements of aspects of the device 120 status. In step 530, the status testing unit 340 is directed to transmit a warning if the unit fails any of the status tests. In the first embodiment, tests include measuring the power supply 350 output voltage. If the power supply 350 output voltage exceeds the minimum acceptable value, then the method ends. If the measured voltage is below the minimum value,

then the status testing unit 340 conveys an alert signal to the processing unit of the remote device.

FIG. 6 is an example of the image 600 that can be displayed on the audiovisual output device 130 in the event that the remote control status testing unit 340 determines that the power supply 350 voltage is below the minimum acceptable value. The remote control device 120 transmits the information to the audiovisual control unit 140 by transmitting a characteristic signal indicating the power test has failed. The audiovisual control unit 140 receives the signal and sends another command over the network or outputs an image 600 or sound via the audiovisual output device 130 thereby alerting the user to the status of the remote device. In the present example, the audiovisual output device 130 displays the image 600 of a pair of batteries along with a message indicating that the batteries need to be replaced.

It is to be recognized that aspects of remote control device 120 status other than battery voltage may be monitored by the system and method of the present invention. For example, the status testing unit 340 may run tests to insure that all sensors 320 are working correctly. Other aspects of remote control device 120 status which may be advantageously tested will occur to those skilled in the art. Further, although the invention has been described in the context of its implementation in a particular environment and for particular applications, e.g., videoconferencing systems, those skilled in the art will recognize that its usefulness is not limited thereto and that the present invention can be beneficially utilized in any number of environments and implementations. Accordingly, the claims set forth below should be construed in view of the full breadth and spirit of the invention as disclosed herein.

WHAT IS CLAIMED IS:

1. A self-monitoring remote control device comprising:

a status testing unit incorporated into the remote control device for testing at least one aspect of the operational status of the remote control device;

a remote control processing unit coupled to the status testing unit for processing status information received from the status testing unit;

a transmitter incorporated into the remote control device and coupled to the remote control processing unit, for transmitting processed status information.

2. The self-monitoring remote control device of claim 1, wherein the remote control device is powered by at least one battery, and the status testing unit tests the output voltage of the at least one battery.

3. The self-monitoring remote control device of claim 1, wherein the transmitter comprises an infrared light emitting diode.

4. The self-monitoring remote-control device of claim 1, wherein the status testing unit is configured to test the at least one aspect of the operational status at a predetermined interval.

5. The self-monitoring remote control device of claim 4, wherein the interval comprises a fixed time interval.

6. A system for remotely monitoring device status, the system comprising:

a first device including a transmitter for transmitting information;

a second device situated remotely from the first device, the second device including a receiver for receiving information transmitted thereto by the first device;

a status testing unit incorporated into the first device for testing at least one aspect of the operational status of the first device and accordingly generating status test information; and

a first device processing unit incorporated into the first device and coupled to the status testing unit and to the transmitter, for processing status test information received from the status testing unit and directing the transmitter to transmit a status signal in accordance with the processed status test information.

7. The system of claim 6, wherein the first device comprises a remote control device.

8. The system of claim 6, wherein the second device comprises an audiovisual display unit for presenting a message to the user in accordance with the status signal received from the first device.

9. The system of claim 6, wherein the second device further comprises a network interface coupled to a network for selectively conveying a message to at least one other device coupled to the network in accordance with the status signal received from the first device.

10. The system of claim 6, wherein the transmitter comprises an infrared light emitting diode and the receiver comprises a photodiode.

11. The system of claim 6, wherein the transmitter comprises a radio frequency transmitter and the receiver comprises a radio frequency receiver.

12. The system of claim 6, wherein the second device comprises a videoconferencing unit.

13. The system of claim 6, wherein the first device is powered by at least one battery, and the status testing unit measures the output voltage of the at least one battery.

14. The system of claim 6, wherein the status testing unit is configured to test the at least one aspect of the first device operational status at a predetermined interval.

