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Thrift et al.

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(54) **WIRELESS VOICE-ACTIVATED DEVICE FOR CONTROL OF A PROCESSOR-BASED HOST SYSTEM**

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(73) Assignee: **Texas Instruments Incorporated**, Dallas, TX (US)

(*) Notice: Under 35 U.S.C. 154(b), the term of this patent shall be extended for 0 days.

(21) Appl. No.: **08/943,795**

(22) Filed: **Oct. 3, 1997**

Related U.S. Application Data

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(51) **Int. Cl.**[7] **G10L 15/00**; H04N 5/44

(52) **U.S. Cl.** **704/275**; 348/734

(58) **Field of Search** 704/275, 270; 348/734, 738

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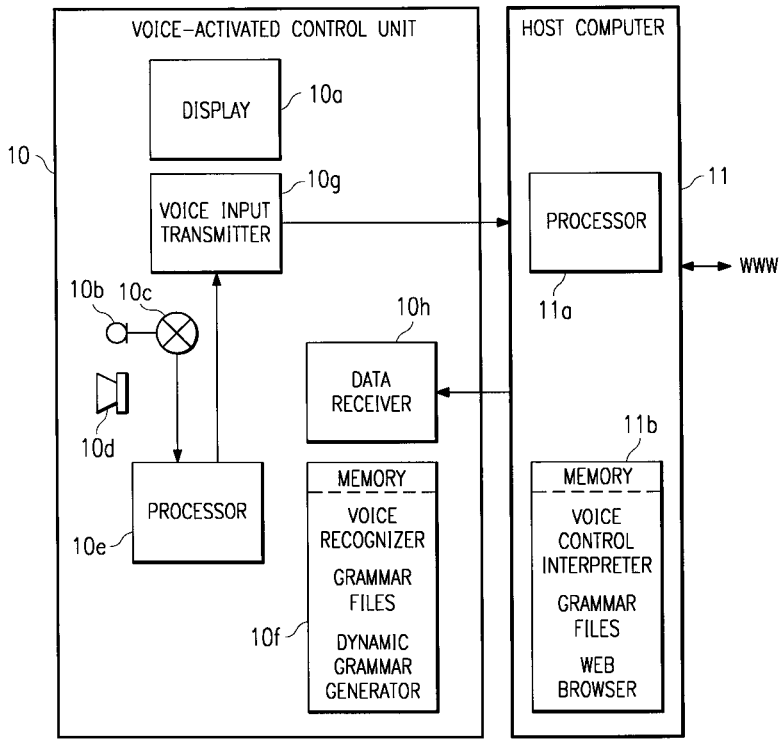
(57) **ABSTRACT**

A hand-held wireless voice-activated device (**10**) for controlling a host system (**11**), such as a computer connected to the World Wide Web. The device (**10**) has a display (**10***a*), a microphone (**10***b*), and a wireless transmitter (**10***g*) and receiver (**10***h*). It may also have a processor (**10***e*) and memory (**10***f*) for performing voice recognition. A device (**20**) can be specifically designed for Web browsing, by having a processor (**20***e*) and memory (**20***f*) that perform both voice recognition and interpretation of results of the voice recognition.

