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Stone

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[54] **AUTOMATION AND DIAL-TIME CHECKING OF SYSTEM CONFIGURATION FOR INTERNET**

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[73] Assignee: **Microsoft Corporation**, Redmond, Wash.

[21] Appl. No.: **634,389**

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[51] **Int. Cl.**[6] **G06F 17/00**

[52] **U.S. Cl.** **395/200.5**

[58] **Field of Search** 395/200.5, 200.59, 395/200.56, 200.34, 200.35, 186, 187.01, 608

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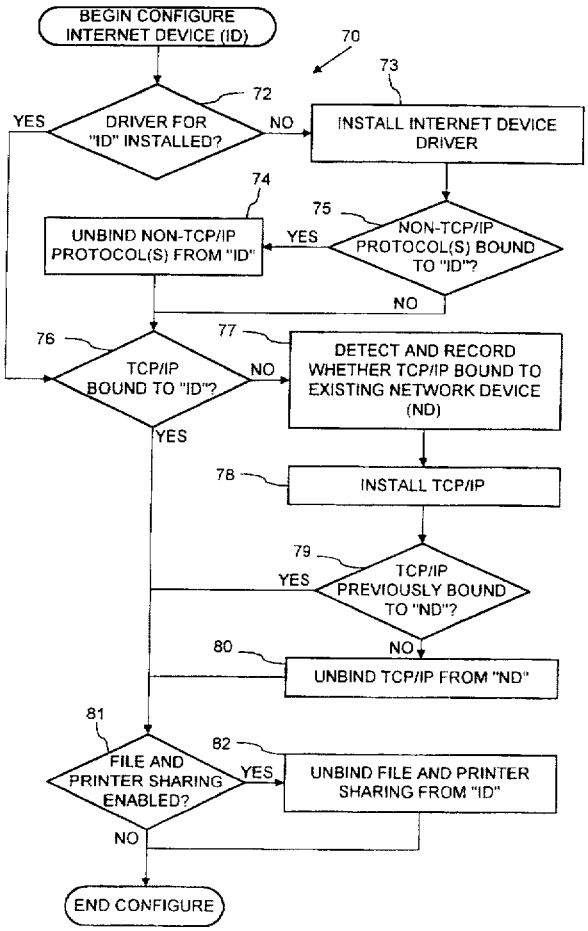
Primary Examiner—Ellis B. Ramirez

Attorney, Agent, or Firm—Klarquist Sparkman Campbell Leigh & Whinston

[57] **ABSTRACT**

Networking software is configured for connecting to the Internet with a set-up automation software without disturbing the networking software's configuration for connecting to another computer network, such as a corporate local area network. Where installing the TCP/IP network protocol for communicating on the Internet also causes binding to a device configured for connecting to the other computer network, the set-up automation software records whether the TCP/IP network protocol was previously bound to that device and unbinds the TCP/IP network protocol from the device after installing the TCP/IP network protocol if not previously bound to the device. The set-up automation software also unbinds file and printer sharing services from a device used for connecting to the Internet. Where a dial-up device is used for connecting to the Internet, a dial-time security check and configuration check software verifies that the network software is correctly and securely configured for connecting to the Internet. The dial-time check software warns the user and corrects the configuration if the configuration is incorrect or insecure.

22 Claims, 11 Drawing Sheets



Google Exhibit 1052
Google v. VirtaMove

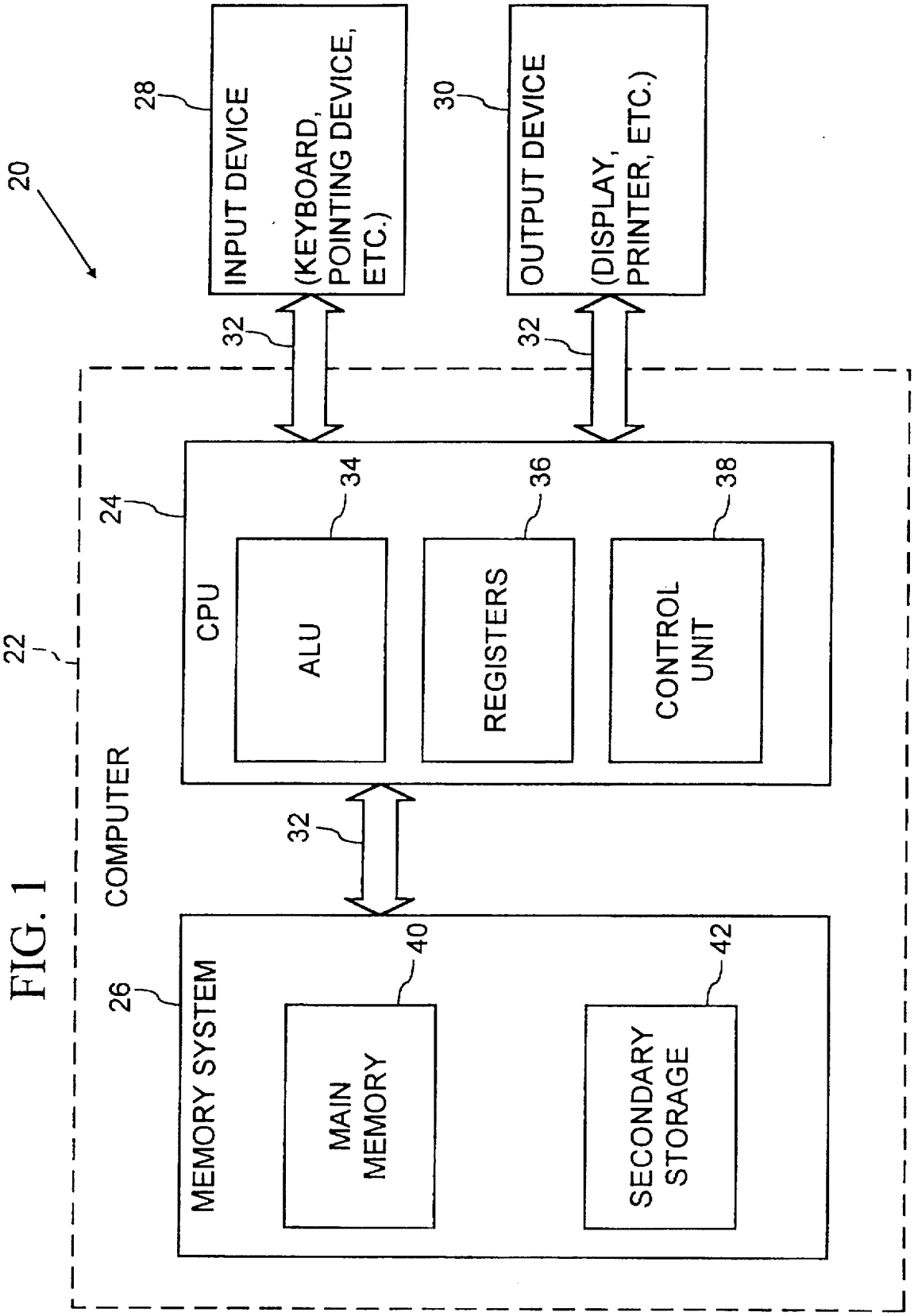

20
22
COMPUTER
28
INPUT DEVICE
(KEYBOARD, POINTING DEVICE, ETC.)
30
OUTPUT DEVICE
(DISPLAY, PRINTER, ETC.)
32
32
24
CPU
34
ALU
36
REGISTERS
38
CONTROL UNIT
32
26
MEMORY SYSTEM
40
MAIN MEMORY
42
SECONDARY STORAGE

FIG. 1

FIG. 2

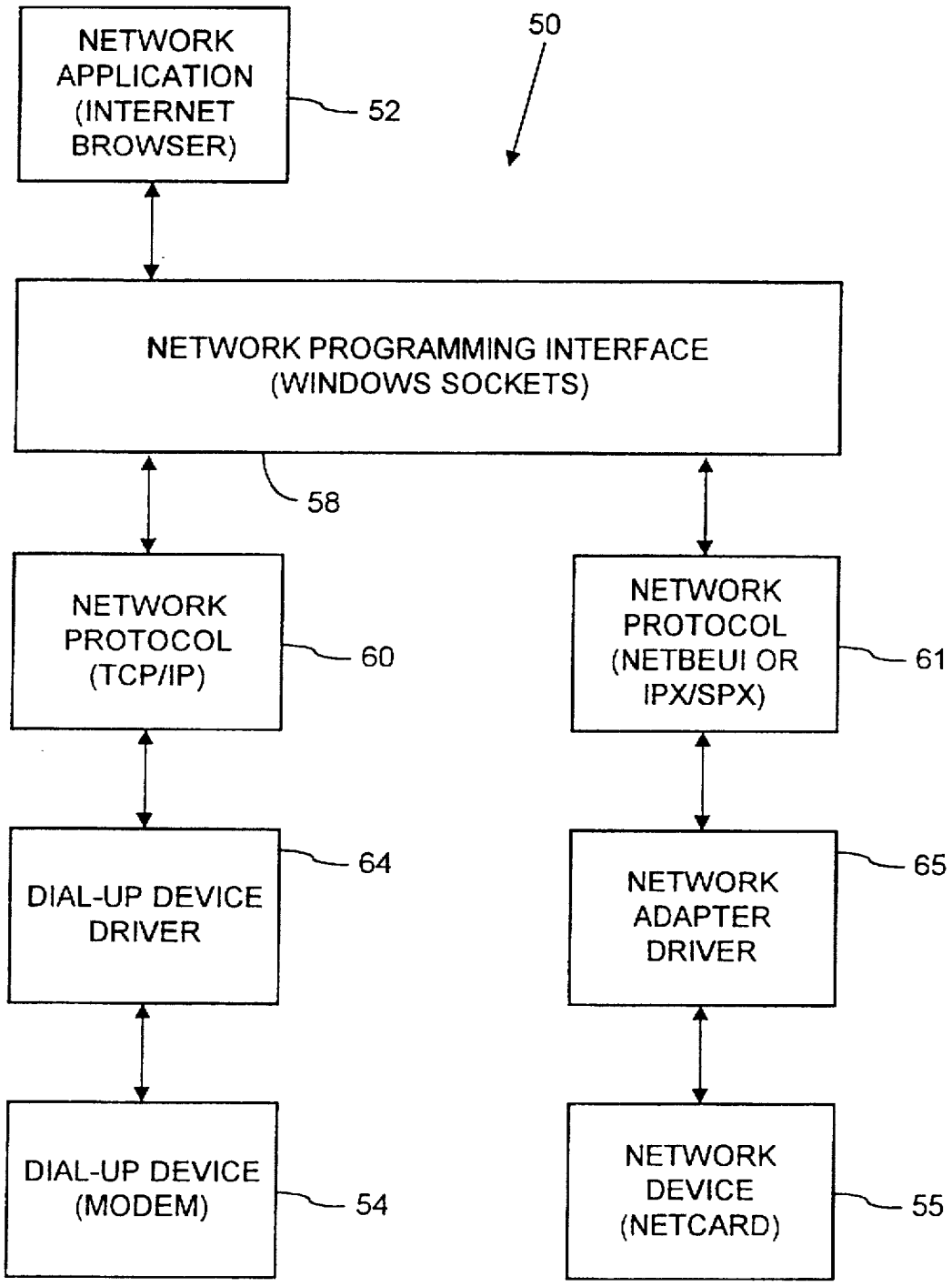
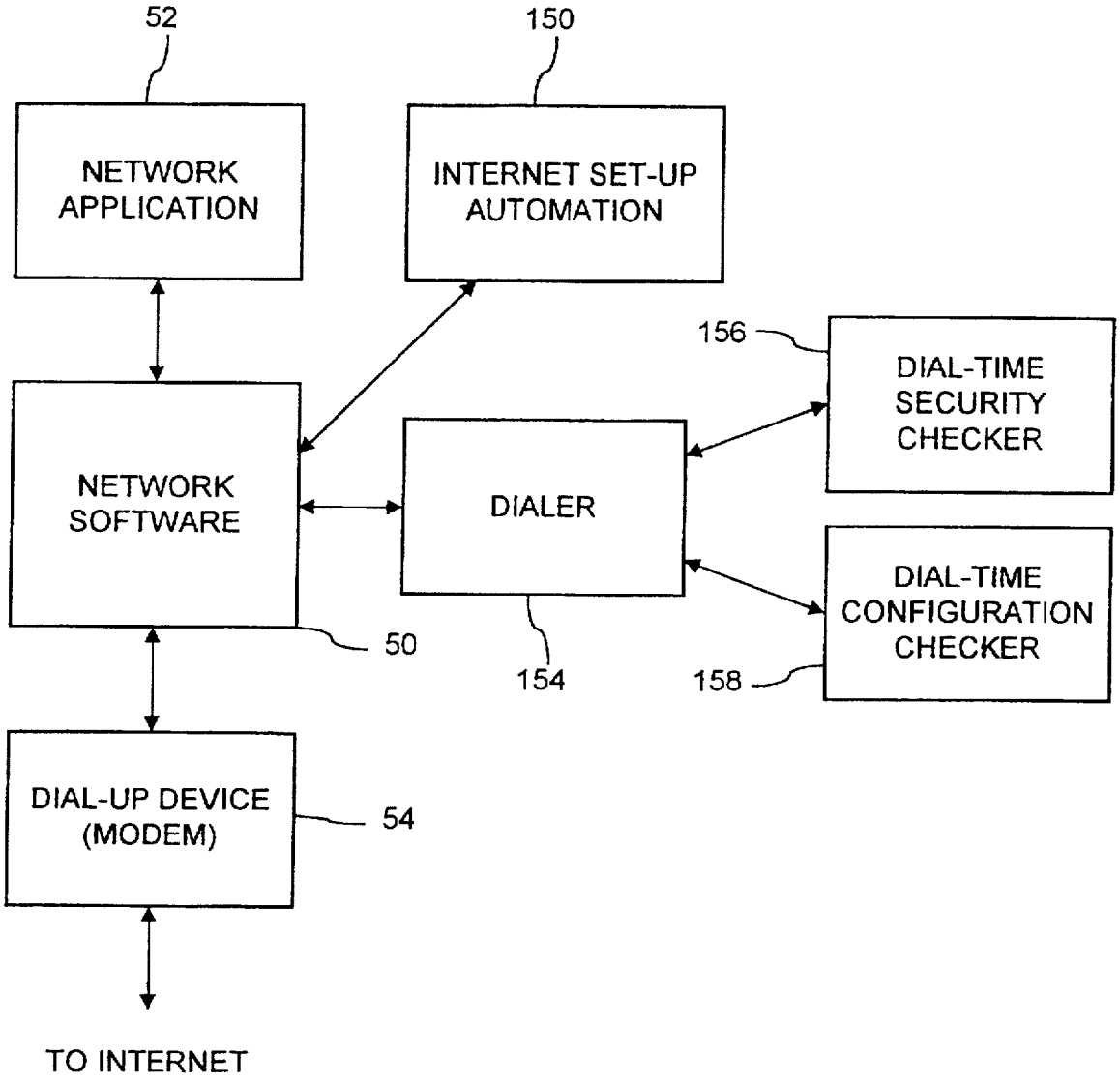

