

FLEXIBLE CIRCUIT CONNECTOR, CIRCUIT APPARATUS AND INFORMATION RECORDING APPARATUS

TECHNICAL FIELD

5 [0001] The present invention relates to a flexible circuit connector, a circuit apparatus and an information recording apparatus, and more particularly to a flexible circuit connector, a circuit apparatus and an information recording apparatus which enable reuse of a communication module.

10

BACKGROUND ART

[0002] A sheet-like assay device has been put into practical use which has a conductive pattern formed by silk-screen printing on a substrate, and in which pads of a communication module are
15 electrically connected via a conductive adhesive to a terminal section of the conductive pattern.

[0003] The assay device disclosed in patent document 1 can be sent by mail to a user. When the user peels off the front cover of a package including the assay device, the user will find some
20 selection buttons and their explanations, provided on the inside of the package. If the user presses a button based on its explanation, the information is stored in the communication module embedded in the paper substrate. The stored information can be retrieved by a host device via near field
25 communication.

[0004] In such an assay device, the substrate having a conductive pattern is composed of a plurality of parts connected at folding lines. While the substrate is unfolded during use, the substrate is folded at the folding lines into a compact size after use. A
30 repetition of folding and unfolding of the substrate can cause breakage or damage of the conductive pattern extending across the folding lines.

Citation List

Patent Literature

35 [0005] Patent document 1: Published Japanese Translation No. 2008-516248 of the PCT International Publication

Patent document 2: Japanese Patent Laid-Open Publication No. H7-22099

SUMMARY OF THE INVENTION

5 Problems to be Solved by the Invention

[0006] The present invention has been made in view of the above situation. It is therefore an object of the present invention to provide a flexible circuit connector, a circuit apparatus and an information recording apparatus which can avoid breakage or
10 damage of a conductive pattern on a substrate even when the substrate is folded and unfolded repeatedly.

Means for Solving the Problems

[0007] The present invention provides a flexible circuit connector to be disposed over a folding line between a first substrate having a first conductive circuit and a second substrate having a second conductive circuit, which are connected at the folding line, and to connect the first conductive circuit and the second conductive circuit, said connector comprising: an insulating substrate; a one-side terminal section provided on one side of the insulating substrate and to be connected to the first conductive circuit; an other-side terminal section provided on the other side of the insulating substrate and to be connected to the second conductive circuit; and a conductive portion connecting the one-side terminal section and the other-side terminal section.

[0008] In a preferred embodiment of the present invention, the insulating substrate comprises polyethylene terephthalate or polybutylene terephthalate.

[0009] In a preferred embodiment of the present invention, an anisotropic conductive adhesive has been applied to the one-side terminal section and the other-side terminal section.

[0010] In a preferred embodiment of the present invention, the conductive portion on the insulating substrate is covered with an
15 insulating layer.

[0011] The present invention also provides a circuit apparatus comprising: a circuit board including a first substrate having a first conductive circuit and a second substrate having a second

conductive circuit, which are connected at a folding line; a communication module connected to the first conductive circuit or the second conductive circuit; and a flexible circuit connector disposed over the folding line between the first substrate and the second substrate, and connecting the first conductive circuit and the second conductive circuit, wherein the flexible circuit connector includes: an insulating substrate; a one-side terminal section provided on one side of the insulating substrate and connected to the first conductive circuit; an other-side terminal section provided on the other side of the insulating substrate and connected to the second conductive circuit; and a conductive portion connecting the one-side terminal section and the other-side terminal section.

[0012] In a preferred embodiment of the present invention, an anisotropic conductive adhesive has been applied to the one-side terminal section and the other-side terminal section, or to the first conductive circuit and the second conductive circuit.

[0013] The present invention also provides an information recording apparatus comprising: a circuit board including a first substrate having a first conductive circuit and a second substrate having a second conductive circuit, which are connected at a folding line; a communication module connected to the first conductive circuit or the second conductive circuit; and a flexible circuit connector disposed over the folding line between the first substrate and the second substrate, and connecting the first conductive circuit and the second conductive circuit, wherein the first conductive circuit or the second conductive circuit is configured to be partly breakable, wherein the communication module includes an IC chip and a button cell for supplying a source voltage to the IC chip, wherein the IC chip includes a storage unit for storing information on a site where the first conductive circuit or the second conductive circuit has broken and the time of the breakage in chronological order, a control unit for controlling the storage unit, and a wireless communication unit for performing close range wireless communication between the wireless communication unit and an external host device, and

wherein the flexible circuit connector includes: an insulating substrate; a one-side terminal section provided on one side of the insulating substrate and connected to the first conductive circuit; an other-side terminal section provided on the other side of the insulating substrate and connected to the second conductive circuit; and a conductive portion connecting the one-side terminal section and the other-side terminal section.

[0014] The present invention also provides an information recording apparatus comprising: a circuit board including a first substrate having a first conductive circuit and a second substrate having a second conductive circuit, which are connected at a folding line; a communication module connected to the first conductive circuit or the second conductive circuit; and a flexible circuit connector disposed over the folding line between the first substrate and the second substrate, and connecting the first conductive circuit and the second conductive circuit, wherein the first conductive circuit or the second conductive circuit is configured to be pressable, wherein the communication module includes an IC chip and a button cell for supplying a source voltage to the IC chip, wherein the IC chip includes a storage unit for storing information which identifies a section button pressed on the first conductive circuit or the second conductive circuit and the time of the pressing in chronological order, a control unit for controlling the storage unit, and a wireless communication unit for performing close range wireless communication between the wireless communication unit and an external host device, and wherein the flexible circuit connector includes: an insulating substrate; a one-side terminal section provided on one side of the insulating substrate and connected to the first conductive circuit; an other-side terminal section provided on the other side of the insulating substrate and connected to the second conductive circuit; and a conductive portion connecting the one-side terminal section and the other-side terminal section.

[0015] The present invention also provides an information recording apparatus comprising: a circuit board including a first substrate having a first conductive circuit and a second substrate

having a second conductive circuit, which are connected at a folding line; a communication module connected to the first conductive circuit or the second conductive circuit; and a flexible circuit connector disposed over the folding line between the first substrate and the second substrate, and connecting the first conductive circuit and the second conductive circuit, wherein the first conductive circuit or the second conductive circuit is configured to be partly breakable, and is provided with pressable selection buttons, wherein the communication module includes an IC chip and a button cell for supplying a source voltage to the IC chip, wherein the IC chip includes a storage unit for storing information on a site where the first conductive circuit or the second conductive circuit has broken and the time of the breakage in chronological order, and for storing information which identifies a selection button pressed on the first conductive circuit or the second conductive circuit and the time of the pressing in chronological order, a control unit for controlling the storage unit, and a wireless communication unit for performing close range wireless communication between the wireless communication unit and an external host device, and wherein the flexible circuit connector includes: an insulating substrate; a one-side terminal section provided on one side of the insulating substrate and connected to the first conductive circuit; an other-side terminal section provided on the other side of the insulating substrate and connected to the second conductive circuit; and a conductive portion connecting the one-side terminal section and the other-side terminal section.