15. The system of claim 14, wherein the interval is a fixed time interval.

16. Apparatus for remote monitoring of device status, comprising:

means for testing at least one aspect of the operational status of a first device and generating status information in accordance therewith;

means coupled to the testing means for processing the generated status information; and

means coupled to the processing means for transmitting a signal to a second device in accordance with the processed status information.

17. The apparatus of claim 16, wherein the testing means measure an output voltage of at least one battery powering the first device.

18. A method for monitoring a remote control device, the method comprising the steps of:

testing at least one aspect of the operational status of the remote control device and generating status information in accordance with the status test results;

processing the status information; and

transmitting the processed status information to a receiving unit.

19. The method of claim 18, wherein the testing step comprises testing the output voltage of at least one battery, the at least one battery powering the remote control unit.

20. The method of claim 18, further comprising the step of selectively distributing over a network the processed status information received by the receiving unit.

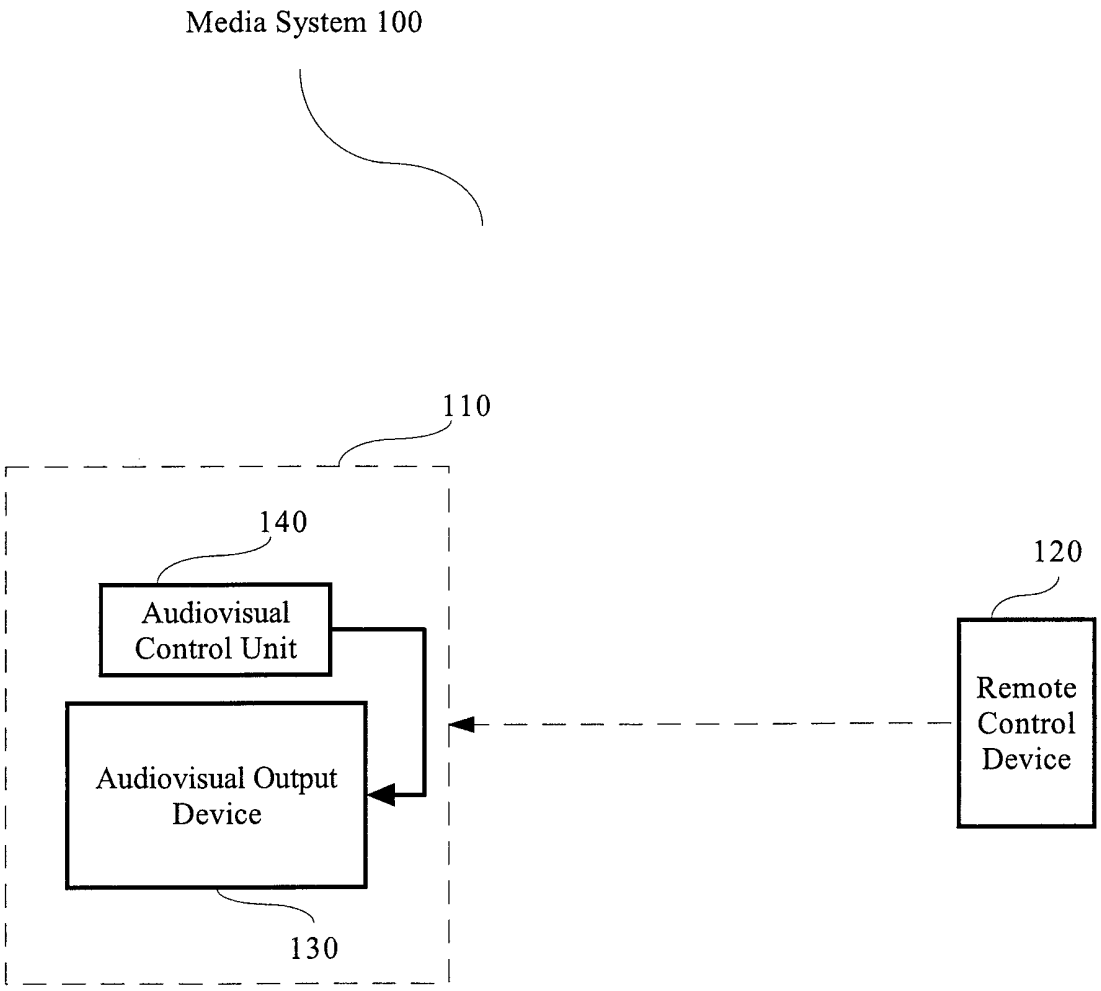
Media System 100
110
140
Audiovisual Control Unit
Audiovisual Output Device
130
120
Remote Control Device

