

SPECIFICATION -**Title of the Invention****PANEL UNIT OF DEALING BOARD****Background of the Invention****Field of the Invention**

The present invention relates to a panel unit of a dealing board adapted to be employed in terminals of banks and financial organizations. Reference is made to co-pending application number 9206518.4 from which this application was divided out.

Description of the Prior Art

Nowadays, the terminal of the banking organizations uses a dealing system carrying out transactions or dealings of securities, shares, and foreign exchange by means of telephone lines. A unit of such dealing system has a dealing board provided with operating portions and multi-function telephones and the like, a desk on which the dealing board is installed. The dealing system is constructed by installing a plurality of the desks in a dealing room.

FIG 20 shows a conventional desk 50 installed in the dealing room. The desk 50 has an operation part 51 having various telephoning functions and a dealing board 53 having a hand-set 52, respectively placed on the desk. Further, the desk 50 has a display appliance 54 placed on the rear part of the desk so as to show economic information and the

like.

In order to use the dealing board 53 as a communication means, the dealing board provides a set panel units containing a dial operating portion 55, a displaying portion 56 of, for example, a liquid crystal display and the like showing a name of the sender, a volume dial 57 for controlling sound volume of the hand-set 52 and dark-and-light level of the displaying portion 56, and a set of one-touch dial buttons 58 (hereinafter referred to as a button merely) for calling out the particular or appointed customer in a one-touch manner through the telephoning lines or network.

Each button 58 has a label on which a name of the client is printed and stucked onto its top face in order to shown whom the button relates.

Because the clients whom the dealing board 53 is used are differed from each other, it has been necessary to paste different set of labels for different dealing boards 53 to the top faces of the buttons 58 in accordance with the prior art. It has been difficult to mass-product the dealing boards and cope with a change-demand occurred when personal changes and the similar change are done in client companies.

FIG 22 shows one of the apparatus for solving such problem of the conventional method. According to the prior art, a liquid crystal indicator 59 is installed by a button 58 as shown in FIG 22. Names of the customers are indicated

on the liquid crystal indicator 59 of the panel unit of the conventional dealing board can be easily changed by means of a controlling of the software of the computer.

According to the prior art, due to a narrow space for containing the mounted parts of the panel unit, the indication device is restricted to ones of a liquid crystal, such as the liquid crystal indicator 59. It is noted that the characters displayed on the indicator 59 of such kind is not clear and a viewing angle is narrow. In addition, the liquid crystal indicator 59 must be mounted on every low of the buttons 58, so that an electric wiring of the liquid crystal indicator 59 is made complicated and a mounting operation of the liquid crystal indicator 59 necessitates much hand-work.

According to another indication method of the customer names on the panel unit, a touching panel is placed on the top face of a plasma display device and the like, so that it is possible to recognize the names of the customers without labels attached onto the top faces. According to such panel unit, when light of ultraviolet ray LEDs arranged on the top face of the display device in a matrix shape is interrupted by a finger of the operator, the position of the finger is detected and it is a function of a switch. As a result, there is no feeling of pressing the buttons and an operability of the panel unit is deteriorated. Because the indicator 59 is

directly touched, the indicator 59 is apt to become dirty deteriorating visibility of the indicators.

Additionally, the conventional dealing board 53 used as a terminal of financial organizations or companies deals with financial transactions by means of telephone lines, so that it is necessary to provide telephone functions and a keyboard for using these telephone functions.

In the conventional dealing board 53, the keyboard is made and used as a unit and the unit keyboard has operation buttons as shown in FIG 23 and FIG 24.

In detail, the operation button shown in FIG 31 consists of a button 58, an electric conductive contacting rubber 59 placed below the button 58, a printed substrate 61, and a panel 62 covering the printed substrate 61. The button 58 is adapted to be urged upwardly by a resiliency of the electric conductive contact rubber 59. An outwardly projected engagement portion 63 is formed on the lower and outer circumferential portion of the button 58. Because the engagement portion 63 engages with the bottom face of the panel 62, the button 58 doesn't get out of place from a hole 64 of the panel 62.