NETWORK APPLICATION (INTERNET BROWSER)
52
50
NETWORK PROGRAMMING INTERFACE (WINDOWS SOCKETS)
58
NETWORK PROTOCOL (TCP/IP)
60
NETWORK PROTOCOL (NETBEUI OR IPX/SPX)
61
DIAL-UP DEVICE DRIVER
64
NETWORK ADAPTER DRIVER
65
DIAL-UP DEVICE (MODEM)
54
NETWORK DEVICE (NETCARD)
55

FIG. 3


52
150
NETWORK APPLICATION
INTERNET SET-UP AUTOMATION
156
DIAL-TIME SECURITY CHECKER
NETWORK SOFTWARE
DIALER
DIAL-TIME CONFIGURATION CHECKER
50
154
158
DIAL-UP DEVICE (MODEM)
54
TO INTERNET

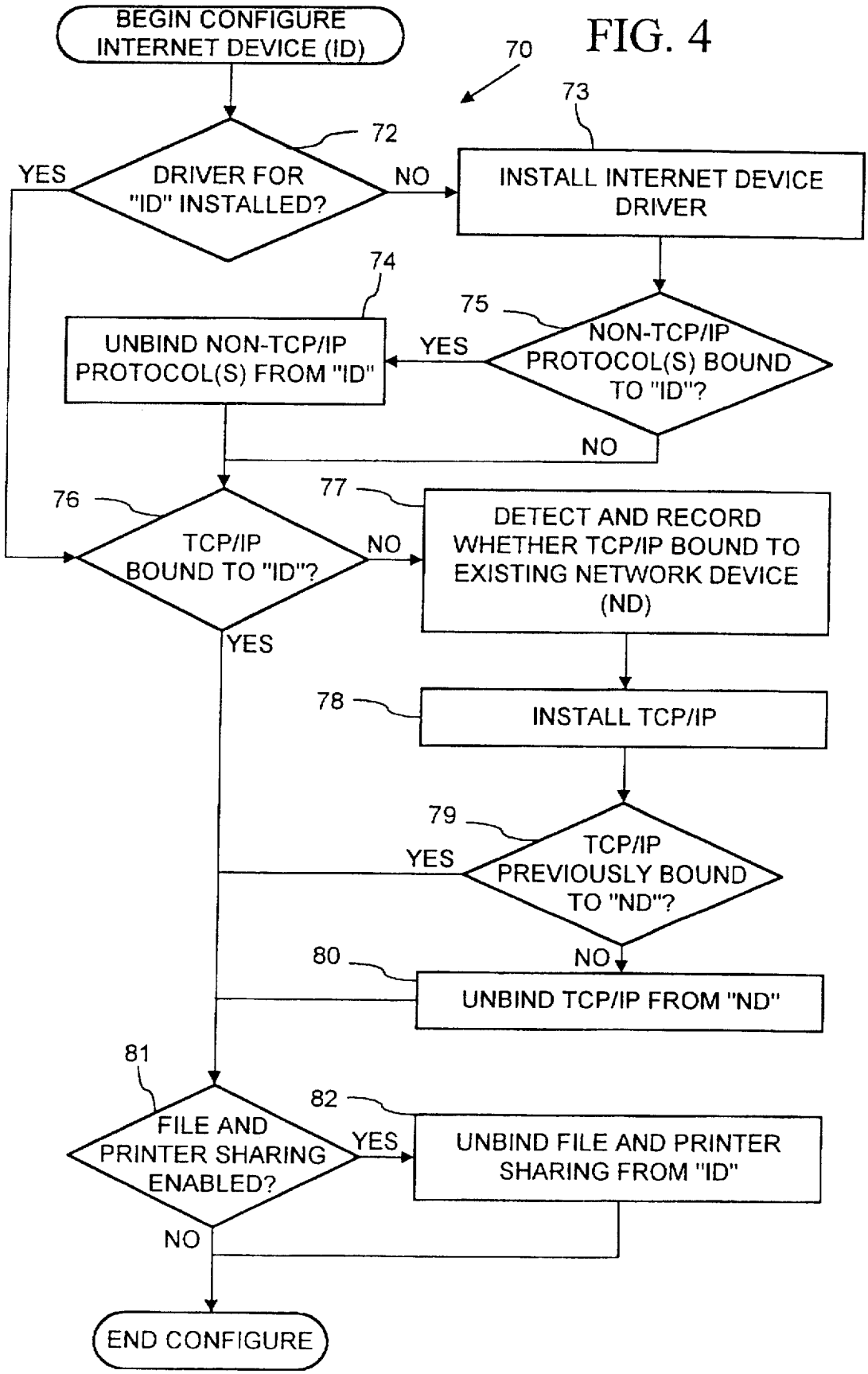


FIG. 4
70
BEGIN CONFIGURE INTERNET DEVICE (ID)
72
DRIVER FOR "ID" INSTALLED?
YES
NO
73
INSTALL INTERNET DEVICE DRIVER
74
UNBIND NON-TCP/IP PROTOCOL(S) FROM "ID"
75
NON-TCP/IP PROTOCOL(S) BOUND TO "ID"?
YES
NO
76
TCP/IP BOUND TO "ID"?
NO
YES
77
DETECT AND RECORD WHETHER TCP/IP BOUND TO EXISTING NETWORK DEVICE (ND)
78
INSTALL TCP/IP
79
TCP/IP PREVIOUSLY BOUND TO "ND"?
YES
NO
80
UNBIND TCP/IP FROM "ND"
81
FILE AND PRINTER SHARING ENABLED?
YES
NO
82
UNBIND FILE AND PRINTER SHARING FROM "ID"
END CONFIGURE