FIG. 1

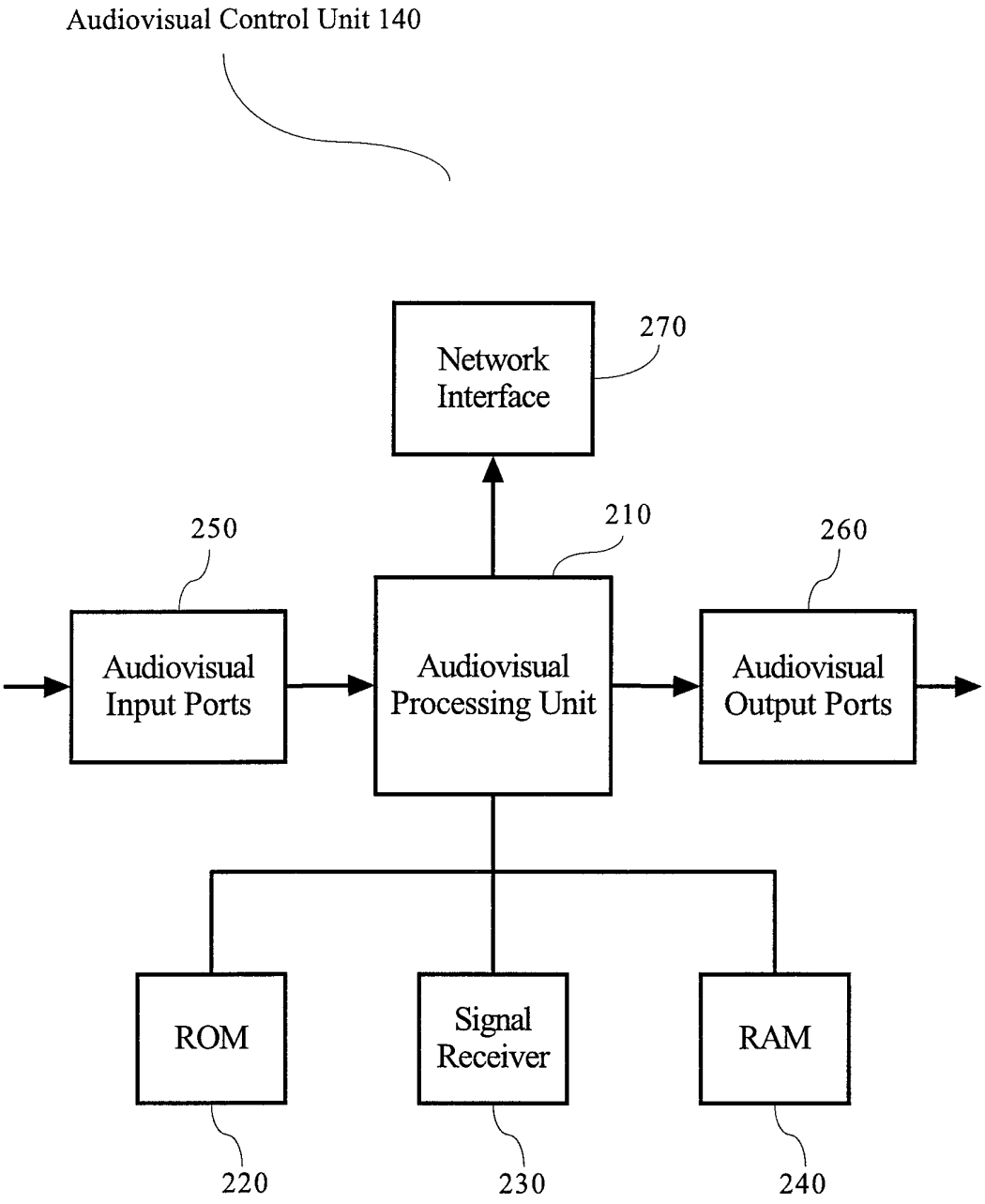
Audiovisual Control Unit 140
Network Interface
270
250
210
260
Audiovisual Input Ports
Audiovisual Processing Unit
Audiovisual Output Ports
ROM
Signal Receiver
RAM
220
230
240