18 Claims, 3 Drawing Sheets



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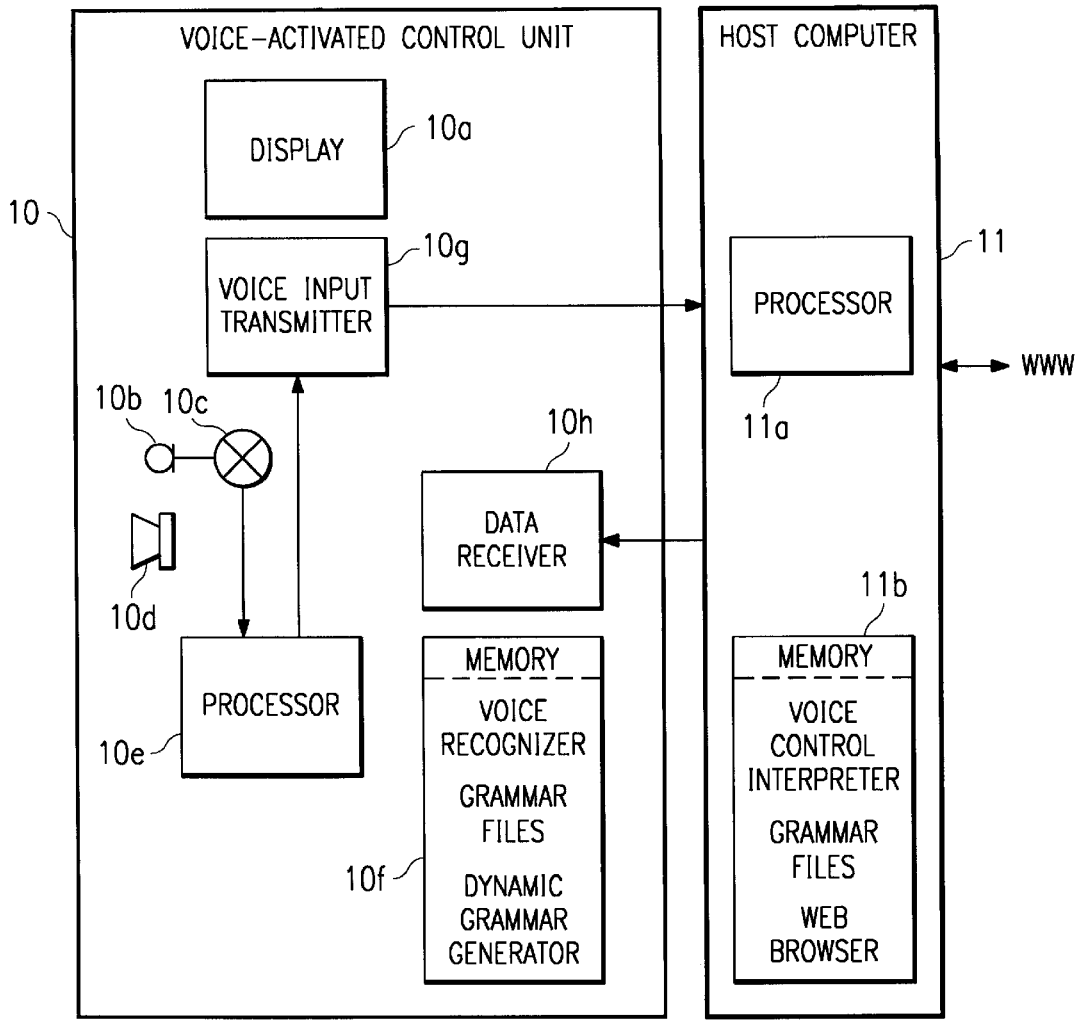