FIG. 5

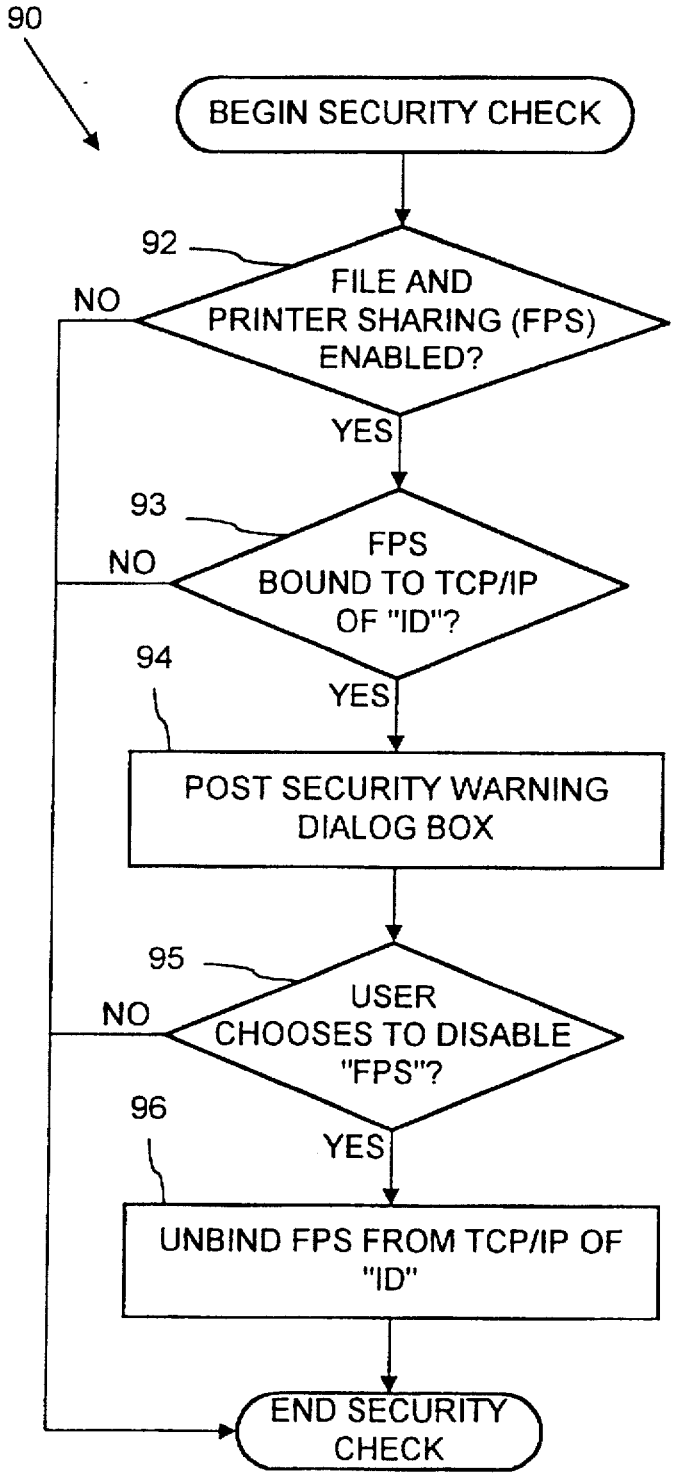
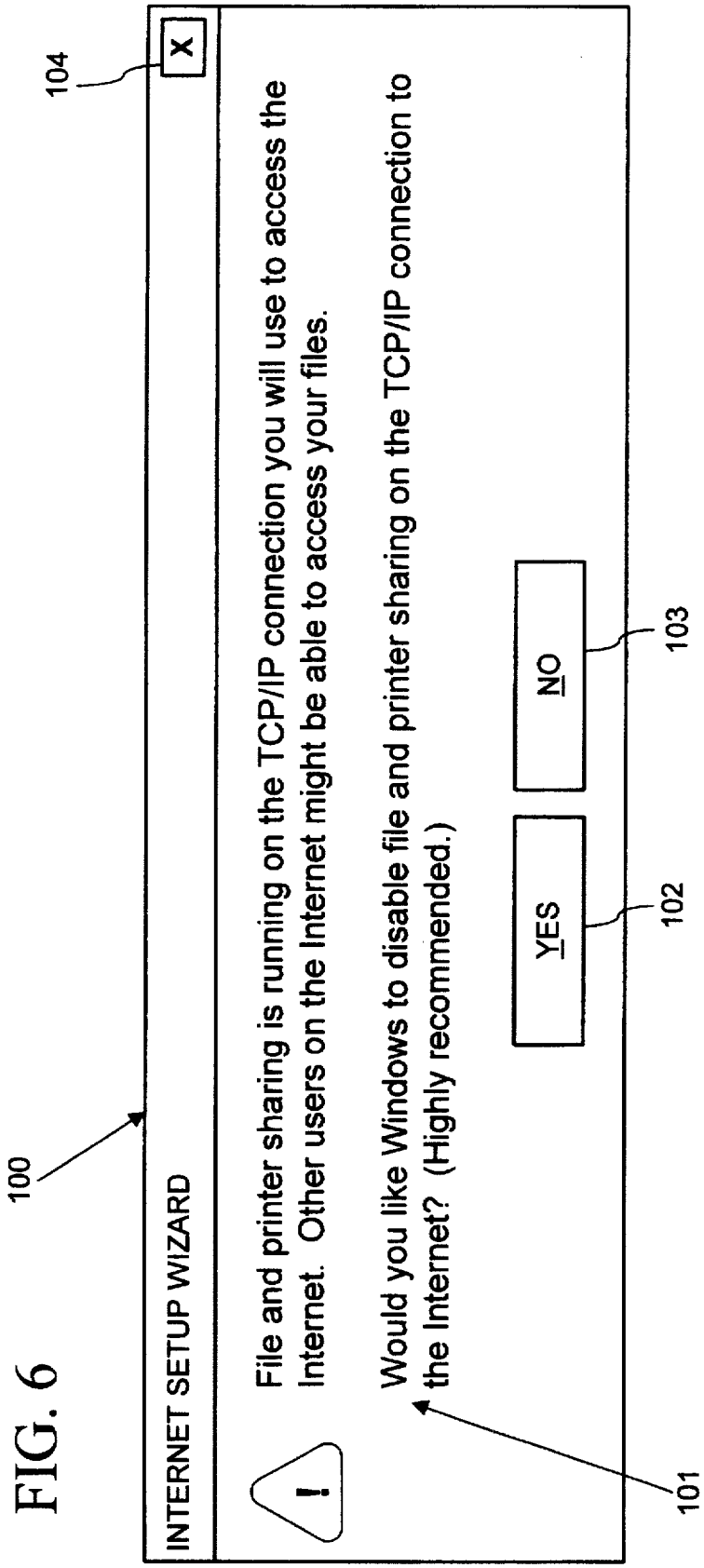

90
BEGIN SECURITY CHECK
92
FILE AND PRINTER SHARING (FPS) ENABLED?
NO
YES
93
FPS BOUND TO TCP/IP OF "ID"?
NO
YES
94
POST SECURITY WARNING DIALOG BOX
95
USER CHOOSES TO DISABLE "FPS"?
NO
YES
96
UNBIND FPS FROM TCP/IP OF "ID"
END SECURITY CHECK

FIG. 6


100
INTERNET SETUP WIZARD
104
X
!
File and printer sharing is running on the TCP/IP connection you will use to access the Internet. Other users on the Internet might be able to access your files.
Would you like Windows to disable file and printer sharing on the TCP/IP connection to the Internet? (Highly recommended.)
YES
NO
101
102
103

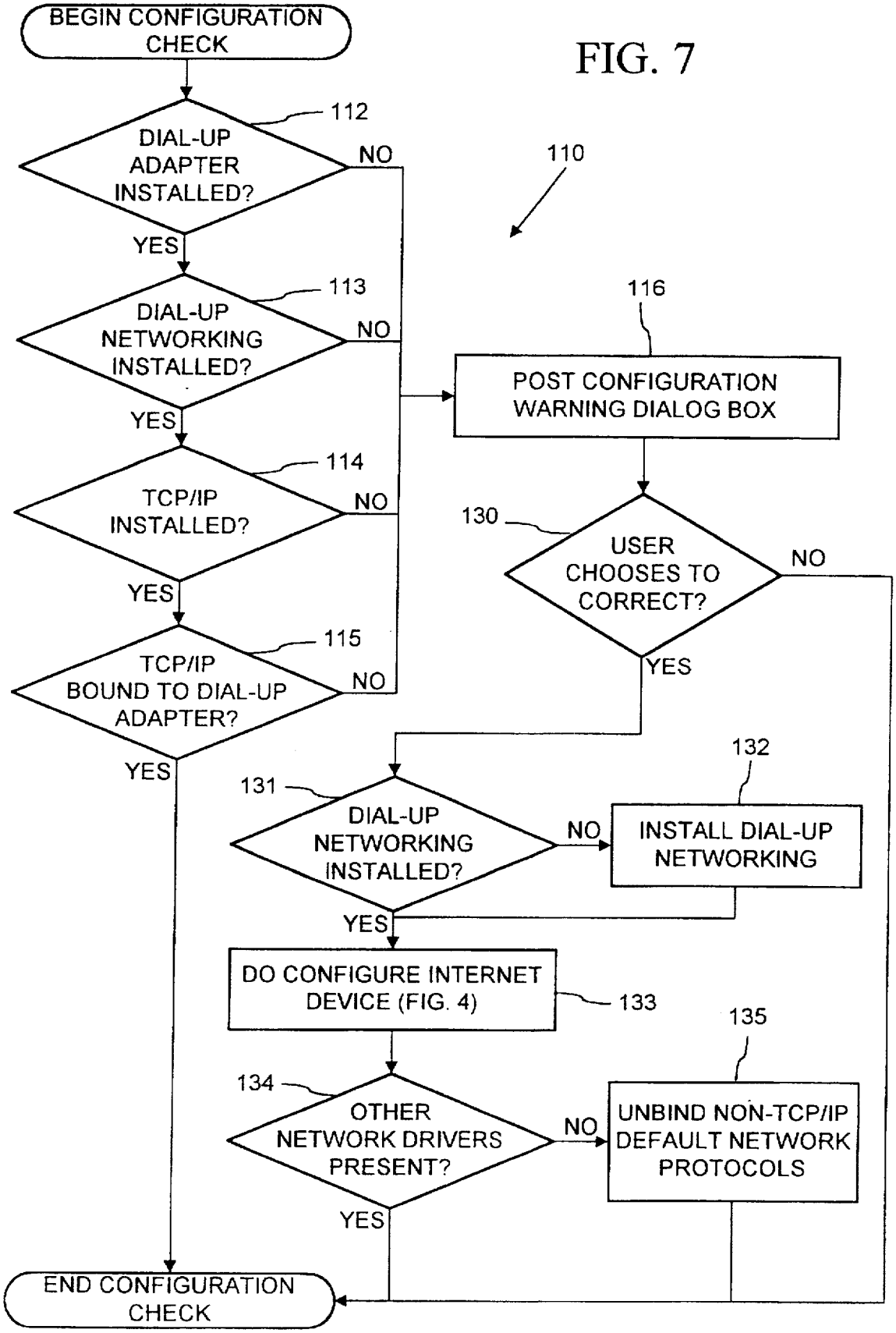
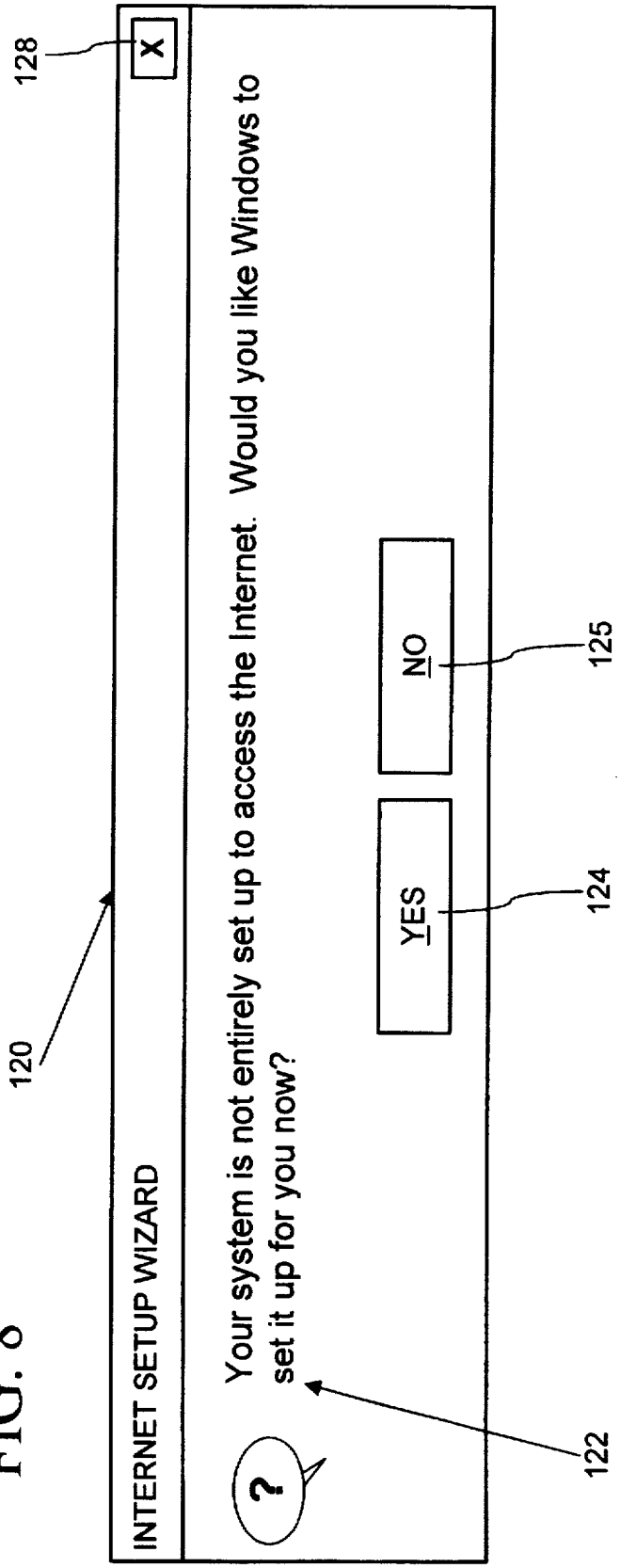