[0016] In a preferred embodiment of the present invention, an anisotropic conductive adhesive has been applied to the one-side terminal section and the other-side terminal section, or to the first conductive circuit and the second conductive circuit.

Advantageous Effects of the Invention

[0017] According to the present invention, a conductive pattern on a substrate will not suffer from breakage or damage even when the substrate is folded and unfolded repeatedly.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] FIG. 1 is an external view of an information recording apparatus according to an embodiment of the present invention;

FIG. 2 is a development view of the information recording apparatus of FIG. 1;

FIG. 3 is a block diagram illustrating a schematic construction of a communication module;

FIG. 4 is a block diagram illustrating an exemplary internal construction of an ASIC;

FIG. 5 is a development view of a paper substrate which serves as a base of a medicine-taking recording card;

FIG. 6A is a plan view of a flexible circuit connector;

FIG. 6B is a side view of the flexible circuit connector;

FIG. 7A is a cross-sectional side view of the flexible circuit connector;

FIG. 7B is a cross-sectional side view of the flexible circuit connector;

FIG. 8 is a diagram of a lowermost substrate, illustrating a variation according to the present invention;

FIG. 9 is a diagram of a flexible circuit connector, illustrating the variation according to the present invention;

FIG. 10 is a diagram of the lowermost substrate to which an anisotropic conductive adhesive has been applied, illustrating the variation according to the present invention;

FIG. 11 is a diagram of a flexible circuit connector, illustrating the variation according to the present invention;

FIG. 12 is a plan view of a lowermost substrate, illustrating another variation according to the present invention;

FIG. 13 is a plan view of a lowermost substrate, illustrating another variation according to the present invention;

FIG. 14 is a plan view of a lowermost substrate, illustrating another variation according to the present invention;

FIG. 15 is a plan view of a lowermost substrate, illustrating another variation according to the present invention;

FIG. 16 is a plan view of the paper substrate of Example 1 according to the present invention;

FIG. 17 is a diagram illustrating the paper substrate to which an anisotropic conductive adhesive has been applied;

FIG. 18 is a plan view of the flexible circuit connector of Example 1 according to the present invention;

5 FIG. 19 is a plan view of the paper substrate of Example 2 according to the present invention;

FIG. 20 is a plan view of the flexible circuit connector of Example 2 according to the present invention;

10 FIG. 21 is a perspective view of an information recording apparatus in a folded state; and

FIG. 22 is a perspective view of an information recording apparatus in a folded state.

DESCRIPTION OF THE EMBODIMENTS

15 [0019] <Embodiment of the Invention>

An embodiment of the present invention will now be described in detail.

This embodiment is an information recording apparatus (also termed a circuit apparatus) for a patient to record a date and time when the patient took a medicine and the patient's condition after the medication. FIG. 1 is an external view of the information recording apparatus. The information recording apparatus of FIG. 1 is comprised of a sheet-like medicine-taking recording card 1. The medicine-taking recording card 1 is foldable and, when it is unfolded, an information input face 2 as shown in FIG. 2 appears. The medicine-taking recording card 1 as an information recording apparatus includes the below-described paper substrate 30, a conductive circuit 18A provided on the paper substrate 30, and a communication module 10 capable of wireless transmission, connected to the conductive circuit 18A via a circuit connector 90 (see FIGS. 3 and 5).

20
25
30

[0020] The paper substrate 30 and the conductive circuit 18A, provided on the paper substrate 30, constitute a circuit board 70. The circuit connector 90 is not necessarily provided. The circuit connector 90 may be either a flexible connector or a rigid connector.

35

[0021] The information recording apparatus 1 comprised of the medicine-taking recording card will now be described further. The medicine-taking recording card 1 is to be given to a patient after a medical examination of the patient in a hospital and upon
5 completion of the preparation of a medicine based on a prescription. After the patient takes a medicine, the patient presses a selection button of the medicine-taking recording card 1, whereby their condition can be recorded.

[0022] The information input face 2 of the medicine-taking
10 recording card 1 of FIG. 2 has a three-face structure: a start button 3 and a cancel button 4 are provided in a first face 2a; a medicine (tablets) 5 to be taken by the patient is placed in a second face 2b; and selection buttons for the patient to input the degree of a symptom are disposed in a third face 2c. The surface
15 opposite the first face 2a is the surface with "Medicine-Taking Recording Card" printed on it, shown in FIG. 1.

[0023] A plurality of symptoms associated with the effectiveness of the medicine are written on the third face 2c. In the example illustrated in FIG. 2, five types of symptoms, namely (1) symptom
20 1, (2) symptom 2, (3) symptom 3, (4) symptom 4 and (5) symptom 5, are written on the third face 2c. One of three degrees (severe, moderate, mild) can be selected for each symptom. The patient first presses one of a first button row 6, consisting of selection buttons 6a to 6e corresponding to the five
25 types of symptoms, to select a particular symptom, and subsequently presses one of a second button row 7 consisting of selection buttons 7a to 7c corresponding to the degrees of the symptom. In this manner, the patient can input the degree of the particular symptom after taking the medicine. The patient
30 need not respond to all the five types of symptoms, and may respond to only some of the symptoms.

[0024] The selection buttons 6a to 6e, constituting the first button row 6, are arranged along the X-direction shown in FIG. 2, while the selection buttons, constituting the second button rows 7,
35 are arranged in rows approximately parallel to the first button row 6 and in lines along the Y-direction.

[0025] The symptoms and the degrees written on the third face 2c are merely an example, and may be arbitrarily changed depending on the type of the medicine.

5 [0026] The patient presses the start button 3 when starting the use of the medicine-taking recording card 1. Thereafter, the patient presses one of cases for the tablets 5, placed in the second face 2b, with a finger to eject the tablet from the surface opposite the second face 2b, and takes the medicine. Thereafter, the patient presses those selection buttons 6 and 7 which correspond
10 to the relevant symptom and degree after the medication.

[0027] Information on the start button 3, the cancel button 4, a the particular case for the tablet 5 and the particular selection buttons 6, 7 which the patient has pressed is automatically stored in the communication module 10 embedded in the
15 medicine-taking recording card 1.

[0028] FIG. 3 is a block diagram illustrating a schematic construction of the above-described communication module 10 capable of wireless transmission. The communication module 10 of FIG. 3 includes an ASIC (Application Specific Integrated Circuit)
20 12 as an IC chip, mounted on a resin substrate 11, a crystal oscillator 13, a button cell 14, a speaker 15, a plurality of pads 16 formed along a long side of the resin substrate 11, an antenna pattern 17a formed along the periphery of the resin substrate 11, and a conductive pattern 17b formed on the resin substrate 11.

25 [0029] FIG. 3 is a block diagram illustrating a functionalized internal construction of the communication module 10. The actual disposition, size, shape and number of the circuit components and the patterns may be arbitrarily changed.