When the button 58 such constructed above is pressed, the button 58 lowers by a stroke S and a contact portion 65 placed on the electric conductive contact rubber 59 comes in contact with contacts 66 on the printed substrate 61 leading

electricity between these contacts 66. It is apparent that the low end of the button 58 is separated from a top face of the electric conductive contact rubber 59 by a gap X2, thereby the former cannot come in contact with the latter even when the contact portion 65 comes in contact with these contacts 66.

When a thickness of the panel 62 is shown by D, a height of the engagement portion 63 is C, and a thickness of the electric conductive contact rubber 59 is B, a total of D, C, and B, as well as the stroke S and the gap X2 equals to a thickness size A measured from the top face of the printed substrate 61 to the top face of the panel 62.

Other operation buttons shown in FIG 25 and FIG 26 have been used in the field. The button shown in FIG 25 has a dome-like button 68, and a polyester sheet 67 having its upper surface printed and covering the button 68. Another button shown in FIG 26 has a silicone rubber sheet 69 in addition to the dome-like button 68 and the polyester sheet 67, and a different button 70 connected to the silicone rubber sheet 69. It is apparent that the flat button 70 is placed on and above the dome-like button 68. A thickness size A of the button shown in FIG 26 measured from the top face of the printed substrate 61 to another top face of the panel 62 is exceedingly shorter than the size A of the operation button shown in FIG 23.

The conventional operation buttons 68 and 70 shown in FIG 25 and FIG 26 respectively have strokes S of only about 1 mm because a molding process of polyester material has a restriction and life of the polyester sheet 67 is short.

Consequently, operation or pressing feeling of the buttons 68 and 70 are bad. When these buttons 68 and 70 are employed in the dealing board and they are used frequently, they will be broken before long periods. It is said that they haven't reliability in operation.

When the thickness size measured from the top face of the printed substrate 61 and the top face of the button 58 in the conventional keyboard unit 53 is made small, insulation resistance between the printed substrate 61 and the button 58 becomes low, static electricity noise impressed to around the button 58 through its top side is transferred to a signal pattern 72 connected to an electrode of the contact 71 shown in FIG 27, and entered into an electronic circuit from a through hole 73 through a connector, thereby generating errors in operation.

Summary of the Invention

According to a first aspect, the present invention is a panel unit of a dealing board provided with a keyboard unit which, including a plurality of buttons, is disposed so as to contact the surface of a display,

wherein the keyboard unit comprises:

a printed substrate provided with a plurality of switch contacts, a rubber sheet which, disposed on the printed substrate has a plurality of contact portions moveable into contact/ with the switch contacts, the buttons which, disposed on the rubber sheet bring the contact portion into contact with the switch contact, and a panel disposed above the printed substrate and which has a plurality of holes through which each of the buttons moves in up-and-down direction, and

wherein each of the buttons has engagement portions which, being adapted to prevent the buttons from coming out of the keyboard unit, is adapted to engage upward with the lower face of the panel, and the portions of the rubber sheet and the printed substrate which face the engagement portions are provided with a plurality of relief holes through which each of the engagement portions is moved when the button is pressed.

According to a second aspect, the present invention is a panel unit of a dealing board provided with keyboard unit comprising:

a panel;

a rubber sheet including a plurality of contact portions;

a printed substrate disposed beneath the panel and having a plurality of switch contacts and earth patterns disposed on the substrate around the switch contacts for preventing generation of static electricity noise, and

buttons disposed in a plurality of holes formed in the panel so as to move in up-and-down direction to move the contact portions of the rubber sheet into contact portions with the switch contacts of the printed substrate wherein the buttons include engagement portions adapted for engagement with a lower face of the panel to prevent the buttons from coming out of the keyboard, and relief holes are formed in the rubber sheet and the printed substrate facing the engagement portions, through which relief holes the engagement portions are moved when the button is pushed.

