(54) Title: LIGHT EMITTING KEYPAD

(57) Abstract: A light emitting keypad comprised of a key plate formed with a plurality of keys, a protective layer disposed underneath the key plate and formed with a plurality of protrusions partially or wholly corresponding to the keys, and an EL (Electroluminescence) device formed underneath the protective layer is provided, and for example, a light emitting keypad is provided that is mounted with a key plate formed with a plurality of keys and through holes, a rear surface layer disposed underneath the key plate and formed thereon with penetrating protrusions that go through the corresponding through holes, a protective layer disposed underneath the rear surface layer and formed with upper protrusions to correspond to the keys, and an EL device disposed underneath the protective layer, whereby protrusions are upwardly formed to provide a good click feel and to prevent the protrusions from directly applying pressure to an EL device, thereby substantially obviating deformation and destruction of the EL device, and penetrating protrusions are provided if necessary, and whereby formation of intaglios caused by reflection and interference of light emitted from an EL device can be obviated to allow the light to propagate therethrough, and to facilitate a key plate and the EL device to be easily assembled.
For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
[DESCRIPTION]

LIGHT EMITTING KEYPAD

[Technical Field]

The present invention relates to a light emitting keypad.

[Background Art]

FIG.1 illustrates a perspective view of a typical mobile communications terminal. As shown in FIG.1, the mobile communications terminal includes a liquid crystal screen 120 for displaying various information required for operation such as receipt and transmission states, and a key panel 110 housing grooves in which a plurality of key buttons of key pad for performing various functions including signal generation are inserted.

The key pad consists of a plurality of key buttons formed with a surface printed with visible alphanumeric characters or indicia, and the key buttons are jutted out of the key panel 110 of the mobile communications terminal. A user first checks the alphanumeric characters printed on the surface of the key pad and depresses the key buttons for use of the mobile communications terminal. Light source formed of a luminous element is installed on an external bottom of the key buttons 130 so that the user can identify in a dark place the numerical numbers and letters printed on the key buttons. When the light source is turned on, light is emitted to the letters and numerical numbers printed on the key buttons 130 by the backlight effect, allowing the user to identify the key buttons 130.

However, it is practically difficult to manufacture the existing luminous LED (Light Emitting Diode) key pad in a slim structure, making the key pad relatively thick. Also using a large number of LEDs increases the power consumption due to the light emission from the LEDs, and therefore, the operating time of a battery is reduced. Furthermore, the uniformity of the light emission varies depending upon where the LEDs are located, resulting in difficulty in designing. In order to overcome the limit of slimness of the LED light emitting keypad, development of slim structured light emitting keypad applied with an EL (Electroluminescence) keypad has been demanded.

FIG.2 illustrates a cross-sectional view of a conventional EL keypad, which has been
developed to solve the problems caused in the direct illumination type LED keypad. As illustrated in FIG.2, the EL keypad includes a key top 210, an EL metal dome sheet 220 and a printed circuit board 230, where the EL metal dome sheet 220 consists of an EL sheet 221, a metal dome 223 and a base tape 222, the construction of which enables to manufacture mobile communications terminals smaller, lighter, slimmer, and with reduced power consumption.

With regard to function of the EL metal dome key pad, when a user depresses the key top 210, the metal dome 223 and a fixed contact terminal 213 of the printed circuit board 230 are interconnected by protrusions 211 disposed at the rear surface of the key top 210, thereby generating a predetermined electric signal, by which the EL sheet 220 emits light to uniformly illuminate the keypad.

However, the conventional EL light emitting key pad suffers from shortcomings in that there is a high likelihood of the EL sheet 221 being damaged due to continued pressure by and abrasion against the protrusions 211, thereby generating a reliability problem, and causing a decreasing click feel of the keypad, such that it is imperative that light emitting keypad free of the above-mentioned shortcomings be developed.

[Technical Problem]

The present invention is disclosed to solve the afore-said shortcomings and it is an object of the present invention to provide a light emitting keypad, whereby protrusions are upwardly formed to provide a good click feel and to prevent the protrusions from directly applying pressure to an EL device, thereby substantially obviating deformation and destruction of the EL device.

It is another object of the present invention to provide an EL device for light emitting keypad wherein penetrating protrusions are provided if necessary, whereby formation of intaglios caused by reflection and interference of light emitted from an EL device can be obviated to allow the light to propagate therethrough, and to facilitate a key plate and the EL device to be easily assembled.

[Technical Solution]

In accordance with one aspect of the present invention, the above and other objects can be
accomplished by the provision of a light emitting keypad comprising: a key plate formed with a plurality of keys; a protective layer disposed underneath the key plate and formed with a plurality of upper protrusions partially or wholly corresponding to the keys; and an EL (Electroluminescence) device formed underneath the protective layer.