FIG. 2

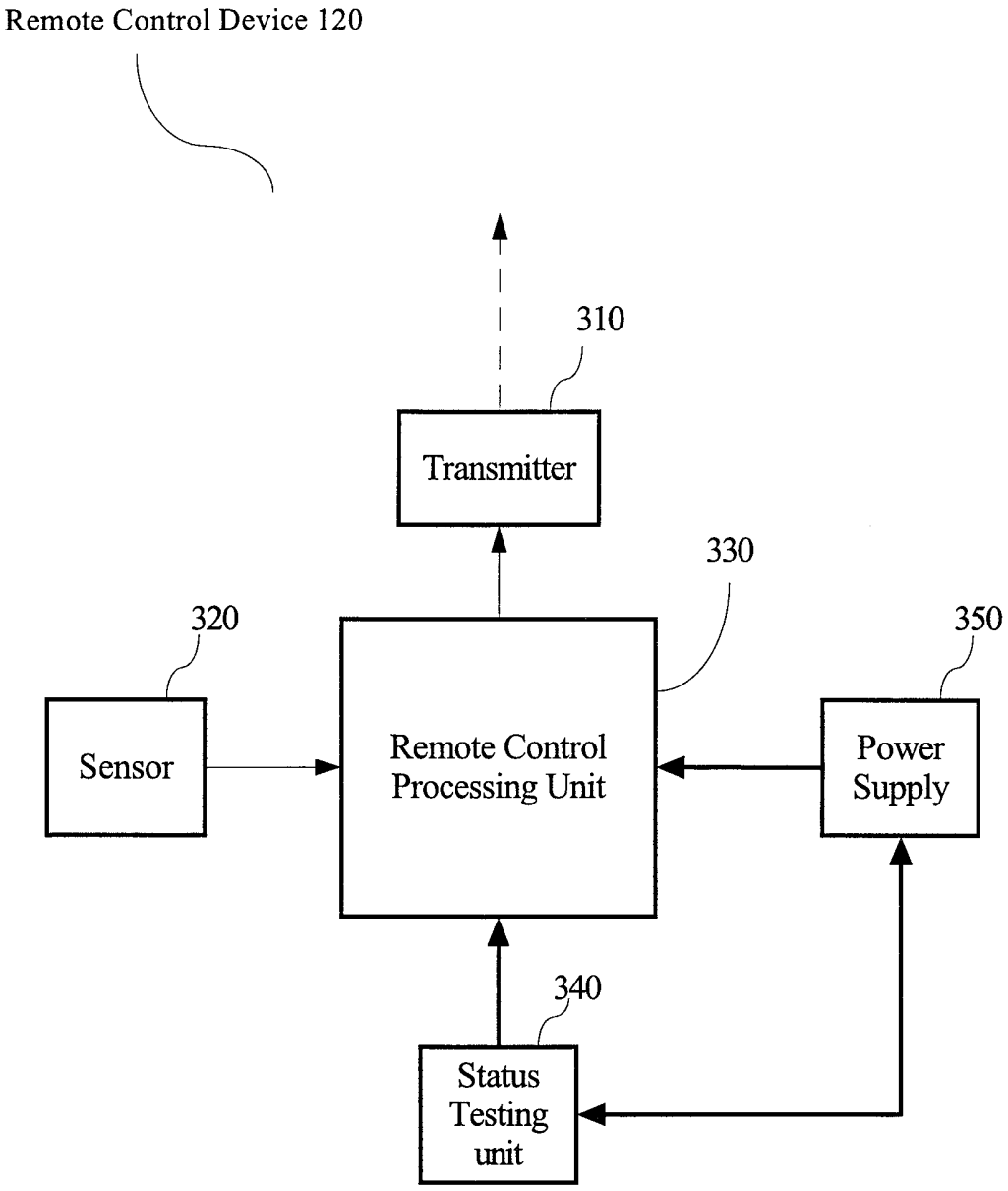
Remote Control Device 120
310
Transmitter
330
320
350
Sensor
Remote Control Processing Unit
Power Supply
340
Status Testing unit