FIG. 7
BEGIN CONFIGURATION CHECK
DIAL-UP ADAPTER INSTALLED?
112
NO
YES
110
DIAL-UP NETWORKING INSTALLED?
113
NO
YES
116
POST CONFIGURATION WARNING DIALOG BOX
TCP/IP INSTALLED?
114
NO
YES
130
USER CHOOSES TO CORRECT?
NO
YES
TCP/IP BOUND TO DIAL-UP ADAPTER?
115
NO
YES
132
131
DIAL-UP NETWORKING INSTALLED?
NO
INSTALL DIAL-UP NETWORKING
YES
DO CONFIGURE INTERNET DEVICE (FIG. 4)
133
135
134
OTHER NETWORK DRIVERS PRESENT?
NO
UNBIND NON-TCP/IP DEFAULT NETWORK PROTOCOLS
YES
END CONFIGURATION CHECK

FIG. 8


INTERNET SETUP WIZARD
X
?
Your system is not entirely set up to access the Internet. Would you like Windows to set it up for you now?
YES
NO
120
122
124
125
128

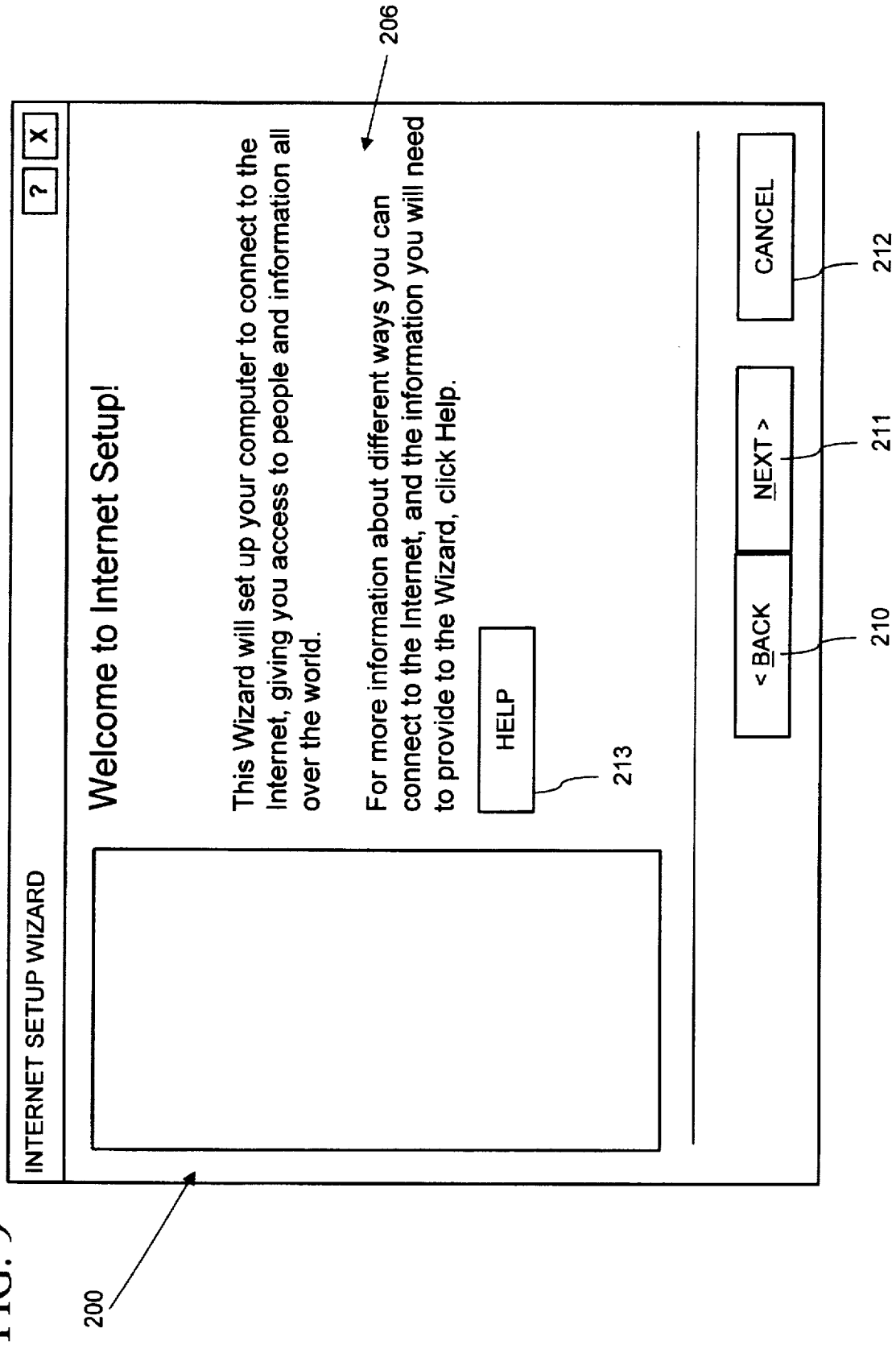

INTERNET SETUP WIZARD
?
X
Welcome to Internet Setup!
This Wizard will set up your computer to connect to the Internet, giving you access to people and information all over the world.
For more information about different ways you can connect to the Internet, and the information you will need to provide to the Wizard, click Help.
HELP
< BACK
NEXT >
CANCEL
200
206
210
211
212
213

FIG. 9

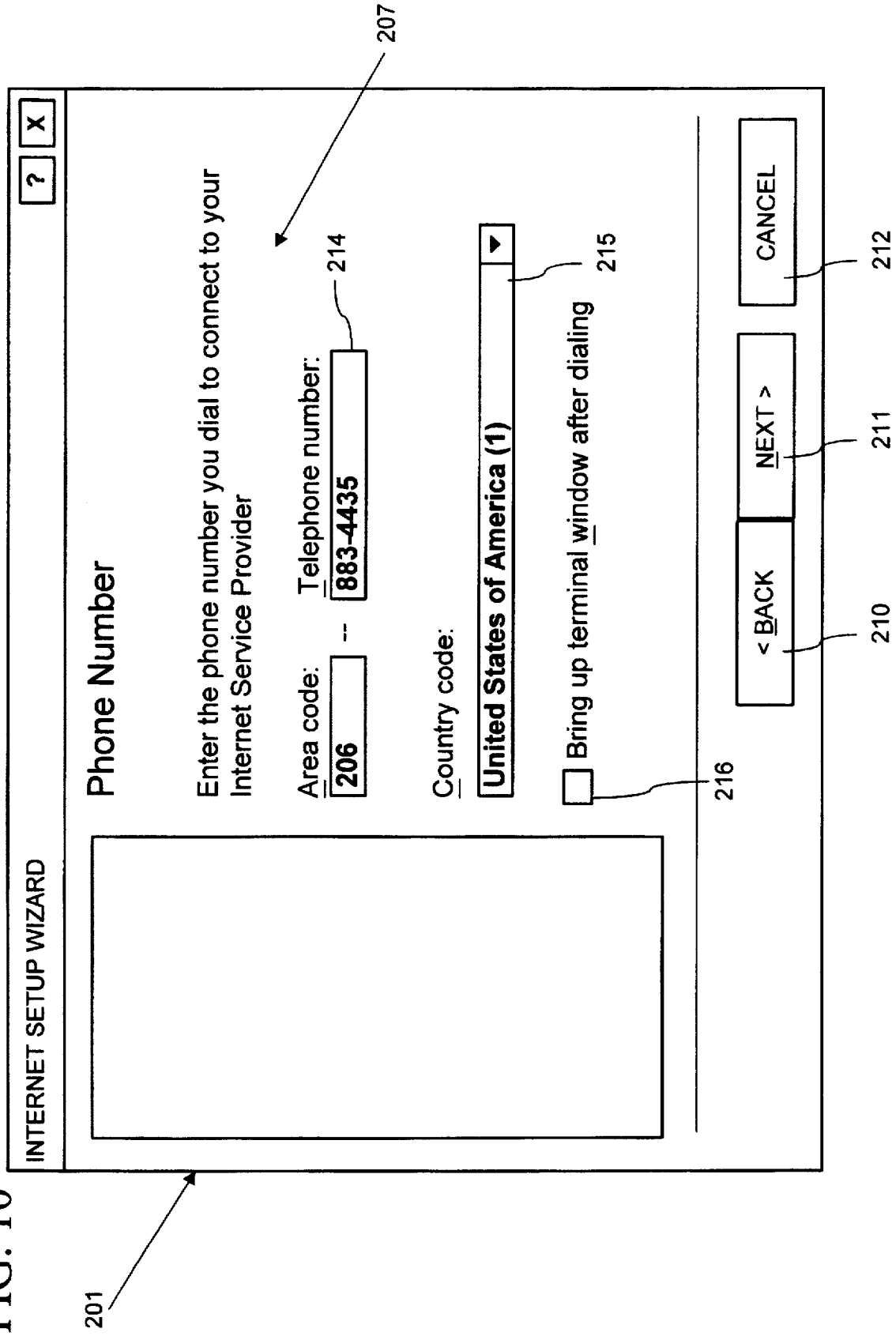

INTERNET SETUP WIZARD
?
X
Phone Number
Enter the phone number you dial to connect to your Internet Service Provider
Area code:
206
--
Telephone number:
883-4435
Country code:
United States of America (1)
Bring up terminal window after dialing
< BACK
NEXT >
CANCEL
201
207
214
215
216
210
211
212