Brief Description of the Drawings

FIG 1 is a plan view showing the keyboard unit according to another embodiment of the present invention.

FIG 2 is a front view of the another embodiment above.

FIG 3 is a side view of the another embodiment.

FIG 4 is an enlarged section showing the operation buttons and its neighboring portion of the keyboard unit according to the other embodiment.

FIG 5 is a section taken along a line E-E shown in FIG 10.

FIG 6 is a section depicting an operation condition of the operation button.

FIG 7 is a section taken along a line F-F of FIG 10.

FIG 8 is a section depicting an operation condition of the operation button.

FIG 9 is a diagram of curves depicting strokes and downing force of the electric conductive contact rubber.

FIG 10 is a diagram of the curves depicting strokes and pressing force in experiments.

FIG 11 is a flat view of another embodiment of the keyboard according to the present invention.

FIG 12 is a front view of the embodiment shown in FIG 19.

FIG 13 is a side elevation of the embodiment above.

FIG 14 is an enlarged plan view of a part about the operation button on the keyboard unit.

FIG 15 is a section taken along the line G-G shown in FIG 22.

FIG 16 is a section depicting an operation condition of the operation button.

FIG 17 is a section taken along the line H-H shown in FIG 22.

FIG 18 is a section showing an operation condition of the operation button.

FIG 19 is a detailed view of a contact in the keyboard

unit.

FIG 20 is a perspective view of the desk installed on the conventional dealing board.

FIG 21 is a perspective view of a panel unit of the conventional dealing board.

FIG 22 is a section of the panel unit shown in FIG 29.

FIG 23 is a section of an operation button installed on the conventional keyboard.

FIG 24 is a section showing an operation condition of the operation button.

FIG 25 is a section of another operation button employed on the conventional keyboard unit.

FIG 26 is a section of still another operation button used on the conventional keyboard unit.

FIG 27 is a detailed view of the contact installed on the conventional keyboard unit.

Description of the Embodiments

FIG 1 to FIG 7 , respectively show another embodiment of the key board unit used as an operation part of the dealing board.

It is apparent that a panel 24 has a plurality of square openings 24a arranged along vertical lines or rows and horizontal lines or columns, and buttons 23 each fitted into the square openings 24a.

The buttons 23 has a shape of thin plates. The button 23 has an engagement portion 23a formed at lower corners of the button 23. The engagement portion 23a is inserted to a bottom face of the panel 24 and engaged with the bottom face.

The button 23 has projections or protrusions 23b formed on its bottom face coming in contact with a top face of a contact portion 22a of an electric conductive contact rubber 22.

The electric conductive contact rubber 22 is adapted to intimately contact with a printed substrate 21. Each button 23 has, for example, two contact portions 22a protruding upward and attached on the bottom face of the button 23. A thin portion 22b of the contact portion 22a has a resiliency urging the button 23 upward. Two contacts 21a adapted to be electrically connected to each other through the contact portion 22a are formed on the printed substrate 21. It is apparent that these contacts 21a are placed under the contact portion 22a.

In addition, the electric conductive contact rubber 22 has a recess portion or relief hole 22c to which portion the engagement portion 23a projected from the corner of the button 23 is applied. The printed substrate 21 has another relief hole 22b formed therein. The engagement portion 23a of the button 23 is loosely inserted downward through these relief holes 22c and 21b.

The thickness of the electric conductive contact rubber 22 is decided so as not to project of the front end of the engagement portion 23a lower than the bottom face of the printed substrate 21 even when the button 23 is pressed and the contact portion 22a lowers by the stroke S.

Operation of the panel unit of the present invention will

be explained with reference to the accompanying drawings.

