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[54] **OPERATING SYSTEM FOR HANDHELD COMPUTING DEVICE HAVING GRAPHICAL WINDOW MINIMIZATION/ENLARGEMENT FUNCTIONALITY**

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[51] **Int. Cl.**^{6} **G06F 3/14**

[52] **U.S. Cl.** **345/342**; 345/348

[58] **Field of Search** 345/342, 339, 345/340, 348, 354, 347, 343, 173; 395/682

[56] **References Cited**

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[57] **ABSTRACT**

A portable computing device has a processor and a touch-sensitive display. The display includes a touch-sensitive area superimposed on a viewing area, whereby the touch-sensitive area extends beyond the viewing area to form a border outside of the viewing area but within the touch-sensitive area. The handheld computing device has an operating system which executes on the processor to provide a graphical user interface environment capable of presenting a graphical window and a program taskbar within the viewing area. The program taskbar presents a program icon representing a program that is active within the graphical window. The operating system is configured to minimize the graphical window to remove the graphical window from the viewing area or to enlarge the graphical window to restore the graphical window in the viewing area in response to contacting the program icon.
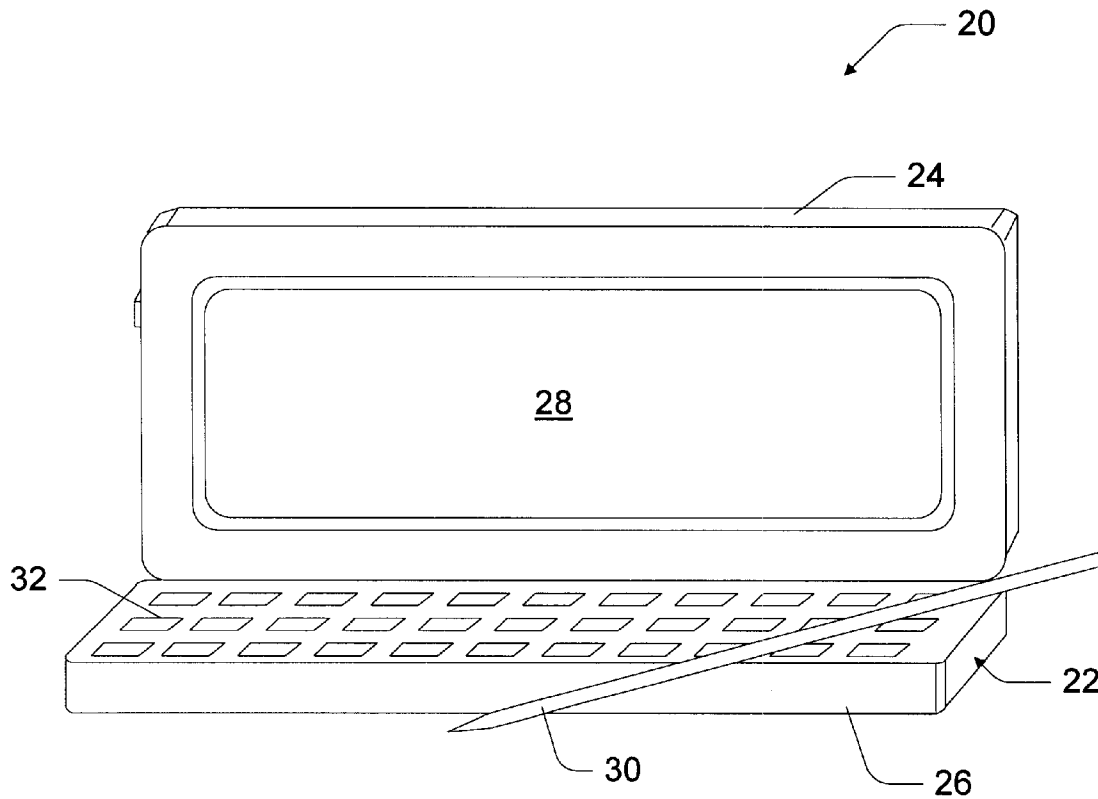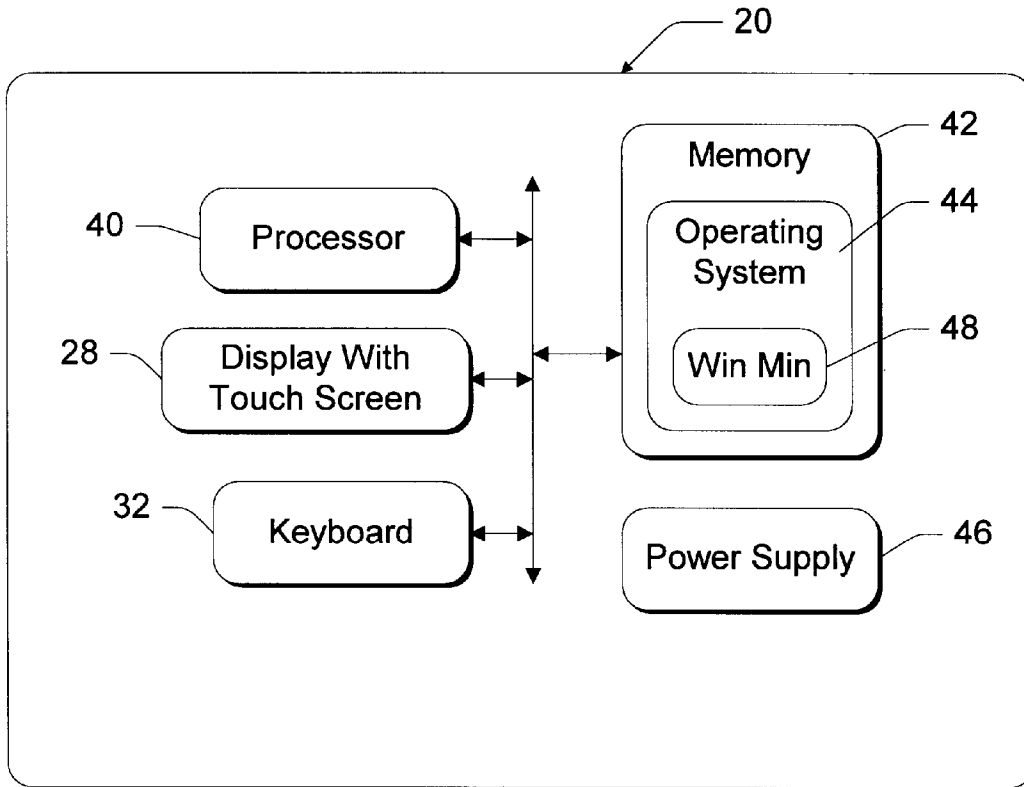
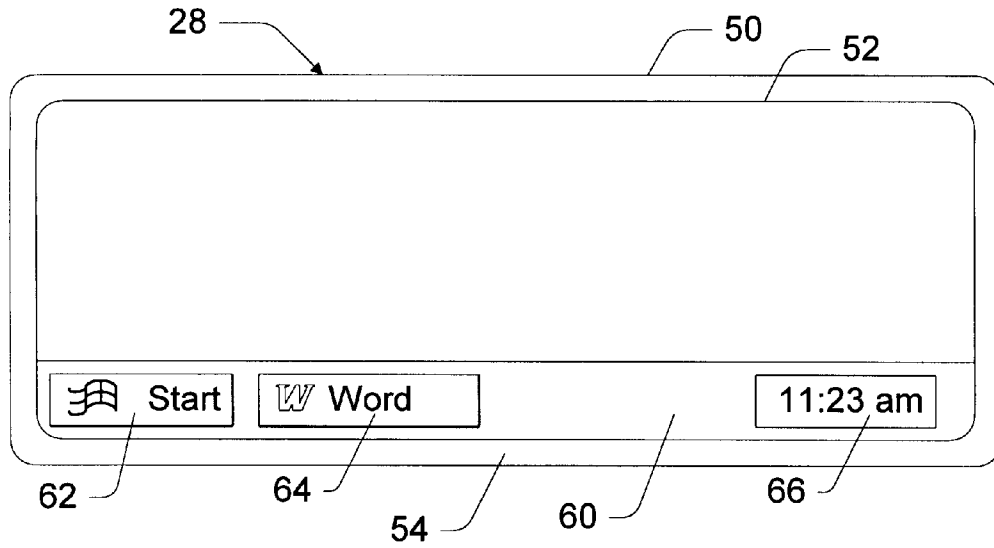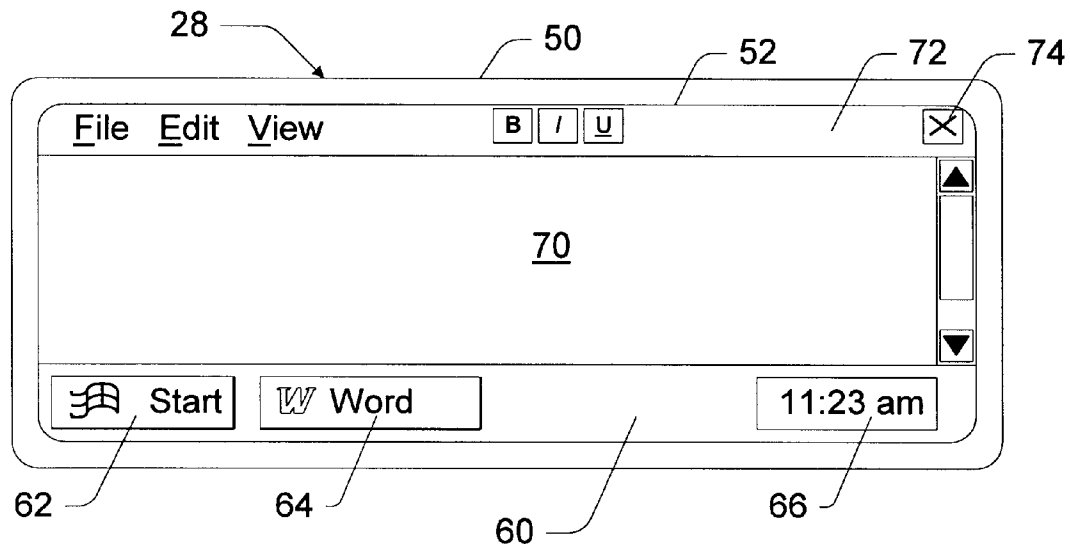**9 Claims, 3 Drawing Sheets**
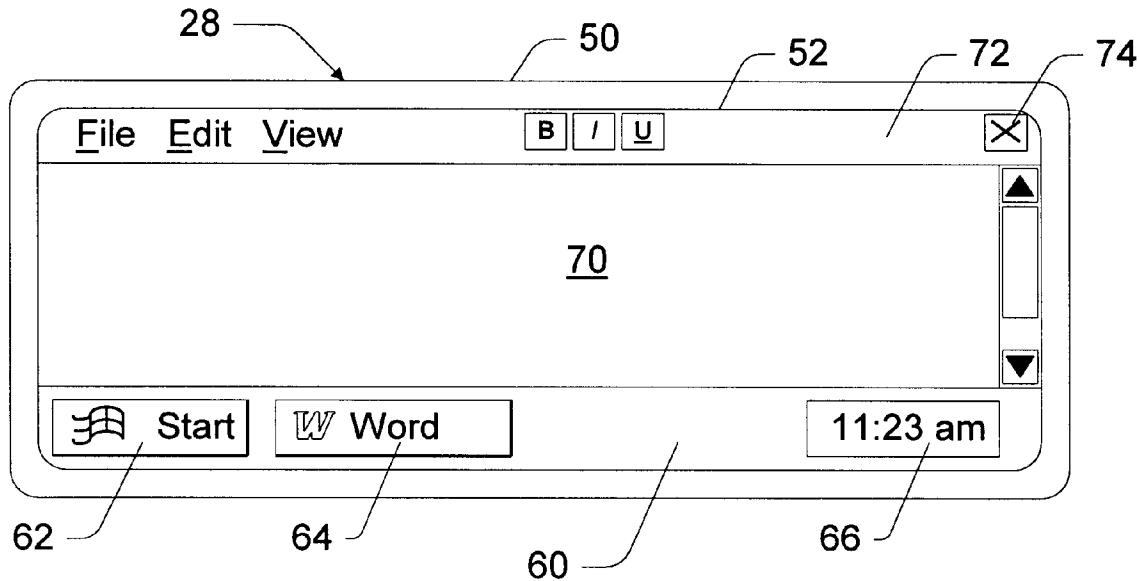
Fig. 1