FIG. 10

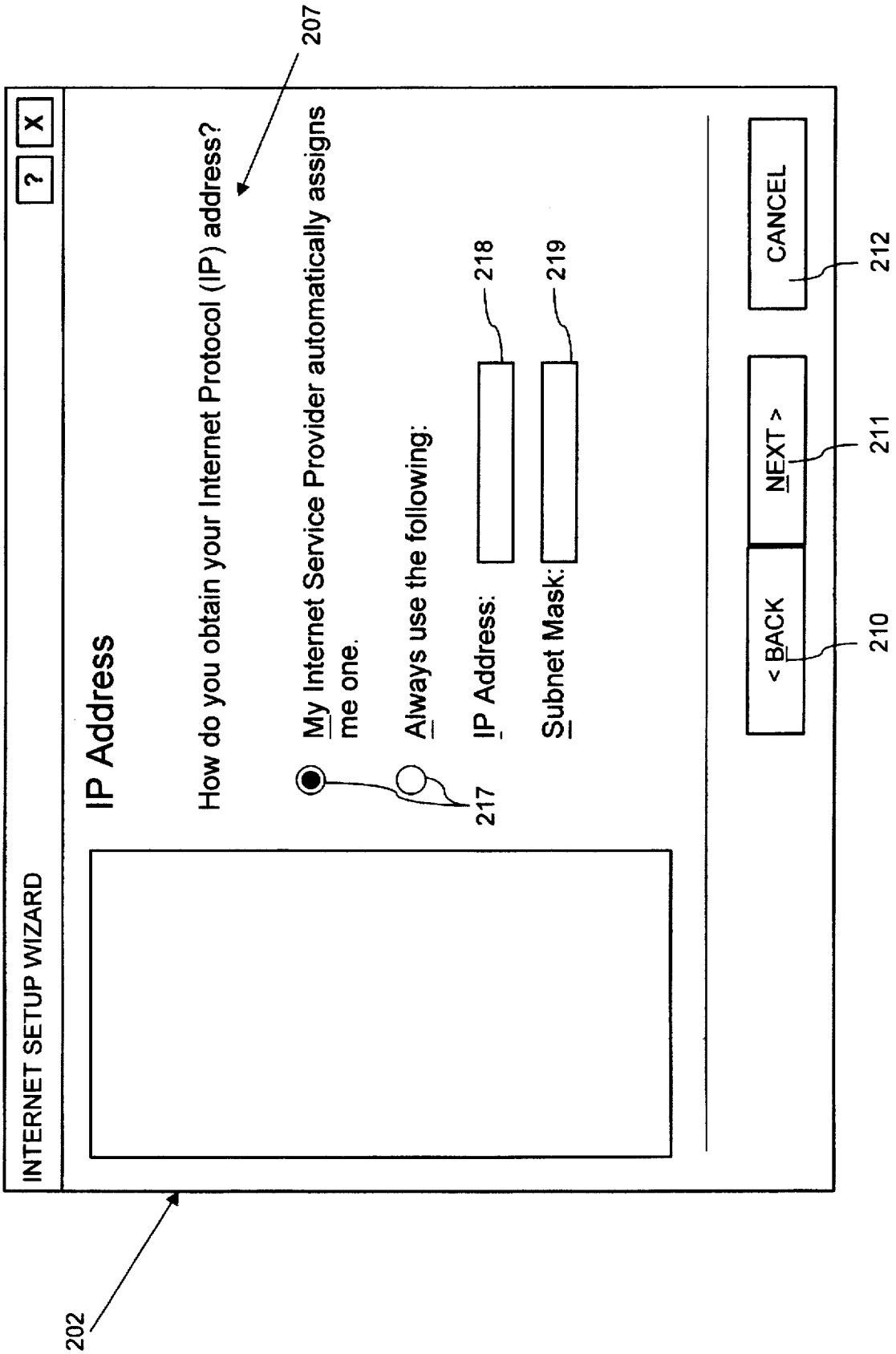

INTERNET SETUP WIZARD
?
X
IP Address
How do you obtain your Internet Protocol (IP) address?
My Internet Service Provider automatically assigns me one.
Always use the following:
IP Address:
Subnet Mask:
< BACK
NEXT >
CANCEL
202
207
217
218
219
210
211
212

FIG. 11

AUTOMATION AND DIAL-TIME CHECKING OF SYSTEM CONFIGURATION FOR INTERNET

FIELD OF THE INVENTION

This invention relates to configuring a computer system for accessing the Internet, and more particularly relates to aids for correctly configuring computers to access the Internet.

BACKGROUND AND SUMMARY OF THE INVENTION

Due to the increasing complexity and sophistication of software application programs, there has been a need for tools and procedures that automate performing specialized tasks in these applications. Automation of specialized tasks that are frequently repeated (e.g., setting up a document to have a particular format such as a legal brief in a word processing application or a financial report in a spreadsheet application) is particularly beneficial. Interface programs, known as "Wizards," which control an application program to perform specialized tasks according to user selected options are described in U.S. Pat. No. 5,301,326 to Linnett et al., and now included with many of Microsoft Corporation's application programs.

Another difficult task for computer users is that of properly configuring or setting up application and operating system software for connecting to a computer network such as the Internet. Such configuring involves many variables that depend on the particular computer system and the connection to be used for computer network access. A large proportion of computer users, however, is unfamiliar with computer networking, and also with the details of their own computer system and network access connection. A large number of computer users therefore lack the necessary knowledge to successfully configure their systems for network communication on their own.

Further, even where the computer user has the necessary knowledge, the task of configuring a computer for connecting to the Internet can still be burdensome. For example, experienced computer system administrators generally have many individual computers to configure and maintain. Each computer takes time to configure, and may require configuring differently.

In particular, there are a number of problems that make correctly configuring computers for access to the Internet difficult. First, some configuration operations can affect the configurations of a computer's other network connections. For example, setting up network protocols for an Internet connection in Microsoft Corporation's Windows® operating system can affect the configurations of other network connections. Although most home computers have no other network connections, many computers in businesses are connected to other networks, such as a private corporate computer network. These other network connections often require different configurations than the computer's connection to the Internet. So, modifying the configurations of these other network connections when configuring the Internet connection can adversely affect their performance, or cause them to be inoperative.

Second, some network configurations settings can be a security concern for an Internet connection. For example, enabling file and printer sharing allows files stored at a computer (e.g., on its hard disk) to be accessed from a network by another computer. On a corporate network or other private computer network, this configuration setting allows collaboration between computer users working as a group with a set of files and to share a common printer. However, an Internet connection with this configuration setting can expose the computer's files and printer to access by unknown others while the computer is actively connected to the Internet.

In addition to the problems associated with initially configuring a computer's connection to the Internet, the configuration can be inadvertently or unknowingly changed by the user. Such configuration changes can render the connection inoperative or compromise the computer's security. Often, the user becomes very confused and frustrated when the computer then fails to connect to the Internet, and only a cryptic error message results from the attempt.

The present invention is an automated process and system for configuring a computer to connect to the Internet. In one embodiment of the invention, the automated process and system performs an initial configuration of a computer's connection to the Internet. The automated process and system prompts the user to input information needed in configuring the computer, then proceeds to complete setting the configuration according to the information provided. Since the automated process and system completes the settings, the user is relieved from having to manually set a myriad of configuration settings and from even having to know any details of which settings are made to correctly configure the Internet connection. In the most common case where the Internet connection is a dial-up modem connection to an Internet access server of an Internet service provider, the information provided by the user defines communications parameters of the Internet access server which are obtained by the user directly from the Internet service provider. The user then simply enters the communications parameters without having to know their significance. Thus, the user can configure an Internet connection using the automated process and system without having to configure settings manually or even know which settings to make. Novice and experienced users alike can easily configure an Internet connection in a short time using the invention.

According to a further aspect of the invention, the automated process and system configures an Internet connection without disturbing configurations of any existing connections to other networks (e.g., a corporate network). For configuring operations which affect other existing configurations (e.g., binding communications protocols to the connection), the automated process and system records the original configuration of the other network connections and restores the original configuration after the configuring operation.

According to yet another aspect of the invention, the automated process and system performs security checks to ensure that the Internet connection configuration does not pose an inadvertent security risk. In the illustrated embodiment, the automated process and system checks whether file and printer sharing is enabled for the Internet connection. If so, the automated process and system warns the user of the security risk and prompts the user whether to disable file and printer sharing. The invention thus protects the user from unknowingly setting risky configurations of the Internet connection.

In another embodiment of the invention, the automated process and system checks and corrects the configuration of the computer's connection to the Internet at time of use, e.g., at dial time for a dial-up connection to the Internet. Preferably, the automated process and system checks both

that the Internet connection has an operative configuration and also that the configuration does not pose a security risk. Thus, if the user inadvertently changes configuration settings that affect the configuration of the Internet connection (such as by inadvertently removing a needed communications protocol or setting file and printer sharing), the automated process and system corrects the configuration at the time of use to prevent failure of the Internet connection or unknown risk to security. Accordingly, connecting to the Internet is made safer and more robust. As a result, computer support costs to individuals and corporations are reduced.

Additional features and advantages of the invention will be made apparent from the following detailed description of an illustrated embodiment which proceeds with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram of a computer system that may be used to implement a method and apparatus embodying the invention for automated and dial-time Internet configuring.

FIG. **2** is a block diagram of one example of a possible network software configuration including a dial-up TCP/IP connection to the Internet and an existing network connection within a computer system such as shown in FIG. **1**.

FIG. **3** is a block diagram of an Internet set-up automation, dial-time security checker and dial-time configuration checker for configuring the network software of FIG. **2**.

FIG. **4** is a flow diagram of set-up process according to the illustrated embodiment of the invention for configuring a connection such as shown in FIG. **2**.

FIG. **5** is a flow diagram of a dial time security check method according to the illustrated embodiment of the invention for a connection to the Internet such as shown in FIG. **2**.

FIG. **6** is a view of a dialog box with controls to confirm disabling file and printer sharing on the connection in the dial time security check method of FIG. **4**.

FIG. **7** is a flow diagram of a dial time configuration check method according to the illustrated embodiment of the invention for a connection to the Internet such as shown in FIG. **2**.

FIG. **8** is a view of a dialog box with controls to confirm disabling file and printer sharing on the connection in the dial time security check method of FIG. **6**.

FIGS. **9–11** are views of a sequence of dialogs for the Internet set-up automation of FIG. **3**.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

With reference to FIG. **1**, an operating environment for an illustrated embodiment of the present invention is a computer system **20** with a computer **22** that comprises at least one high speed processing unit (CPU) **24**, in conjunction with a memory system **26**, an input device **28**, and an output device **30**. These elements are interconnected by at least one bus structure **32**.

The illustrated CPU **24** is of familiar design and includes an ALU **34** for performing computations, a collection of registers **36** for temporary storage of data and instructions, and a control unit **38** for controlling operation of the system **20**. The CPU **24** may be a processor having any of a variety of architectures including Alpha from Digital, MIPS from MIPS Technology, NEC, IDT, Siemens, and others, x86 from Intel and others, including Cyrix, AMD, and Nexgen, and the PowerPc from IBM and Motorola.

The memory system **26** generally includes high-speed main memory **40** in the form of a medium such as random access memory (RAM) and read only memory (ROM) semiconductor devices, and secondary storage **42** in the form of long term storage mediums such as floppy disks, hard disks, tape, CD-ROM, flash memory, etc. and other devices that store data using electrical, magnetic, optical or other recording media. The main memory **40** also can include video display memory for displaying images through a display device. Those skilled in the art will recognize that the memory **26** can comprise a variety of alternative components having a variety of storage capacities.

The input and output devices **28**, **30** also are familiar. The input device **28** can comprise a keyboard, a mouse, a physical transducer (e.g., a microphone), etc. The output device **30** can comprise a display, a printer, a transducer (e.g., a speaker), etc. Some devices, such as a network interface or a modem, can be used as input and/or output devices.

As is familiar to those skilled in the art, the computer system **20** further includes an operating system and at least one application program. The operating system is the set of software which controls the computer system's operation and the allocation of resources. The application program is the set of software that performs a task desired by the user, using computer resources made available through the operating system. Both are resident in the illustrated memory system **26**.

In accordance with the practices of persons skilled in the art of computer programming, the present invention is described below with reference to acts and symbolic representations of operations that are performed by computer system **20**, unless indicated otherwise. Such acts and operations are sometimes referred to as being computer-executed. It will be appreciated that the acts and symbolically represented operations include the manipulation by the CPU **24** of electrical signals representing data bits which causes a resulting transformation or reduction of the electrical signal representation, and the maintenance of data bits at memory locations in memory system **26** to thereby reconfigure or otherwise alter the computer system's operation, as well as other processing of signals. The memory locations where data bits are maintained are physical locations that have particular electrical, magnetic, or optical properties corresponding to the data bits.

Network Software Architecture

With reference to FIG. **2**, an example network software configuration **50** for illustrating the invention utilizes a network software architecture which provides support for networking in the computer system **20** (FIG. **2**). In the illustrated embodiment of the invention, the network software architecture is that of the Windows 95 operating system, which is described in Inside Windows 95, by Adrian King, Microsoft Press, 1994, among other references. The network software architecture preferably has a layered structure, that separates networking operations and functionality into distinct modules organized in layers. The layered structure allows a network application **52** (such as an Internet browser application for interactively viewing information from the Internet) at a top layer of the architecture to communicate over a computer network (such as the Internet) via a network hardware device **54–55** at a bottom layer of the architecture without having to itself implement the

various networking operations and functionality provided in the intervening layers.