[0030] FIG. 4 is a block diagram illustrating an exemplary internal construction of the ASIC 12. The ASIC 12 of FIG. 4 includes a
30 storage unit 21 for storing, together with temporal information, time-series information on the start button 3, the cancel button 4, a particular case for the tablet 5 and particular selection buttons which the patient has pressed, a control unit 22 for controlling the storage of the informations in the storage unit 21, and a wireless
35 communication unit 23 for performing wireless communication

between it and a not-shown host computer.

[0031] The storage unit 21 stores information that identifies a button which the patient pressed in combination with information on the time when the button was pressed. The cancel button 4 is
5 intended to cancel information on a button which was pressed immediately before the cancel button 4 is pressed. When information on pressing of the cancel button 4 and information on the time when the button was pressed are stored in the storage unit 21, the host computer cancels the information on the button
10 which was pressed immediately before the pressing of the cancel button 4.

[0032] The wireless communication unit 23 sends/receives information to/from the host computer via so-called NFC (Near Field Communication). There is no particular limitation on a
15 method and a frequency range for use by the wireless communication unit 23 in close range wireless communication. For example, wireless communication may be performed at a frequency of 13.56 MHz by using a radio system in accordance with ISO 14443.

[0033] The NFC standard allows for transmission of electric power. Therefore, it is possible in principle to drive the communication module 10 without a battery. The communication module 10 of
20 this embodiment, however, includes the speaker 15; therefore, the power consumption is relatively high. The communication module 10 therefore uses the button cell 14.

[0034] The detailed construction of the medicine-taking recording card 1 according to this embodiment will now be described. The medicine-taking recording card 1 has a three-layer structure in which the paper substrate is longitudinally divided into three
30 equal parts which are folded, with the information input face 2 shown in FIG. 2 appearing at the surface. Further, the medicine-taking recording card 1 is laterally divided into three equal parts by the below-described folding lines 64. The divided parts, when folded, takes the shape shown in FIG. 1. A
35 conductive pattern, formed on the paper substrate as a base, will now be described.

[0035] FIG. 5 is a development view of the paper substrate 30 which serves as a base of the medicine-taking recording card 1. The paper substrate 30 of FIG. 5 is trisected into three divided substrates 30a, 30b, 30c by longitudinally-extending folds 61. The divided substrates 30a, 30b, 30c are provided with a conductive pattern 18, cutouts, etc. which differ among the substrates 30a, 30b, 30c. The three divided substrates 30a, 30b, 30c are foldable at the folds 61, and are not to be physically separated from each other. Further, as described above, the divided substrates 30a, 30b, 30c each have the folding lines 64, and the divided substrates 30a, 30b, 30c are folded into one-third at the laterally-extending folding lines 64. In FIG. 5, for the sake of convenience, the two single folding lines 64 are provided in each of the divided substrates 30a, 30b, 30c; however, a pair of parallel folding lines 64, 64 may be provided instead of each single folding line 64 (see FIG. 1).

[0036] The middle divided substrate 30b of FIG. 5 is a lowermost substrate 30b which is to be disposed as a lowermost part and on which the conductive pattern 18 is formed. The right-hand divided substrate 30c is an intermediate substrate 30c which mainly has cutouts 62 and perforations 63 and which is to be disposed on the lowermost substrate 30b. The left-hand divided substrate 30a is a topmost substrate 30a which has conductive patterns 38 for performing conduction/blocking of switch contacts and which is to be disposed on the intermediate substrate 30c.

[0037] As will be described later, the structure shown in FIG. 2 is obtained by folding the intermediate substrate 30c onto the lowermost substrate 30b, followed by thermal compression bonding, placing a formed sheet containing the tablets 5 on the folded intermediate substrate 30c, and then folding the topmost substrate 30a onto the sheet, followed by thermal compression bonding. Accordingly, the back or opposite surface of the topmost substrate 30a shown in FIG. 5 is the information input face 2 shown in FIG. 2.

[0038] Before folding the intermediate substrate 30c onto the lowermost substrate 30b and performing thermal compression

bonding, the communication module 10 is bonded to the
 lowermost substrate 30b, and the topmost substrate 30a is
 thermally compression-bonded to the communication module 10.
 Thus, the communication module 10 is sandwiched between the
 5 lowermost substrate 30b and the topmost substrate 30a.
 Therefore, the conductive pattern 18 and the communication
 module 10, formed on the surface of the lowermost substrate 30b,
 do not appear in the final form of the medicine-taking recording
 card 1. Similarly, since the topmost substrate 30a is folded onto
 10 the intermediate substrate 30c, followed by thermal compression
 bonding, the conductive pattern on the topmost substrate 30a
 also does not appear in the medicine-taking recording card 1.
 [0039] The conductive pattern 18, formed on the surface of the
 lowermost substrate 30b, will now be described with reference to
 15 FIG. 5. The conductive pattern 18 of FIG. 5 has first to third
 pattern faces 30b1 to 30b3 corresponding to the trisected first to
 third faces 2a to 2c of the information input face 2.
 [0040] The first pattern face 30b1 has a switch contact 31
 corresponding to the start button 3, and a switch contact 32
 20 corresponding to the cancel button 4. The second pattern face
 30b2 has 6 switch contacts 33 corresponding to the cases for the
 tablets 5. The third pattern face 30b3 has a total of 15 switch
 contacts 34 to 37 corresponding to the selection buttons for the
 selection of a patient's symptom and its degree.
 25 [0041] Of the switch contacts 31 to 37, the 6 switch contacts 33
 corresponding to the cases for the tablets 5 are electrically
 conductive in their initial states, whereas the other switch
 contacts 31, 32, 34 to 37 are all electrically blocked in their initial
 states.
 30 [0042] Each of the switch contacts 33, corresponding to the cases
 for the tablets 5, is physically broken when pressing the
 corresponding case and taking the tablet 5 out of the case,
 whereby the electrical conduction of the switch contact 33 is
 blocked. On the other hand, when a button, corresponding to
 35 one of the other switch contacts 31, 32, 34 to 37, is pressed, the
 corresponding circular conductive pattern 38, provided on the

surface opposite the information input face 2, contacts the corresponding switch contact. Thus, the switch contact becomes electrically conductive temporarily only while the button is being pressed.

5 [0043] As described above, the switch contacts 31 to 37 include those which are electrically conductive in their initial states, and those which are electrically blocked in their initial states. The state of conduction of each switch contact can be switched either by physically breaking the switch contact, or by bringing the
10 switch contact into contact with a different conductive pattern.

[0044] One end of each of the switch contacts 31 to 37 shown in FIG. 5 is connected via the conductive pattern 18 to a corresponding terminal of a terminal section 39 on the first pattern face 30b1, while the other end is connected via the
15 conductive pattern 18 to a ground terminal. The terminal section 39 has the same number of terminals as the total number of the switch contacts and, in addition, has ground terminals at both ends of the terminal section 39. A conductive pattern (hereinafter referred to as ground pattern 18a), extending from
20 the ground terminals, is formed along the periphery of the first to third pattern faces 30b1 to 30b3 such that it surrounds the other conductive pattern and the switch contacts.