FIG. 1

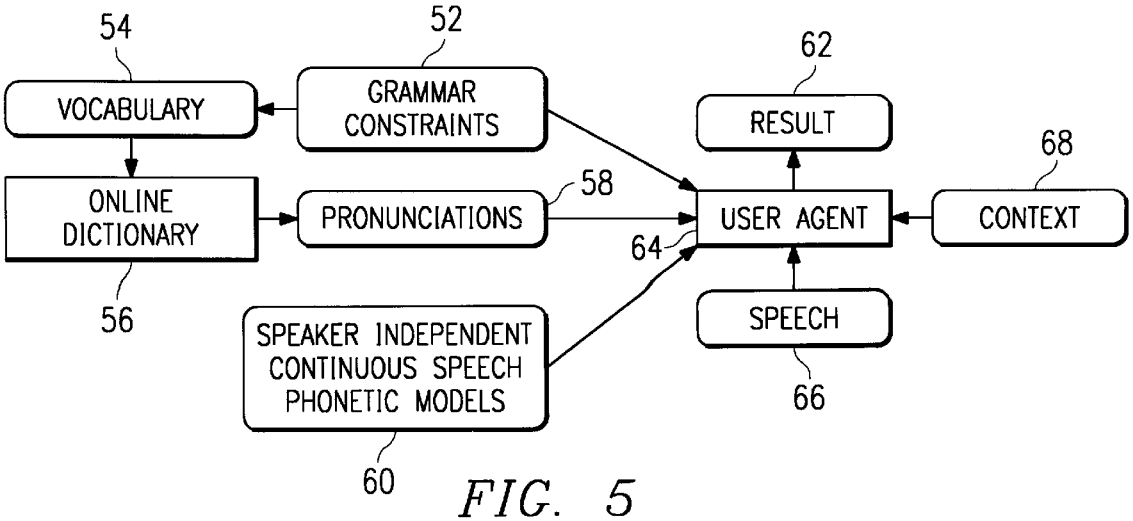

FIG. 5

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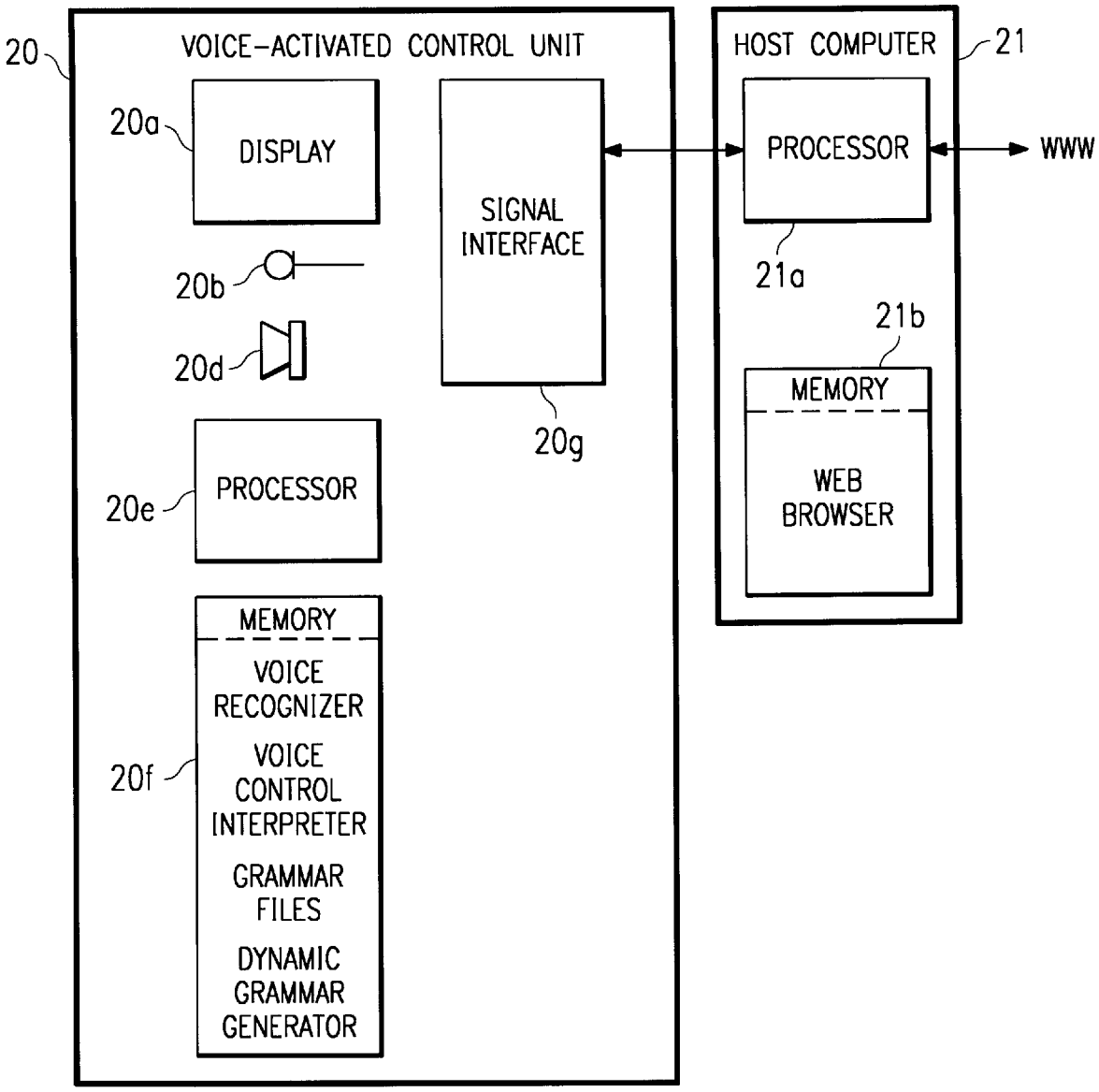