The illustrated network software configuration **50** supports networking with two separate network devices **54–55**. Network devices generally are of two types, dial-up connection network devices and dedicated connection network devices. Dial-up devices, such as modems, connect to a remote computer or network by dialing on the public telephone system or like switched communications network. Dedicated connection network devices, such as network adapter cards for Ethernet local area networks (LANs), are directly wired to other computers in a network. The illustrated configuration **50** of the network software architecture includes both a dial-up connection network device **54** (e.g., a modem) and a dedicated connection network device **55** (e.g., an Ethernet LAN network adapter card). Such configuration **50** is commonly used in corporate computing environments where the dedicated connection network device connects the computer with a private corporate network and the dial-up network device is used for connecting to the Internet. As compared to an alternative configuration in which the corporate network includes a remote communications server and the computer connects to both the corporate network and the Internet using a single dedicated connection network device, the configuration **50** with a separate dial-up connection device for connecting to the Internet helps avoid the security risk of exposing the corporate network from access by unknown others on the Internet and avoids consuming corporate network bandwidth for Internet communications.

The network application **52** is an application software program which communicates on the Internet or other computer network. The illustrated network application **52** preferably is an Internet browser application with which a user of the computer system **20** (FIG. **2**) interactively accesses and views information from the Internet. Many other network applications **52** also can use the illustrated configuration **50** including, but not limited to, electronic mail and/or news readers, multi-media references and games, tax preparation software, on-line shopping software, etc. which access, update information from, or post information to the Internet. Likewise, the illustrated configuration **50** also allows software applications to communicate over a local network (e.g., a corporate LAN) connected to the dedicated connection network device **55**.

The intermediate layers above the network devices **54–55** each provide a packaged set of functions which abstract network communications at decreasing levels of hardware and network specificity for the next higher layer. These intermediate layers in the illustrated configuration **50** include a network programming interface **58**, network protocols **60–61**, and network adapter drivers **64–65**. For expository convenience, FIG. **2** is a top level view of the network software architecture used in the configuration **50**. While each of the layers is shown as a separate component, each layer can itself be implemented as more than one separate component or layer.

The network programming interface **58** is the next highest layer under the network application **52**. The network application **52** communicates on the Internet or local network by calling application programming interfaces (APIs) of functions in a network programming interface **58**. The illustrated network programming interface **58** is a Windows sockets networking programming interface. The Windows sockets **58** comprises a facility or set of services for inter-process communications, e.g., communications over the Internet or other network between a process (such as one associated with the network application **52**) on the computer system **20** (FIG. **1**) and a process executing on a remote computer. These services are implemented as a set of functions which are callable from a network application **52** using associated application programming interfaces (APIs). The functions are included in a dynamic link library file called WSOCK32.DLL. Dynamic link library files provide function libraries that applications can link to and call using regular function calls. Alternatively, the network programming interface **58** can be implemented using other file names and types.

The Windows sockets **58**, in turn, relies on network operations and functionality implemented in lower layers of the network software architecture. At the layer under the Windows sockets **58**, the network protocols **60–61** comprise one or more protocol drivers that implement a set of functions which abstract communicating according to established networking protocols for the Windows sockets **52**. Network protocols are a set of rules and a prearranged data format defining how two computers communicate on a network. Computers connected to the Internet typically use the Transmission Control Protocol (TCP) and the Internet Protocol (IP) protocol suite to communicate. Corporate often use the NetBIOS Extended User Interface (NETBEUI) of Microsoft Corporation or Novell's IPX/SPX protocols.

TCP/IP is a layered set of protocols which conceptually is stacked vertically into layers. TCP is a transport layer that defines data flow, acknowledges data, and retransmits lost or damaged data. However, the User Datagram Protocol (UDP) is also commonly used as a transport layer in place of TCP. IP is a network layer that defines the format of data, and the basic unit of data transfer. TCP/IP provides a reliable, byte-stream-oriented virtual circuit for data transfer and is well known in the art. There are also application protocols in the Internet protocol suite including File Transfer Protocol (FTP), Simple Mail Transfer Protocol (SMTP), Hyper Text Transfer Protocol (HTTP), Gopher, etc. which use TCP/IP to pass data across the Internet.

As TCP/IP is the default transport/network protocol suite for communications with computers on the Internet, the network protocol **60** configured for the dial-up device **54** used for Internet connection preferably is the TCP/IP protocol, although other network protocols used for communications on the Internet alternatively can be used for the network protocol **60**. For example, UDP/IP can be used to provide an unreliable (i.e., no guaranteed delivery of data packets) byte-stream-orientated, connectionless (i.e., no virtual circuit) transport/network protocol suite for data transfer. On the other hand, the network protocol **61** configured for the network device connecting to the local network can be any of various network protocols including, but not limited to, the NetBIOS Extended User Interface(NetBEUI), Internet Packet Exchange/Sequenced Packet Exchange (IPX/SPX), DECnet by Digital Equipment Corporation, NetBIOS by Microsoft Corporation, and OSI/TP-4.

The network adapter drivers **64–65** control the network devices **54–55**, respectively. (The term driver commonly is used to refer to a software component that interfaces with hardware.) The network adapter driver **64** configured for the dial-up device **54** comprises one or more drivers that implement functions for connection protocols and for directly controlling the operation of the dial-up device **64** (e.g., modem). The network adapter driver **64** preferably uses the Point-to-Point Protocol (PPP) to connect to the Internet host with the modem. The Serial Line Protocol (SLIP) alternatively can be used. SLIP and PPP allow two computers to communicate using TCP/IP over a standard modem and

telephone line dial-up connection, and typically provide full access to the set of available Internet protocols and services. The network adapter driver **65** configured for the network device **55** connecting to the local network directly controls operation of the device **55**.

Each of the blocks in FIG. **2** except for the devices **54–55** is typically implemented as a module of code for a set of related functions.

In the following discussion, the term "binding" generally refers to linking together software components (e.g., the network protocols **60–61** with the network device drivers **64–65**) so that the components can interface and interoperate, such as by creating a reference for one component to the other in a system registry or the like as described below. The term "unbinding" generally refers to removing the link, such as by deleting the reference.

Configuration and Security Automation

Referring now to FIG. **3**, in the illustrated embodiment of the invention, the network software configuration **50** (FIG. **2**) is initially configured by an Internet set-up automation software **150**. The network software configuration **50** also is checked and corrected if needed by a dial-time security checker **156** and a dial-time configuration checker **158**, each time that a dialer **154** associated with the network software dials on the dial-up device **54** (FIG. **2**) to connect to the Internet. The operation of the Internet set-up automation software **150**, the dial-time security checker **156** and the dial-time configuration checker **158** are next described with reference to the flow charts of FIGS. **4**, **5** and **7**. The Internet set-up automation software **150**, dial-time security checker **156** and dial-time configuration checker **158** can be provided as components of the network application **52**, components of the computer's operating system software, or as separate software components.

Internet Set-up Automation

Referring now to FIG. **4**, an Internet set-up automation software **150** (FIG. **3**) (also referred to as the"Internet Set-up Wizard") in the illustrated embodiment of the invention initially configures the network software configuration **50** as shown in FIG. **2** according to a configure Internet device process **70** to provide a dial-up connection to the Internet for the network application **52** (FIG. **2**). Although the process **70** in the illustrated embodiment configures the network software for connecting to the Internet with a dial-up device **54** (FIG. **2**), alternative embodiments can configure the network software to connect to the Internet with a dedicated connection network device.

The Internet set-up automation software **150** generally is run when the network application **52** or any other network application that accesses the Internet is first installed on the computer system **20** (FIG. **1**). The Internet set-up automation software **150** can be run after the network software already has been configured for the network device **55** (hereafter the "existing network device") which connects with another computer network, such as an internal corporate local area network (LAN). According to the illustrated embodiment of the invention, the process **70** configures the network software for the dial-up network device **54** (FIG. **2**) so as to avoid disturbing an existing configuration of the network software for the existing network device **55**.

The Internet set-up automation software **150** generally has a two phase operation. In a first phase, the Internet set-up automation software **150** displays a sequence of dialogs **200–202** (FIGS. **9–11**) which comprise textual prompts **206–208** that request certain configuration information from the user and user interface controls **210–219** which the user manipulates using an input device **28** of the computer system **20** (FIG. **1**) to input the configuration information. The configuration information includes various parameters defining the dial-up connection to be used for connecting to the Internet, such as a telephone number of an Internet access service provider's Internet server computer, and communications parameters of the server computer. In a second phase of operation, the Internet set-up automation software **150** configures the network software for connecting to the Internet using the dialup device **54** according to the configuration information specified by the user. The Internet set-up automation software **150** performs the configure Internet device process **70** in this second phase so as to avoid disturbing the network software configuration for the existing network device **55**.

In the Windows 95 operating system used in the illustrated computer system **20** (FIG. **1**), the network software is configured by installing software modules (e.g., the network software components such as the network programming interface **58**, the network protocols **60-61** and the network device drivers **64–65**) into the secondary memory **42** (FIG. **1**) and setting entries in a system registry. The system registry is a database stored as a file in the secondary memory **42** and used in the Windows 95 operating system for storing hardware and software configuration information. The Windows 95 operating system includes functions accessed by calls to a set of system application programming interfaces (APIs) which allow querying and deleting system registry entries, and installing the modules of the network software. The system APIs used by the Internet set-up automation software **150** in the illustrated process **70** are summarized in the following table 1.

TABLE 1

System APIs Used in Internet Set-up Process 70.

Action	System API used
Determine list of existing network devices	DiGetClassDevs
Install software for a network device	DiCallClassInstaller
Determine list of protocols bound to a network device	Registry APIs (RegOpenKey, RegQueryValueEx, RegCloseKey, et al)
Unbind or delete a protocol from a network device, or unbind file sharing from a protocol	Registry APIs (RegOpenKey, RegQueryValueEx, RegCloseKey, et al)

At a first step **72** of the process **70**, the Internet set-up automation software **150** checks whether the driver (e.g., dial-up adapter driver **64** of FIG. **2**) of the device (hereafter "Internet device," e.g., dial-up device **54** of FIG. **2**) to be used for connecting to the Internet has been installed. This is done in the illustrated process **70** by calling a system API named "DiGetClassDevs" (hereafter referred to as the "get class devices API") in the Windows 95 operating system which returns a list of network device drivers presently installed in the computer system **20**. The Internet setup automation software **150** determines whether the driver of the Internet device is installed by calling the get class devices API and checking for the Internet device's driver in the list of installed network device drivers returned by the API call. If the Internet device's driver is not yet installed, the Internet set-up automation software **150** proceeds to install the driver in steps **73-75**. Otherwise, the process **70** continues to a step **76**.

In some embodiments of the invention, the steps **72–73** can be simplified to check for and install the internet device driver only if a dial-up device (e.g., the modem **54**) is to be

used for connecting to the Internet, and not if a dedicated connection network device (e.g., a network adapter card) is used. This may be done because, in the Windows 95 operating system, modems generally all can use a same driver (called the "dial-up adapter"). On the other hand, dedicated connection network devices require unique device drivers which are often installed and configured differently. The process **70** in such alternative embodiments therefore can require that the user first install and configure such dedicated connection network devices before running the Internet set-up automation, so that the Internet set-up automation is simplified.