[0045] In order to reduce noise, the ground pattern 18a is formed thicker than the other conductive pattern.

25 [0046] The above-described conductive pattern 18 and the ground pattern 18a constitute the conductive circuit 18A. The terminal section 39 is connected to the conductive circuit 18A. The paper substrate 30 and the conductive circuit 18A, formed on the paper substrate 30, constitute the circuit board 70 before
30 bonding to the communication module 10.

[0047] All the switch contacts are thus interposed between and connected to the corresponding terminals and the ground pattern 18a. Therefore, when the state of a switch contact has changed, information on the change is transmitted via the dedicated
35 terminal to the communication module 10. The storage unit 21 in the communication module 10 stores information that identifies

a switch contact whose state has changed, i.e. information that identifies a selection button which has been pressed or a switch contact which has been broken, and temporal information indicating the time of the change in the state of the switch contact.

5 [0048] The switch contacts on the third pattern face 30b3 are grouped into a first switch contact row 34, corresponding to the first button row consisting of the selection buttons arranged along the X-direction, and second switch contact rows 35 to 37, corresponding to the second button rows 7 consisting of the selection buttons arranged in rows approximately parallel to the first button row and in lines along the Y-direction.

10 [0049] One-side ends of the five switch contacts of each of the second switch contact rows 35 to 37 are all connected to a common terminal, while the other ends are connected to the ground terminals. The five switch contacts of each row are connected in parallel. In the example illustrated in FIG. 5, the medicine-taking recording card 1 has three second switch contact rows 35 to 37, each consisting of five parallel-connected switch contacts.

15 [0050] Information on a change in the state of every one of the parallel-connected five switch contacts of each row is transmitted to the communication module 10 via the same terminal. Therefore, the communication module 10 cannot determine which switch contact has changed its state based only on the information. In view of this, this embodiment makes it a rule to change the state of a switch contact in the first switch contact row 34 before changing the state of a switch contact in the second switch contact rows 35 to 37. This makes it possible to identify which switch contact in the second switch contact rows 35 to 37 has changed its state.

20 [0051] More specifically, the state of a switch contact in the first switch contact row 34 is changed, and the X-direction position of the switch contact is detected. Subsequently, the three switch contacts, belonging to the second switch contact rows 35 to 37 and located at the same X-direction position as the switch contact

in the first switch contact row 34, are determined as selection candidates. Next, if any one of the three switch contacts has changed its state, information on the switch contact is transmitted to the communication module 10.

5 [0052] By thus combining information on a change in the state of a switch contact in the first switch contact row 34 with information on a change in the state of a switch contact in the second switch contact rows 35 to 37, the state of a particular switch contact in the second switch contact rows 35 to 37 can be accurately
10 transmitted to the communication module 10.

[0053] The total number of terminals in the terminal section 39 and the number of conductive lines in the conductive pattern 18 can be reduced by connecting a plurality of switch contacts in parallel and connecting their one-side ends to a common terminal.
15 This method is effective especially in cases where there is a limitation on the pattern area. Even when a plurality of switch contacts in the second switch contact rows 35 to 37 are connected in parallel, the state of a particular switch contact in the second switch contact rows 35 to 37 can be accurately determined by
20 combining information on a change in the state of a switch contact in the second switch contact rows 35 to 37 with information on a change in the state of a switch contact in the first switch contact row 34 which is disposed parallel to the second switch contact rows 35 to 37. Therefore, this method will not cause any
25 practical problem.

In addition to the start button 3 and the various selection buttons, the medicine-taking recording card 1 of this embodiment has the cancel button 4 for cancelling the last button operation. The use of the cancel button 4 can prevent misinformation due to
30 incorrect operation of a button from being transmitted to the communication module 10 without cancel information, thereby enhancing the reliability of information transmitted to the communication module 10 and the host computer.

[0054] As described above, the divided substrates 30a, 30b, 30c
35 are folded into one-third at the laterally-extending folding lines 64.

[0055] The lowermost substrate 30b has the conductive circuit 18A consisting of the conductive pattern 18 and the ground pattern 18a. The lowermost substrate 30b also has flexible circuit connectors 80A, 80B, disposed close to the folding lines 64, in order to prevent breakage or damage of the conductive pattern 18A even when the lowermost substrate 30b is folded repeatedly.

[0056] In particular, the lowermost substrate 30b, which is to be folded into one-third at the two laterally-extending folding lines 64, is divided by the two folding lines 64 into a first substrate 91, a second substrate 92 and a third substrate 95. The flexible circuit connector 80A is disposed over the folding line 64 between the first substrate 91 and the second substrate 92, and the flexible circuit connector 80B is disposed over the folding line 64 between the second substrate 92 and the third substrate 95.

[0057] The flexible circuit connectors 80A, 80B have approximately the same structure; therefore, the flexible circuit connector 80A will be described with reference to FIGS. 6A and 6B.

[0058] As shown in FIGS. 6A and 6B, that portion of the conductive circuit 18A which lies on the first substrate 91 is a first conductive circuit 93, and that portion of the conductive circuit 18A which lies on the second substrate 92 is a second conductive circuit 94.

[0059] The flexible circuit connector 80A is to be disposed over the folding line 64 between the first substrate 91 and the second substrate 92, which are connected at the folding line 64, of the lowermost substrate 30b, and to connect the first conductive circuit 93 on the first substrate 91 and the second conductive circuit 94 on the second substrate 92. The first conductive circuit 93 on the first substrate 91 and the second conductive circuit 94 on the second substrate 92 are separated from each other, and become electrically connected to each other by the provision of the flexible circuit connector 80A. However, the first conductive circuit 93 on the first substrate 91 and the second conductive circuit 94 on the second substrate 92 may be connected to each other from the first even without the flexible circuit connector 80A.

In this case, the flexible circuit connector 80A functions as a backup circuit in the event of disconnection between the first conductive circuit 93 and the second conductive circuit 94.

[0060] The flexible circuit connector 80A will now be described further.

[0061] As shown in FIGS. 5, 6A and 6B, the flexible circuit connector 80A includes an insulating substrate 81, a one-side terminal section 83 provided on one side of the insulating substrate 81, an other-side terminal section 84 provided on the other side of the insulating substrate 81, and a plurality of conductive portions (conductive ink) 82 connecting the one-side terminal section 83 and the other-side terminal section 84.

[0062] The conductive portions 82 extend linearly from the one-side terminal section 83 to the other-side terminal section 84.

[0063] An anisotropic conductive adhesive 87, which exhibits anisotropic conductivity upon heat sealing, has been applied to the one-side terminal section 83 and the other-side terminal section 84.