When the button 23 is not pressed, resiliency of the thin portion 22b of the electric conductive contact rubber 22 raises the button 23 to a position shown in FIG 11, at which position the engagement portion 23a engages with the bottom face of the panel 24 preventing the engagement portion 23a from coming out of the hole 24a.

Next, when the button 23 is pressed, the contact portion 22a strokes by a distance S and comes into contact with the contact 21a on the printed substrate 21 leading the contacts 21a to each other. Then, the engagement portion 23a of the button 23 lowers through the relief holes 22c and 21b, respectively formed in the electric conductive contact rubber 22 and the printed substrate 21. Apparently, there is no intervention or conflict between the button 23 and the electric conductive contact rubber 22, and the button 23 and the printed substrate 21.

A thickness size A' measured from a top face of the printed substrate 21 to a top face of the panel 24 is determined with a thickness size B of the electric conductive contact rubber 22 and another thickness size D of the panel 24. The thickness size A' doesn't have relation to the stroke S, so that even when the stroke S becomes large, the thickness size A' can be made small by making these thickness sizes B and D small. Consequently, it is possible to make considerably

small of a non-seeing range Z' for the display 25 even when the operator watches the display 25 slantly as shown by a dotted line Y in FIG 6 through an open portion 21c formed in the printed substrate 21.

Next, pressing down characteristic of the button 23 will be explained.

Analysis value of pressing feeling of the button 23 is decided by the following equation.

$$V = \text{Operation load } P1 / \text{restoring load } P2 \times \text{stroke } S$$

When the value V becomes larger than 1.5, pressing feeling of the button 23 is said good.

FIG 9 shows experimental results of characteristics of strokes and pressing forces with reference to various materials of the electric conductive contact rubber.

The following table 1 shows several analysis values V obtained from the experimental results. Comparing the analysis values to pressing feeling of a real button 23 decides that the best material for the button 23 is QGR4-60A (hardness 60').

**Table 1 : Comparing of Analysis Value V of
Pressing Feeling**

material	designed value	Black sample (Hardness 50)	Black sample (Hardness 55)
V	1.90	1.44	1.54

Black sample (Hardness 60)	Black sample (Hardness 60)	Black sample (Hardness 60')	Black sample (Hardness 70)
1.49	1.35	1.56	1.36

The size of the button 23 is a factor determining operability of the button. Two electric conductive contact rubbers 22 correspond to one button 23 as mentioned above. so that it is possible to exceedingly make the button 23 large and obtain some pressing feeling even when the corner of the button 23 is pressed improving its reliability.

Because the stroke attained, when the button 23 is pressed, is the same as that attained when the conventional electric conductive contact rubber is used, operation feeling

is not deteriorated, as well as durability of the button 23 is exceedingly improved comparing to that made of polyester sheet. A high reliability is attained in the product of the panel unit of the present invention.

Another embodiment of the keyboard unit adapted to be used in the operation portion of the dealing board is shown in FIG 10 to FIG 18.

As shown, the panel 34 has a number of square holes 34a arranged in vertical rows and horizontal columns and buttons 33 are fitted into these holes 34a.

The button 33 is a thin one and has an engagement portion 33a adapted to engage upward with the lower face of the panel 34, which portion 33a projects from the lower corner portion. On the lower face of the button 33, there are protrusions 33b protruded so as to contact with the top face of the contact portion 32a of the electric conductive contact rubber 32.

The electric conductive contact rubber 32 is placed so as to intimately contact with the printed substrate 31. On the bottom face of the button 33, there are, for example, two contact portions 32a projecting upward. The buttons 33 are urged upward due to resiliency of the thin portion 32b of the contact portion 32a. A pair of contacts 31a led by the contact portion 32a as formed on the printed substrate 31 below the respective contact portions 32a.

The portions of the electric conductive contact rubber 32 and of the printed substrate 31, to which portions the engagement portions 33a projected from the corners of the button 33 abut, have relief holes 32c and 31b. The engagement portions 33a of the button 33 are loosely and downward inserted through the relief holes 32c and 31b.