In accordance with another aspect of the present invention, there is provided a light emitting keypad comprising: a key plate formed with a plurality of keys and through holes; a rear surface layer disposed underneath the key plate and formed thereon with penetrating protrusions that go through the corresponding through holes; a protective layer disposed underneath the rear surface layer and formed with upper protrusions to correspond to the keys; and an EL device disposed underneath the protective layer.

In accordance with yet another aspect of the present invention, there is provided a light emitting keypad comprising: a key plate formed with a plurality of keys and through holes; a protective layer disposed underneath the key plate, formed with upper protrusions that correspond to the keys and formed with penetrating protrusions that go through the corresponding through holes; and an EL device formed underneath the protective layer.

Implementations of these aspects may include one or more of the following features.

The light emitting keypad further includes a printed circuit board disposed underneath the EL device and formed with a dome switch.

The light emitting keypad is formed in such a manner that the EL device is coupled thereunder to a dome substrate integrally formed with a plurality of metal domes.

The key plate is a flat sheet integrally formed with a plurality of keys.

[Advantageous Effects]

The light emitting keypad according to the present invention has advantages in that protrusions are upwardly formed to enhance the click feel and to prevent the protrusions from directly applying pressure to an EL device, thereby substantially obviating deformation and destruction of the EL device, and penetrating protrusions are provided if necessary, whereby formation of intaglions caused by reflection and interference of light emitted from the EL device can be substantially obviated to allow the light to propagate
therethrough, and to ensure an enhanced easiness in assembly between a key plate and the EL device.

[Description of Drawings]

FIG. 1 illustrates a perspective view of a typical mobile communications terminal.
FIG. 2 illustrates a cross-sectional view of a conventional EL keypad.
FIG. 3 illustrates a cross-sectional view of a light emitting keypad according to one preferred embodiment of the present invention.
FIG. 4 illustrates a cross-sectional view of a light emitting keypad according to another preferred embodiment of the present invention.
FIG. 5 illustrates a cross-sectional view of a light emitting keypad according to another preferred embodiment of the present invention.
FIGS. 6 to 8 illustrate a cross-sectional view of a light emitting keypad according to still yet another preferred embodiment of the present invention.

[Best Mode]

Now, the present invention will be described in detail with reference to preferred embodiments and accompanying drawings.

FIG. 3 illustrates a cross-sectional view of a light emitting keypad according to one preferred embodiment of the present invention. Referring to FIG. 3, the light emitting keypad includes a key plate (11) formed with a plurality of keys, a protective layer (20) disposed underneath the key plate (11) and formed with a plurality of upper protrusions (21) partially or wholly corresponding to the keys, and an EL (30) device formed underneath the protective layer (20). The EL device (30) may be formed thereunder with a printed circuit board disposed with a dome switch mounted with a metal dome (40) and a contact terminal (42).

The light emitting keypad according to the present invention is such that the protrusions are upwardly formed to enhance the click feel and tactile activation and to prevent the protrusions from directly applying pressure to the EL device, thereby substantially obviating deformation and destruction of the EL device.

It should be recognized that the known key plates of a light emitting keypad may be
limitlessly used to the key plate (11) of the present invention, and materials and shapes for the key plate (11) of the present invention are not restricted either. The key plates are well-known in the related fields so that detailed explanations thereto are omitted for clarity and conciseness.

Preferably, the key plate (11) is made of a transparent flat sheet integrally formed with keys. In other words, the key plate composed of a flat sheet is integrally formed thereunder with keys by forming the keys by a method of printing ink layer (12). Preferably, the key plate is made of a flat sheet free of the conventional keys so specifically formed as to protrude, although the conventional protruding key plate is not excluded from the present invention. Through the above-mentioned flat sheet processing, the mobile communications terminal can be slimmer and miniaturized, and the key plate can be embodied in various colors through the printing ink method. The key plate may be coated with a protective coating layer (not shown) on at least an upper surface or a lower surface thereof.

Furthermore, key portions of the key plate are provided with a concave pattern (dimpled) for an easy contact with the dome switch disposed thereunder, thereby preventing malfunction of the keying operation. The key plate may be further formed with a rear surface layer (13) as illustrated in the drawing, or may be dispensed with. Formation of the rear surface layer would protect the printing ink layer (12). The rear surface layer is not limited in material thereof but is preferred to be made of silicon material.