[0064] The one-side terminal section 83 is a terminal section to be connected to the first conductive circuit 93 on the first substrate 91, while the other-side terminal section 84 is a terminal section to be connected to the second conductive circuit 94 on the second substrate 92.

[0065] An insulating layer 88 of an acrylic resin, which covers the conductive portions 82 while exposing the one-side terminal section 83 and the anisotropic conductive adhesive 87 thereon, and also exposing the other-side terminal section 84 and the anisotropic conductive adhesive 87 thereon, is provided on the insulating substrate 81.

[0066] There is no particular limitation on the material of the insulating layer 88. For example, a vinyl material or a rubber material can be used. Alternatively, as shown in FIG. 7A, an anisotropic conductive adhesive 87 may be used for the insulating layer 88 of the flexible circuit connector 80A.

[0067] Referring to FIG. 7A, by printing the same anisotropic

conductive adhesive on the conductive portions 82, an anisotropic conductivity pre-exhibition portions 87a, made of the anisotropic conductive adhesive and which are to exhibit anisotropic conductivity, and the insulating layer 88 made of the anisotropic conductive adhesive and which is not to exhibit anisotropic conductivity, can be formed simultaneously. Thus, the production efficiency can be increased.

[0068] As shown in FIG. 7B, when heat-sealing the flexible circuit connector 80A to the first conductive circuit 93 or the second conductive circuit 94, the anisotropic conductivity pre-exhibition portions 87a made of the anisotropic conductive adhesive are heat-sealed and change into anisotropic conductivity-exhibiting portions 87b which exhibit anisotropic conductivity. Referring to FIG. 7B, the insulating layer 88, which is made of the anisotropic conductive adhesive, does not exhibit anisotropic conductivity.

[0069] The insulating substrate 81 of the flexible circuit connector 80A is a flexible substrate, for example, a polyethylene terephthalate or polybutylene terephthalate substrate. The one-side terminal section 83 and the other-side terminal section 84 of the flexible circuit connector 80A are directed downward, and the one-side terminal section 83 is connected to the first conductive circuit 93 of the first substrate 91, and the other-side terminal section 84 is connected to the second conductive circuit 94 of the second substrate 92. The flexible circuit connector 80A thus connects the first conductive circuit 93 and the second conductive circuit 94 (see FIGS. 6A and 6B).

[0070] The flexible circuit connector 80A, disposed over the folding line 64 between the first substrate 91 and the second substrate 92 of the lowermost substrate 30b, and connecting the first conductive circuit 93 and the second conductive circuit 94, will not be broken even when the lowermost substrate 30b is folded and unfolded at the folding line 64 repeatedly. Therefore, no breakage or damage of the conductive circuit 18A occurs between the first conductive circuit 93 of the first substrate 91 and the second conductive circuit 94 of the second substrate 92. This makes it possible to achieve continuous and stable electrical

conduction between the first conductive circuit 93 and the second conductive circuit 94.

[0071] How to use the flexible circuit connector will now be described with reference to FIGS. 6A and 6B.

5 [0072] First, the above-described flexible circuit connector 80A is prepared. Next, the one-side terminal section 83 of the flexible circuit connector 80A is connected to the first conductive circuit 93 of the first substrate 91. In particular, the flexible circuit connector 80A, with the one-side terminal section 83 and the
10 other-side terminal section 84 facing downward, is superimposed on the first conductive circuit 93, and the one-side terminal section 83 of the flexible circuit connector 80A is thermally compression-bonded (heat-sealed) from above. The anisotropic conductive adhesive 87 on the one-side terminal section 83
15 exhibits anisotropic conductivity by the heat sealing, and connects the one-side terminal section 83 and the first conductive circuit 93.

[0073] Similarly, the other-side terminal section 84 of the flexible circuit connector 80A is connected to the second conductive
20 circuit 94 of the second substrate 92.

[0074] As described hereinabove, according to this embodiment, the flexible circuit connector 80A will not be broken even when the lowermost substrate 30b is folded and unfolded at the folding line 64 repeatedly. Therefore, no breakage or damage of the
25 conductive circuit 18A occurs between the first conductive circuit 93 of the first substrate 91 and the second conductive circuit 94 of the second substrate 92. This ensures stable electrical conduction between the first conductive circuit 93 and the second conductive circuit 94.

30 [0075] <Variation according to the Invention>

A variation according to the present invention will now be described with reference to FIGS. 8 through 11. As shown in FIGS. 8 through 11, a first substrate 91 and a second substrate 92 are connected at a folding line 64, and a flexible circuit connector
35 80A, which connects a first conductive circuit 93 on the first substrate 91 and a second conductive circuit 94 on the second

substrate 92, is disposed over the folding line 64 between the first substrate 91 and the second substrate 92.

[0076] In this embodiment, the first conductive circuit 93 and the second conductive circuit 94 have terminals 93a and terminals 94a, respectively. The terminals 93a of the first conductive circuit 93 and the terminals 94a of the second conductive circuit 94 are separated from each other. The flexible circuit connector 80A includes an insulating substrate 81, and conductive portions 82 provided on the insulating substrate 81 and having a one-side terminal section 83 and an other-side terminal section 84. The one-side terminal section 83 is connected to the terminals 93a of the first conductive circuit 93, while the other-side terminal section 84 is connected to the terminals 94a of the second conductive circuit 94.

[0077] An anisotropic conductive adhesive 87 has been applied to the terminals 93a of the first conductive circuit 93 and the terminals 94a of the second conductive circuit 94 (see FIG. 10). However, the anisotropic conductive adhesive 87 may have been applied to the one-side terminal section 83 and the other-side terminal section 84 (see FIG. 11). It is also possible to apply the anisotropic conductive adhesive 87 to the terminals 93a of the first conductive circuit 93 and the terminals 94a of the second conductive circuit 94, and also to the flexible circuit connector 80A.

[0078] Alternatively, the terminals 93a of the first conductive circuit 93 on the first substrate 91 and the terminals 94a of the second conductive circuit 94 on the second substrate 92 may have been connected by connecting lines 96, and the flexible circuit connector 80A, disposed over the folding line 64 between the first substrate 91 and the second substrate 92, may be provided to connect the terminals 93a of the first conductive circuit 93 and the terminals 94a of the second conductive circuit 94 (see FIG. 12).

[0079] In this case, the flexible circuit connector 80A functions as a backup circuit in the event of breakage of the connecting lines 96 connecting the first conductive circuit 93 and the second conductive circuit 94.

[0080] Alternatively, as shown in FIG. 13, a first substrate 91, a second substrate 92 and a third substrate 95 are connected at folding lines 64. A first conductive circuit 93 having terminals 93a is provided on the first substrate 91, a second conductive circuit 94 having terminals 94a is provided on the second substrate 92, and a third conductive circuit 97 having terminals 97a is provided on the third substrate 95.