The thickness of the electric conductive contact rubber 32 is decided so as to prevent the ends of the engagement portion 33a from projecting downward out of the lower face of the printed substrate 31 even when the button 33 is pressed and the contact portion 32a lowers by a stroke S.

The carbon contact 35 shown in FIG 18 has a pair of contacts 31a and one earth pattern 35b. The earth pattern 35b surrounds the contacts 31a. The earth pattern 35b has a solder coating thereon in order to improve its conductivity.

Electrodes of the contacts 31a have buyer holes 35c. In order to prevent static electricity noise from conveying, a signal pattern (corresponding to q shown in FIG 26) connected to the contact 1a is not provided on a face of the contact 31a. In order to improve reliability of electric connection, two buyer holes 35c are formed on the electrode of the contact 31a.

Next, operation will be explained. When the button 33 is not pressed, resiliency or elasticity of the thin portion 32b of the electric conductive contact rubber 32 raises the button 33 to its position shown in FIG 16, and the engagement

portion 33a engages with the lower face of the panel 34 preventing the button 33 from dropping out of the hole 34a.

Pressing the button 33 lowers the contact portion 32a by the stroke S and the contact portion 32a comes in contact with the contacts 31a in order to electrically connect these contacts 31a to each other. Then, the engagement portion 33a of the button 33 lowers through the relief holes 32c and 31b formed in the electric conductive contact rubber 32 and the printed substrate 31 without any conflict of the electric conductive contact rubber 32 and the printed substrate 31.

The thickness size A' measured from the top face of the printed substrate 31 to the top face of the panel 34 is determined with reference to the thickness size B of the electric conductive contact rubber 32 and the thickness size D of the panel 34, without relation to the stroke S. Consequently, it is possible to make the thickness size A' small by making these thickness sizes B and D of the electric conductive contact rubber 32 and the panel 34 even when the stroke S is large. As a result, it is possible to reduce considerably the non-seeing range Z' of the display 36 even when the operator watches the display 36 slantly through the open portion 31c formed in the printed substrate 31 as shown by the sight line Y in FIG 16.

Static electricity noise disadvantageously impressed to the button 33 through a finger tip of the operator pressing

the button due to the thickness size A' of small is conveyed to the earth pattern 35b provided with a solder coating and placed around the contacts 31a, thereby a conveyance of static electricity from the buyer holes 35c formed on the electrode of the contact 31a to the signal pattern is surely prevented. The earth pattern 35b is formed simultaneously with the signal pattern and the buyer holes 35c, a manufacturing cost of the printed substrate 31 is low.

Concerning the keyboard unit provided with the printed substrate 31, the printed substrate 31 has the electric conductive contact rubber 32 and the panel 34, respectively formed thereon and the buttons 33 for contacting the contact 31a of the printed substrate 31 to the contact portion 32a of the electric conductive contact rubber 32 is inserted into a plurality of holes 34a open in the panel 34 so as to move freely and vertically. In addition, relief holes 32c and 31b, through which the engagement portions 33a are inserted when the button 33 is pressed, are formed in the portions corresponding to the engagement portions 33a adapted to prevent the button 33 from coming out of the relief holes 32c and 31b, and the earth pattern 35b is formed around the contact 31a of the printed substrate 31, thereby the engagement portion 33a of the pressing button 33 is inserted through the relief holes 32c and 31b and lowers without any intervention of the electric conductive contact rubber 32 and the printed substrate 31.

In consequence, it is possible to make the thickness size measured from the top face of the printed substrate 31 and the top face of the panel 34 small without lessening the stroke of the button 33.

the non-recognisable or watchable range of the display 36 when the display 36 is slantly seen is exceedingly reduced improving a visuability of the display 36 or without a deterioration of the visuability. Additionally, an operation or manual feeling of the operator obtained when he or she presses the button 33 is not deteriorated, as well as a durability of the machanism of the panel unit is improved very much attainining its high reliability.