The protective layer (20) and the upper protrusions (21) are preferred to be integrally formed and made of silicon material, although not restrained. The protective layer may serve as a buffer between the upper protrusions and the EL device to prevent the upper protrusions to directly apply pressure to the EL device, and to simultaneously protect the EL device against penetration of oxygen and moisture that could cause damages thereto.

Preferably, the upper protrusions (21) are plurally formed to correspond to key positions on the key plate of the light emitting keypad, and when the keys are depressed by a user, the upper protrusions relevant thereto are depressed to generate a switching at a switching unit comprising a dome switch and the like to be positioned underneath the EL device.

There is no structural limit in the present invention in using the EL device (30) as long as light is emitted from inorganic or organic light emitting body by being applied with
electromagnetic field. The EL device is well-known in the related fields so that detailed explanations thereto are also omitted for clarity and conciseness. For example, the following structure may be adequate for the EL device. In other words, preferably, the EL device is formed with an insulating layer, a front surface electrode layer, a light emitting layer, a dielectric layer, a rear surface layer and an insulating layer. The front surface electrode layer, the light emitting layer, the dielectric layer and the rear surface layer form an EL system that is a light emitting structure of the EL device. Preferably, the EL device (13) is formed by screen printing process for slimming and miniaturization.

Preferably, the EL device (30) is coupled thereunder with a printed circuit board (43) mounted with a dome switch correspondingly disposed with the upper protrusions, and the dome switch is preferably comprised of a contact terminal (42) and a metal dome (41) discretely disposed on the contact terminal. The metal dome is preferred to be made of material with excellent elasticity for good tactile actuation and good click feel.

Therefore, if the key plate of the key pad unit is depressed by a user, the metal dome of the printed circuit board provided underneath a particular key is depressed to allow the metal dome to be brought into contact with the contact terminal and switched.

[Mode for Invention]

FIG 4 illustrates a cross-sectional view of a light emitting keypad according to another preferred embodiment of the present invention. Referring to FIG 4, the light emitting keypad comprises: a key plate (11) formed with a plurality of keys and through holes; a rear surface layer (13) disposed underneath the key plate and formed thereon with penetrating protrusions (14) that go through the corresponding through holes; a protective layer (20) disposed underneath the rear surface layer (13) and formed with upper protrusions (21) to correspond to the keys; and an EL device (30) disposed underneath the protective layer (20). The EL device (30) may be disposed thereunder with a printed circuit board (43) formed with a dome switch mounted with a metal dome (40) and a contact terminal (42).

The light emitting keypad according to the present invention is such that the protrusions are upwardly formed to enhance the click feel and tactile activation and to prevent the protrusions from directly applying pressure to the EL device, thereby substantially obviating deformation and destruction of the EL device.
It should be recognized that the known key plates of a light emitting keypad may be limitlessly used to the key plate (11) of the present invention, and materials and shapes for the key plate (11) of the present invention are not restricted either. The key plates are well-known in the related fields so that detailed explanations thereto are omitted for clarity and conciseness.

Preferably, the key plate (11) is made of a transparent flat sheet integrally formed with keys. In other words, the key plate composed of a flat sheet is integrally formed thereunder with keys by forming the keys by a method of printing ink layer (12). Preferably, the key plate is made of a flat sheet free of the conventional keys so specifically formed as to protrude, although the conventional protruding key plate is not excluded from the present invention. Through the above-mentioned flat sheet processing, the mobile communications terminal can be slimmer and miniaturized, and the key plate can be embodied in various colors through the printing ink method. The key plate may be coated with a protective coating layer (not shown) on at least an upper surface or a lower surface thereof.

Furthermore, key portions of the key plate are provided with a concave pattern (dimpled) for an easy contact with the dome switch disposed thereunder, thereby preventing malfunction of the keying operation. The key plate (11) is formed with through holes through which the penetrating protrusions (13) formed at the rear surface layer (13) can pass.

The rear surface layer (13) is formed thereon with the penetrating protrusions (14) to allow the penetrating protrusions (14) to pass through the through holes of the key plate (11), thereby enabling the key plate (11) to be coupled with the rear surface layer (13). Preferably, the through holes are respectively formed at borders of each key. By this construction, a particular key may be easily and selectively depressed to improve the click feel. Furthermore, the formation of and coupling by the penetrating protrusions (14) can prevent the light from forming an intaglio that may be caused when the light emitted from the EL layer is reflected and interfered by the through holes, and can allow the light to pass through the through holes without any reflection and interference. It should be also noted that the rear surface layer can function as a protector of the ink layer. The rear surface layer is not limited in the use of material but may be preferably made of silicon.
The protective layer (20), the upper protrusions (21), the EL device (30), and the printed circuit board (43) disposed with the dome switch correspondingly positioned to the upper protrusions have been already described in the foregoing, such that explanations thereto will be omitted.