FIG. 3

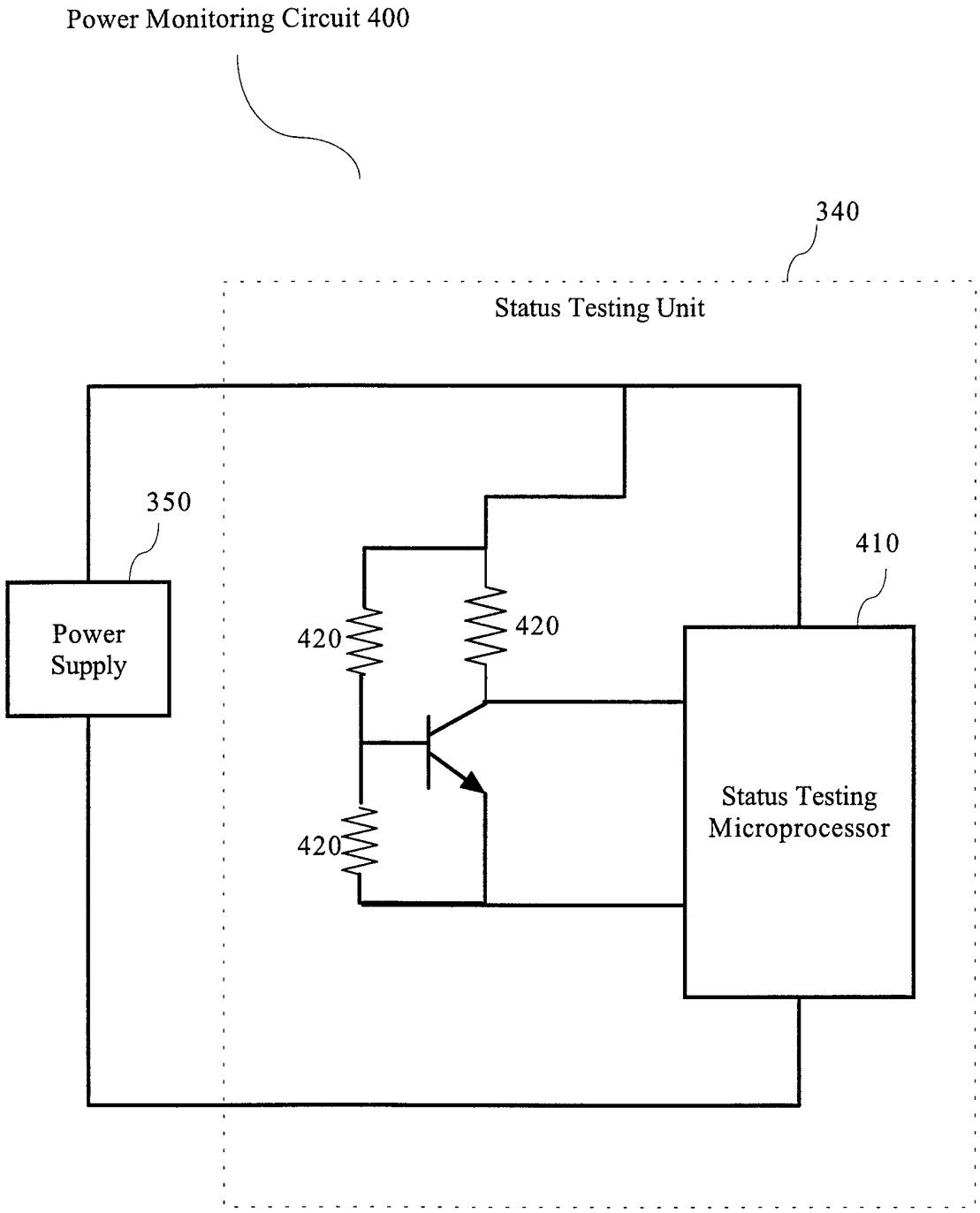
Power Monitoring Circuit 400
340
Status Testing Unit
350
Power Supply
420
420
420
410
Status Testing Microprocessor