At step **73**, the Internet set-up automation software **150** installs the driver **64** for the Internet device **54**. This is done in the illustrated process **70** by calling a system API named-"DiCallClassInstaller" (referred to hereafter as the "call class installer API") in the Windows 95 operating system. This API call causes the Windows 95 operating system to install the driver **64**, and also automatically to bind to the Internet device any network protocols (e.g., a NetBEUI or IPX/SPX network protocol **61**) that are bound to any existing network device **55**. Thus, if there is an existing network device which has network protocols other than the TCP/IP protocol bound to it, such other network protocols also will be bound to the Internet device **54** when that device's driver **64** is installed. Since only the TCP/IP protocol **60** is needed for communicating on the Internet, these other protocols are not likely to be used where the Internet device is being installed for the first time (and has not been previously installed with other network protocols for use in connecting to other networks) as determined from step **72**.

At step **74**, the Internet set-up automation software **150** therefore checks whether any protocols other than TCP/IP have been bound to the Internet device. If such other protocols are bound to the Internet device, the Internet set-up automation software **150** unbinds these protocols from the Internet device at step **75**. Otherwise, the process **70** continues to step **76**. Thus, the process **70** binds only the TCP/IP protocol **60** to the Internet device **54** even if the Internet device driver **64** is installed while non-TCP/IP protocols are bound to an existing network device.

In the Windows 95 operating system, the network protocols **60–61** are bound to the network devices **54–55** by setting entries in a system registry associated with the device drivers **54–55**. The values of entries in the system registry can be queried, deleted and modified by calling a set of registry APIs, named "RegOpenKey," "RegQueryValueEx," "RegCloseKey," etc. In the illustrated process **70**, the Internet set-up automation software **150** determines whether non-TCP/IP protocols are bound to the Internet device at the step **74** by calling these registry APIs to query the values of entries in the system registry related to the network protocols bound to the Internet device. For each protocol other than the TCP/IP protocol, the Internet set-up automation software **150** unbinds the protocol from the Internet device at step **75** by calling Registry APIs to delete the system registry entries for binding that protocol to the Internet device.

At the step **76**, the Internet set-up automation software **150** checks whether the TCP/IP protocol **60** is yet bound to the Internet device **54**. In general, where the Internet device was just installed at step **73** of the process **70**, the TCP/IP protocol **60** is bound to the Internet device driver only if it previously was bound to an existing network device. Again, the Internet set-up automation software **150** determines which protocols are bound to the Internet device **54** by querying the system registry with calls to the registry APIs. If the TCP/IP protocol **60** is not yet bound to the Internet device driver **64**, the Internet set-up automation software **150** continues to steps **77–80** with installing and binding the TCP/IP protocol to the Internet device driver while preserving the configuration of the network software for the existing network devices. Otherwise, the process **70** proceeds to a step **81**.

At step **77**, the Internet set-up automation software **150** detects for each existing network device (e.g., the network device **55**) whether the TCP/IP protocol is bound to that device, and records that fact as a temporary variable. As discussed previously, the Internet set-up automation software **150** determines which network devices are installed by calling the get class devices API, and detects that the TCP/IP protocol is bound to the particular device by calling the registry APIs to query registry entries for binding network protocols to the device.

At step **78**, the Internet set-up automation software **150** then installs the TCP/IP protocol **60**. In the illustrated process **70**, the Internet set-up automation software **150** calls the call class installer API to have the TCP/IP protocol installed. When the Windows® 95 operating system installs the TCP/IP protocol **60** in response to the call, it automatically binds the TCP/IP protocol to each network device **54–55** then installed in the computer system **20** (FIG. **1**). Thus, the TCP/IP protocol is bound to not just the Internet device **54**, but also to the existing device **55**. Such change to the network software configuration of the existing network devices for other computer networks, however, could cause failure of the computer system **20** to connect to the other computer networks.

In the process **70**, the Internet set-up automation software **150** avoids disturbing the network software configuration of the existing network devices by unbinding the TCP/IP protocol at steps **79–80** if the TCP/IP protocol was not originally bound to the network device (as detected and recorded at step **77** immediately prior to installing the TCP/IP protocol). Again, the Internet set-up automation software **150** unbinds the TCP/IP protocol by calling the registry APIs to delete the entries from the system registry for binding the TCP/IP protocol to the existing network device **55**.

Finally, at steps **81–82**, the Internet set-up automation software **150** determines whether the file and printer sharing option is enabled for the instance of the TCP/IP protocol **60** bound to the Internet device **54**. (If more than one network device has a network protocol bound to it, each network device can have a different version of a network protocol bound to it, referred to herein as an "instance" of that protocol.) The file and printer sharing option also is configured by setting a system registry entry (also referred to as a registry "key"). The Internet set-up automation software **150** therefore detects that file and printer sharing is enabled for the Internet device's instance of the TCP/IP protocol **60** by querying the entry with calls to the registry APIs.

As discussed previously, the file and printer sharing option enables the files stored in the memory system **26** (FIG. **1**) and any printer attached to the computer system **20** (FIG. **1**) to be accessed from another computer which is networked with the computer system **20**. Thus, when the network software is configured with file and printer sharing enabled for the Internet device, the files and printer of the computer system **20** are exposed to access from the Internet while the computer system is connected to the Internet. The file and printer sharing option is enabled by default for the instance of the TCP/IP protocol bound to the Internet device **54** if the option was previously enabled for an instance of the

TCP/IP protocol bound to an existing network device (e.g., the network device **55**).

If the Internet set-up automation software **150** detects that file and printer sharing is enabled for the Internet device's instance of the TCP/IP protocol, the automation software unbinds the file and printer sharing option at step **82**. In the illustrated process **70**, the file and printer sharing option is unbound by deleting the system registry entry for binding file and printer service to the Internet device using the registry APIs.

The process **70** thus installs and configures the network software for the Internet device to connect to the Internet without disturbing an existing network device's configuration, and prevents configuring the Internet device in a way that poses a security risk.

Dial-Time Security Check

With reference now to FIG. **5**, a dial-time security checker **156** (FIG. **3**) in the illustrated embodiment of the invention checks the network software configuration **50** at dial time in a security check process **90**. The security check process **90** preferably is performed when the dialer **154** (FIG. **3**) associated with the network software dials to connect to the Internet to prevent the security risk posed when file and printer sharing is enabled on the Internet device's instance of the TCP/IP protocol **60** (FIG. **2**). Thus, if the network software configuration is inadvertently changed so that the file and printer sharing option is enabled on the Internet device **54** (FIG. **2**), the dial-time security checker **156** prevents the user from unknowingly connecting to the Internet with this configuration.

In the illustrated embodiment of the invention, the network programming interface **58** (FIG. **2**) includes an automatic dialer as the dialer **154** which automatically initiates dialing by the Internet device **54** (FIG. **2**) when the network application attempts to communicate on the Internet with calls to the APIs of the network programming interface **58** and the computer system **20** is disconnected from the Internet. Alternatively, dialing can be initiated from another component of the network software. For example, the dialer **154** can be included as a component in the network application **52** and is responsible for dialing to connect to the Internet before the network application attempts to communicate on the Internet. The dialer **154** can be either automatically initiated or manually activated by the user. In any case, the dialing code preferably first calls the dial-time security checker **156** to initiate a security check of the network configuration prior to dialing. Since file and printer sharing can be set either deliberately or unintentionally by the user at any time, the dial-time security checker **156** preferably performs the security check process **90** every time the computer system **20** (FIG. **1**) dials to connect to the Internet.

At a first step **92** of the security check process **90**, the dial-time security checker **156** checks whether file and printer sharing services are enabled in the network software configuration **50** (FIG. **2**). This check is performed in the illustrated process **90** by examining a system registry entry that controls enabling file and printer sharing services in the Windows 95 operating system. If the file and printer sharing services are enabled, the process **90** continues to a next step **93**, otherwise, the dial-time security checker **156** ends the process **90** and returns to the dialing code.

At the step **93**, the dial-time security checker **156** checks whether the file and printer sharing services are bound to the Internet device's instance of the TCP/IP protocol **60** (FIG. **2**). In the Windows 95 operating system, this check is performed by locating the registry key for the TCP/IP protocol instance, which has the following form:

HKEY_LOCAL_MACHINE\Enum\Network\MSTCP\xxxx

where xxxx is a four digit number. This registry key has a "Bindings" subkey which contains a list of network drivers that are bound to the TCP/IP protocol instance. If the name of any of these network drivers begins with the characters "VSERVER," then file and printer sharing services are bound to the TCP/IP protocol instance. The dial-time security checker **156** thus examines the names of the network drivers in the Bindings subkey list of the TCP/IP protocol instances registry key, and determines that file and printer sharing services are bound to the TCP/IP protocol instance if any of the names begin with "VSERVER." If file and printer sharing services are bound to the TCP/IP protocol instance, the process proceeds to a step **94**. Otherwise, the dial-time security checker **156** ends the process **90** and returns to the dialing code.

Referring also to FIG. **6**, the dial-time security checker **156** posts a dialog box **100** at the step **94** (FIG. **5**) which is displayed by the computer's output device **30** (FIG. **1**) to the user. The illustrated dialog box **100** includes a graphic and text **101** which warns the user that a security risk exists due to the file and printer sharing being enabled on the Internet device **54** (FIG. **2**), and offers to disable the file and printer sharing. The illustrated dialog box **100** further includes button controls **102–103** which the user activates with the input device **28** (FIG. **1**) to respond "yes" or "no" to the offer. The dialog box **100** also includes a disabled close button **104** at an upper right corner as is standard for message dialog boxes in the Windows 95 operating system.

Referring again to FIG. **5**, as shown at steps **95–96**, the dial-time security checker **156** proceeds to unbind the file and printer sharing services from the Internet device's instance of the TCP/IP protocol **60** (FIG. **2**) if the user responds affirmatively to the offer in the dialog box **100** to disable file and printer sharing. In the Windows 95 operating system, the file and printer sharing services are unbound from the TCP/IP protocol instance by deleting from the list of network drivers names in the Bindings subkey of the TCP/IP protocol instance's registry key any name beginning with "VSERVER." In order for this configuration change to take effect, it also is necessary to restart the Windows 95 operating system. In the illustrated embodiment, the dial-time security checker **156** returns a value which indicates a need to restart the operating system. Thus, the dialing code which called the dialtime security checker **156** can initiate restarting the operating system, such as by first displaying another dialog box which offers to restart the operating system, and automatically restarts the operating system if the user responds affirmatively.

If the user chooses not to disable file and printer sharing for the Internet device at step **95**, the dial-time security checker **156** does not unbind the file and printer sharing services from the TCP/IP protocol instance **60** (FIG. **2**). Since the dial-time security checker **156** has warned the user of the security risk posed by enabling file and printer sharing, the user is now knowingly connecting to the Internet with file and printer sharing enabled. The dial-time security checker **156** therefore ends the process **90** and returns to the dialing code.

Accordingly, the security check process **90** protects against the user inadvertently or unknowingly connecting to the Internet with file and printer sharing enabled, and disables file and printer sharing for the Internet if needed.

Dial-Time Configuration Check

Referring now to FIG. **7**, a dial-time configuration checker **158** (FIG. **3**) in the illustrated embodiment of the invention also checks the network software configuration **50**

(FIG. 2) at dial time with a configuration check process **110**. The dial-time configuration checker **158** preferably is called by the dialer **154** (FIG. 3) which establishes a connection to the Internet for the network application **52** (FIG. 2) in the network software architecture. Preferably, the dialer is an automatic dialer in the network programming interface (Windows sockets) **58**, but alternatively can be implemented in another network software component such as the network application itself. The dial-time configuration checker **158** preferably is called to perform the configuration check process **110** each time that the network software dials to connect to the Internet. Preferably, the dial-time configuration checker **158** performs the configuration check process **110** when any Internet connection is being dialed by the network software. Alternatively, the configuration. check process **110** can be performed only when dialing a specific Internet access service provider.