According to the panel unit of the present invention, static electricity impressed to the button 33 when it is pressed is transferred to the earth pattern 35b around the contacts 31a before being transferred to the signal pattern connected to the contacts 31a, therefore static electricity is not transferred to the signal pattern preventing the electronic circuits from erroneous operating due to such static electricity noise and heightening a reliability of the mechanism or system.

Co-pending British Patent Application No. 9206518.4 discloses, according to a first aspect, a panel unit of a dealing board which provides a keyboard unit which, including a plurality of buttons, is disposed on a display unit,

wherein the display unit is a single display, including a plurality of discrete indication regions which are formed

by dividing or sectioning the single display into a plurality of regions and which indicate a function name which, corresponding to each of said plurality of buttons, can be changed programably by software,

wherein the keyboard unit comprises: a printed substrate provided with switch contacts for respective buttons, a plurality of further contacts which are engageable with the switch contacts of the printed substrate, the buttons which, disposed on the further contacts can bring the further contacts into contact with the switch contacts on the printed substrate, and click means associated with each of the buttons for generating a click when a button is pushed, and

wherein the printed substrate includes through holes for revealing the function name indicated by the discrete indication regions on the display unit.

According to a second aspect, co-pending British Patent Application No. 9206518.4 discloses a panel until of a dealing board which comprises a display unit having discrete indication regions and a keyboard unit disposed on the display unit, the keyboard unit including:

- a plurality of buttons;

- a printed substrate having a plurality of switch contacts at positions corresponding to positions of said plurality of buttons and through holes in the substrate disposed at positions adjacent said plurality of buttons in order to reveal an indication region of the display unit adjacent a corresponding button, the discrete indication

regions for indicating a function of each button;

a contact sheet having a plurality of further contacts, each further contact being engageable with a switch contact of the printed substrate; and

click means associated with each of said plurality of buttons for generating a click when a button is pushed.



CLAIMS

1. A panel unit of a dealing board provides a keyboard unit which, including a plurality of buttons, is disposed so as to contact the surface of a display,

wherein the keyboard unit comprises:

a printed substrate provided with a plurality of switch contacts, a rubber sheet which, disposed on the printed substrate has a plurality of contact portions moveable into contact with the switch contacts, the buttons which, disposed on the rubber sheet bring the contact portion into contact with the switch contact, and a panel disposed above the printed substrate and which has a plurality of holes through which each of the buttons moves in up-and-down direction, and

wherein each of the buttons has engagement portions which, being adapted to prevent the buttons from coming out of the keyboard unit, is adapted to engage upward with the lower face of the panel, and the portions of the rubber sheet and the printed substrate which face the engagement portions are provided with a plurality of relief holes through which each of the engagement portions is moved when the button is pressed.

2. The panel unit of a dealing board according to claim 1, wherein the keyboard unit has earth patterns provided around respective switch contacts of said printed substrate so as to prevent static electricity noise from generating.



3. A panel unit of a dealing board provided with a keyboard unit comprising:

a panel;

a rubber sheet including a plurality of contact portions;

a printed substrate disposed beneath the panel and having a plurality of switch contacts and earth patterns disposed on the substrate around the switch contacts for preventing generation of static electricity noise, and

buttons disposed in a plurality of holes formed in the panel so as to move in up-and-down direction to move the contact portions of the rubber sheet into contact with the switch contacts of the printed substrate wherein the buttons include engagement portions adapted for engagement with a lower face of the panel to prevent the buttons from coming out of the keyboard, and relief holes are formed in the rubber sheet and the printed substrate facing the engagement portions, through which relief holes the engagement portions are moved when the button is pushed.

4. The panel unit according to claim 3, including a display for displaying information adjacent each button.