[0081] A flexible circuit connector 80A is disposed over the folding line 64 between the first substrate 91 and the second substrate 92, and a flexible circuit connector 80B is disposed over the folding line 64 between the second substrate 92 and the third substrate 95. The flexible circuit connector 80A connects the terminals 93a of the first conductive circuit 93 and the terminals 94a of the second conductive circuit 94, and the flexible circuit connector 80B connects the terminals 94a of the second conductive circuit 94 and the terminals 97a of the third conductive circuit 97.

[0082] Alternatively, as shown in FIG. 14, a first substrate 91, a second substrate 92 and a third substrate 95 are connected at folding lines 64, and a fourth substrate 98 is connected to the second substrate 92 at a folding line 64. A flexible circuit connector 80A, disposed over the folding line 64 between the first substrate 91 and the second substrate 92, may be provided to connect the terminals 93a of a first conductive circuit 93 on the first substrate 91 and the terminals 94a of a second conductive circuit 94 on the second substrate 92. Further, a flexible circuit connector 80B, disposed over the folding line 64 between the second substrate 92 and the fourth substrate 98, may be provided to connect the terminals 94a of the second conductive circuit 94 on the second substrate 92 and the terminals 99a of a fourth conductive circuit 99 on the fourth substrate 98.

[0083] Referring to FIG. 14, a protective substrate 98A for protecting the fourth substrate 98 is connected to the fourth substrate 98 at a folding line 64, and a protective substrate 91A for protecting the first substrate 91 is connected to the first substrate 91 at a folding line 64.

[0084] Alternatively, as shown in FIG. 15, a first substrate 91, a

second substrate 92, a third substrate 95 and a fourth substrate 98 are connected successively in a line at folding lines 64. A flexible circuit connector 80A, disposed over the folding line 64 between the first substrate 91 and the second substrate 92, may be provided to connect the terminals 93a of a first conductive circuit 93 on the first substrate 91 and the terminals 94a of a second conductive circuit 94 on the second substrate 92. Similarly, two flexible circuit connectors 80B, respectively disposed over the folding line 64 between the second substrate 92 and the third substrate 95 and over the folding line 64 between the third substrate 95 the fourth substrate 98, may be provided.

Examples

[0085] <Example 1>

Examples of the present invention will now be described with reference to FIGS. 16 through 22.

[0086] First, as shown in FIG. 16, a paper substrate 30 which serves as a base of a medicine-taking recording card 1 was prepared. The paper substrate 30 of FIG. 16 is trisected by longitudinally-extending folds 61 into divided substrates 30a, 30b, 30c. The divided substrates 30a, 30b, 30c are provided with a conductive pattern 18, cutouts, etc. which differ among the substrates 30a, 30b, 30c. The three divided substrates 30a, 30b, 30c are foldable at the folds 61, and are not to be physically separated from each other. Further, the divided substrates 30b, 30c each have folding lines 64, and the divided substrates 30b, 30c are folded into one-half at the laterally-extending folding lines 64.

[0087] The middle divided substrate 30b of FIG. 16 is a lowermost substrate 30b which is to be disposed as a lowermost part and on which a conductive circuit 18A is formed. The right-hand divided substrate 30c is an intermediate substrate 30c which mainly has cutouts 62 and perforations 63 and which is to be disposed on the lowermost substrate 30b. The left-hand divided substrate 30a is a topmost substrate 30a which is to be disposed on the intermediate substrate 30c.

[0088] The paper substrate 30 is a mount-like substrate having a

PE coating. The conductive circuit 18A consisting of the conductive pattern 18 and the ground pattern 18a, shown in FIG. 16, was formed with a carbon ink on the lowermost substrate 30b. [0089] Further, switch contacts 33, which are to be physically
 5 broken to block their electrical conduction, were mounted on the lowermost substrate 30b.

[0090] The design of the conductive ink on the mount is as follows. The width of the surrounding ground pattern 18a is 2 mm, while the width of the conductive pattern 18 is 1mm except that those
 10 portions which bridge the two folding lines 64 are designed to have a width of 2 mm. The distance between the two folding lines 64 is designed to be 10 mm in consideration of the thickness of the tablet 5.

[0091] Next, an anisotropic conductive adhesive 87 was applied
 15 to a terminal section 39 for a communication module, and to the terminals 93a of the first conductive circuit 93 on the first substrate 91 and the terminals 94a of the second conductive circuit 94 on the second substrate 92 (see FIG. 17). The width of the anisotropic conductive adhesive 87 on the terminal section 39
 20 was 5 mm, and the area of the anisotropic conductive adhesive 87 on each terminal 93a, 94a was 5 mm x 5 mm. The lines of the conductive circuit 18A, lying between the terminals 93a and the terminals 94a, each had dimensions of 2 mm x 16 mm.

[0092] Next, a flexible circuit connector 80A was produced as
 25 shown in FIG. 18.

[0093] Conductive portions 82 were formed with a silver ink on a PET film (insulating substrate) 81 in conformity with the circuit pattern on the mount. The width of each conductive portion 82 was 2 mm.

30 [0094] An insulating layer 88 for the purpose of protection was formed on those portions of the conductive portions 82 other than the one-side terminal section 83 and the other-side terminal section 84.

[0095] Next, the terminals 93a of the first conductive circuit 93 on
 35 the first substrate 91 and the terminals 94a of the second conductive circuit 94 on the second substrate 92 were connected

by heat sealing to the one-side terminal section 83 and the other-side terminal section 84, respectively, of the flexible circuit connector 80A.

[0096] Next, a communication module 10 and the terminal
5 section 39 of the second substrate 92 were connected by heat sealing with the anisotropic conductive adhesive 87.

[0097] Next, the entire conductive circuit 18A was covered with the topmost substrate 30a, thereby completing the production of the information recording apparatus 1.

10 [0098] <Example 2>

A circuit as shown in FIG. 19 was formed with a carbon ink on a lowermost substrate 30b of a paper substrate 30 made of base paper for liquid, and switch contacts 34, which become
15 electrically conductive upon pressing of corresponding buttons, were mounted in the circuit to form a conductive circuit 18A. An information recording apparatus 1, which records information on pressing of the buttons, was produced in the following manner.

[0099] The paper substrate 30 has two pairs of folding lines 64. The distance between the two lines 64 of each pair is 5 mm.

20 [0100] FIG. 19 is a development view of the paper substrate 30 which serves as a base of the medicine-taking recording card 1. As shown in FIG. 19, the paper substrate 30 is trisected by longitudinally-extending folds 61 into divided substrates 30a, 30b, 30c. The divided substrates 30a, 30b, 30c are provided with a
25 conductive circuit 18A, consisting of a conductive pattern 18 and a ground pattern 18a, cutouts, etc. which differ among the substrates 30a, 30b, 30c. The three divided substrates 30a, 30b, 30c are foldable at the folds 61, and are not to be physically separated from each other. Further, the divided substrates 30b,
30 30c each have the two pairs of folding lines 64, and the divided substrates 30b, 30c are folded into one-third at the two pairs of laterally-extending folding lines 64.

