

KEYPAD APPARATUS AND METHOD FOR INPUTTING DATA AND CHARACTERS FOR A COMPUTING DEVICE OR CELLULAR PHONE

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] This application claims the benefit of Japanese Patent Application No. 2001-104284 filed on Apr. 3, 2001. This invention relates to a device and a method for inputting data by depressing keys on a keyboard. More particularly it relates to a keyboard data inputting device with individual keys to which a plurality different characters or input data are assigned for use with a cellular phone, hand held or other computer which uses the data inputting device, and a to a method of inputting characters for such electronic devices attached to the keyboard inputting device.

[0003] 2. Prior Art

[0004] With ever widening use and popularity of communication networks such as Internet, an ever increasing number of users enjoy communication network services like the World Wide Web and e-mail services. Recently, cellular phones with data inputting functions have been extensively used for transmission and reception of data and messages over such networks in addition to information processing terminals as personal information managers and hand held computers.

[0005] A typical cellular phone is shown in FIG. 11, of the accompanying drawings, which features a front elevation of a conventional cellular phone 10a. The cellular phone 10a comprises a keyboard 1a and a visual display 3a on its front surface, and a key depression detector and a logic value generator (both of which are housed therein and not shown) communicating between the keyboard 1a and the display 3a. In use on a network or when gaining access to a Web site or sending an e-mail, a user hits keys on the keyboard 1a in order to enter data, which is then translated according to the key hit by the logic value generator and indicated on the display 3a.

[0006] Conventionally, a plurality of keys is arranged on the keyboard 1a also shown in FIG. 12(a). Specifically, nine keys B1a to B9a are present on the keyboard 1a. In using the keyboard 1a to enter data to the cell phone, the user can enter a total of 27 characters, i.e., alphabets A to Z, and a dot (.) by hitting the appropriate keys. Each key corresponds to three characters, which are engraved thereon. For instance, the key B1a corresponds to "A", "B" and "C".

[0007] A printed circuit board is housed in the cellular phone 10a and is positioned on the rear surface of the keyboard 1a. Contact pads P1a to P9a are arranged on the printed circuit board 2a. The keys B1a to B9a are positioned for registered engagement with the contact pads P1a to P9a on one-to-one basis, for example, the contact pads P1a to P9a are positioned in line and to the rear of the keys B1a to B9a, respectively.

[0008] The keys B1a to B9a have individual contacts C1a to C9a on their rear surfaces facing the printed circuit board 2a. The contacts C1a to C9a are substantially in parallel and in line with the contact pads P1a to P9a. When each individual key is depressed, each contact touches each contact pad on the printed circuit board 2a.

[0009] FIG. 13(a) is a side elevation of a key on the keyboard 1a, showing that the key B1a biased away from and not depressed and therefore having its contact C1a being out of contact from the contact pad P1a. Conversely, FIG. 13(b) shows that the key B1a is depressed and has its contact C1a being in contact with the contact pad P1a.

[0010] Conventionally, three characters are assigned to each key, and can be entered by hitting each individual key once, twice or three times to choose the letter or character desired. For example, the key B1a is hit once, twice and three times in order to enter the characters "A", "B" and "C", respectively, into the cell phone and onto the display.

[0011] FIG. 14 shows the sequence and method conventionally used for entering characters on the cellular phone 10a. The user hits one of the keys on the keyboard 1a in a first step. The key depression detector detects a depressed key and the number of key depressions (step S2). The logic value generator produces a logic value in accordance with the number of key depressions (step S3). A converter of the cellular phone 10a converts the produced logic value into a character, which is shown on the display 3a (step S4).

[0012] The key depression detector detects communication of the contact and the contact pad and the number of key operations by periodically scanning a potential which varies each time a certain contact is touched to or detached from a certain contact pad.

[0013] Referring to FIG. 15(a), a potential V1a varies each time the contact C1a is touched to or detached from the contact pad P1a. The potential V1a is VH when the contact C1a is away from the contact pad P1a, when the key B1a is not depressed. Further, the potential V1a is VL when the contact C1a is depressed and communicates with the contact pad P1a, when the key B1a is depressed. The potential V1a is scanned at times Tn-1, Tn and Tn+1. There is the relation of Tn+1-Tn=Tn-Tn-1. When the contact C1a is touched to the contact pad P1a at the time T1 and is detached therefrom at the time T2, the key B1a remains depressed from the time T1 till the time T2.

[0014] FIG. 15(b) is a graph showing variations of the potential V1a scanned by the key depression detector, which electrically communicates with and which detects that the key B1a is operated once. When the key B1a is repeatedly depressed, the potential V1a varies from VH to VL to VH in accordance with the number of key depressions, which enables the key depression detector to detect the number of key depressions. The key depression detector resets the number of key depressions back to zero when the user hits an additional key on the keyboard 1a (such as an Enter key) in order to approve and enter the character corresponding to the logic value. Thereafter, the key depression detector detects one key depression for another new character when the same key is depressed.

[0015] However, since cellular phones are developing to be more compact, and a contact pad must be proportionally compact, this can inevitably lead to a reduction in the number of keys. As a result, each key should be able to be used to enter a plurality of different characters; for example, the key would be hit a plurality of times by a user in order to enter one desired character. Consequently, it takes more time to enter the user-desired characters.

[0016] The device herein disclosed is contemplated in order to overcome the foregoing problems of prior art, and