FIG. 2

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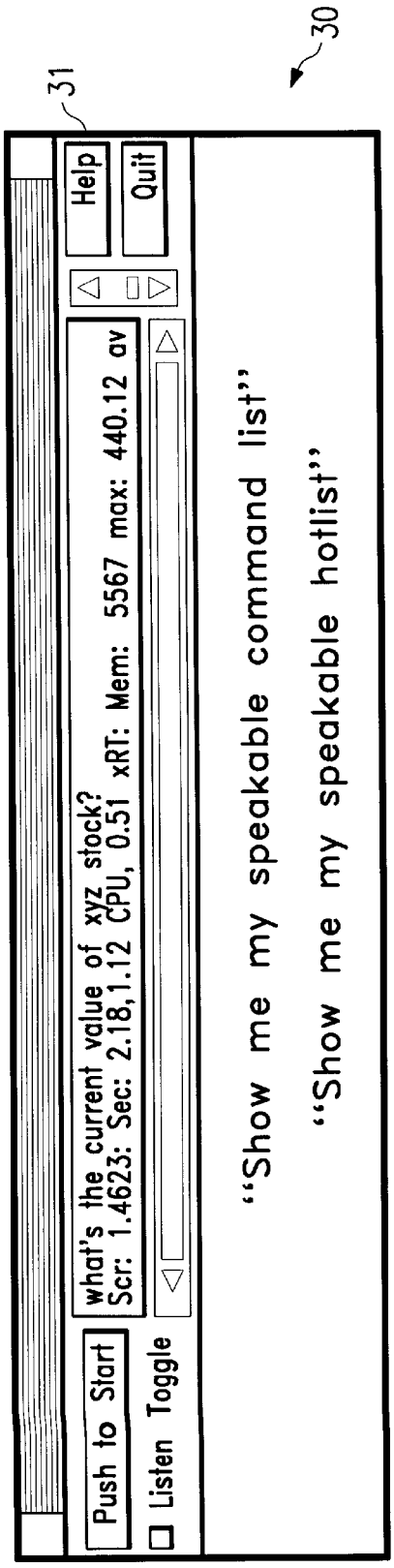

FIG. 3

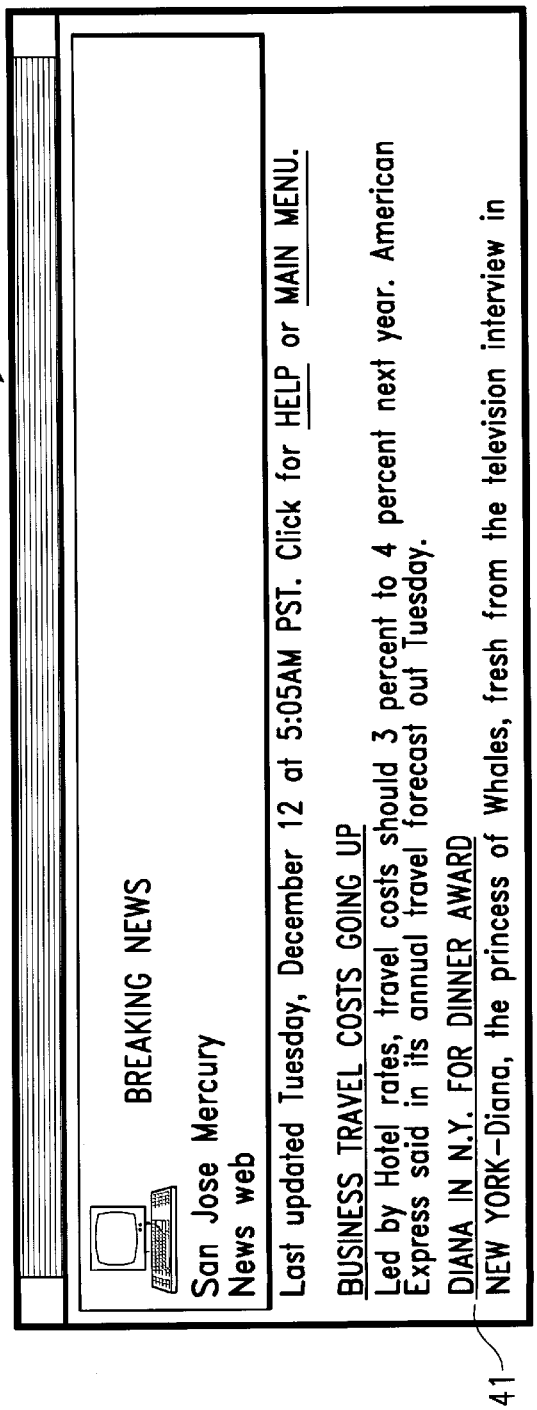

FIG. 4

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WIRELESS VOICE-ACTIVATED DEVICE FOR CONTROL OF A PROCESSOR-BASED HOST SYSTEM

This application claims benefit of Ser. No. 60/034,685 filed Jan. 6, 1997.

TECHNICAL FIELD OF THE INVENTION

The present invention relates generally to voice recognition devices, and more particularly to a wireless voice-controlled device that permits a user to browse a hypermedia network, such as the World Wide Web, with voice commands.