[0101] The middle divided substrate 30b of FIG. 19 is a lowermost substrate 30b which is to be disposed as a lowermost part and on
35 which the conductive circuit 18A is formed. The right-hand divided substrate 30c is an intermediate substrate 30c which

mainly has cutouts 62 and which is to be disposed on the lowermost substrate 30b. The left-hand divided substrate 30a is a topmost substrate 30a which is to be disposed on the intermediate substrate 30c.

5 [0102] The design of the conductive ink on the mount is as follows. The width of the surrounding ground pattern 18a is 2 mm, while the width of the conductive pattern 18 is 1mm. The terminals 93a of the first conductive circuit 93 and the terminals 94a of the second conductive circuit 94 each have a 2-mm x 4-mm
10 rectangular shape.

[0103] Next, flexible circuit connectors 80A, 80B were each produced as shown in FIG. 20.

[0104] Conductive portions 82 were formed with a silver ink on a PET film (insulating substrate) 81 in conformity with the circuit
15 pattern on the mount. The width of each conductive portion 82 was 2 mm.

[0105] An anisotropic conductive adhesive 87 was applied to the one-side terminal section 83 and the other-side terminal section 84 of the conductive portions 82, while an insulating layer 88 was
20 applied to the other portions of the conductive portions 82.

[0106] The flexible circuit connectors 80A, 80B, which have the same construction, were placed over the two pairs of folding lines 64 of the lowermost substrate 30b.

[0107] Next, the terminals 93a of the first conductive circuit 93 on
25 the first substrate 91 and the terminals 94a of the second conductive circuit 94 on the second substrate 92 were connected by heat sealing to the one-side terminal section 83 and the other-side terminal section 84, respectively, of the flexible circuit connector 80A. Similarly, the terminals 94a of the second
30 conductive circuit 94 on the second substrate 92 and the terminals 97a of the third conductive circuit 97 on the third substrate 95 were connected by heat sealing to the one-side terminal section 83 and the other-side terminal section 84, respectively, of the flexible circuit connector 80B.

35 [0108] Next, a communication module 10 and the terminal section 39 of the third substrate 95 were connected with an

anisotropic conductive adhesive.

[0109] The flexible circuit connectors 80A, 80B each comprise the conductive portions 82 of the silver ink, the anisotropic conductive adhesive 87 and the insulating layer 88.

5 [0110] Next, the entire conductive circuit 18A was covered with the topmost substrate 30a and the topmost substrate 30a was bonded to the intermediate substrate, thereby completing the production of the information recording apparatus 1.

[0111] <Example 3>

10 An information recording apparatus 1 was produced in the same manner as in Example 2 except that paperboard was used as the paper substrate 30, and that the anisotropic conductive adhesive 87 was applied to the terminals 93a of the first substrate 91, the terminals 94a of the second substrate 92, and the
15 terminals 97a of the third substrate 95.

[0112] <Comparative Example 1>

An information recording apparatus 1 was produced in the same manner as in Example 1 except that the flexible circuit connector 80A was not provided at the folding lines 64.

20 [0113] <Comparative Example 2>

An information recording apparatus 1 was produced in the same manner as in Example 2 except that the flexible circuit connectors 80A, 80B were not provided at the folding lines 64, and that the conductive circuit 18A was formed such that it
25 extends across the folding lines 64 and connects the opposing terminals.

[0114] <Comparative Example 3>

An information recording apparatus 1 was produced in the same manner as in Example 3 except that the flexible circuit
30 connectors 80A, 80B were not provided at the folding lines 64, and that the conductive circuit 18A was formed such that it extends across the folding lines 64 and connects the opposing terminals.

[0115] <Evaluation>

35 A fold test was conducted on the information recording apparatuses 1 obtained in Examples 1 to 3 and Comparative

Examples 1 to 3, and the information recording apparatuses 1 were checked for the occurrence of disconnection.

[0116] (Checking Method)

(Example 1 and Comp. Example 1)

5 Each information recording apparatus 1 was double-folded at the folding lines 64 (FIG. 21).

The communication module 10 was activated, and the information recording apparatus 1 was subjected to a fold test.

10 After completion of the fold test, the results were retrieved by a PC to check the occurrence of disconnection.

The occurrence of disconnection even in a single line was evaluated as "NG".

[0117] (Examples 2, 3 and Comp. Examples 2, 3)

15 Each information recording apparatus 1 was triple-folded at the folding lines 64 (FIG. 22).

20 The communication module 10 was activated, and the information recording apparatus 1, which had been set to sound when any button was pressed and the corresponding switch contact became electrically conductive, was subjected to a fold test.

The fold test was conducted by folding at both of the two pairs of folding lines 64.

25 After completion of the fold test, the buttons of the information recording apparatus 1 were pressed. Sounding upon pressing of every button was evaluated as "OK", whereas non-sounding upon pressing of a button(s) was evaluated as "NG". The results were retrieved by the PC to check the occurrence of disconnection.

[0118] (Folding Condition)

30 Condition 1: folding an information recording apparatus 1 in one direction into the shape of the letter "U" 100 times

Condition 2: further folding the information recording apparatus 1 100 times in the one direction

35 Condition 3: further folding the information recording apparatus 1 in the opposite direction into the shape of the letter "U" 10 times

Condition 4: further folding the information recording apparatus 1 in the opposite direction into the shape of the letter "U" 10 times

[0119] The above test was conducted on three samples of each information recording apparatus 1. The test was terminated when an "NG" evaluation was made.

[0120] The test results are shown in Table 1 below.

Table 1

10 Results

	Condition 1	Condition 2	Condition 3	Condition 4
Example 1	OOO	OOO	OOO	OOO
Example 2	OOO	OOO	OOO	OOO
Example 3	OOO	OOO	OOO	OOO
Comp. Ex. 1	OOO	OOO	XXX	
Comp. Ex. 2	OOO	OOO	XXX	
Comp. Ex. 3	OOX	XX		

In Table 1, O indicates no occurrence of disconnection, X indicates the occurrence of disconnection.

[0121] The evaluation data in Table 1 indicates that the information recording apparatuses of Examples 1 to 3 cleared all the test conditions.

[0122] While the information recording apparatuses of Comparative Examples 1 and 2 cleared the test conditions on the one-direction folding, they were vulnerable to the opposite-direction folding.

[0123] One sample of the information recording apparatus of Comparative Example 3 was evaluated as "NG" after the first 100-time folding step.

[0124] The test results thus demonstrate that the use of the flexible circuit connector increases the folding endurance.