Fig. 2

Fig. 3

Fig. 4

OPERATING SYSTEM FOR HANDHELD COMPUTING DEVICE HAVING GRAPHICAL WINDOW MINIMIZATION/ENLARGEMENT FUNCTIONALITY

TECHNICAL FIELD

This invention relates to computing devices, and particularly to handheld computing devices.

BACKGROUND OF THE INVENTION

Small, handheld computing devices have been steadily growing in popularity in recent years. The devices go by different names, including palmtops, pocket computers, personal digital assistants, personal organizers, and the like. In this disclosure, this class of computing devices is generally referred to as "handheld personal computers", "handheld PCs", or "H/PCs".

H/PCs are small, pocket-sized devices having an LCD (liquid crystal display) with a touch-sensitive screen, a stylus to enter data through the screen, and an input device such as a keypad or miniature QWERTY keyboard. H/PCs have a microprocessor, memory, and are capable of running an operating system and one or more applications on the operating system. Microsoft Corporation recently released the Windows® CE operating system for use on H/PCs, which is a scaled-down version of its popular Windows® operating systems manufactured for personal computers.

One of the most desirable characteristics of H/PCs is their portability. The compact, portable H/PCs provide a user with real computer-like applications—such as email, PIM (personal information management), Internet browser, spreadsheet, word processing. A traveling user can receive email messages, schedule meetings or appointments, and browse the Internet from the H/PC.

Chief among the design compromises is an undersized display. Screen space is very limited. Traditional user interface techniques which users are accustomed to on desktop computers are not available for H/PC displays due to the limited size. Additionally, the screen must be efficiently utilized to enable effective data input from the stylus.

In view of this design constraint, it would be advantageous to develop user interfaces that can be effectively employed on the miniaturized screen of a handheld computing device.

SUMMARY OF THE INVENTION

This invention concerns a computing device having an operating system with improved user interfaces for miniaturized screens.

The computing device has a processor and a touch-sensitive display. The computing device has an operating system that executes on the processor to provide a graphical user interface environment capable of presenting a graphical window and a program taskbar within the viewing area. The program taskbar presents a program icon representing a program that is active within the graphical window.

The operating system is configured to minimize the graphical window to remove it from the viewing area, or alternatively to enlarge the graphical window to restore it in the viewing area, in response to contacting the program icon in the taskbar. That is, when the window is viewable, the user taps the program icon with the stylus to minimize the graphical window. Conversely, when the window is minimized, the user taps the program icon to enlarge the graphical window.

BRIEF DESCRIPTION OF THE DRAWINGS

The same reference numbers are used throughout the drawings to reference like components and features.

FIG. **1** is a perspective view of a handheld computing device in an open position.

FIG. **2** is a block diagram of the handheld computing device.

FIG. **3** is a diagrammatic illustration of a touch-sensitive display utilized in the handheld computing device. FIG. **3** shows a taskbar user interface presented within a viewing area of the display.

FIG. **4** is a diagrammatic illustration of a graphical window presented above the taskbar and within the viewing area of the display.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. **1** shows a computing device implemented as a handheld computing device **20**. As used herein, "handheld computing device" means a small computing device having a processing unit that is capable of running one or more application programs, a display, and an input mechanism such as a keypad, a touch-sensitive screen, a track ball, a touch-sensitive pad, a miniaturized QWERTY keyboard, or the like.

The handheld computing device **20** is embodied as a handheld personal computer. The terms "handheld computing device" and "handheld personal computer" (or handheld PC or H/PC) are used interchangeably throughout this disclosure. However, in other implementations, the handheld computing device may be implemented as a personal digital assistant (PDA), a personal organizer, a palmtop computer, a computerized notepad, or the like. The invention can also be implemented in other types of computers and computer-like or computer-controlled devices having a graphical display.

Computing device **20** has a casing **22** with a cover or lid **24** and a base **26**. The handheld computing device **20** has a liquid crystal display (LCD) **28** with a touch-sensitive screen mounted to the lid **24**. The lid **24** is hingedly connected to the base **26** to pivot between an open position, which exposes display **28**, and a closed position, which protects the display. The device is equipped with a stylus **30** to enter data through the touchscreen display **28** and a miniature QWERTY keyboard **32**. The stylus **30** and keyboard **32** are both mounted in base **26**.

The handheld computing device **20** can also be implemented with a wireless transceiver (not shown) such as an IR (infrared) transceiver and/or an RF (radio frequency) transceiver. Although the illustrated implementation shows a two-member H/PC **20** with a lid **24** and a base **26**, other implementations of the H/PC Might comprise an integrated body without hinged components, as is the case with computerized notepads (e.g., Newton® from Apple Computers).

FIG. **2** shows functional components of the handheld computing device **20**. It has a processor **40**, a memory **42**, a display **28**, and a keyboard **32**. The memory **42** generally includes both volatile memory (e.g., RAM) and non-volatile memory (e.g., ROM, PCMCIA cards, etc.). An operating system **44** is resident in the memory **42** and executes on the processor **40**. The operating system **44** is a multitasking operating system that allows simultaneous execution of multiple applications. The operating system employs a graphical user interface windowing environment that presents applications and documents in specially delineated

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