FIG. 5 illustrates a cross-sectional view of a light emitting keypad according to another preferred embodiment of the present invention.

Referring to FIG. 5, the light emitting keypad includes a key plate (11) formed with a plurality of keys and through holes, a protective layer (20) disposed underneath the key plate and formed with upper protrusions (21) correspondingly disposed with the keys and penetrating protrusions (22) that correspondingly penetrate the through holes, and an EL device (30) formed underneath the protective layer (20). The EL device (30) may be positioned thereunder with a printed circuit board formed with a dome switch mounted with a metal dome (40) and a contact terminal (42).

What is recognizable in the construction of FIG. 5 and what is distinguishable from that of the previous light emitting keypad is that the rear surface layer (13) is deleted and the penetrating protrusions are formed at the protective layer (20). Through this configuration, the light emitting keypad may be further slimmed and miniaturized. The key plate, the protective layer, the EL device and the printed circuit board have been already described so that further explanations thereto will be omitted.

FIGS. 6 to 8 illustrate a cross-sectional view of a light emitting keypad according to still yet another preferred embodiment of the present invention.

As depicted in FIGS. 6 to 8, the light emitting keypad may be featured in such a fashion that the EL device is coupled thereunder with a dome substrate (41) integrally formed with a plurality of metal domes (40). The integral formation of the plurality of metal domes enables the light emitting keypad to be easily assembled. The dome substrate (41) is disposed thereunder with a printed circuit board (43) mounted with the contact terminal (42).

The above-described embodiments of the present invention are intended to be examples only and not to be limiting. Alterations, modifications and variations may be effected to
the particular embodiments by those of skill in the art without departing from the scope of
the invention, which is defined solely by the claims appended hereto.

[Industrial Applicability]

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The light emitting keypad according to the present invention has an industrial
applicability in that protrusions are upwardly formed to provide a good click feel and to
prevent the protrusions from directly applying pressure to an EL device, thereby
substantially obviating deformation and destruction of the EL device, and penetrating
protrusions are provided if necessary, whereby formation of intaglions caused by reflection
and interference of light emitted from an EL device can be obviated to allow the light to
propagate therethrough, and to facilitate a key plate and the EL device to be easily
assembled.
[CLAIMS]

[Claim 1] A light emitting keypad, characterized in that: a key plate is formed with a plurality of keys; a protective layer is disposed underneath the key plate and formed with a plurality of upper protrusions partially or wholly corresponding to the keys; and an EL (Electroluminescence) device is formed underneath the protective layer.

[Claim 2] A light emitting keypad, characterized in that: a key plate is formed with a plurality of keys and through holes; a rear surface layer is disposed underneath the key plate and formed thereon with penetrating protrusions that go through the corresponding through holes; a protective layer is disposed underneath the rear surface layer and formed with upper protrusions to correspond to the keys; and an EL device is disposed underneath the protective layer.

[Claim 3] A light emitting keypad characterized in that: a key plate is formed with a plurality of keys and through holes; a protective layer is disposed underneath the key plate with upper protrusions that correspond to the keys and formed with penetrating protrusions that go through the corresponding through holes; and an EL device is formed underneath the protective layer.

[Claim 4] The light emitting keypad according to any one claim of 1 to 3, further characterized in that a printed circuit board is disposed underneath the EL device and formed with a dome switch.

[Claim 5] The light emitting keypad according to any one claim of 1 to 3, further characterized in that the EL device is coupled thereunder to a dome substrate integrally formed with a plurality of metal domes.

[Claim 6] The light emitting keypad according to any one claim of 1 to 3, further characterized in that the key plate is a flat sheet integrally formed with a plurality of keys.
A. CLASSIFICATION OF SUBJECT MATTER

H01H 13/70(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 8: H01H 13/70

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Utility models and applications for Utility models since 1975
Japanese Utility models and applications for Utility models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKIPASS(KIPO internal) "keypad", "electroluminescent", "metal dome", "EL sheet", "plunger", "protrusion"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>US 5924555 A (SADAMORI, A. et al.) 20 July 1999</td>
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<td>See the abstract, column 6, line 62 - column 7, line 24; figure 7.</td>
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☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
  "A" document defining the general state of the art which is not considered to be of particular relevance
  "E" earlier application or patent but published on or after the international filing date
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Date of the actual completion of the international search
13 JULY 2007 (13.07.2007)

Date of mailing of the international search report
13 JULY 2007 (13.07.2007)

Name and mailing address of the ISA/KR

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SONG, Hyun Chae
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