FIG. 4

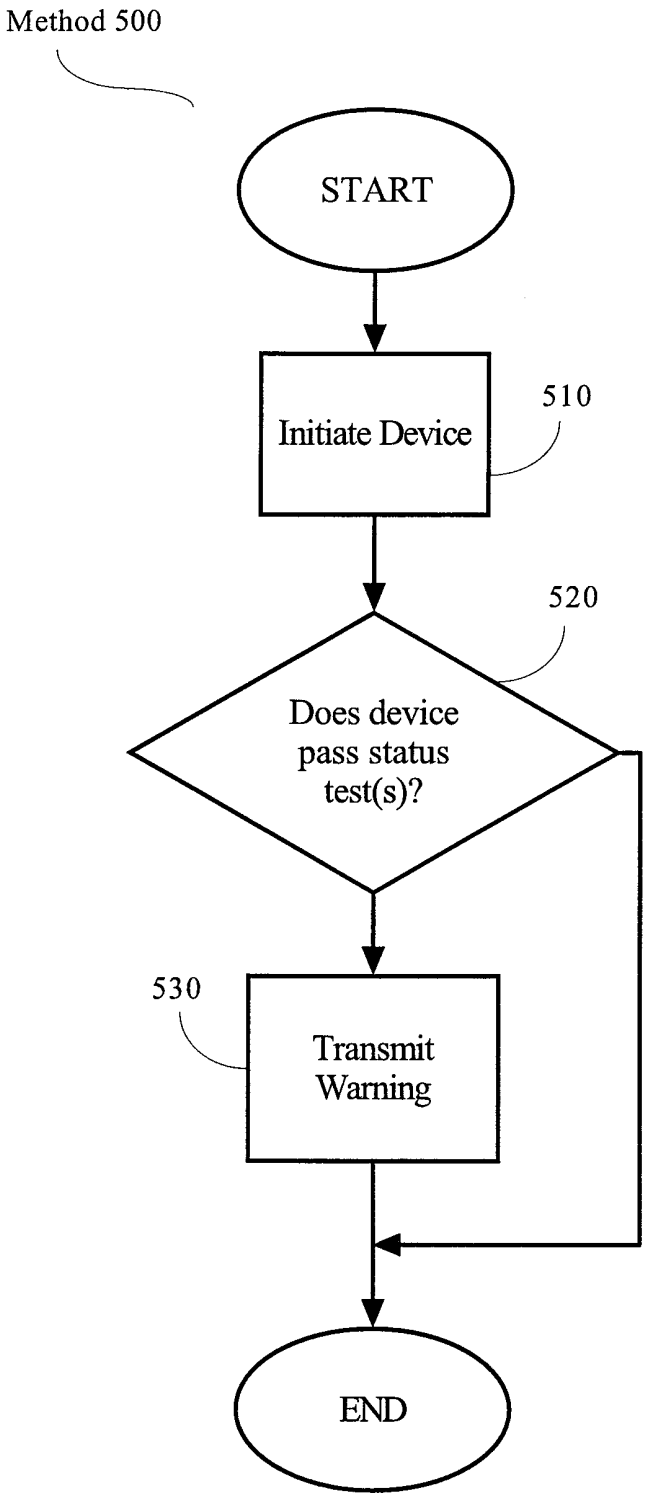
Method 500
START
Initiate Device
510
520
Does device pass status test(s)?
530
Transmit Warning
END