RELATED PATENT APPLICATIONS

This patent application is related to the following patent applications, each assigned to Texas Instruments Incorporated.

- U.S. patent U.S. Pat. No. 5,774,628 entitled "Speaker-Independent Dynamic Vocabulary and Grammar in Speech Recognition"
- U.S. patent application Ser. No. 08/419,229, entitled "Voice Activated Hypermedia Systems Using Grammatical Metadata"

BACKGROUND OF THE INVENTION

The Internet is a world-wide computer network, or more accurately, a world-wide network of networks. It provides an exchange of information and offers a vast range of services. Today, the Internet has grown so as to include all kinds of institutions, businesses, and even individuals at their homes.

The World-Wide Web ("WWW" or "Web") is one of the services available on the Internet. It is based on a technology known as "hypertext", in which a document has links to its other parts or to other documents. Hypertext has been extended so as to encompass links to any kind of information that can be stored on a computer, including images and sound. For example, using the Web, from within a document one can select highlighted words or phases to get definitions, sources, or related documents, stored anywhere in the world. For this reason, the Web may be described as a "hypermedia" network.

The basic unit in the Web is a "page", a (usually) text-plus-graphics document with links to other pages. "Navigating" the Web primarily means moving around from page to page.

The idea behind the Web is to collect all kinds of data from all kinds of sources, avoiding the problems of incompatibilities by allowing a smart server and a smart client program to deal with the format of the data. This capability to negotiate formats enables the Web to accept all kinds of data, including multimedia formats, once the proper translation code is added to the servers and clients. The Web client is used to connect to and to use Web resources located on Web servers.

One type of client software used to access and use the Web is referred as "web browser" software. This software can be installed on the user's computer to provide a graphic interface, where links are highlighted or otherwise marked for easy selection with a mouse or other pointing device.

SUMMARY OF THE INVENTION

One aspect of the invention is a wireless voice-activated control unit for controlling a processor-based host system

such as a computer connected to the World Wide Web. A compact hand-held unit has a microphone, a wireless audio input transmitter, a wireless data receiver, and a display. The microphone receives voice input from a user, thereby providing an audio input signal. The audio transmitter wirelessly transmits data derived from the audio signal to the host system. After the host acts on the audio input, it delivers some sort of response in the form of image data wirelessly delivered to the receiver. A display generates and displays images represented by the image data.

Variations of the device can include a speaker for audio output information. The device can also have a processor and memory for performing front-end voice recognition processes or even all of the voice recognition.

An advantage of the invention is that it makes information on the Web more accessible and useful. Speech control brings added flexibility and power to the Web interface and makes access to information more natural.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates one embodiment of a wireless voice-activated control unit in accordance with the invention.

FIG. **2** illustrates another embodiment of a wireless voice-activated control unit, specially configured for translating and interpreting audio input from the user.

FIG. **3** illustrates an example of a display provided by the speakable command process.

FIG. **4** illustrates a portion of a Web page and its speakable links.

FIG. **5** illustrates a process of dynamically creating grammars for use by the voice recognizer of FIGS. **1** and **2**.

DETAILED DESCRIPTION OF THE INVENTION

The invention described herein is directed to a wireless voice-activated device for controlling a processor-based host system. That is, the device is a voice-activated remote control device. In the example of this description, the host system is a computer connected to the World-Wide Web and the device is used for voice-controlled web browsing. However, the same concepts can be applied to a voice-controlled device for controlling any processor-based system that provides display or audio information, for example, a television.

Various embodiments of the device differ with regard to the "intelligence" embedded in the device. For purposes of the invention, the programming used to recognize an audio input and to interpret the audio input so that it can be used by conventional web browser software is modularized in a manner that permits the extent of embedded programming to become a matter of design and cost.

FIG. **1** illustrates one embodiment of a wireless voice-activated control unit **10** in accordance with the invention. It communicates with a host system **11**. As stated above, for purposes of this description, host system **11** is a computer and is in data communication with the World-Wide Web.

Control unit **10** has a display **10***a* and a microphone **10***b*. Display **10***a* is designed for compactness and portability, and could be an LCD. Microphone **10***b* receives voice input from a user. It may have a "mute" switch **10***c*, so that control unit **10** can be on, displaying images and even receiving non-audio input via an alternative input device such as a keypad (not shown), but not performing voice recognition. Microphone **10***b* may be a microphone array, to enhance the ability to differentiate the user's voice from other sounds

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