The dial-time configuration checker **158** is responsible for ensuring that the network software is properly configured for connecting to the Internet. As described above, the Internet set-up automation software **150** initially configures the network software for connecting to the Internet. However, it is possible that the user will manually change the network software configuration **50** (FIG. 4) at some point thereafter in such a way that it is no longer possible to connect to the Internet. This can cause dialing to connect to the Internet to fail, often with only a cryptic error message. Since the user is often unaware of the cause of the failure, or even that the configuration was changed, this can be very confusing to the user.

The dial-time configuration checker **158** examines the network system configuration **50** (FIG. 4) in the configuration check process **110** and checks that each of the network software modules (e.g., the TCP/IP network protocol **60**, the Internet device driver **64**, etc.) are installed and properly configured to connect to the Internet. If the configuration does not appear correct, the dial-time configuration checker **158** warns the user and offers to correct the configuration **50**. If the user chooses to have the configuration corrected, the checker **158** installs any needed network software modules and/or makes appropriate changes to the configuration **50**. The dialer **154** for the network software **50** can then continue with dialing the Internet.

In a first sequence of steps **112–115**, the dial-time configuration checker **158** checks whether the network software configuration **50** (FIG. 3) is correct. In the illustrated process **110**, the dial-time configuration checker **158** checks the following conditions: that the dial-up device driver **64** (FIG. 2) is installed (step **112**), that dial-up networking (optional operating system files, e.g., the remote network access (RNA) of Windows 95) are installed (step **113**), that the TCP/IP protocol is installed (step **114**), and the TCP/IP protocol is bound to the dial-up device **54** (step **115**). If all these conditions are true, then the configuration is considered correct in the illustrated embodiment and the configuration check process **110** ends. Otherwise, if any of the conditions are false, then the configuration is considered suspect and the configuration checker **158** proceeds to step **116**.

At step **116**, the configuration checker **158** posts a dialog box **120** shown in FIG. 8 which is displayed on the computer's output device **30** (FIG. 1) to the user. The illustrated dialog **120** includes a graphic and text **122** which warn the user that the network software configuration is not correct, and offer to correct the configuration. The illustrated dialog box **120** further includes button controls **124–125** which the user activates with the input device **28** (FIG. 1) to respond "yes" or "no" to the offer. The dialog box **120** also includes a close button **128** at an upper right corner as is standard for dialog boxes in the Windows 95 operating system.

As shown at step **130** of FIG. 7, the configuration checker **158** (FIG. 3) proceeds to correct the network software configuration in steps **131–135** if the user chooses to correct the configuration by responding affirmatively to the offer in the dialog box **120** (FIG. 8). Otherwise, if the user chooses not to have the configuration **50** corrected, the configuration check process **110** ends.

At step **131**, the configuration checker **158** first determines whether the dial-up networking is installed. If dial-up networking is not installed, the configuration checker **158** installs dial-up networking, which are optional operating system files, by copying these files into the secondary storage **42** (FIG. 1) at step **132**.

At step **133**, the configuration checker **158** then performs the steps **72–82** of the configuration process **70** shown in FIG. 4 and described above. This includes installing the dial-up device driver **64** (FIG. 2), installing the TCP/IP protocol **60**, and binding the TCP/IP protocol to the dial-up device **54** while avoiding disturbing the configurations of any other existing network adapter devices and avoiding configuring the dial-up device with file and printer sharing enabled.

At step **134**, the configuration checker **158** then checks for a situation where the dial-up device driver **54** is just installed and no other network adapter cards are presently installed (i.e., the network adapter driver **65** of FIG. 2 is not installed). In such case, installing the dial-up device driver with the above-described call class installer API of the Windows 95 operating system causes unneeded network protocols to be installed and bound to the dial-up device **54** by default. At step **135**, the configuration checker **158** then unbinds protocols other than the TCP/IP protocol **60** from the dial-up device **54**. The configuration check process **110** then ends.

By performing the configuration check process **110** immediately prior to dialing each Internet connection, the dial-time configuration checker **158** ensures that the network software configuration **50** is correct when dialing to the Internet. The network software configuration is thus made more robust. This reduces network software service costs and avoids user confusion and frustration resulting from inadvertent or unknown configuration changes.

Having described and illustrated the principles of my invention with reference to an illustrated embodiment, it will be recognized that the illustrated embodiment can be modified in arrangement and detail without departing from such principles. It should be understood that the programs, processes, or methods described herein are not related or limited to any particular type of computer apparatus, unless indicated otherwise. Various types of general purpose or specialized computer apparatus may be used with or perform operations in accordance with the teachings described herein. Elements of the illustrated embodiment shown in software may be implemented in hardware and vice versa.

In view of the many possible embodiments to which the principles of my invention may be applied, it should be recognized that the detailed embodiments are illustrative only and should not be taken as limiting the scope of my invention. Rather, I claim as my invention all such embodiments as may come within the scope and spirit of the following claims and equivalents thereto.

I claim:

1. A method of configuring network software on a computer for securely connecting to a remote public computer network, the network software having a facility for sharing

local resources of the computer, the facility having a sharing setting controlling access to said resources from the remote public computer network, the method comprising:

checking whether said setting is enabled for a connection to the remote public computer network; and

if said setting is enabled for said connection, disabling said setting for said connection, thereby preventing access from the remote public computer network to said resources.

2. The method of claim 1 wherein said access comprises access to a file or printer.

3. The method of claim 1 wherein enabling said setting for the connection comprises binding said setting to a network device used for connecting to the remote public computer network, the method comprising:

checking a system registry entry for binding said setting to the network device; and

if the system registry entry shows that said setting is bound to the network device, unbinding said setting from the network device.

4. The method of claim 1 comprising:

posting a dialog to a user of the computer having a warning that said setting is enabled for the connection to the remote public computer network;

prompting the user to choose whether to disable said setting for said connection;

receiving input from the user; and

disabling said setting for said connection if the user chooses to disable said sharing for said connection.

5. The method of claim 4 wherein said connection is a dial-up connection, the method comprising:

dialing on a dial-up device to form said connection to the remote public computer network;

performing the step of checking at the time of dialing.

6. The method of claim 1 comprising:

configuring the network software to connect to the remote public computer network; and

performing the step of checking at the time of configuring.

7. A method of configuring network software on a computer for connecting to a remote computer network as well as connecting to a second computer network, comprising:

detecting whether a network protocol for communicating on the remote computer network is bound to a device of the computer for connecting to the remote computer network;

if the network protocol is not bound to the device for connecting to the remote computer network, performing the steps of:

recording whether the network protocol is bound to a device of the computer for connecting to the second computer network;

installing the network protocol to bind to the devices; and

unbinding the network protocol from the device for connecting to the second computer network if the network protocol was recorded as not previously bound to the device for connecting to the second computer network.

8. The method of claim 7 wherein binding the network protocol to one of the devices comprises setting a system registry entry for that device and wherein unbinding the network protocol to one of the devices comprises clearing a system registry entry for that device.

9. The method of claim 7 comprising:

installing a driver for the device for connecting to the remote computer network, said installing causing network protocols which are bound to the device for connecting to the second computer network also to be bound to the device for connecting to the remote computer network; and

for each network protocol bound to the device for connecting to the remote computer network, unbinding that network protocol from the device for connecting to the remote computer network if that network protocol is other than the network protocol for communicating on the remote computer network.

10. The method of claim 7 comprising:

detecting whether file and printer sharing services are bound to the device for connecting to the remote computer network; and

unbinding said sharing services from the device for connecting to the remote computer network if said services are bound to the device for connecting to the remote computer network.

11. A method of configuring network software on a computer having a dial-up device for connecting to a remote computer network, comprising:

initially configuring the network software for connecting to the remote computer network by dialing with the dial-up device;

checking whether the network software is correctly configured for connecting to the remote computer network at a time of dialing on the dial-up device to connect to the remote computer network; and

reconfiguring the network software for connecting to the remote computer network with the dial-up device if the network software is not correctly configured for connecting to the remote computer network.

12. The method of claim 11 wherein the step of checking comprises:

checking a plurality of conditions comprising that a driver for the dial-up device is installed, that a network protocol for communicating on the remote computer network is installed, and that the network protocol is bound to the dial-up device; and

determining that the network software is not correctly configured for connecting to the remote computer network with the dial-up device if any of said conditions are false.

13. The method of claim 12 wherein the conditions further comprise that an operating system dial-up networking service is installed.

14. The method of claim 11 comprising, when said checking indicates that the network software is not correctly configured for connecting to the remote computer network:

posting a dialog to a user of the computer having a warning that the network software is not correctly configured for connecting to the remote computer network;

prompting the user to choose whether to reconfigure the network software for connecting to the remote computer network;

receiving input from the user; and

reconfiguring the network software for connecting to the remote computer network with the dial-up device if the user chooses to reconfigure.

15. The method of claim 11 wherein the step of reconfiguring the network software comprises:

installing a driver for the dial-up device if the driver is not installed; and

where installing the driver causes network protocols other than a network protocol for communicating on the

remote computer network to be bound to the dial-up device, unbinding said other network protocols from the dial-up device.

16. The method of claim **11** wherein the step of reconfiguring the network software comprises:

installing a network protocol for communicating on the remote computer network if the network protocol is not installed; and

where installing the network protocol causes the network protocol to be bound to any network adapter devices of the computer other than the dial-up device, unbinding the network protocol from said other network adapter devices.

17. The method of claim **11** wherein an operating system of the computer provides a service for network sharing of a local resource, the step of reconfiguring the network software comprising:

unbinding said service from the dial-up device if said service is bound to the dial-up device.

18. A remote public computer network set-up automation software for configuring network software on a computer to connect to a remote public computer network with a dial-up device and contained on a computer readable data storage medium, comprising:

code for detecting that a network protocol for communicating on the remote public computer network is bound to the dial-up device;

code for recording whether the network protocol also is bound to any network adapter devices other than the dial-up device;

code for installing the network protocol, said installing causing the network protocol to be bound to the dial-up device; and

code for unbinding the network protocol from those of said other network adapter devices which were recorded as not having the network protocol bound to the network adapter device.

19. The remote public computer network set-up automation software of claim **18** wherein an operating system of the computer provides a service for network sharing of a local resource, the remote public computer network set-up automation software comprising:

code for unbinding said service from the dial-up device if said service is bound to the dial-up device.

20. A dial-time security checker for securely configuring network software of a computer to connect to a remote public computer network with a dial-up device and stored on a computer readable data storage medium, comprising:

code for checking whether a network software service for network sharing a local resource of the computer is bound to the dial-up device at a time of dialing with the dial-up device to connect to the remote public computer network; and

code for unbinding said service from the dial-up device, thereby preventing access to the local resource from the remote public computer network.

21. A dial-time configuration checker for a computer having a dial-up device and a network software configured to connect to a remote public computer network with a dial-up device, the dial-time configuration checker stored on a computer readable data storage medium, comprising:

code for verifying that the network software is correctly configured to connect to the remote public computer network with the dial-up device at a time of dialing with the dial-up device to connect to the remote public computer network; and

code for reconfiguring the network software to connect to the remote public computer network when the network software is verified not to be correctly configured to connect to the remote public computer network.

22. A method of configuring network software on a computer for securely connecting to a remote public computer network, the network software having a facility for sharing local resources of the computer, the facility having a configuration setting controlling access to said resources from the remote public computer network, the resources accessible to programs executing on the computer, the method comprising:

checking whether said setting is enabled for a connection to the remote public computer network; and

if said setting is enabled for said connection, disabling said setting for said connection, thereby preventing access from the remote public computer network to said resources while said resources remain accessible to a plurality of the programs.

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