DESCRIPTION OF THE SYMBOLS

[0125] 1 medicine-taking recording card

- 2 information input face
- 3 start button
- 4 cancel button
- 5 medicine (tablet)
- 5 6 (6a to 6e) selection buttons
- 7 (7a to 7c) selection buttons
- 10 communication module
- 11 resin substrate
- 12 ASIC
- 10 13 crystal oscillator
- 14 button cell
- 15 speaker
- 16 pads
- 17a antenna pattern
- 15 18 conductive pattern
- 18A conductive circuit
- 18a ground pattern
- 30 paper substrate
- 30a, 30b, 30c divided substrates
- 20 30b1 first pattern face
- 30b2 second pattern face
- 30b3 third pattern face
- 31 to 37 switch contacts
- 39 terminal section
- 25 40 pain recording card
- 41 start button
- 42 selection button
- 43 medicine-taking recording button
- 44 stop button
- 30 45 selection button
- 46 start button
- 47 selection button
- 51 to 57 switch contacts
- 61 fold
- 35 62 hole (cutout)
- 63 perforation

- 64 folding line
- 70 circuit board
- 80 flexible circuit connector
- 81 insulating substrate
- 5 82 conductive portion
- 83 one-side terminal section
- 84 other-side terminal section
- 87 anisotropic conductive adhesive
- 88 insulating layer
- 10 90 circuit connector
- 91 first substrate
- 92 second substrate
- 93 first conductive circuit
- 93a terminal
- 15 95 third substrate
- 97 third conductive circuit

CLAIMS

1. A flexible circuit connector to be disposed over a folding line between a first substrate having a first conductive circuit and a second substrate having a second conductive circuit, which are connected at the folding line, and to connect the first conductive circuit and the second conductive circuit, said connector comprising:

an insulating substrate;

a one-side terminal section provided on one side of the insulating substrate and to be connected to the first conductive circuit;

an other-side terminal section provided on the other side of the insulating substrate and to be connected to the second conductive circuit; and

a conductive portion connecting the one-side terminal section and the other-side terminal section.

2. The flexible circuit connector according to claim 1, wherein the insulating substrate comprises polyethylene terephthalate or polybutylene terephthalate.

3. The flexible circuit connector according to claim 1 or 2, wherein an anisotropic conductive adhesive has been applied to the one-side terminal section and the other-side terminal section.

4. The flexible circuit connector according to any one of claims 1 to 3, wherein the conductive portion on the insulating substrate is covered with an insulating layer.

5. A circuit apparatus comprising:

a circuit board including a first substrate having a first conductive circuit and a second substrate having a second conductive circuit, which are connected at a folding line;

a communication module connected to the first conductive circuit or the second conductive circuit; and

a flexible circuit connector disposed over the folding line between the first substrate and the second substrate, and connecting the first conductive circuit and the second conductive circuit, wherein the flexible circuit connector includes: an insulating substrate; a one-side terminal section provided on one side of the insulating substrate and connected to the first conductive circuit; an other-side terminal section provided on the other side of the insulating substrate and connected to the second conductive circuit; and a conductive portion connecting the one-side terminal section and the other-side terminal section.

6. The circuit apparatus according to claim 5, wherein an anisotropic conductive adhesive has been applied to the one-side terminal section and the other-side terminal section, or to the first conductive circuit and the second conductive circuit.

7. An information recording apparatus comprising:

a circuit board including a first substrate having a first conductive circuit and a second substrate having a second conductive circuit, which are connected at a folding line;

a communication module connected to the first conductive circuit or the second conductive circuit; and

a flexible circuit connector disposed over the folding line between the first substrate and the second substrate, and connecting the first conductive circuit and the second conductive circuit, wherein the first conductive circuit or the second conductive circuit is configured to be partly breakable, wherein the communication module includes an IC chip and a button cell for supplying a source voltage to the IC chip, wherein the IC chip includes a storage unit for storing information on a site where the first conductive circuit or the second conductive circuit has broken and the time of the breakage in chronological order, a control unit for controlling the storage unit, and a wireless communication unit for performing close range wireless communication between the wireless communication unit and an external host device, and wherein the flexible circuit connector includes: an insulating

substrate; a one-side terminal section provided on one side of the insulating substrate and connected to the first conductive circuit; an other-side terminal section provided on the other side of the insulating substrate and connected to the second conductive circuit; and a conductive portion connecting the one-side terminal section and the other-side terminal section.

8. The information recording apparatus according to claim 7, wherein an anisotropic conductive adhesive has been applied to the one-side terminal section and the other-side terminal section, or to the first conductive circuit and the second conductive circuit.

9. An information recording apparatus comprising:

- a circuit board including a first substrate having a first conductive circuit and a second substrate having a second conductive circuit, which are connected at a folding line;

- a communication module connected to the first conductive circuit or the second conductive circuit; and

- a flexible circuit connector disposed over the folding line between the first substrate and the second substrate, and connecting the first conductive circuit and the second conductive circuit, wherein the first conductive circuit or the second conductive circuit is configured to be pressable, wherein the communication module includes an IC chip and a button cell for supplying a source voltage to the IC chip, wherein the IC chip includes a storage unit for storing information which identifies a section button pressed on the first conductive circuit or the second conductive circuit and the time of the pressing in chronological order, a control unit for controlling the storage unit, and a wireless communication unit for performing close range wireless communication between the wireless communication unit and an external host device, and wherein the flexible circuit connector includes: an insulating substrate; a one-side terminal section provided on one side of the insulating substrate and connected to the first conductive circuit; an other-side terminal section provided on the other side of the insulating substrate and

connected to the second conductive circuit; and a conductive portion connecting the one-side terminal section and the other-side terminal section.

10. The information recording apparatus according to claim 9, wherein an anisotropic conductive adhesive has been applied to the one-side terminal section and the other-side terminal section, or to the first conductive circuit and the second conductive circuit.

11. An information recording apparatus comprising:

- a circuit board including a first substrate having a first conductive circuit and a second substrate having a second conductive circuit, which are connected at a folding line;

- a communication module connected to the first conductive circuit or the second conductive circuit; and

- a flexible circuit connector disposed over the folding line between the first substrate and the second substrate, and connecting the first conductive circuit and the second conductive circuit, wherein the first conductive circuit or the second conductive circuit is configured to be partly breakable, and is provided with pressable selection buttons, wherein the communication module includes an IC chip and a button cell for supplying a source voltage to the IC chip, wherein the IC chip includes a storage unit for storing information on a site where the first conductive circuit or the second conductive circuit has broken and the time of the breakage in chronological order, and for storing information which identifies a selection button pressed on the first conductive circuit or the second conductive circuit and the time of the pressing in chronological order, a control unit for controlling the storage unit, and a wireless communication unit for performing close range wireless communication between the wireless communication unit and an external host device, and wherein the flexible circuit connector includes: an insulating substrate; a one-side terminal section provided on one side of the insulating substrate and connected to the first conductive circuit; an other-side terminal section provided on the other side of the

insulating substrate and connected to the second conductive circuit; and a conductive portion connecting the one-side terminal section and the other-side terminal section.

12. The information recording apparatus according to claim 11, wherein an anisotropic conductive adhesive has been applied to the one-side terminal section and the other-side terminal section, or to the first conductive circuit and the second conductive circuit.