

user input apparatus **101** according to the present embodiment can recognize the shape of an object.

[0204] It is also expected that the non-contact user input apparatus **101** according to the present embodiment is combined with another device and applied. For example, when the non-contact user input apparatus **1** is superposed on a flat display such as a liquid-crystal display (LCD) or an organic EL, a user input apparatus with an integrated display is provided. According to such a user input apparatus, the user can input commands to a computer intuitively and easily while guided by the contents of a GUI screen displayed. The user can perform an input operation without distracting his or her eyes from the display screen, reducing the possibility of erroneous operations.

[0205] FIG. 24 shows in a sketch manner a cross-sectional structure of a non-contact user input apparatus **1** structured integrally with a display apparatus formed of light emitting devices made from electrically conductive polymer, that is, organic LEDs.

[0206] In the case shown in the figure, an anode electrode layer and a cathode electrode layer made from electrically conductive polymer are laminated with an insulating layer made from an organic material placed therebetween. The anode electrode and the cathode electrode are arranged perpendicular to each other. This structure is similar to that shown in FIG. 16, in which the transmission electrodes **111-1**, **111-2**, . . . , and **111-m** and the receiving electrodes **115-1**, **115-2**, . . . , and **115-n** are intersected without contacting each other.

[0207] In organic displays, to emit light from pixels, a direct voltage is sequentially applied to each electrode toward a screen scanning direction in one electrode layer.

[0208] In the present embodiment, an alternating voltage for detecting a human body is superposed on a direct voltage applied in one electrode layer, and applied. As a result, the other electrode layer receives alternating current. Since the intensity of received alternating current is reduced at intersections to which a human body such as a finger tip of the user is approaching, the position of the finger tip of the user can be determined, and further, the shape of the approaching object can be recognized.

[0209] According to the structure shown in FIG. 24, the display apparatus can be used as is as a non-contact user input apparatus without changing the screen structure of the organic display.

[0210] Organic displays are generally flexible, and can be fold in any manner. Therefore, according to the application example shown in FIG. 24, a spherical or cylindrical display apparatus with a user input apparatus integrated can be structured.

[0211] B. Applications in Computer Connected to User Input Apparatus

[0212] As already described, a computer connected to the user input apparatus **1** according to the present invention can change the system state and an application processing operation in response to the result of recognition of whether the right hand and the left hand are disposed on the keyboard **10**. Applications in the computer connected to the user input apparatus will be described below.

[0213] FIG. 25 shows in a sketch manner the hardware structure of a computer **200** to which the present invention can be applied. By referring to the figure, each component of the computer **200** will be described below.

[0214] A CPU (central processing unit) **201**, serving as a main controller of the system **200**, executes various applications under the control of the operating system (OS). The CPU **201** can execute a procedure (described later) for changing the system state and an application processing operation in response, for example, to the result of recognition of a human body. As shown in the figure, the CPU **201** is mutually connected to other units (described later) by a bus **208**.

[0215] A memory **202** is a storage apparatus which stores program code to be executed by the CPU **201** and is used to temporarily hold work data being executed. It is assumed that the memory **202** shown in the figure can be either a non-volatile memory or a volatile memory.

[0216] A display controller **203** is a special controller for actually processing drawing instructions issued by the CPU **201**. Drawing data processed by the display controller **203** is written, for example, into a frame buffer (not shown), and then displayed on a display **211**.

[0217] An input-unit interface **204** is an apparatus for connecting the user input apparatus **1**, including the keyboard **10** and the mouse **30**, described before, to the computer **200**. The input-unit interface **204** according to the present embodiment can receive detection signals  $R_{XL}$ ,  $R_{XR}$ , and  $R_{XM}$  sent through a human-body detection apparatus, in addition to a scanning code input sent from the keyboard **10** and a coordinate designation input sent from the mouse **30**.

[0218] A network interface **205** can connect the system **200** to limited-area networks such as LANs (local area networks) and further to wide area networks such as the Internet according to a predetermined communication protocol such as the Ethernet.

[0219] On a network, a plurality of host terminals (not shown) are connected in a transparent state to form a distributed computing environment. Software programs and data contents can be distributed through the network. For example, software which describes in a computer readable format a procedure for changing the system state and an application processing operation according to the result of recognition of a human body can be downloaded through the network. Multi-dimensional values for user authentication processing, obtained from the human-body detection apparatus **70** may be transferred between systems through a network.

[0220] An external-unit interface **207** is an apparatus for connecting external apparatus such as a hard disk drive (HDD) **214** and a media drive **215** to the system **200**.

[0221] The HDD **214** is an external storage apparatus (known) in which a magnetic disk serving as a storage medium is mounted fixedly, and is superior to other external storage apparatuses in terms of the storage capacity and the data transfer rate. Placing a software program in the HDD **214** in an executable state is called the "installation" of the program into the system. Usually, the HDD **214** stores the program code of the operating system to be executed by the CPU **201**, application programs, device drivers, and others in a non-volatile manner.