FIG. 5

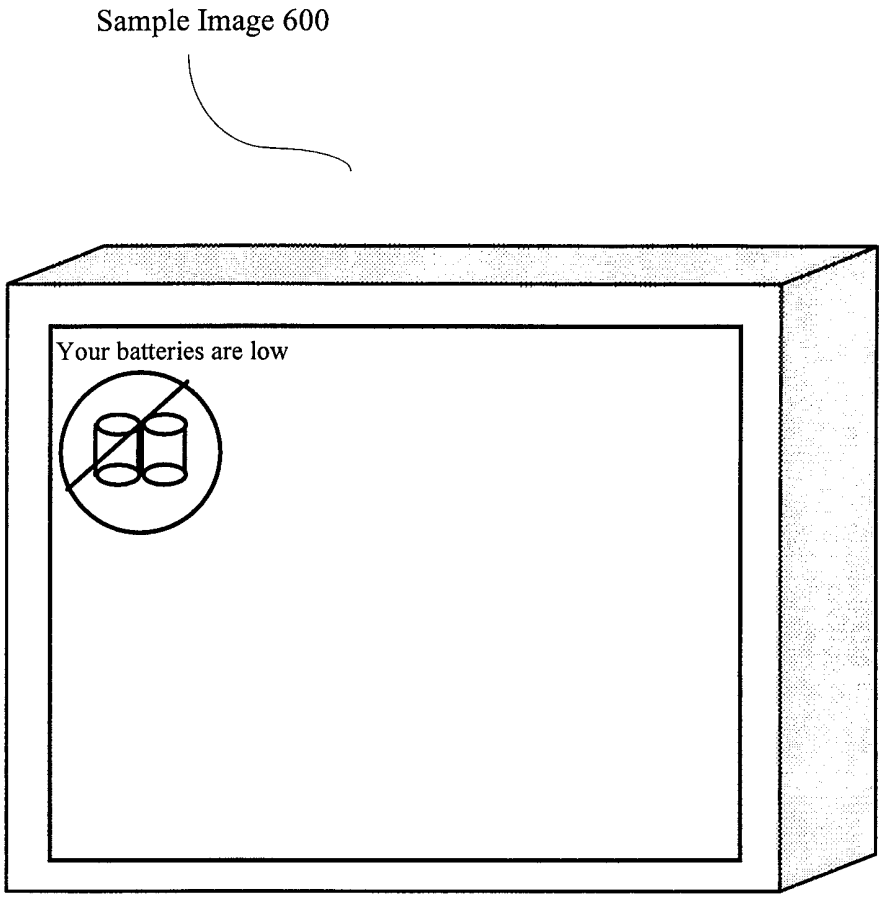

FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/15184

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :G08C 19/00
US CL : 340/825.72, 825.69

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 340/825.72, 825.69, 825.57; 348/734

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

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

APS search terms: remote control, low battrey, low power, 340/825.57-825.78

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ---- Y	US 5,583,491 A (KIM) 10 DECEMBER 1996, col 1 lines 8-13 and 61-67, col 2 lines 3-12 and 30-62, col 3 lines 40-65, col 4 lines 3-17.	1-8, 10-19 9, 20
Y	US 5,081,534 A (GEIGER ET AL.) 14 JANUARY 1992, ABSTRACT lines 1-7, col 5 lines 11-19.	9, 20

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

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
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Date of the actual completion of the international search 07 OCTOBER 1998	Date of mailing of the international search report 12 JAN 1999
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