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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :
H03K 17/96, G06K 11/06

A1

(11) International Publication Number: **WO 99/35745**

(43) International Publication Date: 15 July 1999 (15.07.99)

(21) International Application Number: PCT/AU98/01075

(22) International Filing Date: 23 December 1998 (23.12.98)

(30) Priority Data:

PP 1198	2 January 1998 (02.01.98)	AU
PP 4149	17 June 1998 (17.06.98)	AU

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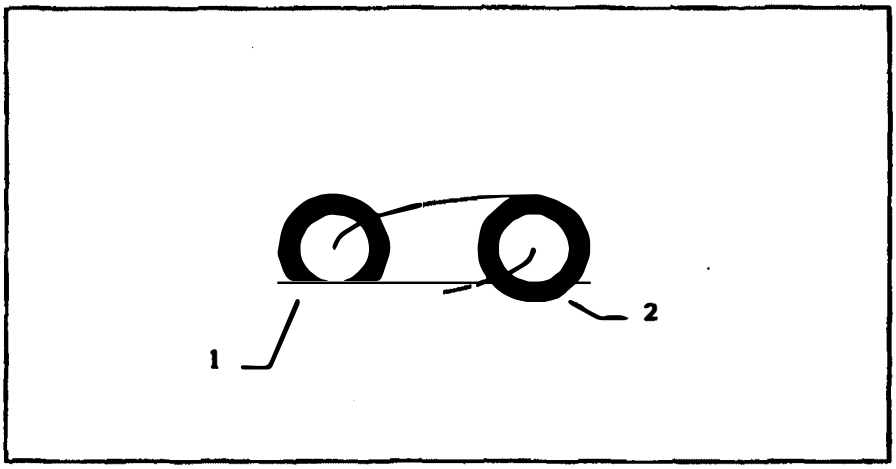
(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: SENSOR DEVICE



(57) Abstract

A sensor device comprising: (a) an interface medium having an outer layer for interaction by a user; (b) at least two transducers located on or in, the interface medium and spaced from the outer layer, and each adapted to generate a signal in response to interaction by the user; and (c) a processor to receive the signal and determine the location on the outer layer at which the user has interacted with the outer layer.

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Sensor Device

Field of the Invention

The invention relates to a sensor device which relies on transducers which are capable of being activated by, for example, sound, thermal conditions, light or chemicals.

Background of the Invention

Whilst the following description is in terms of touch switch sensor technology, it will be appreciated that the invention is not limited to touch switch "sensors".

Conventional touch sensitive technology is limited to highly electrically insulated areas of sensitivity (ie in terms of electrical resistance or capacitance) between adjacent touch sensitive areas. These insulated areas are required to prevent touch sensitive areas from being activated from an area adjacent to that area being touched.

Unfortunately such insulative requirements usually mean that complicated manufacturing techniques need to be adopted, both in terms of design and process steps. For example, in conventional user interfaces (touch pads) used in automatic teller machines, the touch pad is fabricated by providing a number of layers of plastic in predetermined areas. This arrangement of layers ensures that adjacent touch sensitive areas are not inadvertently activated.

Likewise physical barriers have been introduced to prevent such undesired activation. These are usually in the form of a rigid metal or rigid plastic stencil which overlays the touch sensitive areas and has openings which align with each individual touch sensitive area. Therefore, the stencil provides a rigid barrier between these areas. Another alternative which has been used is to provide a semi-rigid form of stencil under the outer touch pad.

As each of these approaches is complicated, a higher number of components may be required for the touch plate interface, thereby involving extra manufacturing processes and hence a higher manufacturing cost becomes apparent.

Description of the Invention

According to one embodiment of the invention, a sensor device is provided which comprises:

(a) an interface medium having an outer layer for interaction by a user;

(b) at least two transducers located on or in, the interface medium and spaced from the outer layer, and each adapted to generate a signal in response to interaction by the user; and

(c) a processor to receive the signal and determine the location on the outer layer at which the user has interacted with the outer layer.

Typically, the transducers are sound, thermal, light and/or chemically activated.

Typically, the location of the interaction determined by the processing means is achieved by differential sensing of the transducers. One way of doing this is by digital (including computational software), analogue or both, signal conditioning which provides an absolute "sensed" position on or in that outer layer.

Such type of sensor device permits the transducers to be used in an array (depending on the thickness of the interface medium) or a multi dimensional array, thereby providing discrete "spatial" sensitive areas as well as conventional two dimension applications.

One example of the two dimensional application is as a key pad. The sensing device is able to discriminate between adjacent transducers through a structurally rigid monolithic plate (in the key pad example). When the transducer(s) are activated, this state maybe determined through electrical signal conditioning circuits, such as an amplifier and/or appropriate computer software (eg digital sequence programming). In another example, the sensing device may be used on urinal wall plates to activate flushing systems.

Preferably, the processor is a microcomputer.

In yet another preferred embodiment of the invention, the sensor device may include a "touch hold function". This function is used when continual interaction by the user with the sensor device is needed over a predetermined time to achieve a desired effect. For example, if the sensor device is to be used to allow dimming of lights or adjustment of volume etc.

This touch hold function may be implemented by the "unique characteristic" that a user, whilst interacting with the interface medium, will always generate a signal of predictable (and therefore) filterable amplitude(s) over a determined time duration, no matter how still the user may think they are interacting with the interface medium.

For example, the software filter could set the initial detection threshold at the interface medium quite high, until the user interaction is detected (eg. user touches the interface medium), and then after a certain validation period, the detection threshold is lowered into the domain where continued interaction (ie without the user removing his interaction with the interface medium) by the user, can still be detected until such time when the user terminates such interaction with the interface.

Examples of "transducers".

Pressure wave activated transducers such as microphone or piezo electric transducers maybe utilised. Piezo electric based transducers have "electro mechanical" and "mechanical electrical" characteristics, meaning that they may produce a physical displacement of a mechanically coupled resonator plate by way of the application of pulse/s of voltage across its connection plates or the generation of a voltage pulse when a dynamic physical application of mechanical force is applied to one of the connection plates relatively to the other plate.

The pressure wave activated transducers may be either in the form of "discrete devices" or alternatively, the pressure wave activated transducers may be fabricated directly onto or into either the interface medium.

Another example of a transducer is any PVDF (Polyvinylidene fluoride) type material, which displays characterisitcs which are both piezoelectric and pyroelectric sensitive. (Either or both characteristics are applicable to this invention)

Accordingly, the sensor device of the invention may be a sensor array for a monolithic interface plate provided with discretely sensitive (but invisible) areas. The simple (visual and mechanically) interface lends itself to use in "unfriendly" environments where conventional complex "touch switch" technologies cannot be easily implemented, such as oil saturated environments e.g. an NC machine workshop.

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